

Innovative applied experiments to develop relief printmaking laboratories, its impact on the quality of printed copies and the methods of expressions

Dr. Sherief Mohamed Hosny Shokry Sadek Bakr

Printed Designs Department- Faculty of Fine Arts- Alexandria University

Sherief.Mohamed@alexu.edu.eg

ABSTRACT

This research studies the development of printmaking tools historically, and the extent of developing the main prinmaking laboratory techniques and supplies, in addition to following the development of printmaking tools historically and their importance technically. The study stresses the researcher's interest in vertical pressing of relief printmaking. There is no doubt that relief printmaking has its own characteristic aesthetic values including the associated graphic state with the copied prints that results from the impressions of printmaking pressing after pressing the blocks upon the paper on using the heavy printmaking tools of vertical or horizontal presses, according to the features of each method, in addition to the possibility of pressing the high-density cotton paper leading to outstanding graphic and visual effects. In addition, these tools can reduce the efforts of artists and fine arts students by replacing the procedures of rubbing by mechanic or hydraulic simple means that save time and effort while encouraging to print larger sizes of special printmaking paper and accelerating the dryness of printmaking ink by using specialized machines. However, most of these tools and machines are not available inside the labs of printmaking of the Egyptian universities, or being broken and requires maintenance and development, so that the researcher endeavored to create real technical solutions and more effective printmaking tools by reviewing the historical and technical development of printmaking equipment to reach the best aims and results of attempting to develop and execute some important laboratory printmaking tools, which indicate the success of artistic experiment, fixing the copied prints during the printing process and controlling the printmaking inks, dryness speed, presssure strengnth, type of paper, its density and thickness and the special graphic artistic impressions such as movement, reptetive and transperancy, which result from using perfect printmaking equipment. These tools, which created by the researcher, are found inside the laboratories of Egyptian universities. Besides, the research compares between many printed works, which executed by using these tools to study their effectiveness and importance in achieving the results that were positive and promising, technically and experimentally, These works were exhibited in the 2nd international Gulf Symposium, Bahrain, February 2024.

KEYWORDS

Relife printmaking; Quality of printed copies; Experessional methods.

الملخص

يناقش البحث تطور معدات الطباعة البارزة تاريخياً ومدى تطور التقنيات الطباعية والتجهيزات المعملية الرئيسية للطباعة البارزة، كما يناقش البحث دراسة تحليلية لعدة تجارب تطبيقية لمعدات معملية خاصة بالطباعة الفنية البارزة وتتبع

تطور آلات الطباعة الفنية تاريخياً وأهميتها من الناحية التقنية، وتشمل تلك الدراسة اهتمام الباحث بطرق الكبس الرأسي للقوالب الطباعية البارزة، ولا شك أن للطباعة الفنية البارزة لها جمالياتها الخاصة بها التي تميزها وعلى رأسها الحالة الجرافيكية المصاحبة للنسخ الطباعية التي ينتج عنها آثار الضغط الطباعي نتيجة ضغط القوالب على الورق نتيجة استخدام المعدات الطباعية الثقيلة وذات الكبس الرأسي أو الأفقي ومميزات كل منها وإمكانية ضغط الأوراق الفنية ذات الكثافة العالية مما ينتج عنها حالة جرافيكية وتأثيرات بصرية لا يضاهيها أو يشبهها أي شيء آخر، بل وإمكانية تيسير المجهود الذي يشق علي الفنان وطلاب الفنون الجميلة وإستبدال إجراءات الدك والضغط اليدوي بأساليب ميكانيكية أو هيدروليكية بسيطة توفر الجهد والوقت بل وتشجع علي طباعة مساحات كبيرة علي أوراق طباعية مميزة وتعمل من سرعة جفاف الحبر نتيجة الضغط الطباعي المتميز بآلات طباعية متخصصة، ولكن أغلب تلك المعدات والآلات غير متوفرة في معامل الطباعة الفنية بالجامعات المصرية أو أن بعضها متهالك ويحتاج للصيانة والتطوير وما جعل الباحث يسعى خلف إيجاد حلول تقنية ومعدات طباعية أكثر كفاءة، لذا فقد تتبع الباحث من خلال هذه الصفحات تطور المعدات الطباعية تاريخياً وتقنياً للتوصل لأهداف ونتائج من محاولات لتطوير وتنفيذ مجموعة من المعدات الطباعية العملية الهامة والتي تضمن نجاح التجربة الطباعية وعدم تحريك النسخ الطباعية أثناء طباعتها أو اهتزازها والتحكم في طبقات الحبر الطباعي وسرعة جفافه وقوة الضغط ونوع الورق وكثافته وثخائنه والتأثيرات الفنية الجرافيكية المميزة كالتحريك والتكرار والشفافية والنتائج عن استخدام معدات طباعية مثالية، وتلك المعدات التي قام بتنفيذها الباحث موجودة الآن بالفعل داخل معامل الجامعات المصرية، بمعمل الطباعة الفنية بالإسكندرية ومن خلال ما قام به الباحث من تطوير للمعدات الطباعية بالفاعلية التعليمية، وما قام بتصميمه وتنفيذه لمعدات الطباعة الفنية بالجامعة المصرية الروسية وأخري بجمعية الفن المعاصر بمملكة البحرين، ولقد تم عرض بعض التجارب الطباعية التي كانت نتاج هذه المعدات بسمبوزيوم ملتقي الخليج الدولي الثاني بمملكة البحرين فبراير ٢٠٢٤.

الكلمات المفتاحية

الطباعة البارزة؛ جودة النسخ؛ أساليب التعبير

1. INTRODUCTION

Artistic relief printing is a printmaking graphic artwork of high value artistically, and the main focus of many graphic artists with particular artistic characteristics. On the other hand, its practice requires a series of main steps, beginning with detecting and selecting the proper paper that match the used printing press in order to transfer the printmaking ink from the surface of the relief printing block, whether by the pressing process that is used in the usual manual rubbing method or by using the manual and mechanic tools, for both ink including or excluding printing methods.

Indeed, the relief printing has its own aesthetical features including, at the first place, the related graphic state of the printed copies that carry impressions of the pressing printmaking process, as when a block presses the paper, these prominent traces could be left around the engraved and stepped areas, which did not catch the printmaking ink during the inking process of the relief printing surface.

The relief printed copies through engraving the relief printmaking blocks are remarkable for using some techniques, such as the "Wood Cut", "Wood Engraving" and "Lino Cut" techniques, which reflect distinctive beauty owing to the manual engraving techniques that imply the spontaneous performance, improvisation, cuts and the direct manual engraving, in addition to

the metal engraved block, or "Metal Cut" technique, and also the constructional blocks, or the "Collagraph".

In general, all used techniques in preparing the printmaking blocks, whether classic, modern, hard, flexible, plastic, metal or wooden, could be used for relief printing. In fact, the most helpful tools for the artist, to achieve his expectations, is the pressing printmaking machine and the printmaking pressing, especially on using the thicker paper and cotton fabric. Therefore, the researcher desired to implement a set of experimental applications (printing machines and printing assist tools), which were designed and made by the researcher himself, in order to meet the desires of artists in facilitating the procedures of printmaking. The researcher followed a research methodology to review the world and historic technical development of these machines, so that the researcher was concerned about some goals, while designing his tools, in producing tools and machines capable of fixing the printed copies into their printing position, while keeping their movement to get different artistic impressions, and also to create machines able to produce proper printing pressure to transfer the printmaking ink to the printing paper, with multiple thicknesses, easily and comfortably.

