



UTILIZATION OF KUNDEKARI TECHNIQUE FOR PRODUCTION OF DURABLE FURNITURE

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Received: 22.11.2016, Accepted: 30.11.2016

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Abstract

Kundekari technique has been known for centuries for its unique characteristics. The original [real] kundekari system where pieces of geometric blocks and keel bars are interlocked through tenon-mortising and tongue-groove without the use of any nails or glue, makes the whole structure very durable. The purpose of this study was to examine properties of original [real] "Kundekari" technique and imitation applications, investigate dimensional and functional properties and analyze the system elements. To make imitation "Kundekari" panel is easier than original kundekari panel. There are three methods to imitate original technique: relief, gluing-nailing and relief-nailing with different construction properties. Deformation properties of original and imitation kundekari panels were investigated and compared with the samples. The results indicated that imitation kundekari panels generally had some fallen decorated keelbars, cracked and split places. So imitation kundekari furniture life is short, due to moisture and hot weather. The furniture produced with original kundekari technique proved to be more durable.

Keywords: Deformation, Kundekari, Wood craft, Turkish Wooden Art, Tradition, Durable furniture

DAYANIKLI MOBİLYA ÜRETİMİ İÇİN KÜNDEKARI TEKNİĞİNİN KULLANIMI

Özet

Yüzyıllardır eşsiz kundekari tekniğinin özellikleri bilinmektedir. geometrik bloklar ve kordonlu çitaller herhangi bir çivi veya tutkal kullanılmadan kını-zıvana yoluyla kilitli orijinal [gerçek] kundekari sistemi, tüm yapıyı çok dayanıklı hale getirir. Bu çalışmanın amacı, orijinal [gerçek] "Kundekari" tekniği ve taklit kundekari tekniklerinin özelliklerini incelemek, boyutsal ve fonksiyonel özelliklerini inceleyerek uygulanmış olan bazı kundekari elemanlarını analiz etmektir. Taklit "Kundekari" paneli yapmak gerçek kundekari panelden daha kolaydır. Taklit kundekari tekniğinin üç farklı yöntemi vardır. kabartma, yapıştırma-çakma ve kabartma-çakma. Gerçek ve taklit kundekari panellerinin deformasyon özellikleri araştırılmıştır ve örnekleri ile karşılaştırılmıştır. Sonuç olarak genellikle taklit kundekari panellerindeki bazı kordonlu çita ve geometric bloklarda düşmeler, çatlaklar, yarılmalar meydana gelmiştir. Yani nem ve sıcak havanın etkisiyle taklit kundekari mobilya ömrünün kısadır. Orijinal kundekari tekniği ile üretilen mobilyaların daha dayanıklı olduğunu kanıtlanmıştır

Anahtar Kelimeler: Deformasyon, Kundekari, Ahşap oymacılığı, Türk ahşap sanatı, Geleneksel, Uzun ömürlü mobilya

1 Introduction

In human history, people had used cavity of a tree as a house to protect themselves from wild animals and hard weather conditions. Moreover, wood is used for basic requirements such as shelter and furniture. Thus, architecture and wood art had been created and developed till today [1].

After the wood discovered, its swelling and shrinking properties were known. People started to use the wood in different places. For example, "Kundekari" technique (art) was commonly used in the ancient time. "Kundekari" technique is very precious in Turkey. Thereby, wood located in human life and it has been used for thousands of years.

"Kundekari" technique is very important among the Turkish wooden art. However, this technique is obsolete in last decades. "Kundekari" technique was developed in Anatolia during the era of the Seljuk and it had been widely used during the Ottomans. It grew into furniture application area, particularly on mosque doors, mosque furniture, cupboard doors, windows hutters, and trunks. Today, it does not use in furniture industry while it was used for centuries in Seljuks and Ottomans. There are some examples that still exist from the ancient time and the examples have been used successfully. This has proofed that the

products which are constructed with "Kundekari" technique are very durable [2].

