SETAR CONSTRUCTION

An Iranian Musical Instrument

Nasser Shirazi

Originally issued by PART Publications + Distribution, Tehran, 2002, as ISBN 964-5664 28 4.

Updated item ***version v7.0*** (see update list in INSERT0010).

Additional illustrations by Pierre D HEROUVILLE, 2006-2018

C O N T E N T S

ACKNOWLEDGMENTS

Scores of friends and family members gave me support, advice and encouragement as I conducted my research, and I was privileged to conduct interviews with several master musicians and instrument makers as well. This book is the result of that support. I owe them all a debt of gratitude.

Mahmoud Zolfonoun was an early inspiration and introduced me to his brother, Jalal Zolfonoun (both master musicians) who, in turn, introduced me to master setar maker Mahmoud Hashemi. Mohammad Reza Lotfi, master musician, lent his expertise as I developed my skills and introduced me to another master setar maker, Mehdi Kamalian, recently deceased. Mrs. Kamalian was very generous in providing me with the dimensions of one of her husband's setars, named "Marmar", which I have included in this book. I also would like to thank another master musician, Hossain Alizadeh, who tested some of my instruments and gave valuable feedback.

My deep appreciation also goes to Nasser Rastegar-nejad, poet, composer and musician, who assisted in editing the Persian text and my wife who edited the English translation. My thanks also go to Hy Geller who provided the cover photo.

This book is dedicated to
my daughter, Nina, with love.

- INSERT 00010 -

ZOLFONOUN, Jalal (born 1937)

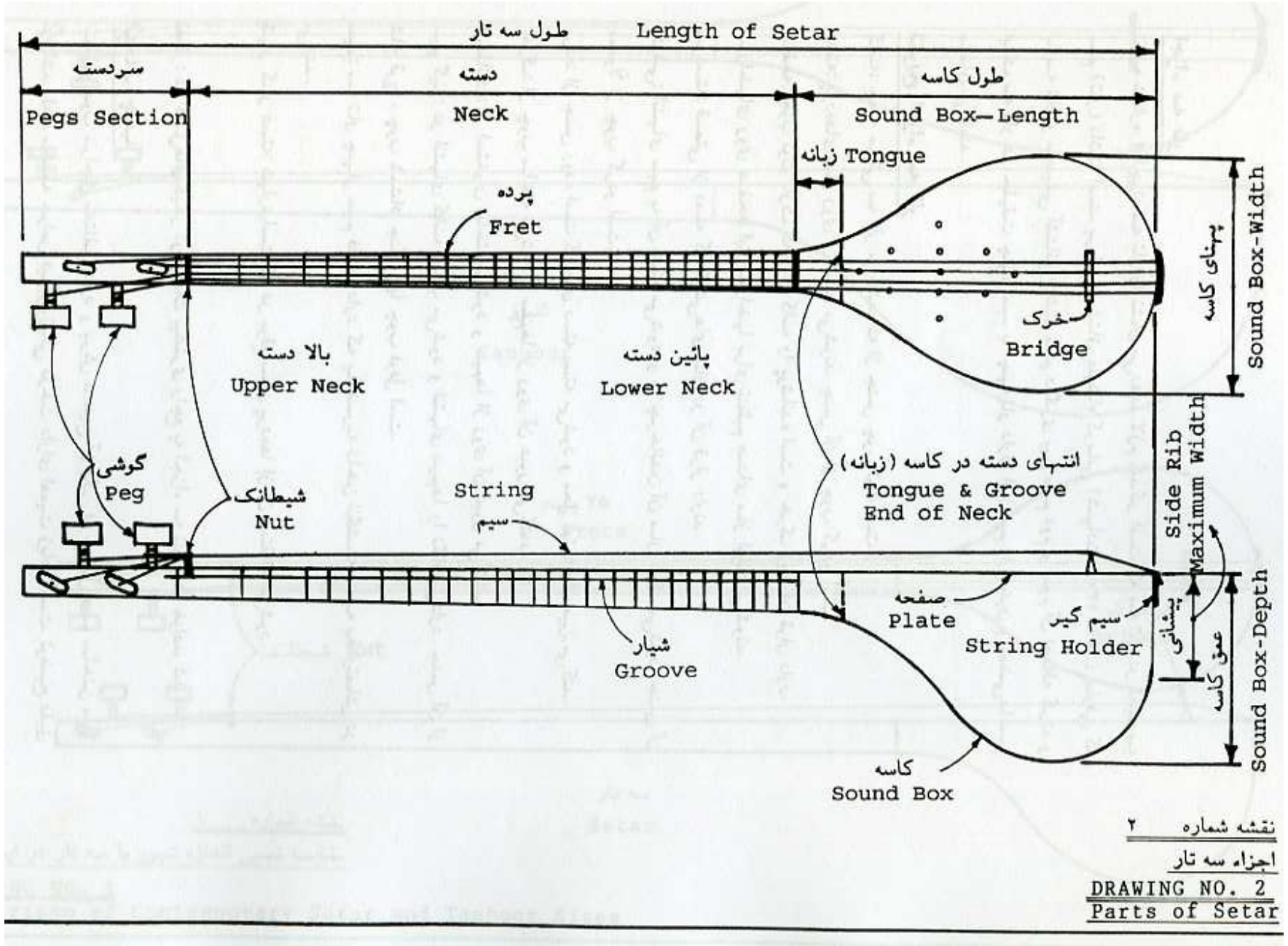
version	date	on line	updates
0.0	Dec. 2006	no	Original scan
1.0-3.0	. 2007	yes	Inserts 00010, 00030, 00060, 00083, 00020, 00023, 00024, 00066, 00073, 00075,00077, 00079, 00096, biblio
4.0	June 2008	no	Biblio, insert 00014, 00015, 00021, 00045, 00067, 00068, 00069, 0074, 00090
5.0	Febr 2009	yes	Inserts 00047, 00048, 00080, 00088
6.0	Febr 2012	yes	Baglama and insert 0082
7.0	Jul 2013	yes	insert 00092
8.0	Aug. 2013	yes	Update inserts 00020, 00021, 00022, 00088
9.0	May 2017	yes	insert 00092