1.1 Research problem

The researcher aims to reach clear solutions for promoting the performance of relief printmaking labs, especially by developing and updating the relief printing laboratory tools and machines, in addition to creating technical, practical, quick and simple solutions for their continuous development, in accordance with the ongoing developments of practical and laboratory training programs, especially to meet the lack of our universities to the needed materials and the high cost of imported machines, equipment and tools. So that, the research discusses a group of machines that developed and implemented by himself to solve the previously mentioned problems of Egyptian universities, and to achieve the desired results. The problem of research could be summarized in the following questions:

- Do the Egyptian universities possess already specialized machines for relief printing to facilitate the procedures of vertical pressing?
- Are the tools and applications that executed by the researcher able to fill that gap in the Egyptian universities in order to save time and efforts, instead of the manual rubbing by spoons and the manual pressing tools, beside reducing the hard efforts of students to execute the relief printing upon thick cotton paper and large sizes?
- Is it possible to implement innovative tools to fix the print copies into the printing positions, and to control their movements in order to get the special printing impressions?
- How to execute innovative work of art through the self and national development to the assistant laboratory tools and equipment?

2.1 Research objectives

This research aims to study the development of relief printmaking equipment and labs throughout history, and the world technical development, in order to develop the relief printmaking labs inside the Egyptian universities, in addition to developing and creating relief printmaking tools, the different techniques and the assistant laboratories tools.

3.1 Importance of research

Developing creative and distinctive tools relevant to the ongoing technical advancement, and to achieve the highest standards of laboratory and practical training for the academic levels of Egyptian universities.

4.1 Methodology of research

The researcher followed a descriptive and analytical methodology in reviewing and describing the previous historic experiments, and an experimental method to produce models, laboratory equipment and assistant tools, and also to execute the art works by using the equipment and applications that implemented and developed by the researcher.

5.1 Previous studies

Some of previous publications addressed the methods of processing the printmaking techniques for the art works that used the relief printing, however they were indirect in studying how to develop the laboratory equipment and their applications. These studies include:

- Alaa Hany Ahmed Abdou, the effect of using the new engraving methods and the manufactured different materials on the expressional aspect of artist print, A master thesis, Alexandria, 2017.
- Tamer Asem Ali, the contemporary British art of engraving, A master thesis, Helwan, 2022.
- Dalia Salem Mohammed Abd-Elatif, the expressional value of color through the new means, A master Thesis, Helwan, 2022.
- Mohamed Abd El-Al Abd El-Salam, the impact of heritage and advanced techniques on the expressional approach of printmaking, A doctorate thesis, Alexandrian 1989.
- Yasmin Mahmoud Hamdy Zaki, the role of direct expression on surfaces in enriching the printmaking, A doctorate thesis, Alexandria, 2009.

2. Historical background

In eastern world, especially China, many identified printing practices relate to the emergence of relief printing, owing to creating the moveable hand-carved woodblocks. By the 2nd century A.D, the Chinese invented a method to print the books, especially after their invention to paper in 105 B.C, and the emergence of Buddhism. During that time, the papyrus and vellum prevailed the paper manufacture in western world, as both materials were unsuitable for printing, because of the fragility of papyrus and its high cost, leading to the presence of mechanical printing as a direct result. About 200 yeas A.D, the Chinese began in engraving the relief writings and images upon woodblocks, as Tipitaka divine Buddhi book of 130.000 pages was printed in 972 A.D by using the woodblocks, Then the printing developed from printing plates of engraved woodblocks carrying the whole page into movable type, according to the techniques of assembly, to be assembled in compact blocks, but the characters are separate. The movable type technique faced a serious problem in China, since its emergence, because of the Chinese Alphabet includes from 40 to 2000 separate characters, and faced the same problem in Korea during the 14th century A.D, as they continued in using the direct engraved woodblocks. In fact, the Chinese excelled in the field of relief printing considerably during the reign of Tang Dynasty (618 – 906 A.D), but the followed printing method was the "Rubbing" method by putting a plate of thin paper over a

prominent surface, then passing a dry fatty substance over the paper surface to transfer the prominent image, in the color of fatty ink, into the paper.

By the beginning of 13th century, the woodblock and wooden characters methods of relief printing on textile and paper transferred firstly to Persia then the Islamic east during medieval ages, then to Europe by the 14th century where the relief printing flourished considerably and used for printing seals, religious images, play cards, textile and block books.

The applications and practices varied largely during the introduction and emergence of relief printing in Europe. These applications contributed in the development of relief printing, and also the methods and processes of pressing and rubbing, which were used to transfer the printing ink and accomplishing the printing process. Among these applications are "seal printing", which found by the beginning of 11th century using the metal and wooden seals, and also for printing the first letters of kings and princes' names, then by the renaissance age the designs of letters transformed into characteristic emblem for those kings to seal the royal documents and preventing their falsification.

Besides, the relief printing practices in Europe included printing textiles via woodblock that participated in creating and developing varied forms of printing machines, and also printing play cards and religious images by the end of 15th century A.D, which were executed by using the woodblocks to print book block by utilizing wooden relief printing machines that were developing gradually until the 19th century into iron and bronze machines.

On the other hand, the relief printing pressing tools developed in Europe through the development of relief and moveable characters as by the mid of 15th century, the moveable character printing machine was invented in 1450 A.D by the German Johannes Gutenberg (1398-1468), which was a wooden screw printing press, followed by the evolution of modern printing to print books and newspaper including millions of papers See (fig.4). Indeed, the most important contribution was in 1436, when appeared the first model of a flat-ped vertical pressing relief printing machine with screw presses resulting in revolution in the relief printing field. This machine was inspired from the early modern wine press, an early model for winemaking with screw presses See (fig. 3).

The relief printing witnessed a set of changes related to the development of pressing process and the methods of moving the screw press, then found a lot of successive inventions leading to a considerable revolution in making the relief printing machines with vertical pressing. The field pioneered by Adam Ramage (1772-1850) See (fig.5)., the Scottish, who invented the moveable metal pressure bar method, to control the height of iron printing platen easily following the pressure process. Then, Frederick Bronstrup, the successor of Adam Ramage, produced a special model in 1875 that was made completely out of iron and now wxposed in the The Museum's Philadelphia Press, locates in South Street Seaport Museum in New York. (See Fig. 6).

2.1 The first indications of developing the printing machines and pressing tools for prominent surfaces:

In fact, the relief and multiple printing practices led to the emergence of many tools and the development of tens of assistant techniques to copy the relief printing blocks, including the direct manual and the portable tools, whether lightweight of huge tools, some of them were invented to be used by the artist for printing purposes.

2.2 Rubbing and direct press tools:

Tens of technical methods and techniques were invented to provide pressing tools to press the printed copies over the relief printing blocks during the printing process. Many of these inventions were found as press and rubbing tools to facilitate for the artist the procedures that relate to the relief printing process. The artists developed many tools, which were not intended for printing purposes at the beginning.

1st: manual rubbing tools, Baren's tool for relief printing via manual rubbing:

The manual rubbing tool, which is known as Baren, originates from Japan and consists of a wooden disk covered by fiber or the bark of Bamboo plant, with coated surface by smooth leather or some fibers that allow the tool to pass through the surface of printing paper, then it can slide over the paper surface while pressing it to produce the printed copies. There are many classic and modern forms of this tool, according to the manufacturer, such as Yasutomo Babmoo Baren, the most famous of them and the manufacturer of Baren tool, with standard measurements and specifications for the Japanese Bamboo original too, See (fig. 1).



