International Journal of Engineering Research And Advanced Technology (IJERAT)
ISSN: 2454-6135 [Special Volume. 02 Issue.01, May-2016]

Development of Embroidery Hoop Stand

Ullas U[#1], G Girish Raj[#2], Akarsh B S[#3] Thirumala S V[#4]

#1 *Student, VI Sem., Department of Mechanical engineering, SJBIT, Bangalore, Ullas1795@gmail.com*
#2 *Student, IV Sem., Department of Mechanical engineering, SJBIT, Bangalore, girishcool15@gmail.com*
#3 *Student, IV Sem., Department of Mechanical engineering, SJBIT, Bangalore, aakarshcta@gmail.com*
#4 *Guide, Assistant professor, Department of Mechanical engineering, SJBIT, Bangalore, svthiru@gmail.com*

***Abstract*— A completely detachable fabric frame holder, for the purpose of holding the frame firmly, which is commercially available in different sizes, enabling the artist to work on the fabric with ease. The work on fabric can be embroidery or other artworks such as painting, aari work, zardosi work etc. The stand consists of a rigid base with two vertical sliding arms, each having a holder, which can be tightened to hold the frame. The arms can move horizontally along provided dovetail joints, and can be locked in place, so as to adjust it to the different sizes of the fabric frames. The stand promotes women, especially from the rural areas, to carry out craft on the cloth, without much stress in holding the hoop in their hand, so as to help promote not only the artistry of women, but also to improve small scale trade in rural areas, for economic development.**

Keywords*—*Embroidery, Embroidery Hoop, Detachable stand, Embroidery Hoop Stand.

I. Introduction

Clothing is the fiber and textile material worn over human body, for protection from the elements. Archeological evidence suggests that men started to wear clothing 40 – 70 thousand years ago. What started as a necessity, became a symbol of status, prestige, and a way of self-presentation. One important aspect of clothing is the various artwork that is present on it. It could be from simple print, paintings, to embroideries done using different color and type of threads. This is more seen on women's clothes. [1]

Painting or embroidery on fabric is an art that needs good practice, and skill to do, with less investment. Many rural women practice these arts, and is the source of livelihood for most of them. [2]. The fabric has to be wrinkle free, and should be stretched to an extent, making it like a painting canvas to the artist. This is achieved by embroidery hoops that are commercially available in various sizes, to fit the demands of the work. The hoop, also known as the **tambour frame,** consists of a pair of concentric circular or elliptical rings. The inner ring is a complete solid piece. The outer ring has a tightening device, usually a metal screw that can tighten it over the inner ring. The fabric to be worked on is placed on the inner ring, and the outer ring is placed over it, and is pressed down. The fabric is stretched a little, and the screw is tightened to secure the fabric, so that artist can work on the cloth with ease. [3].

Newer technologies such as automatic embroidery machines, which have patterns pre-programmed onto them, or access them through a computer or external memory device, are available in the market. Their high cost and need of technical knowledge, keeps it out of reach of many small scale rural trades. Also, the value of hand artistry, is higher than that done by a machine. These crafts also provide a good employment opportunity, for the rural women to earn their livelihood. The values of doing the work in a group, interacting with others, is preserved by these crafts. The scope for innovation, is also very high.

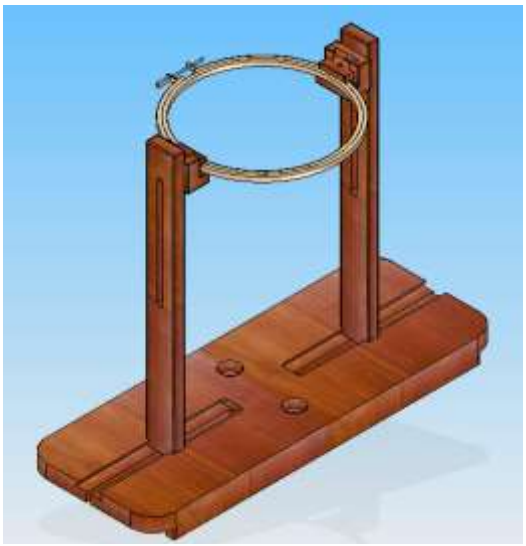


Fig. 1.1 Rendering of the embroidery hoop stand

II. Problem defnition

The usage of the hoops necessitates the artist to hold it in one hand and work with the other. This has a few disadvantages. The work, at times, may need the usage of both the hands, which is difficult. Since the work takes large durations of time, holding the work in one hand, and working with the other, creates ergonomical difficulty to the artist, and can cause aches in the hand and the back. In small scale handicraft production, the difficulties are multiplied. This necessitates the need of a stand to hold the hoops, freeing the artist of this additional burden, and so that they can work at a faster pace with both the hands.

