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Study and conservation of a heritage artifact composed of plant fibers and embroidered with colored wool thread

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Abstract:

Heritage is all that was left to us by our predecessors in various fields, tangible or intangible, in addition to historical buildings and objects that were transferred and inherited through generations. Therefore, it is necessary to preserve and conserve our heritage, as well as preserve its authenticity. Specialists should pay special attention when preserving cultural heritage artifacts. In this paper we will study one of the commonly objects used in our daily life, a handmade mat known in Arabic as “Al-Bursh”. It was widely used in the oases of Egypt in the New Valley Governorate and in Nubia.

The chosen “Bursh” for the study is one of the acquisitions of the Folklore Museum at the Higher Institute of Arts, Academy of Arts in Al-Haram, Giza, Egypt. Due to years of use, followed by years of storage, several deterioration aspects were noticeable. These aspects were documented, photographed and recorded, also the types of fibers used in the manufacturing technique were identified. The technique of making the "Bursh" was also closely studied, as a preliminary step in the conservation and treatment process.

The deterioration aspects of the “Bursh” were examined in several ways, starting with photography and documenting by AutoCAD program and mapping the deterioration aspects using different keys, so that it could be easily recognized by non-specialists. Detailed documentation for the object by utilizing USB Digital Microscope was conducted to identify the deterioration aspects that are not visible by the naked eye. The identification of the plant was made with the aid of a Stereo Microscope, in addition the Infrared spectroscopy (FTIR analysis) was carried out to identify the extent of changes that occurred in the functional groups within the chemical composition of the plant used in manufacturing the Bursh. Analysis were followed by conservation and treatment, which included mechanical cleaning and consolidation process of the object without changing its structure, and the addition of a linen support, which helps protect it from external deterioration factors, to maintain it for future generations.

Keywords: Bursh, consolidation, documentation, examination, Mat, palm fronds, support

Introduction:

The artistic heritage is an essential component of the authentic Egyptian identity, and traditional embroidery is considered a creative art form that distinguishes Egyptian women. The oases, the Egyptian countryside, and northern Sinai are places known for their artistic creativity. Some institutions have sought to document certain aspects of heritage through the implementation of a pioneering project within the "Women as Guardians of Heritage" program.

The Academy of Arts has also shown interest in preserving heritage. One of the academy's objectives is to educate and document arts, as well as conducting scientific research to serve society and contribute to its cultural advancement. The weaving industry is one of the oldest traditional industries in Egypt, dating back to ancient times when Egyptians used various environmental components around them. Among these components, palm fronds are widely spread in the oases, the New Valley, and villages in Upper Egypt. Craftsmen in this profession use green palm fronds, which are soaked in water for a certain period, to shape many products. The core of the palm tree, which is characterized by its flexibility, is used in the production of baskets, some types of mats placed in houses, rugs, and various forms of prayer rugs.

Manufactured models made from plant fibers are particularly susceptible to damage due to their composition. A study was conducted on the deterioration aspects of one of the heritage pieces in the Folk Heritage Museum at the Higher Institute of Folk Arts - the Academy of Arts in Giza. The piece was acquired through a purchase made by the Folk Arts Center. "Al-Bursh" is considered one of the most important heritage pieces in the New Valley Governorate, as it is an essential part of the bride's trousseau, traditionally made and embroidered with colored threads from an early age.

The research objectives are as follows:

- Study the plant fibers used in the production of "Al-Bursh" (a type of woven mat).
- Investigate the stitches used in embroidery on the surface of "Al-Bursh."
- Examine the techniques employed in the manufacturing process.
- Shed light on the aspects of deterioration of "Al-Bursh" through various examination and analysis methods.
- Utilize restoration reinforcement materials to strengthen the manufactured fibers of "Al-Bursh."

- Employ supportive reinforcement (linen) to preserve the fibers.

Documentation and recording using photography:

Documentation work is essential before carrying out restoration operations using various methods, including photography. In some cases, documentation methods may include examination techniques and the use of modern computer programs such as AutoCAD. Documentation can be defined as textual and visual records collected during maintenance and restoration processes.

- Initially, "Al-Bursh" was divided into eight squares using white cotton thread to facilitate the documentation process.
- Precise recording of "Al-Bursh" was performed to assess its current condition using a Nikon D 7500 digital camera.
- The AutoCAD 2019 program was used, as it significantly aids in studying the piece without causing further damage. It also documents the condition and degree of damage by utilizing dimensioned line drawings. This is achieved by creating a map of the different aspects of deterioration.