According to a journal, the word "Kundekari" came from the Turkish language from the Farsi word "kendekari," that is described plastic arts such as sculpting, engraving, and wood carving. "Kendakariye" implies some kind of engraving in Ottoman Turkish, while the word "Kundekari" emerged again from Farsi from "kunde" (log, solid wood). In time, this word started to being used for fine carpentry practices like woodworking and decorative wood ornamenting. "Kundekari" word is used only in Turkey [3].

The "Kundekari" technique, involves fixing small geometric pieces together with grooves. No nails or other fixatives are used. Thus, the works of art created with this technique have survived until today without being damaged by the environment. The grains of individual pieces were placed crosswise, so moisture or heat would not create deformation. As a result, works of "Kundekari" art have maintained their good condition and smoothness throughout centuries [4].

Unique artifacts which extant from Seljuks are arouse interest with regard their features. Some of these artifacts reflect liking of the era that they produced and also changing from eastern

culture to western culture. These artifacts are used for interior decoration and they have made wealth where they are. The number of artifact of the era are very rare, thus they are very important and precious. Because, they proof that characteristic of Asian Turks begin to chance with effect of Anatolia, Christian and Islam cultures. However, these works are also important due to create base of Ottoman art style [5].

Wood have used widely to construct and product the furniture of religious places in many nations. In churches, the pulpit, the despotic throne, the icon stands etc., in mosques, the pulpit, minbar, entrance doors etc. are just some examples of furniture in these places. The materials most frequently used in decorations are walnut, apple, pear, cedar, ivory and rose [5]. The finest examples of this art, which requires patience and expertise are found in Anatolia [6].

The materials most frequently used in "Kündekari" are cedar (Cedrus), rose (Rosa), pear (Pyrus), walnut (Juglans), ebony (Diospyros) and apple (Malus). Anatolia have been wealth for this species. "Kündekari" or tongue-and-groove joining is the name given to the technique of placing small pieces of wood side by side to form a design. This technique was first seen in Islamic art in the 12th century. It was employed both by the Seljuks and Ottomans, who enriched it with innovative and more advanced methods [7].

Wood material has been used to make any furniture for centuries but it is extremely important that keep alive for a long time. For this reason the techniques can affect the furniture life. Therefore, Original "Kündekari" technique is the best technique to produce any furniture long-lived.

In fact there are a few varieties of techniques about "Kündekari" art. Fundamentally, these techniques are examined in two different groups as original "Kündekari" technique and imitation "Kündekari" technique. When furniture made with the original "Kündekari" technique, there is no any fixative connector, geometric blocks are free to swell and shrink, against to harmful effect of moisture or climate in the elements of original "Kündekari" panel. Therefore, furniture can be durable for centuries without any deformation. However, if any furniture made with imitation "Kündekari" technique, it would not stay for a long time. Because it does not has any functional property to protect against to harmful effect of moisture or climate.

2 Materials and Methods

2.1 Original Kundekari Technique

"Kündekari" technique consists of pieces of wood in various geometric blocks and decorated keel bars skillfully placed side by side. The geometric blocks and keel bars are connected to each other with the help of groove-tongue joint technique while the keel bars are connected to each other by mortise-tenon joint technique. The joining of the system without any screw, nails, glue or any artificial binder requires a high degree of mastery. The way keel bars and geometric blocks are connected to each other allow the geometric blocks will not to fall out even of the wood dries up and shrinks.

Kundekari consisted of a few different structural elements and each element has a different function in the system. Functions and properties of these elements should describe.

- 1- Keel bar
- 2- Narlama
- 3- Geometric block
- 4- Lattice system
- 5- Frame

2.1.1 Keel Bar

The keel bars are the elements of skeleton system. It consists of decorative profile, mortise and tenon joints, tongue and groove joints and cavities on its own. Approximately, keel bar's cross section length is 20-40mm and height is 25-40mm as it shown in Figure1 (a) and Figure1 (a).