Fig. 1: Different forms of Baren Tool Source: nzprintmakers.com

2nd: Tools manufactured for other purposes then used for manual rubbing (from the innovations of artists)

Many printmaking artists utilized unusual tools with smooth surface that could be used for manual pressing and rubbing. These tools are suitable to the printing process such as metal, wooden and plastic spoons. Others used some tools manufactured for different crafts and fields such as the handles of sandpaper. See fig. (2)



Fig. 2: Innovative thoughts for artists to utilize the metal spoons or other tools related to different crafts but could be used for printing manual pressing and rubbing (The researcher)

3.2 Vertical printing presses with flat-bed

These printing machines consist of an upper and lower cylinders for pressing process in a vertical direction from up to down. The technical manufacturing form of these machines depend on the density, material and hardness of used iron that differ as the following:



Fig .4: wooden screw printing press, invented in 1450 by Johannes Gutenberg (1398 – 1468)



Fig .3: Early modern [wine press screw presses](#), which inspired Gutenberg to design the moveable characters press with screw press



Fig 6: Frederick Bronstrup 1875 ,The Museum's Philadelphia Press, South Street Seaport Museum, New York
<https://www.printmuseum.org/185075-philadelphia-press>



Fig .5: Ramage screw Press 1750, Scottish (1772-1850 Adam Ramage) . 1820 after inventing the vertical metal pressure bar method to ensure the height of metal printing cylinder easily after completing the pressure
<https://letterpresscommons.com/press/ramage-screw-press/>

1 -Screw wheel mechanism presses

Many forms of vertical pressing machines were invented between the mid of 17th century and the end of 18th century, especially the previously mentioned invention of Adam Ramage of the pressing screw disc. Then the inventions emerged successively depending on the pressing strength and the mechanism of relief printing vertical pressing machine. Among the early inventors is the Scottish James Watt (1730-1811) who presented illustrations for a machine depends on a vertical pressing spiral bar that developed later to variety of sizes and usages including the large book binding press with measurements of 40-inch height ×28-inch length ×18-inch width, that dates back to 1915 A.D by Latham Machinery company (See fig. 7). A lot of forms of these presses emerged lately, and so far, they are being manufactured in different sizes and materials such as cast iron, iron, wood or in a combination between wood and iron. These presses are characterized of being not heavy and their most disadvantages are their short life and the weak pressing (See fig. 8)



Fig. 7, Large Book Binding screw wheel mechanism press.

Source: (<https://sturgisantiques.com>)



Fig.8, Some modern relief printmaking presses of screw cylinder

Source: (<https://www.mes.net.au/category/696-relief-presses>)

2 -Vertical pressing machines with pressing arm and screw cylinder:

These machines were manufactured to be suitable for copying the moveable character books, bookbinding and to print the prominent woodblocks. These machines are made out of cast iron or wood without clear historical sequence of their development. The upper disc moves around the machine sided axes and an upper iron pillar to produce considerable press power on the lower static disc (See fig. 9). This technique is regarded suitable for small spaces and limited blocks with thinner thicknesses and was developed by using light weighted and simple materials, while its main disadvantage is the weakness of pressure and short life (See fig. 10). These presses developed until the screw disc was merged into the pressing arm (See fig. 11). Ritchie Edinburgh, the English inventor, invented another type that combines between both methods and had a great effect in controlling the pressing in specific degrees.

		
Fig. 9: The first press with Pressing arm https://www.officemuseum.com	Fig. 10: Modern metal tools with pressing arm	Fig.11: Modern metal machines with pressing arm and screw cylinder https://www.mes.net.au/categ

3 -Portable printing boxes to copy the relief printing blocks:

James Watt (1736-1819) and others invented portable vertical pressing machines. The first machine of them, launched in 1786 A.D, which was manufactured in form of a wooden box that resembles the measurements and look of a suitcase, with metal handles that could be transformed into pressing arms (Fig. 12). In addition to his portable vertical pressing model, James invented also portable printing machines using the horizontal pressing and embedded all of its features from copper cylinders, handles, presses, inking cylinders and printing table inside the portable mahogany wooden box. During the printing process he used the wet cotton paper, so that his machine was termed as "The portable desk top wet transfer copies"(Fig. 13).

	
Fig. 12: Portable desk top copying machine. Portable The desk top Copies https://www.officemuseum.com/copy_machines.htm	Fig. 13: Portable The desk top Wet transfer Copies . https://www.officemuseum.com/copy_machines.htm

4 -Printing the relief moveable characters, Johannes Gutenberg

The first press that made by the German scientist Johannes Gutenberg (1398-1468) developed the technique of printing the prominent moveable characters comprehensively. Although some of these techniques emerged in Korea in 1234 A.D, but Gutenberg developed it completely and became the first operating press in Germany in 1430 A.D.

5 -Printing presses with horizontal pressing cylinders:

The horizontal printing machines are regarded the most famous printing machines, commercially and artistically, whether the mechanic or electric ones. They depend on two steel cylinders with a metal bar passing through them as pressing disc can move horizontally to right and left. However, these machines demeaned undesired procedures of unfavorable modifications to match the thicker printing woodblock by adding a wooden layer around the printing block in order to be equated with this value of bigger thicknesses (Fig. 14). The

researcher produced and used a press of two models that are suitable for relief and engraved printmaking on cylinders of hard bixolon, one of them operates manually while the other electrically.

The most important result is producing the high-quality prints and impressions on textile, plastic, leather, engraved wood plates and some kinds of hard Lino-plates, which are supplied from behind by screen braces to prevent them from stretching not the flexible plates because the rolling printmaking machines press from one direction that can result in stretching the block and failing the printmaking process itself on using the flexible blocks. So that, it is better to use hard non-stretchable materials. In fact, the results were satisfying in light of getting high quality prints by using the electrical and manual presses (Fig. 15).



Fig. 14: Relief printmaking horizontal presses and attempts to fill the spaces around the printing block
Source: Invented by the researcher: electric intaglio printmaking press that designed and made by the researcher inside the Egyptian – Russian university and the method of wooden screen.

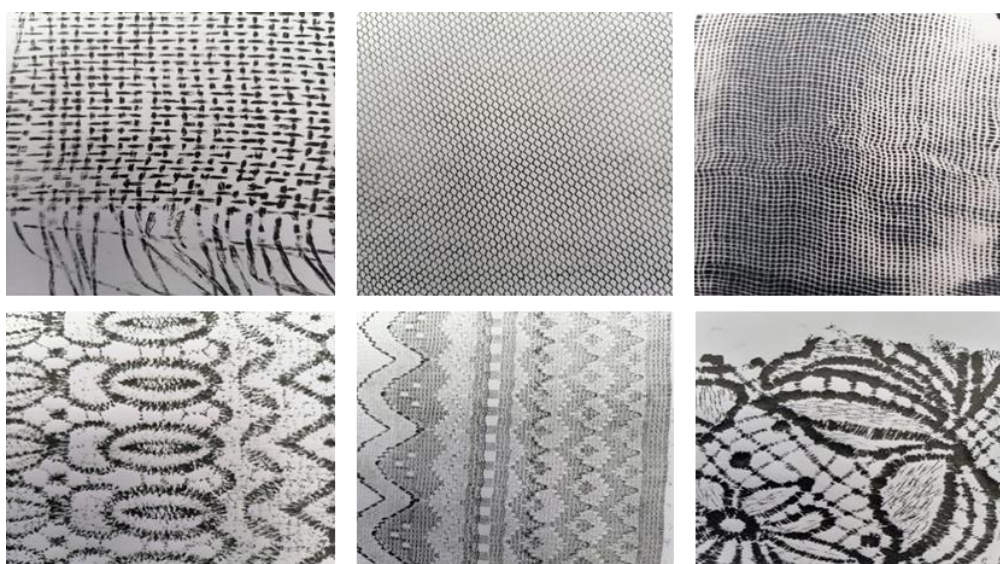


Fig. 15: Relief printmaking work by using horizontal presses to produce visual impressions on textile, screen, plastics and leather.