The name of the artifact: Decorative "Al-Bursh" woven from palm fronds, embroidered with woolen threads in the shape of a lotus flower, oval-shaped. Similar examples can be found in Nubia. The outer frame of "Al-Bursh" is covered with brown fabric, featuring colored fringes made of threads. It has one handle made of twisted fiber.

Place of acquisition: New Valley (Oases)

Artifact registration number: 1520

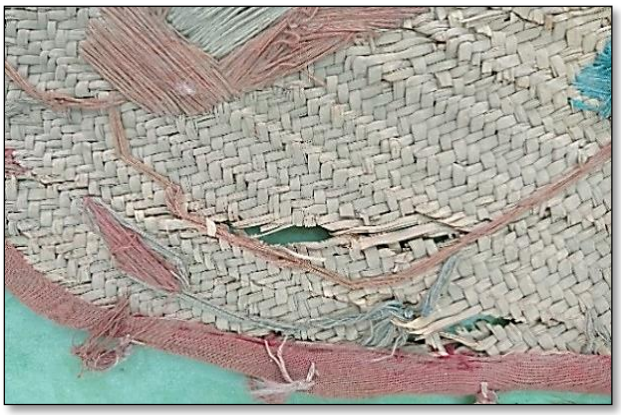
Length of "Al-Bursh": 142 cm

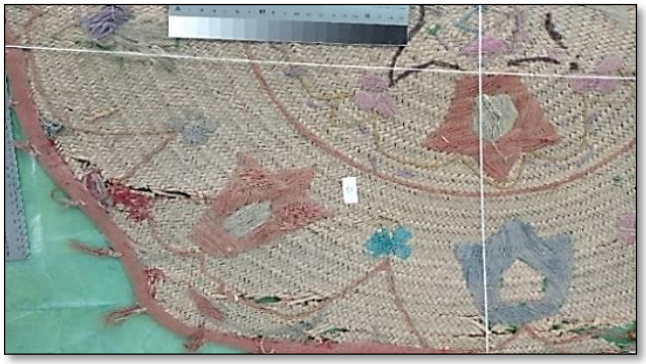
Width of "Al-Bursh": 94 cm

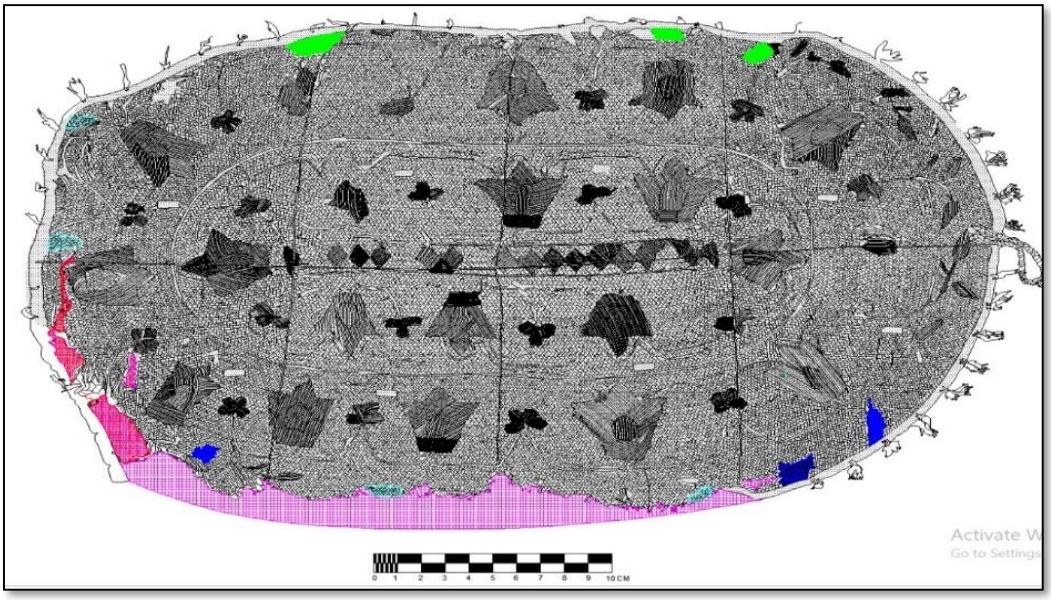
Figure 1 illustrates the "bursh" after being divided into eight units using cotton thread for accurate documentation of each part of the bursh before performing maintenance and restoration procedures.