The stand should be able to satisfy the user needs efficiently. It should be able to securely hold the hoop, preferably the outer ring, and not harm the fabric in any way. Once fixed, there should be sufficient space for the artist to work with ease, above and under the fabric. The holder should be such that the work is tilt-able, not compromising the grip, once in the new orientation. It should also be able to adjust to different heights. The major concern, is that it should be adjustable to different diameters of rings that are commercially available, and should be able to lock onto the new position, after every change. The fasteners and joints used for these transitions should be smooth, quick and efficient for the transitions, and should also be securable in the new position. It is also necessary to have the different positions of the vertical arms marked, for different ring sizes. The wood used for the job should be cheap, light, easily Machin-able and easily available, and at the same time, should take the general wear and tear of work, and bear loads from the artists hand onto the work.

III. design of emroidery hoop stand

The size of the commercially available hoops vary from about 100mm to 300 mm, but the stand is designed for a range of 75 mm to 470mm (outer diameter of the outer ring), and has a thickness of around 10mm and depth of around 10mm. [4]. The depth and thickness is found not to vary much, for different sizes of the hoops. Figure shows the various parts of the embroidery hoop stand.

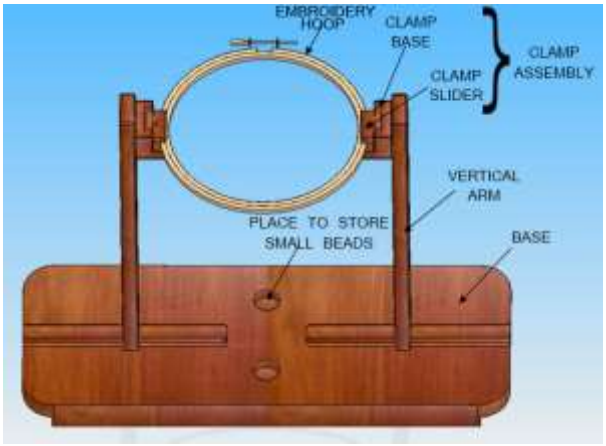


Fig. 3.1 Parts of the embroidery hoop stand

The parts are as explained below:

A. Base

The hoop stand consists of a rigid base, with dovetail joints, running from either side, towards the center, and maintaining a certain gap in the middle, just a little lesser than the least size of the hoop available, so as to have strength in the base, which otherwise may break in this weak point. Two additional blind holes of a small depth are drilled on either side, for the user to keep small beads, wires, threads etc. for the artwork being done, and easily access it when needed. For the ease of machining, the base is made in two parts, one completely solid made of a harder wood, and having only two slots for the bolts from the vertical arms to slide, and the other made of a softer wood, so that the dovetail joint can be easily machined. These two parts are fastened together, making it like one solid part. The edges are rounded for the comfort of the user. The positions of the vertical arms, required for different sizes of commercially available rings, are marked along the dovetail groove on the base, so as to enable the user to space the arms equally from the center. Two wooden beading on the underside acts as a leg, avoiding the fastener of the vertical arm from touching the ground.

B. Vertical Arms

Vertical arms are the vertical members, to which the hoop clamp assembly attaches to, and is the part, which has a dovetail on its bottom end, so that it can slide in the dovetail groove in the base part easily. It has to vertical slots machined, width of which is equal to the diameter of the bolt used on the clamp assembly (with some clearance), so that the vertical position of the clamp assembly may be adjusted, to vary the height, based on user requirements. A vertical bolt is attached to the vertical arm, vertically in the center, to enable it to be locked onto the required horizontal position on the base. They are two in number, one on either side of the center.

C. Clamp Assembly

This assembly is employed to clamp the hoop securely, in the desired vertical and angular position, so as to allow the user to work on the cloth, in the desired position with ease. The assembly should not turn or go down, with the application of pressure under general operating considerations. This is achieved with the usage of washers with larger diameter, with the wing nut and the bolts, for secure grip, without considerable damage to the wood. It consists of two parts: a **base part** with vertical dovetail groove, and a **slider**, with a dovetail cut, so that it can slide in the provided groove. A vertical through hole is drilled through the center of these two parts, so that a bolt can be fixed through the base part, and a wing nut be used on the slider, which can be tightened to secure the hoop. They are two in number, one on each vertical arm.