Source: (Invented by the researcher: an electric intaglio press and another manual one that designed and executed by the researcher in the Egyptian Russian university)

6- Portable and rolling pressing cylinders (Akua Pin Press):

The company of Speedball invented and produced new portable tool includes a moveable cylinder head, that could be carried and transported easily, composes of a copper cylinder coated by a thin layer of aluminum, as a safe substance for use in addition to being fast and precise. While, the main disadvantage of this tool is its incompatibility to the fatty inks, as the manufacturer company recommends that the relief printing inks must be from media of water, and not suitable for fatty inks because of their viscosity that demands higher pressure. (Fig. 16)



Fig. 16: Portable and rolling pressure cylinders for relief printmaking

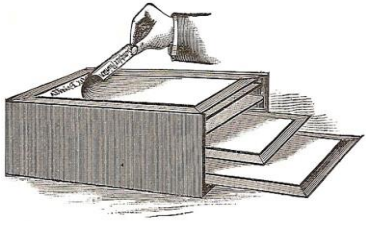
Source: (<https://www.speedballart.com/product/akua-pin-press>)

7- Copying by using the manual vertical pressure for the Hectograph techniques

The old technique of Hectograph, since 1876 A.D, enabled to copy a limited number of copies, not more the 50 copies, and is criticized for its slowness in producing the printed copies, while characterized by getting printed copies directly from the handwritten original document via a layer of wet gelatin that absorbs the handwritten liquid ink from the paper surface allowing to produce several copies for drawings, paintings and written documents directly. Besides, this machine does not require a press or even printing machines, it is operating just by passing the hand palm to press over the printable data. This technique belongs to its inventor Holcomb and his partners in 1876 A.D and was termed as "Transfer Tablet Hectograph", that was considered just a portable machine during that age, it was termed also as the Gelatin Duplicator. (Figs. 17, 18).

8- Copying by using the manual pressure for the Schapirograph technique:

This technique, resembles the hectograph technique, was invented in 1901 A.D, the difference between both techniques that the gelatine block was replaced by paper covered by gelatine, glycerin and glue. This machine is placed inside a portable covered wooden box including two fixed cylinders that carry the gelatine paper, and between them there is a solid surface to accomplish the printing process over it. (Fig. 17).

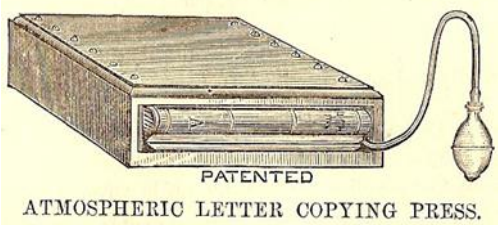
	
Fig. 17: Copying by using the vertical pressing for Hectograph techniques.	Fig. 18: copying by using the vertical Pressing for Schapirograph techniques
https://www.officemuseum.com/copy_machines.htm	

9- The balloon pressure boxes for the gelatine hectograph blocks

In 1881, a new method was invented as a development for the manual pressing of hectograph technique of printmaking and copying paintings and writings via specialized American printing company worked on developing the printing techniques of "Atmospheric letter copying" through a tight wooden box including a balloon that could be blown by a manual outside blower to shrink the inner space of the box to distribute the pressure upon the printable copy over a gelatine block. (Fig. 19).

10- rubber flexible coater for the hectograph gelatine blocks

In 1895, Alvah Bushnell invented a method to copy the books without printing machines, or the technique of rubber flexible coater that could be folded around wooden cylinder to execute the pressing process by rolling the cylinder around itself over another smooth layer and the printing paper sandwiched between them to transfer the printing ink directly. (Fig. 20)

	
Fig. 19: Vertical pressure boxes with air balloons gelatine Pectograph for the techniques of Gelatine Hectograph Atmospheric Letter Copying	Fig. 20: Flexible rubber coater for blocks. A tool for flexible book copying without presses, invented by Bushnell
https://www.officemuseum.com/copy_machines.htm	

4.2 (The researcher's experiments and creative laboratory applications in the relief printing) A general description for the applications:

The research designed and executed 6 applications to be addressed in detail, which are printing machines for relief printmaking that are suitable for printing the wood plate, Lino plate, collagraph and monoprint, whether by using the manufactured material that could be used as printing blocks of wood, plastics, metals, textile, leather, artificial or natural polymers, cork and any other printable material from engraved relief blocks. These tools could be considered as bases for developing and operating any relief printmaking labs. The researcher used, to execute

his applications, many materials, mechanic and hydraulic techniques that were designed, modified and synthesized to be printing machines with specific tasks. For instance, the already made cranes that are used to lift tractors and the hydraulic cranes and brake fluid to lift the heavy transport vehicles, as some of them can lift more than 20 tons at once. Most of these applications were executed inside the faculty of fine arts in Alexandria university and the Egyptian-Russian university. The researcher experimented them through some printmaking works, in addition to the undergraduate students of scientific departments and postgraduates.

The main objectives of applications and the researcher's art experiments

- Aims to facilitate the procedures of manual printing for the students of printmaking throughout the Egyptian universities.
- To enable printing by using the vertical pressing tools over any material, whether paper, textile or wood, at any thickness.
- Designing and executing the printmaking press to meet the needs of scientific printmaking departments all over the Egyptian universities for fine arts, specialized and artistic education faculties, and for the student of scientific departments, students of fine arts and the students of applied arts.
- The suffer of students and some artists from the procedures of manual rubbing of the Lino plates, because of their large sizes, what led to departing from the field of engraving and manual printing.
- The researcher noticed that many female students and the not fitted males physically suffer from acute inflammations in their hand tendons, and sometimes ruptures in muscle ligaments owing to the great required efforts during the processes of manual printing and rubbing.
- The research aims to enrich the printmaking labs, in light of his notice that the laboratories of Egyptian universities, since their establishment, never introduced any kind of development to the relief printmaking machines, as the financial abilities hinder the importing of specialized printing presses from the type of vertical presses with large spiral cylinder.
- Designing machines and paper fixing tools during the printing process, in form of recommendations and tips marked by pens upon the paper and printing table. So that, the researcher designed a creative machine to fix and adjust the printing paper and their movement to achieve innovative artistic impressions.
- Thus, the researcher began in finding simple and scientific techniques to accomplish the manual procedures of printmaking, at the minimum efforts.

Firstly (The first application): A machine to fix and move the relief printing paper positions and achieving repetitive visual impressions (made by the researcher):

General description to the application: This application is a mechanical machine, that can move according to specific coordinates. It could be dismantled and reassembled simply, in addition to a private consecrated wooden case (Figs. 21, 22). Through this application the researcher explores how to achieve special visual impressions, while controlling, adjusting and stabilizing the positions of printed copies across the procedures of manual printing. To guarantee the steadiness and stability of printed copies, throughout the multiple printing cycles over the printing block, by fixing the printing paper at its upper part by a tool included inside the machine

to guarantee the paper stability over its printing position (Figs. 23,24). On the other hand, we can control also the procedures of movement at the artist's will on the printing position at many directions through making colorable repeated shakings or favorable visual impressions, purposed by the artist.