Through visual examination and inspection of the bursh, the current condition reveals the following:

- Accumulation of a thick layer of dust and dirt on the surface of the bursh as a whole (Figure 2).
- Disintegration, separation, and deterioration of the fibers that make up the bursh (Figure 3).
- Changes in the dimensions of the external shape of the bursh and the detachment of the fabric outer frame from the fibers (Figure 4).
- Existence of previous restoration work, possibly carried out by the original user of the bursh, which involved inserting adhesive fabric tape on the edges of the bursh to compensate for the loss of some plant fibers, aiming for repair or reinforcement (Figure 5).
- These aspects were also documented using AutoCAD software, and then recorded using lines and geometric shapes to facilitate understanding for non-specialists in conservation and maintenance (Figure 6).







Description of sprinklers and study of stitches used in its embroidery:

Industry technique used:

It is crafted in a braiding style, where separate braids or braids are made and then intertwined with each other with palm tapes to act as required. M.L. ' In this method, all constructive elements are influential, i.e. all moving by fingers in order to be the form of braiding, i.e. of equal importance in manufacturing.

Decorations:

Oval-shaped sprinkler in the middle of which there is a rectangle of brown thread embroidered with the branch stitch inside which has specimens embroidered with filler stitch The rectangle surrounds the refined lotus flower eight times associated with the chain stitch and then ten lotus flowers that form a fire or external frame of the brush associated with winding lines of the chain stitch, There is also between each of the lotus flowers and another small flower. It is worth mentioning that the source of decorations prevailing in the governorate of the New Valley and located on baskets, nights and brushes is taken from the surrounding environment, which is characterized by simplicity, automatic and inexpensive design.

Embroidery:

Textile decoration after it is woven by embroidery needles using different types and colors. In the case of sprinklers, the subject matter of the study, after completion of the manufacturing process was embroidered through the controversy of palm fronds fibers. As for the methods of embroidery of Bursh, four types of stitches were used: branch, chain, simple and composite filler where girls in the New Valley governorate were embroidering it after finishing the

controversy and developing a design inspired by the surrounding environment and the different colors that fit the design (figure 7).

Figure (7) shows the types of stitches used in brushes.

Branch stitch: This is called because it gives the form of branch-like lifting lines, and it is done from left to right, and it is observed in this stitch that the length of the first stitch is twice the length of the rest of the stitches, where the needle comes out on the face of the weaving, then a short stitch is made and the needle comes out in the middle of the first stitch, urging the thread under the head. Repeat work along the line by swiping the needle from the same hole as the previous stitch, taking into account that the stitches' lengths are equal, and indicate the validity of stitches appearing from the back in the form of a plant stitch ().

Chain stitch: this name is called because it resembles chain rings, and work is done from right to left, and the steps of its work: a - The sewing is fixed in the fabric, the needle is re-inserted from the installation place, the needle is taken a suitable distance and then the needle appears and the sewing is placed under its age, so that it is similar to the chain ring, b- pulls the needle and enters next to its previous exit place inside the ring, c - the rest of the rings are supplemented in the same way and ends the last ring outside the ring (directly into the ring).

Simple filler stitch: This is called because it fills spaces according to design form, using straight or inclined stitches, and this stitch does not fit into large spaces, so as not to increase the length of the stitch from the appropriate length, either the shape or the stamina of the use and is one of the fluctuating stitches. Working method: The work is started from the finest point of drawing, in the form of parallel and contiguous lines covering the entire area of decoration. Tightening in the sewing must be suitable for the filler to appear flat without any contraction or relaxation, while taking care to maintain the limits of the drawing.

Composite filler stitch: Performed like a regular filler stitch, but when the filler stitch is long horizontal, a straight stitch can be executed vertically over it and these stitches are separated by small distances to make the stitch visible and at the same time coherent and are not prone to cutting because of its length and are used in filling spaces and two colors can be used in its execution.

Documentation using multiple types of microscopes

- Detailed photography of the workshops was carried out to identify the manifestations of non-visible damage to the naked eye using the digital microscope YX-AK32 Portable Digital 30W 1000X
- 2.To learn about the type of fiber used in the brush industry, use the Stereo microscope Stemi 508 CL 4500 LED microscope.
- 3.Scanning Electron Microscope (J0EL JSM S400L V EDX Lin ISIS-Oxford high vacuum) was used at the Faculty of Science - University of Assiut, with gold coating to identify changes in the anatomical composition of the surface.