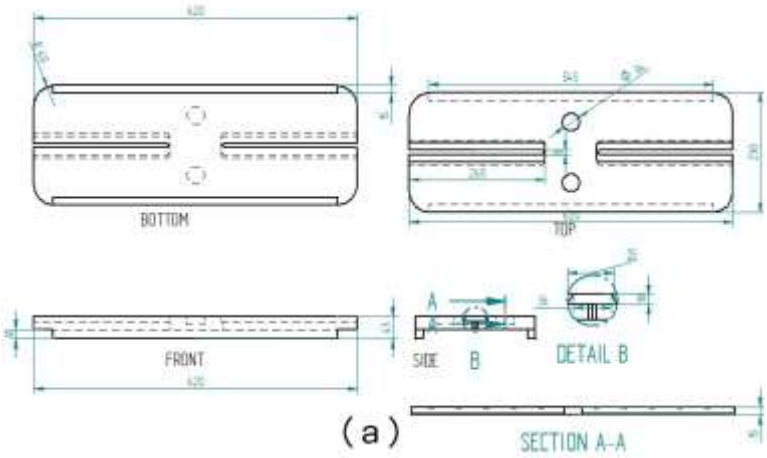
D. Fasteners

For the purpose of assembly, disassembly and changing of positions of the various parts in the assembly, short and long bolts, with wingnuts are employed. Large washers are used to distribute the tightening pressure over a larger area, for a better grip. Wingnuts enable the user to tighten or loosen them, without the necessity of any special tools. [5].

IV. Material selection

The prototype of the stand was built using deal wood. Wood is a cheaper alternative to other materials, and is easier to work with. As it was still a prototype, certain changes had to be made during the work, so a combination of manual and machine work was employed. Since deal wood was not strong

enough for the base part, a plywood base was used, on which the deal wood was fixed. The whole assembly was polished to make it smooth, so that the cloth would not be damaged or torn, and there would be less friction between moving parts.



V. PRODUCTION DRAWINGS

VI. Operation

The cloth to be worked on, is fixed in the embroidery hoop of the required size, stretched and tightened. The vertical arms of the hoop is slid horizontally to the desired position, preferably at equal distance from the center, using the markings on the base as the guide, and tightened in the position. The Clamping assembly is adjusted vertically, its angular position is set, according to the comfort of the artist and tightened in the position. The slider of the clamping assembly is loosened, and the hoop is fixed, so that about half the thickness of the ring of the hoop rests in the two clamps, and the slider is tightened. The artist can work on the cloth, changing the position of the hoop as required for the work, when required. Two blind holes in the base, would be used by the artist to keep small beads, threads etc. to make it easier for the artist to work.

VII. results and conclusions

It can be concluded that the human effort required in holding the embroidery hoop in one hand, and working with the other, poses ergonomical difficulties, which can be eliminated with the usage of the embroidery hoop stand. The stand would be economical in the long run, used by rural women on a small scale. It can also be use of for hobbyists. The stand can be produced on a small scale by carpenters, and marketed, or the design sheets can be sold, for DIY enthusiasts. The stand provided a rigid base for artwork on cloth, not only embroidery, but also paintings on cloth. It also promotes rural women to work in a group, earning their livelihood. The drawings can also be used for mass production, and the process be automated using CNC machines. The stand can also be used to hold other objects such as a painting board, or a writing pad for user comfort while working.