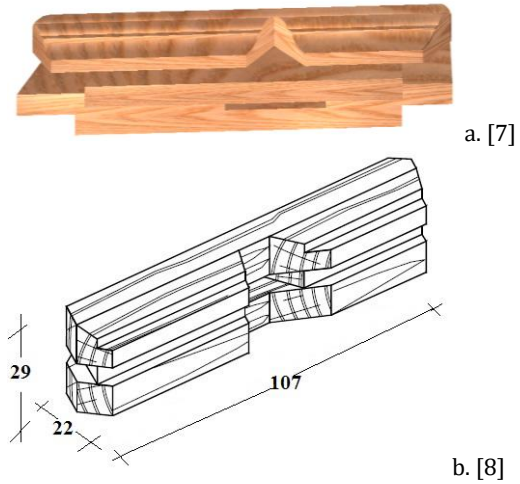


Figure 1. Some view of decorated keel bar

2.1.2 Narlama

"Narlama" is one of the most important elements of the panel. "Narlama" and keel bars connected to other in original "Kündekari" system. Because, it creates the main structural element in order to transfer the loads vertical, horizontal or any direction. In addition, that "Narlama" is manufactured like a keel bars and "Narlama" is also manufactured like a keel bars. Cross section dimensions are between 20-40mm. Dimensions of narlama are the same with keel bar. However, the length is longer than keel bars. So "Narlama" is the longest part and key element of a composition. Moreover, it has a special function what makes it different from other keel bars as it shown in Figure 2.

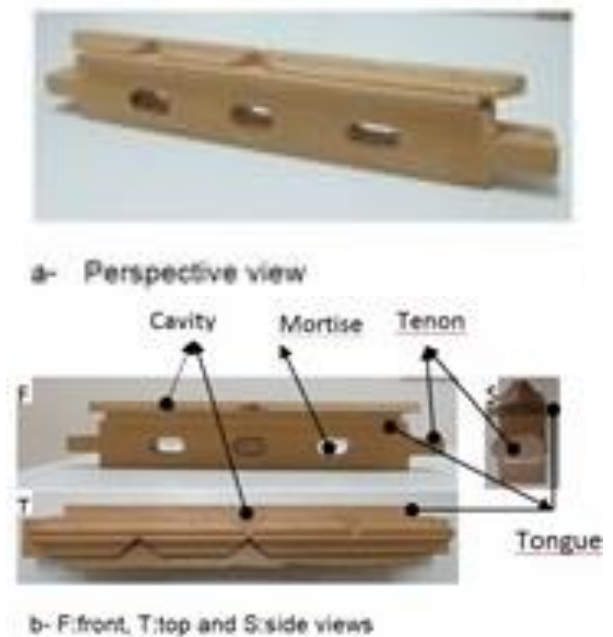


Figure 2. Different views of Narlama

It was decorated with profile and there are a few cavities on top of the "Narlama". There are two tongue on both side and three mortise located at the bottom of "Narlama". In addition, there are two tenons on the head parts as it is shown in Figure 3.

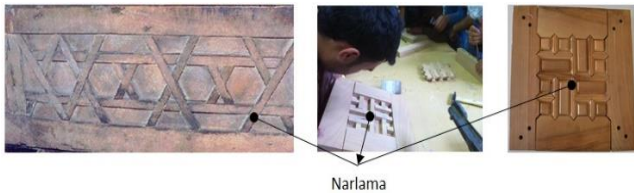


Figure 3. The biggest element of the panel "narlama"

2.1.3 Geometric block (Internal solid wood)

The geometric blocks were used as internal solid wood of the panel. Geometrical blocks have groove joint. The grooves have formed approximately 5 mm in height and 5 mm in depth and the distance between the edge of geometrical blocks. Groove was 7.5 mm. These geometrical blocks have a chamfer of 45° on top side which has distance of 1.5 mm between upper side of groove and bottom side of chamfer. They were assembled with tongue and groove joints to keel bars and frame elements as it shown in Figure 4.

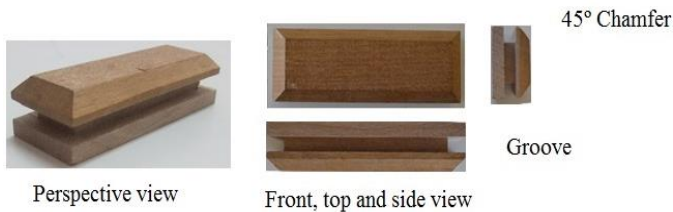


Figure 4. Different views of geometric blocks

2.1.4 Lattice system

Lattice system is a frame work which consists of narlama and decorated keel bars. When narlama and keel bars are connecting to each other with the help of mortise-tenon joint technique, they create the lattice system. Joining the pieces of lattice system without glue, screw or any artificial connectors involves quality craftsmanship. Lattice system surrounds each geometric block with the help of tongue-groove and establishes connection with frame elements to create the whole composition as it shown in Figure 5.