The use of the digital microscope to record the manifestations of damage is explained by the presence of dirt and dirt that formed the layer above the fiber as a result of the use of long periods of time by the original acquisition of the workshops) form 8), as well as potentially damaging brushes produced from the outset of their manufacture of plant fibres that degrade faster than some other organic substances, since the process of cleaving stems and slicing leaves may have caused damage to those phytosanitary fibre parts. The erosion of fibers or decay of the impact surface, which may be caused by a decrease in the water content of fibers with their dehydration, may be associated with a rise in temperature in the new valley area (figure 9). Another phenomenon has also been the detachment of fibers as a result of the union of relative humidity and temperatures for its continuous alternative cycle (drying and hydration cycles lead to deflation and expansion of fibers). These continuous changes in dimensions ultimately lead to separation, flaking and the crystallization of salts on the surface.

Loss in plant fibers with separation and flaking of the outer surface (shape 10, 11) results in weakness, fragility and bombardment of fibers with loss in some parts with effect. It also shows the extent of deterioration and cracking of fiber, which is produced from the needle used to implement the embroidery technique on top of the fiber surface (figure 12, 13).

Shape (8) shows dirt and dirt (magnifying force of 1000X).

Shape (9) shows the loss and rupture of fiber (zoom force of 1000X).

Shape (11) shows corrosion in fiber (zoom strength of 1000X).

Shape (10) shows the detachment of fiber (zoom force of 1000X).

Shape (13) shows the effect of embroidery technique on fiber (zoom strength of 1000X).

Shape (12) shows by brushing technique (zoom force of 1000X).

Results and discussion:

Fiber definition through microscopic screening by examining the digital microscope of the fallen sample and comparing it with modern samples with

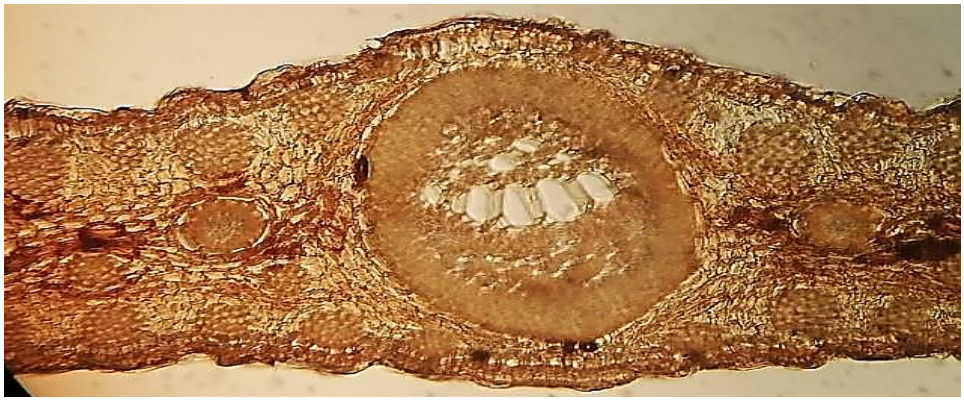
plant-based oases, the use in the new valley (oases) showed that the sprinkles were manufactured from palm fronds, showing the shape of (14, 15) the picture of the standard sample of the balm palms and the sample of the falling sprinkles.

The photoscope was used to confirm the definition of the plant used in the brush industry and through the comparative anatomy and anatomical form of the plant, palm fronds were confirmed as the plant used in the brush industry (Figure 16) Which is characterized by linear rib tapes consisting of chlorinchime cells, rectangular in shape, with regular gaps in two or three rows (But they are not clear in the sample) And these cells are long in 5-12 rows and they have slightly winding merit, and the rib tapes consisting of pranchimi cells cover groups of fibers and are regular cells, longer and narrower than the cells in the rib tapes and with a winding wall. With palm fronds, there are oval silicoscopic objects, clusters of shape that appear in the skin's rib cells.