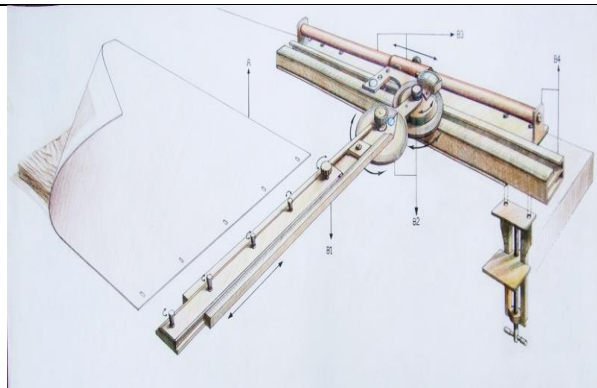


Fig. 21: The first imaginary planning then executed researcher by the researcher.

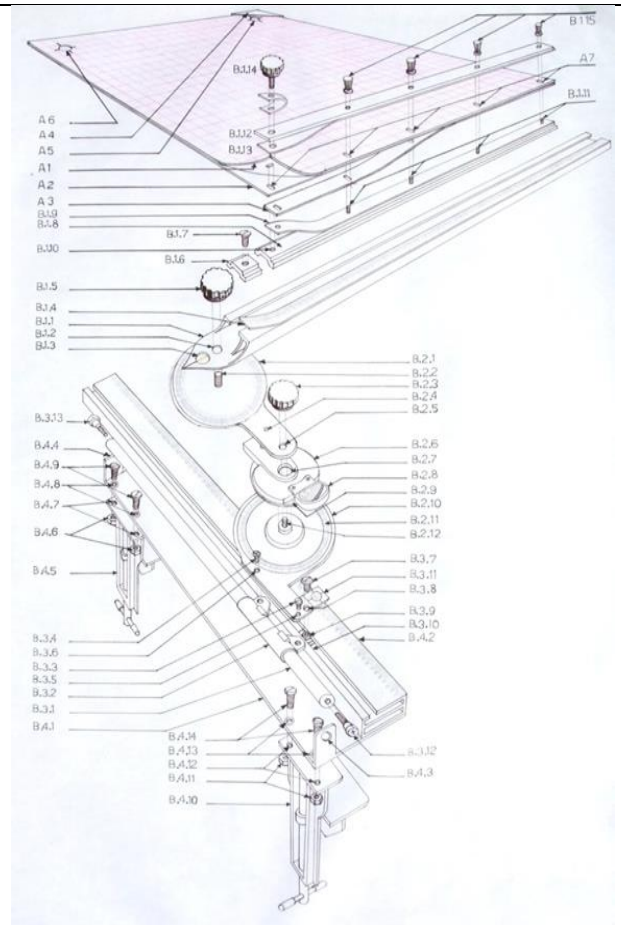


Fig. 22: Preliminary planning, executed by the researcher.

a fixing and moving machine for printmaking paper (The researcher)



Fig. 23: The machine during fixing the printmaking paper During the procedures of fixing and moving the printmaking possibility of paper. (The researcher.

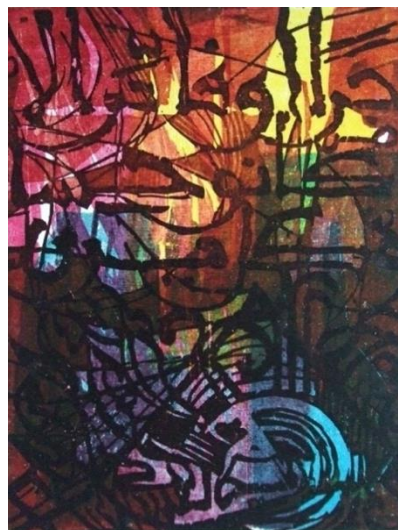


Fig. 24: A photo for a small size Executed in A4 paper size, shows the controlling printmaking procedures.

The main goals of designing and executing the machine:

The researcher noted that most of beginners at printmaking mostly unable to adjust the position of orienting paper over the printing block during the printing process, and that some artists use simple solutions and tricks to adjust the print position. On the other hand, this machine works to ensure a printing process without shaking the printing copies or staining them. This machine is supplied by metal aluminum mechanic joints with stepped divides to control the movement and stability of printing copies, in order to get the favorable colored impressions for the fans of printmaking. The machine is supplied by a handle to hold the printing table, in addition to facilitating the process and helping the junior academic students in fixing the printing copies or moving them in order to ensure the stability of printing copies into their supposed printing positions, during each printing cycle of the printmaking method of fragmentary, disposable and multiple prominent blocks, or the monotype plate. This machine could be characterized by its ability to fix and move the relief printing paper and being supplied by a carrier movable arm to the printing paper, that could be used as an axis for movement to change the position of printing paper in all directions and axes of movement, to facilitate the printing tasks for the artist. To learn about how to fix the machine over the artistic printing table see (Fig. 25): photographs for the machine illustrating the direction of movements.

The specifications of machine:

Easily carried in a case to the printmaking location. It could be fixed, by special handles, upon any printing table or small wooden base, in addition to be of light weight and made out of Aluminum, as it could be used easily to fix the printing paper upon the printing positions, and could be moved at all directions. It can be used partly, only to fix the printing paper and ensure their stability, or being fully utilized to make deliberate repeated artistic impressions, more professionally.