Figure 5. Lattice system

2.1.5 Frame

The frame elements are the outer elements of the panels and it uses to complete the panel. All keel bars which have edge to combine these elements were jointed with mortise and tenon joints and the geometrical blocks which have edge to combine were jointed with tongue-groove joints to this element. The frame elements were jointed with mortise and tenon to each

other and locked by crossing dowel pins. The interlocking system makes whole structure very durable as it is shown in Figure 6.

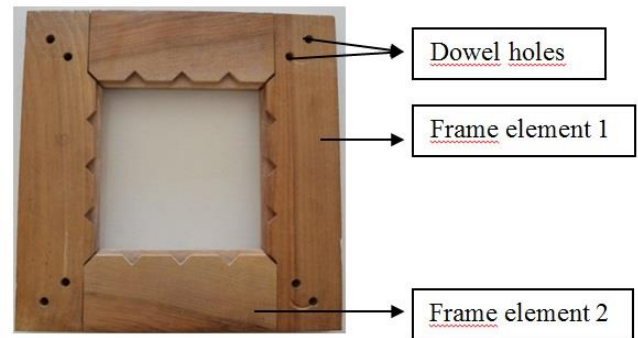


Figure 6. Frame

2.1.6 Original "Kündekari" Technique and Functions of the Elements

As a characteristic of the technique, there are approximately 2 or 3 mm gaps between keel bars and geometrical blocks. This function lets wood swell or shrink freely according to weather conditions such as heat and humidity as it shown in Figure 7. The steps assembling geometrical blocks and decorated keel bars shown in Figure 7-8.

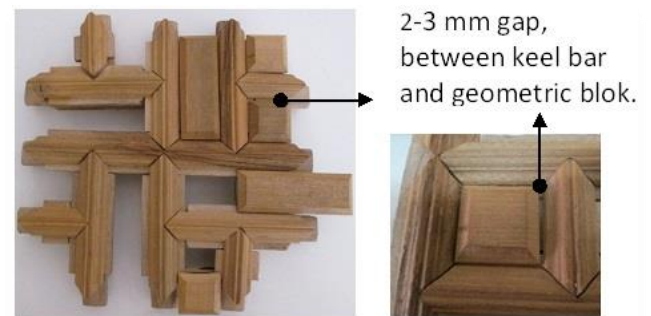


Figure 7. These gaps are for swelling and shrinking



Figure 8. The general assembling procedure of the original "Kündekari" panel

Assembled decorated bars are jointed with mortise-tenon while geometrical blocks are jointed by tongue-groove joint technique without glue, screw, nail or any artificial connector type. The frame is assembled around the composition of panel to keep all system together, as it shown in Figure 8.



Figure 9. The general view of the geometric blocks, narlama and keel bars.

There are some polygons like hexagon, star, deltoit, narlama and keel bar. These pictures are original "Kündekari" parts and visuals were taken in the workshop environment (Figure 9).



Figure 10. Minbar of Birgi gread mosque

Birgi Great Mosque is one of the choicest examples of "Kündekari" which is done in Sultanates age. The mosque had been constructed by Aydinoglu Mehmet Bey between the years 1308 and the mosque's pulpit is completed in 10 years and it was consisted of 300 walnut wood parts. Still it is served in the mosque. As it is shown in Figure10 [9].

Original "Kündekari" technique significantly reduced the dimensional changing of the panel [8]. Grtand Birgi mosque minbar constructed in 1322 and it undeformed by original "Kündekari" technique as it shown Figure 10.