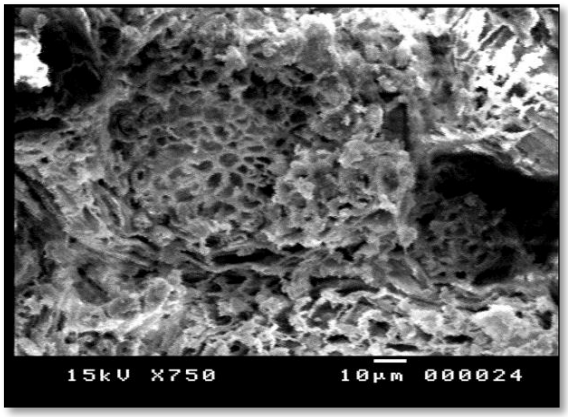
Through scanning electron microscope imaging, a layer of dirt was observed above the outer surface of one of the samples that was falling from the bursh, as also revealed during the inspection by the presence of decay and compression in the cell wall of the sample resulting in weakness and fragility of the fiber (figure 17, 18)

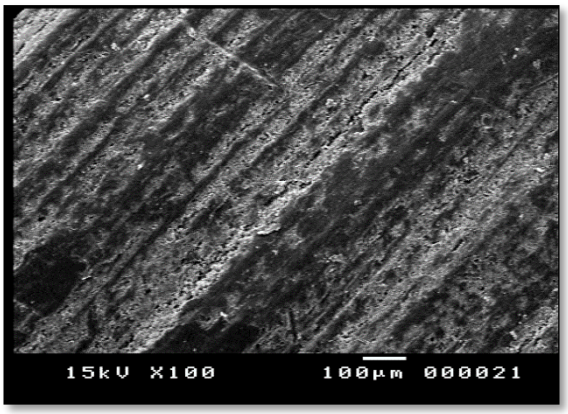
Shape (14) shows the surface appearance of the brush sample, where there are longitudinal fiber cracks (zoom force of 10000X).

Shape (15) shows the surface appearance of the modern standard sample of palm fronds (zoom strength of 1000X).



The shape (16) of the MiSCOP illustrates the cross-section of a fallen sample showing the anatomical composition of the palm palm fronds consisting of skin with tapes between wide ribs and narrow rib tapes (X100 enlargement).





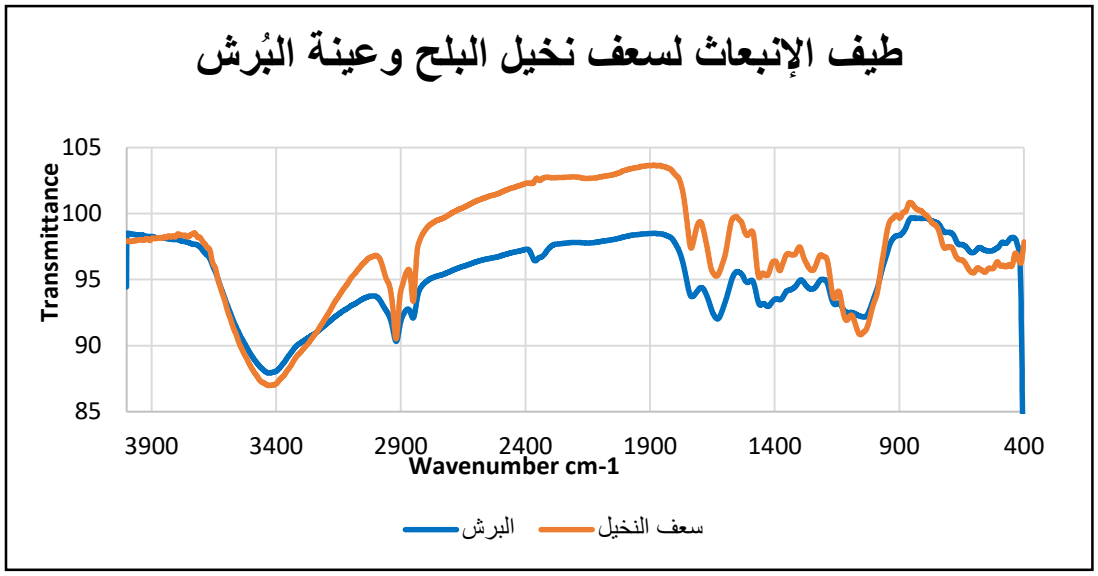
Shape (17) shows the cellular worthiness of barnaceous and chloronchemical skin cells, image by scanning electronic microscope.

Shape (18) illustrates the decay and compression of skin cells, image by scanning electronic microscope.