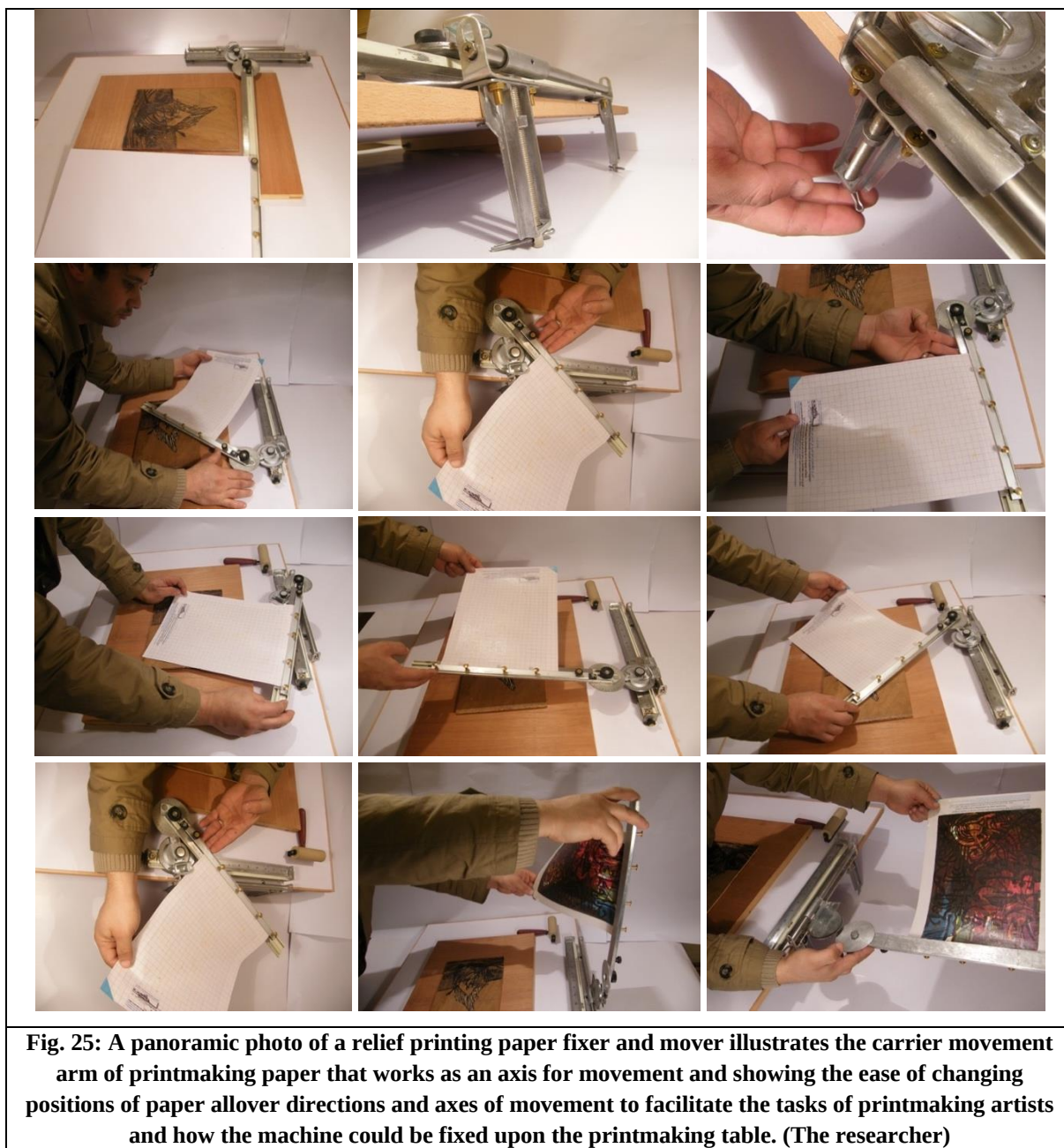


Fig. 25: A panoramic photo of a relief printing paper fixer and mover illustrates the carrier movement arm of printmaking paper that works as an axis for movement and showing the ease of changing positions of paper all over directions and axes of movement to facilitate the tasks of printmaking artists and how the machine could be fixed upon the printmaking table. (The researcher)

Secondly (the second application): relief printing press with large sized mechanic cranes and two drawers as upper storage place (invented by the researcher) (Fig. 26).

General description: A relief printing machine that operates by vertical pressing, designed and made by the researcher. Originally, it was a crane to lift up heavy vehicles and tractors as its is capable to carry more than 20 tons at once. The researcher was careful to have a machine able to print the large sized relief printmaking blocks, and he asked to equip the faculty of fine arts in Alexandria university with this machine to save the efforts and the printing procedures for the students of printmaking, and now it is found inside the labs of faculty after accepting the donation of this press by the board of scientific department, 9th meeting in 22/04/2015. It measures: 85 cm width × 1.15 cm length × 165 cm height. The machine is supplied by a storage unit to keep the upper paper, a piece of natural felt, wood coated iron plates, supplied by wheels to ease the movement or transporting the machine from a place to another inside the lab, while

the wheels are supplied by breaks to ensure the stability of machine throughout the printing procedures.

The objectives of machine:

- By applying this machine, the researcher aimed to find a real scientific solution to print the large sized printmaking blocks, in order to accomplish the manual printmaking procedures at the minimum physical effort, especially on printing the thicker paper over than 200 g, while getting harmonious and thinner layers of ink in good time and reduced effort.
- The quick dryness of printing ink layers, because of their thin thickness.
- It aims to execute the techniques of transferring the soft ground and printing wood, Lino plate and Collagraph.
- Solving the student overcrowd problem around the printmaking presses, because its large size and the possibility of printing multiple prints at once. In addition, the research aims to reduce the student suffer according to their increasing number in governmental universities.



The research includes two printmaking works, which executed by the researcher using the big size hydraulic machine to reassess and modify the quality of pressing, while testing them after several attempts of development, and to realize the printing productions. Both works were executed just in black and white colors as the researcher exposed them throughout his participation in the exhibition of Contemporary Art Association alongside the 2nd Gulf Symposium in Kingdom of Bahrain from 7th February until 17 February 2024. These printed copied are characterized by the harmonious layers of ink, the possibility to be printed on heavy and thick cotton paper, the quick dryness of the thin layer of ink and the high pressure, in addition to the relatively large size of printmaking block, as the traditional manual rubbing never produced that high quality of pressing upon high density cotton paper, but the hydraulic pressing was suitable for accomplishing the task. (Figs, 27, 28).

The advantages of copying prints by using the second application (The relief printing large size press):

- (Type of paper), the cotton high density paper (240 g) was used, what added considerable artistic value to the printed copies.
- (Size), the relatively large size was printed at one with minimum effort.
- (Layer of printing ink), very thin layer with harmonious color tone and brightness, as a result from the harmonious and powerful pressing.
- (The allocated efforts and the quick of printing the copies), the press allowed to save the efforts considerably and reduced the required time in printing process.
- (The speediness of dryness), the printing fatty ink drought in few minutes as paper absorbed the ink owing to the high pressing and the thin ink.
- (Cleaning the blocks from the printing ink), according to the considerable thin used ink, the printing blocks do not require to be cleaned after the inking procedures as the thin layered ink could transfer totally to the surface of printed paper. So that, the blocks do not require any mentioned cleaning, what reduces the consumption of the unfriendly environmentally petroleum products.
- (Machine location), it was designed and made for the laboratories of printed designs in Alexandria university and available for all undergraduate and postgraduate students of printing.
- (The expressional state), the ink is caught inside the careful carvings, which resulted from engraving the linoleum, because of the presence of felts, cotton paper and vertical printing presses, what influenced directly the graphic and expressional status for the printed copies, as dynamic state of careful engraved lines that catch the ink differentially, then the ink is being transferred to paper in untraditional way that could not be happened by using the traditional rubbing method, leading to finding special visual energy and unique expressional state.

	
Fig. 27: (Narcissistic state 1), a printmaking art of work of the researcher exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 60×80 cm(The researcher)	Fig. 28: (Light Narcissistic 1), a printmaking art of work of the researcher exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 60×80 cm (The researcher)
A print on cotton paper of 240 g to test	the Hydraulic press that invented by researcher

Thirdly (The third application): Relief printing press with small spaces and lifts of hydraulic oils (The researcher).

General description: A small machine for relief printing operates by the vertical pressing. This machine was designed and made by the researcher using hydraulic vertical cranes, which originally were intended for use in cars that weight up to 1.5 tons, as the researcher produced two models and presented one of to the faculty of fine arts of Alexandria university, while the other one presented to the Egyptian Russian university. These lifts are of small sizes to match the small and limited printmaking works with an outer ironed body and fillings of wood with measurements of 40 cm width × 60 cm length × 85 cm height, (Fig. 29). These lifts perform all the previously mentioned aims of application, however they are very limited in light of the size of printed works, but is characterized by their light weight, low cost and being helpful for the researcher completely in printing the works of limited sizes and the flexible linoleum printing blocks without affecting the stretch of block, (Figs. 30, 31), these figures indicate the quality and accuracy of lines, as the researcher deliberated this linear design and many impressions.



Fig. 29: A panoramic image for relief printmaking machine that invented and executed by the researcher using hydraulic 1.5 tons capacity crane that measures 40 cm width × 60 cm length × 85 cm height.
Source: (The researcher: The printmaking labs of Alexandrian university and Egyptian Russian University)

The specifications of printing copies by using the third application (The small sized relief printing press).

- The same specifications of the previous machine, but smaller and can print not more than the size of 35 cm × 50 cm.
- (Location of machine), two machines were designed, made and presented to the laboratory of printing design department of Alexandria university to be available for the undergraduate and postgraduate students of printmaking, while the other one inside the laboratory of printmaking in the Egyptian Russian university.