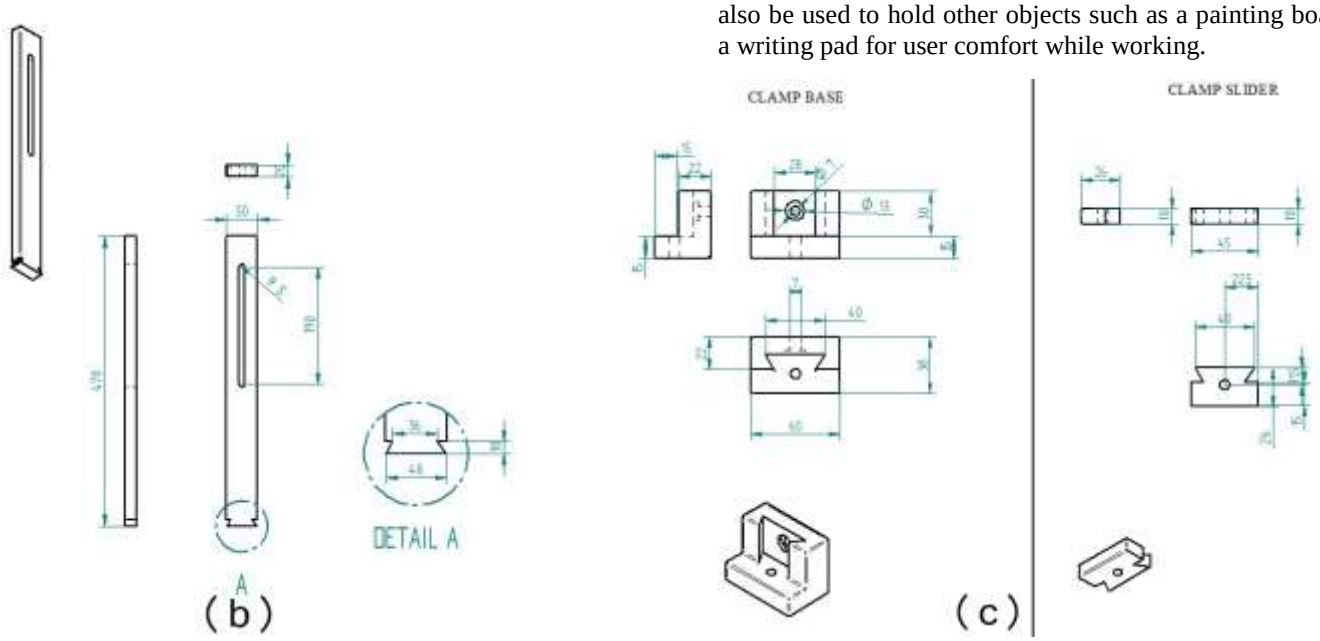


Fig. 5.1 (a) Base (b) Vertical arm (c) Clamp assembly having base and slider

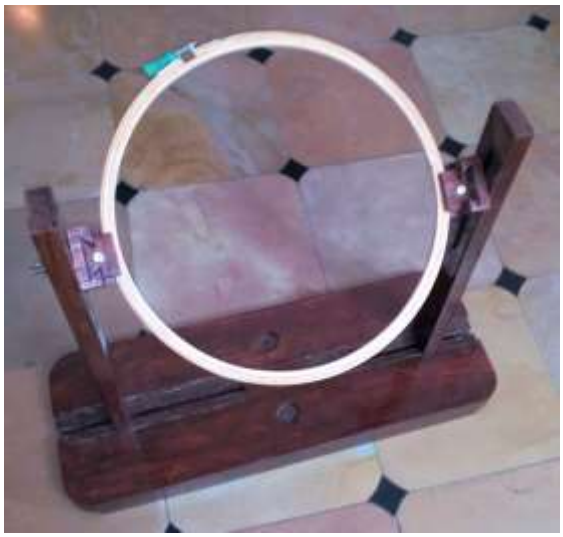


Fig. 7.1 Actual photograph of the embroidery hoop stand

VIII. Future scope

The design can be improved based on the user inputs. Different materials for the stand may be explored. Metal fabrication, and plastics can also be used. The cost of production may be bought down by using cheaper, yet durable materials, and mass production. The stand can also be made at a much larger scale, enabling bigger frames for different purposes be clamped onto it. The stand can be made clamp able to a chair or a table, so that those who cannot sit on ground and work for long durations, may sit on a chair and work. The stand may be modified for differently abled artists, depending on their necessity. The load bearing capability of the stand for general usage may be further studied, and improved. The hoop can be made easily rotatable, enabling the artist to rotate the hoop while working, along its axis, accessing the required portion of the cloth to be worked upon.

IX. References

[1] http://www.historyofclothing.com/
[2] http://www.indianetzone.com/41/embroidery_indian_villages.htm
[3] http://www.google.com/patents/US3818620
[4] http://www.ebay.co.uk/itm/Elbesee-Embroidery-Hoops-Frame-Wooden-Rings-Cross-Stitch-Needlecraft-Choose-Size-/160730978268
[5] https://www.nutsandbolts.com/wing-nuts.html
[6] http://www.google.com/patents/US6138965
[7] http://www.google.com/patents/US396073
[8] http://www.google.ch/patents/US3750312