-Infrared Spectrum Analysis

Infrared spectroscopy used FTIR Analysis to identify the extent of changes in functional groups in the chemical composition of the plant used in the industry where solid tablets of specimens from potassium bromide (KBr) were made at a concentration (% 0,002) within the microprocessor - Faculty of Science - University of Cairo using the Jasco F460 (between 400-4000-Range 1). Comparing the emission spectrum in the brush sample and the modern sample of palm fronds (figure 20) and table (1), the expansion of the hydroxyl tide area (OH) is evident at 3397,96 in the archaeological sample and the disappearance of both the functional group of hemicellulose D = O at 1735,62 and the functional

group of the embryo at 1509,99 mC = oC. The functional groups of cellulose are still very clear and are increasingly absorbed.



The form (19) of the infrared emission spectrum shows the differences between the brush sample and a modern sample of palm fronds.

Maintenance and restoration of workshops

Commencement of mechanical cleaning operations. This phase involved the use of mechanical methods in cleaning dirt and dirty from the surface of the brush using soft and clean brushes (Drawing brushes or beautifying brushes) and small air pumps, and due to the loss of some fibers and the disintegration of others and the loss of some embroidery units, maintenance and restoration work was done in each of the boxes that were divided at the top of the surface of the brush into fake squares using thread to reduce over-cleaning in one place due to weak plant fibres including brushes.

Shape (20) shows mechanical cleaning using soft clean brushes.

Shape (21) shows mechanical cleaning using air pumps.

Chemical cleaning

The woolen yarn was cleaned after the color firmness of these yarns was tested using tie soap and 2% distilled water or 2 grams of tie soap per 100ml distilled water (shape 22, 23).

Shape (22) shows chemical cleaning of woolen yarn using tie soap.

Form (23) explains the researcher during the chemical cleaning of those decorative units.

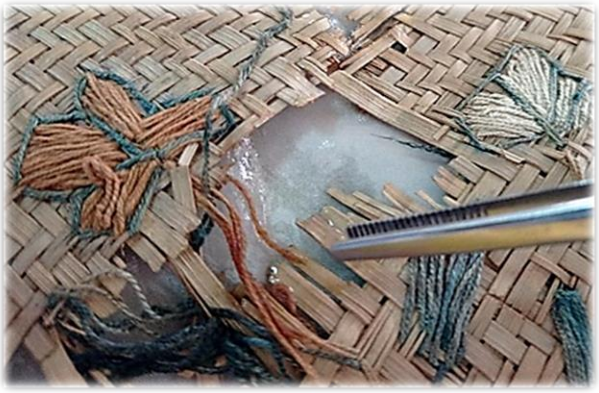
Installation and reinforcement

Clussell E Hydroxyl Propyl Cellulose (HPC) was used for the production of CTS. This substance belongs to the family of non-ion cellulose ethers, is a water soluble substance at a temperature below 38, it is also insoluble in water when the temperature is above 40 ° m, it is also soluble in many polar organic solvents (ethyl alcohol-isopropyl alcohol 95%). It is also insoluble in Toluene and Xylene. Klucel E properties are characterized by low viscosity, where viscosity in the 10% concentration solution is between 150-700 mPas viscosity specified at a temperature of 25 ° C (), the degree of glass transformation TG 120 ° C) (.

Preparation: Chlorinated in ethyl alcohol (purity 99%) was dissolved 5% weight/size for stabilization and adhesion, and for strengthening the concentration of 0.5% was prepared.

A. Process of fixing disassembroidered fiber and embroidery unit threads:

The dismantled fiber tips have been strengthened and stabilized to prevent the breakup of the controversy used in the burshe technique, as well as to install the tips of the woolen embroidery thread to prevent the disintegration of stitches forming the embroidery units, using chloricle at 5% concentration and applied topically using the brush.



Shape (24) shows the installation of embroidery threads so that the decorative unit is not eliminated.

Form (25) shows the installation of plant fibers so that they are not lost. B. Strengthening plant fibres that make up the workshops:

The physical properties of textiles that suffer from fragility and dilapidated tissue composition can be improved through reinforcement treatment, which often includes the addition of materials that reinforce the fabric, and these materials have special specifications, the most important of which are to be retrograde and transparent.