The carving method was used by the Seljuks have been replaced by dovetail works of the Ottomans. This work was done by attaching small geometrical pieces by mortise-tenon joint. Since the veins of the pieces come crosswise in this method, deviations and deformations do not occur due to humidity and heat, and the works preserve their proper appearance over centuries [10].

2.2 Imitation Kundekari Technique

In imitation "Kündekari", a variety of techniques use such as relief carving technique (Figure 11), gluing and nailing technique and relief and nailing techniques.

2.2.1 Relief "Kündekari" technique

To make a relief "Kündekari" panel, two or more timber pieces are glued to each other from edge to obtain a big wood panel and large surface. Then, geometric or plant composition is transferred to the large wood surface. After that, surface of the wood panel would carve until the geometric blocks and decorated keel bars appeared. However, monolithic solid wood can deform due to moisture in the air. Because of wood has a hygroscopic structure, it swells and shrinks according to the equilibrium humidity. So, solid wood can be deforming by the time. Big cracks can appear in the middle of the relief "Kündekari" panel as a line as it is shown in Figure 11.

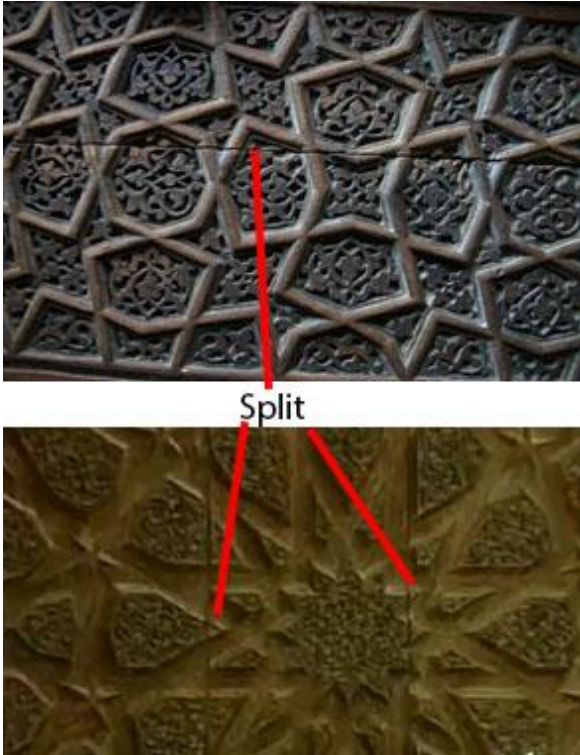


Figure 11 View of the relief “Kündekari” technique compositions

Constitute a group that requires less skill of imitation “Kündekari” technique. In the relief-nailing “Kündekari”, appearance of geometric blocks and decorated keel bars created by nailing on a wooden platform. However, it can be easily understood that the panel manufactured by imitation or original “Kündekari” technique. In imitation technique, the geometric blocks would be fixed and head of the nail can be seen easily on surface as it can be seen in Figure 12. One of the disadvantages in this technique, the nailed decorated keel bars and geometric blocks on the panel can fall down by the time as it shown in Figure 12 [13].



Figure 12. Some minbar view of Hacı Bayram Veli mosque, made with gluing and nailing Kundekari techniques

2.2.2 Gluing and nailing “Kündekari” technique

In this technique, desired geometrical composition is drawn first on the surface of the panel. Then, prepared wood pieces which consist the composition, connected to each other side by side with by glue-nailing technique.

2.2.3 Relief and nailing “Kündekari” technique

Another method of Kundekari technique is relief and nailing method. In this method designed composition is transferred by a drawing to a large panel, then grooves created on the surface of the panel for each keel bar. Following, prepared keel bars [lath] nailed into these created grooves. Thereby, geometric blocks are appeared automatically among the keel bars. Finally, precious carving is made on the surface of the geometric blocks. Minbar of Siirt Great Mosque is created by this method (Figure 13a).