	
Fig. 30: (Vulnerable Narcissism), a printmaking art of work of the researcher's exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 40×60 cm (The researcher)	Fig. 31: (Grandiose Narcissism), a printmaking art of work of the researcher's exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 40×60 cm (The researcher)
A print on cotton paper of 240 g to test the Hydraulic press that invented by researcher	

Fourthly (The fourth application): Relief printing press with hydraulic lifts of large size and lower storage drawers:

General description: A relief printing large sized machine that operates via vertical pressing, designed and made by the researcher. These cranes were already made for heavy transportation means lifting up to 20 tons, and now it is considered a large sized machined to match the large printmaking works, up to 90 cm ×90 cm of measurements. This machine is prepared to include more wooden plates to print larger sizes, with an ironed outer body heavy-duty braces to bear the vertical strong pressing. The machine includes five lower drawers to store paper and printing inks (Fig. 32), as a comprehensive multi use printing machine, supplied by wheels to facilitate its movement inside the printing laboratory, and layers of Spanish flat pressing iron plates without any curves or defects in the degree of its flatness in order to produce high quality printing with large sizes and accuracy of printing (Figs. 33, 34), the measurements of this machine are 100 cm width ×100 cm height ×200 cm height.

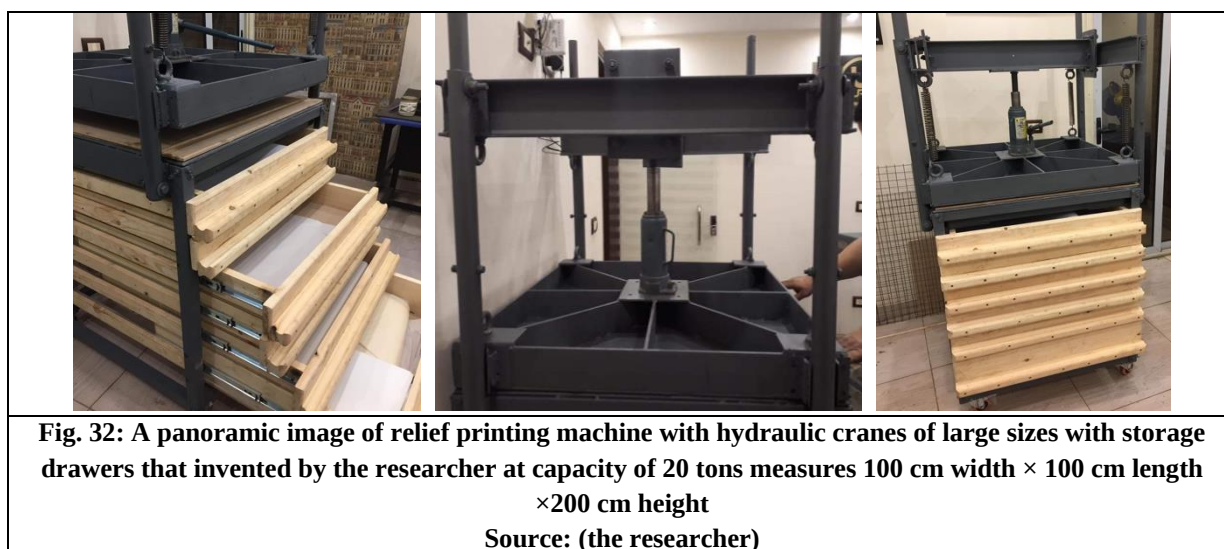


	
Fig. 33: (Somatic Narcissism), a printmaking art of work of the researcher's exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 40×60 cm.	Fig. 34: (Malignant Narcissism), a printmaking art of work of the researcher's exhibition in the 2nd gulf Symposium, Bahrain Kingdom, 7-17 Feb. 2024, 40×60 cm.

The specification of printed copies by using the fourth application (Relief printing press with hydraulic lifts of large size and lower storage drawers)

- The same specifications of the previous applications, but this machine is larger and able to print large sized printmaking works up to 90 cm ×90 cm.
- (The expressional state), it helps the artist to reduced the great efforts and fatigue during the printing process, while results in many simple impressions because of the precious drilling and the engravings leading to a unique graphic linear printed state owing to the high press that produces really distinctive expressional state.
- Include lower storage drawers for the printing paper and tools, and supplied with wheels on moving.
- (Location of machine), owned by the researcher.

Fifthly (The fifth application), The mobile small relief printing press with hydraulic cranes of 20 tons high pressure (made by the researcher)

General description: A machine for relief printmaking of high pressure, up to 20 tons, and operates via vertical pressing. This machine was designed and made by the researcher using high pressure hydraulic cranes, intended originally for middle size cars. It is found now in Contemporary Art Association in Bahrain kingdom, which regarded the oldest art association in Bahrain kingdom, through the events of Gulf 2nd symposium in Bahrain kingdom and the researcher was granted the honorary membership. The researcher made this machine particularly to bear the considerable high pressure as it includes plates of Spanish iron, thickness of 12 mm and height of 35 mm, out of hard chrome and a 20 tons crane. This machine is suitable for the large size printmaking works, up to 50 cm ×70 cm, with an outer iron body with heavy-duty braces to bear the vertical high pressure. This machine could be dismantled into small pieces and then to be reassembled (Fig. 35).



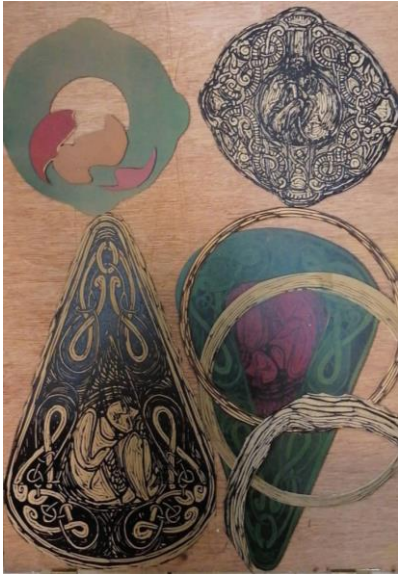
Fig. 35: Relief printmaking machine of high-pressure hydraulic cranes at capacity of 20 tons, invented by the researcher:

Source: (The researcher, owned by printmaking labs of Contemporary Art Association, Bahrain Kingdom)

The specification of mobile small relief printing press with hydraulic cranes of 20 tons high pressure

- The same specifications of the previous applications, but this machine is larger and able to print up to the size of 40 cm × 60cm.
- The machine is small that could be dismantled into small pieces and reassembled, which could be considered the its best advantage, in addition to its ability to bear the considerable high pressure, although its small size, and could be carried, transported and stored.
- (Location of machine), presented by the researcher to develop and support the printmaking laboratories of Contemporary Art Association in Bahrain kingdom.
- The researcher executed some printmaking works from fragmentary Lino plate to copy the colored printed copies. (See Fig. 37).

(The expressional state), this press is useful in adjusting the printing procedures, whether the single or fragmentary blocks, as the passing of printing blocks that are fragmented originally through the printing course will make the process more difficult on using the manual rubbing method because the blocks would stain and fail the procedures of heavy-duty pressure, in addition to taking more time and efforts. On the assumption of thicker paper, then the printing machine will be helpful in a particular way. So that, the researcher made this machine to benefit from its result in this research. Indeed, the expressional state of using this machine is great as a unique technique that enables to contra; the layers of ink and its transparency, as the used colors were of transparent degrees that match the dramatic state of the artistic work(Fig. 36).

	
Fig. 36: Cerebral Narcissism 2: A relief colored printmaking work, fragmentary blocks, from the works of researcher's exhibition in 2nd Gulf Symposium, Kigdom of Bahrain, 7-17 Feb. 2024, 40 cm × 60 cm (The researcher)	Fig. 37: Fragmentary Lino blocks from the works of researcher's exhibition in 2nd Gulf Symposium, Kigdom of Bahrain, 7-17 Feb. 2024.