When applying the reinforcement material in an inappropriate manner, there is a discoloration of the artifacts. (Darkan) which is the result of the rapid evaporation of the solvent used to dissolve the reinforcement material, resulting in the exit of the reinforcement material to the surface which can be observed by the naked eye, as well as causes glitter on the surface of the artifacts as well as poor internal cohesion of its artifacts and the formation of a coherent layer on the surface as a result of the deposition of the reinforcement material without permeating into the inner fibres. Solvents with slow evaporation rates can be used or a technique that slows down solvent evaporation to give a chance for good penetration. A manifestation of the erroneous application is the presence of a superficial calcified layer of reinforcement material, especially if the reinforcement material has a high viscosity or if applied at a high concentration and is applied in consecutive layers without waiting until dehydration or ensuring good penetration of the substance used, so these problems must be taken into account when using and applying the reinforcement substance.

The reinforcement was applied to the brush using the spraying method (figure 26, 27) in order to distribute the reinforcement material to it in a regular manner.

Form (26) shows the strengthening of plant fibres to return essential elements after many have been lost.

Form (27) shows fiber reinforcement process using Clussel E.

Removal of previous restoration

Through visual examination of previous restorations and treatment of the workshops, the old stitches of previous repairs were removed Because of its distortion of its artifacts, it was found that it was added by the original user of the sprinkler as a result of the loss of part of the plant fibres (such as repair or reinforcement for the reuse of brushes) (Figure 28, 29), the external frames of the dyed linen in the structure surrounding the brush were also dismantled, as the frames were installed again after the consolidation phase.

Form (28) clarifies previous restorations by the user for repairs.

Form (29) shows the removal of the previous restoration and stitches that included fiber.

Support strengthening

After the reinforcement phase, the exterior shape had to be restored to normal and the limbs protected from eating again. The reinforcement was done by adding a canvas of natural linen, which was cut 15 centimetres inside to take the correct exterior shape of the workshops (Figure 30). The reinforcement holder was installed in Clussel E at 5% below the sprinkler.

Shape (30) shows the reinforcement reinforcement by using a linen cloth holder in the exterior shape of the shower with a width of 15cm.

- Final reinforcement and tape reinstallation stages for the workshops

The tape was installed in the brush and the linen holder in order to maintain the aesthetic shape of the shower. After the 5% stabilization of the holder in Clussel E, the external shovel was recombined with the thread around the sprinklers in the correct manner (Figure 31, 32), having been pre-installed inside by the original user of the shower, distorting the distinctive oval shape of the sprinkler.

Form (31) shows the installation of the tape by initial installation with a bicycle stitch before the final installation phase.

Figure (32) shows the final installation of the magic stitch to take into account the aesthetic shape of the workshops.

Brush after treatment and maintenance stages

After all maintenance and restoration operations and without any completion of the manufactured fibres including Bursh and preservation of the authenticity of this rare piece, it has been completed and well preserved for future generations (figure 33).

Form (33) shows the final form after treatment and maintenance

Conclusion

Through the methods of examination, documentation and analysis used in the study of the brush, palm fronds can be identified as the plant used in the industry of the brush under study. With the use of Digital microscope USB, there is corrosion in the fibres forming the workshops and there are also separations and loss between the fibres. Through the fallen parts of the sprinkler, the opportunity was given to make cross-specimen segments so that we would be commended for confirming the plant used in the brush industry. Analysis of the FTIR infrared spectrometer confirmed the absence of the basic functional groups of hemicellulose and lignin by comparing the standard sample analysis to the analysis of the brush sample which confirms the weakness of the fiber as a result of its loss of two of the plant's basic components, namely, lignin and hemicellulose with the presence of the cellulose compound, which is the basic structural unit known as fibre at its frequency for water absorption or moisture.

By comparing the characteristics of both modern palm fronds and the plant used in the brush industry and the extent of deterioration, as well as by monitoring the chemical change of the functional groups of fibres, the relationship between the change in the chemical composition of plant fibres and the state of damage to

the brush in terms of separation, weakness or decay of plant fibres and their discoloration is evident.

Recommendations:

- -When presenting the museum of the Burshe piece, it is recommended that it be in a horizontal position and avoid being suspended in a vertical position so that we avoid the breakup or disintegration of the fiber forming the shower again.
- -The best preservation methods for the burshe piece are to save in a horizontal position inside an airtight drawer coated inside with acidity-free Japanese paper.
- -Adjust the temperature of the display or storage environment between 20-22 m, and relative humidity from 45-55%.
- -Dry cleaning is preferred when periodic maintenance of the burshe piece using soft brushes.

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