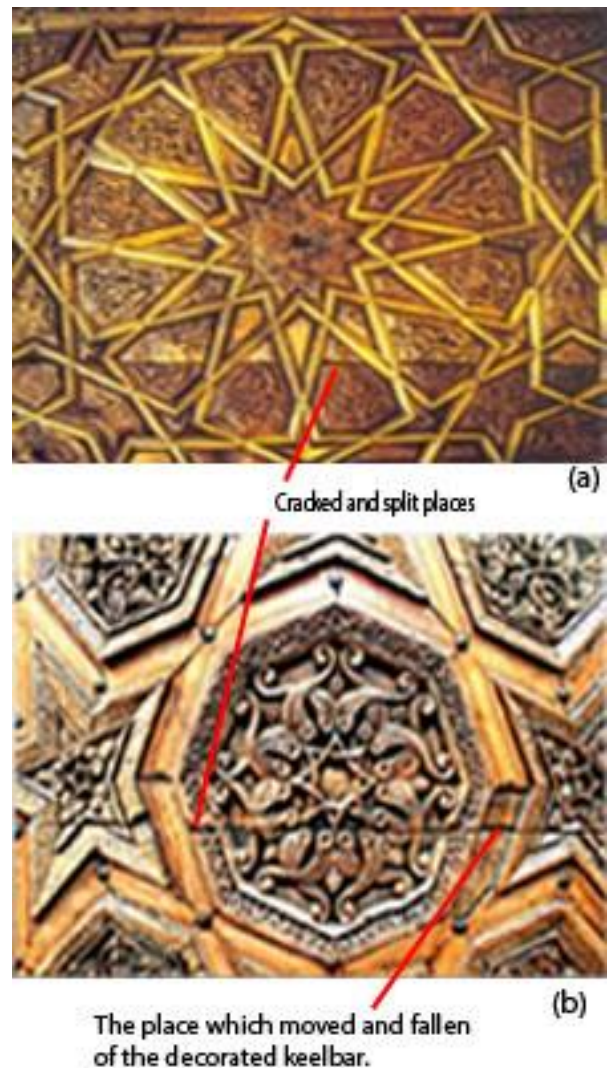


Figure 13. Some samples about relief and nailing “Kündekari” technique (a) Side panel of the Siirt Grand Mosque minbar (b) Embossing and nailing “Kündekari” technique

As a result of deformation of shrinkage and swelling of wooden panel, big cracks can appear as a line in the middle of glued and nailed panel. This line can create some splits on the geometric blocks and in the keel bar. As a result of this, keel bars can fall

down easily from the surface as it is shown in Figure 13b. This is a disadvantage of gluing and nailing "Kündekari" technique.

3 Conclusions

The purpose of this study was to investigate differences between original [real] "Kündekari" technique and imitation "Kündekari" techniques. Identifying their properties, and introduce the advantages and disadvantages of the both techniques.

The results proofed that original [real] "Kündekari" technique has many advantages over imitation "Kündekari" techniques. Wood material has used to make furniture with "Kündekari" techniques for hundreds years. Wood has a hygroscopic structure, therefore wood swells and shrinks according to the air temperature and relative humidity. So, moisture is harmful for solid wood materials. When furniture is made with original "Kündekari" technique, it is not affected by the moisture due to the presence of 2 or 3 mm gap between keel bars and the geometric blocks. These gaps let to geometric blocks to swell and shrink in safe limits. Although, geometric blocks which have swollen and shrunk for many years, they do not have any cracks or slits. They are not monolithic; they consist from a lots of small geometric pieces. This situation reduces the stresses and decreases the deformation of the wood. Furthermore, the technique does not use with any fixing materials like glue, nails, or screw; therefore, geometric blocks are free into the lattice system.

Therefore, furniture manufactured by using original Kundekari technique, would not have disruptive damage from moisture and humidity effects. This has proved to manufacture more durable furniture with original Kundekari technique.

Relief "Kündekari" techniques do not have all those advantages of the original version. They construct as monolithic solid wood and fixing materials. It causes the deformations, cracks, and splits in the wood within a short period of usage time. Although, imitation "Kündekari" technique simplifies the production of the furniture, it cannot serve for a long time.

Original "Kündekari" technique is a unique art and one of Turkish cultural heritage. It has served for more than 700 years and should be preserved and enhanced.

4 Acknowledgment

This study was presented as an oral presentation at the II. International Furniture Congress, 13-15 October 2016, Muğla, Turkey.

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