Results of research:

- By designing these tools, the researcher succeeded in presenting a guiding standard model for the developmnet of relief printing procedures inside the printmaking labs of Egyptian universities in order to meet the needs of students to perform the manual rubbing printing. The research succeeded in poviding the required tools to the Egyptian universitits; the faculty of fine arts in Alexandrian university and the Egyptian Russian university, and even outside Egypt for the printmaking departement of the cintemporary art association in Bahrain Kingdom, and the researcher still aspire for more.
- Throughout the ages, many artists were interested in developing the relief printing equipment, and some artists are still attempting to developing and enhancing the methods of printing pressing. But in Egypt and the Egyptian universitites, the artistis and specialists of printmaking were not concerned in resolving this problem and used only to import these equipment that were never even developed, so that the researcher pursued the problem to meet the needs. Thus, it is clear that our laboratories need to be supplied by suitable printing equipment.
- Some tools were created to adjust the relief printing position, without shaking or altering the position and work on creating outstanding repetitive artistic impressions, graphically and visually.
- The researcher managed to use hydraulic cranes with high capacities to create the large sized printing machines, by transforming the mechanic lifting cranes, with capacity over than 10 tons, that prepared originally for tractors and heavy vehicles into presses for relief printing, collagraph, monoprints or the manual paper, what reduced the considerable cost that represented

in importing the European pressing machines. This could enrich that laboratories of Egyptian universities to achieve the educational quality.

- The transformed presses mechanic cranes are cheaper than imported machines and possess better technical specifications, especially their ability to print the large printable sizes.
- The printing machines of mechanical cranes reduce the efforts of artists and students through the stages of manual rubbing and pressing throughout the faculties of fine arts inside our Egyptian universities, and the departments of printmaking art.
- The created application are distinguished by their large size and the capability to print full sheets of linoleum, wood, plastic, leather, metal or any material that could be engraved or constructed and accepting the attachment of relief layers to be used as relief printmaking blocks, and the produced prints were of high quality.
- The machines are able to be used for relief printing from metals, wood or plastics, as the linoleum is the most favorable, because it is not suitable for horizontal pressing machines owing to its ability to stretching.
- The creative laboratory applications are characterized by its ability to print the heavier and thicker paper, such as the 300 g paper of Canson paper, in addition to printing textiles to enrich the printing value of the printed copy. They can be used also for printing the plates of blockboard and medium-density fiberboard (MDF).
- The vertical pressing machines, locally manufactured, can face the urgent need and the major problem, in light of the large number of students.
- The usage of these creative models does not require efforts or difficulty.
- It is possible to add an electric engine to work whether electrically or manually.
- It is possible to manufacture small presses out of hydraulic cranes of 2 tons lifting capacity.
- These printing machines, with hydraulic cranes that prepared originally for lifting vehicle, to be used for preparing small printing presses to print all of; relief printing, collagraph blocks, single print techniques, printing the woodblocks, the prominent metals and linoleum, in addition to preparing the manually manufactured paper plates or the recycled paper.
- The printing machines of hydraulic cranes save the efforts of artists and students.
- The printing machines of hydraulic cranes are cheaper and could be prepared locally.
- As well, the creative machine achieved the following:
 - (Type of paper), enabled the printing of cotton paper that weighs from 240 g to 300 g, with high density, what added an exceptional artistic value to the printed copy.
 - (Size), it became easy to print the large sizes at once and effortlessly.
 - (The layer of printing ink), very thin layer with harmonious color tone and brightness owing to the harmonious and strong pressing.
 - (The allocated efforts and speediness of getting the printed copy), the presses enabled to save the considerable efforts and reduce the spent time in printing process.
 - (The speediness of dryness), the fatty printing ink dry in few minutes after absorbing the printing ink because of the high pressure and the thin layer of ink.
 - (Cleaning the blocks from the printing ink), according to the considerable thin used ink, the printing blocks do not require to be cleaned after the inking procedures as the thin layered ink could transfer totally to the surface of printed paper. So that, the blocks do not require

any mentioned cleaning, what reduces the consumption of the unfriendly environmentally petroleum products.

- (Machine location), The researcher designed and made for the laboratories of printed designs in Alexandria university, Egyptian Russian university, The Contemporary Art Association in Bahrain Kingdom, the educational effectiveness of Alexandria University, the researcher own gallery and equipment for some artists in Egypt and Saudui Arabia. As well, the rseearcher developed the printmaking equipment in the faculty of fine arts in Zamalek, Helwan University. It is worth noting that the undergradaute, graduate students and the artists of prtintmaking were benefetting from these equipment since 7 years ago.
- (The expressional state), the ink is caught inside the careful carvings, which resulted from engraving the linoleum, because of the presence of felts, cotton paper and vertical printing presses, what influenced directly the graphic and expressional status for the printed copies, as dynamic state of careful engraved lines that catch the ink differentially, then the ink is being transferred to paper in untraditional way that could not be happened by using the traditional rubbing method, leading to finding special visual energy and unique expressional state.

Recommendations:

- 1- The researcher recommends to specify a research project funded by a university or the ministry of higher education to promote the performance of all printmaking laboratories of the faculties of fine arts and graphic departments by providing many printing machines that operate by hydraulic lifts and mechanic lifts to face the laboratory research requirements, practices and the project students in the field of relief printing.
- 2- The researcher recommends to spend a portion of university expenses on the laboratories of printmaking in all of the Egyptian universities to approve a development plan for these laboratories, based on benefitting from the scientific values of this research.
- 3- The researcher recommends to specify a profit margin from the specialized unit of fine arts faculty to supply and develop the artistic laboratories and making earnings by receiving the audience and artists to execute their works and conducting artistic workshops about printmaking by using the new created machines, which will be profitable for the unit and faculty.
- 4- The researcher recommends to appoint specialized scientific committees to develop the printmaking laboratories of fine arts faculty by creating simple ideas to maximize the quality of our Egyptian universities.

References:

- Antony Griffiths, prints and printmaking, published by British museum publications limited, Britain,1980.
- Barry Pearson, Printing History: The Gutenberg Press, Leaflet Printing, 2 Jan 2013.
- Beth Grabowski & Bill Fick, Printmaking a complete guide to materials and processes, Laurence King Publishing Ltd, London,2009.
- Hebe Vernon-Morris, Printmaking, traditional and contemporary techniques, Rot vision SA, Switzerland, 2008.
- John Platt, Color wood cuts, Campbell Dodgson, Pitman Press, London, 1948.

- Judy Martine, The encyclopedia of printmaking techniques, headline book publishing, London, 1993.
- Mike Rendell, James watt inventor of The desk top copying machine, 23jun 2013.
- Merlyn Cbesterman & Rod Nelson, woodblock prints, Cordwood Press Ltd, Ramsbury, Marlborough, London,2015.
- Pamela Clemit, William Godin`s Wet Transfer copies and James Watt`s Copying Machine, Object Archives, reading and writing eccentric histories, 24june 2014.
- Relief Printing and Plaster Casting with Ursula KellyUrsula Kelly printmaking at Orleans House Gallery, Twickenham
- *Rollin Milroy, Industrial Printing in Depth Heavenly Monkey, Publisher of elusive books, 2014.*
- Susan Lambert, Prints art &techniques, V&A publications, London, 2001.
- <http://www.akuainks.com/made-by-printmakers-for-printmakers>
- <http://www.artistcraftsman.com/akua-printmaking-20-pin-press.html>
https://www.officemuseum.com/copy_machines.htm