FOREWORD

This instructional manual is an abridged English translation of the Persian text. It is the culmination of several years of my research and development of methods of constructing the setar and reflects my desire to share the information so as to enable English-speaking luthiers to build this musical instrument. It should be noted that the Persian language is written from right to left and Persian text page numbering begins from the right side of the book. Therefore, the page numbering system for referenced drawings and photos will read from right to left. Also, please note that all the dimensions are given in millimeters.

HISTORICAL BACKGROUND

The Setar (literally meaning "three strings", and not to be confused with the East Indian "sitar") is a very old Iranian instrument. It is played both solo and as part of a music ensemble. Unfortunately, there is so very little previously written information on this uniquely Iranian instrument that it is difficult to provide an accurate account of its origins. The great philosopher Al-Farabi (873-950 AD) in his book, KETABE AL MUSIGHI AL KABIR (The Great Book on Music), writes extensively about another similar instrument, the Tanboor, but he only makes a short reference to a kind of Tanboor that has three strings. Several contemporary books written on the subject of Iranian music conclude that the Setar must be a descendent of the Tanboor. Drawing No. 1 shows a comparison of their sizes. It should be mentioned that early setars originally had only three strings. However, it is said that in the last century, another string (placed between the 2nd and 3rd strings) was added by the mystic and musician, Moshtagh Ali Shah Kermani (died 1892 AD). Thus, contemporary setars have four strings.



نقشه شماره ۲

اجزاء سه تار

DRAWING NO. 2

Parts of Setar

PARTS OF THE SETAR

Drawing No. 2 shows the various parts which comprise the setar. They are:

Sound Box
Plate
Neck with frets
Tuning Pegs
Bridge
String Holder
Nut
Strings

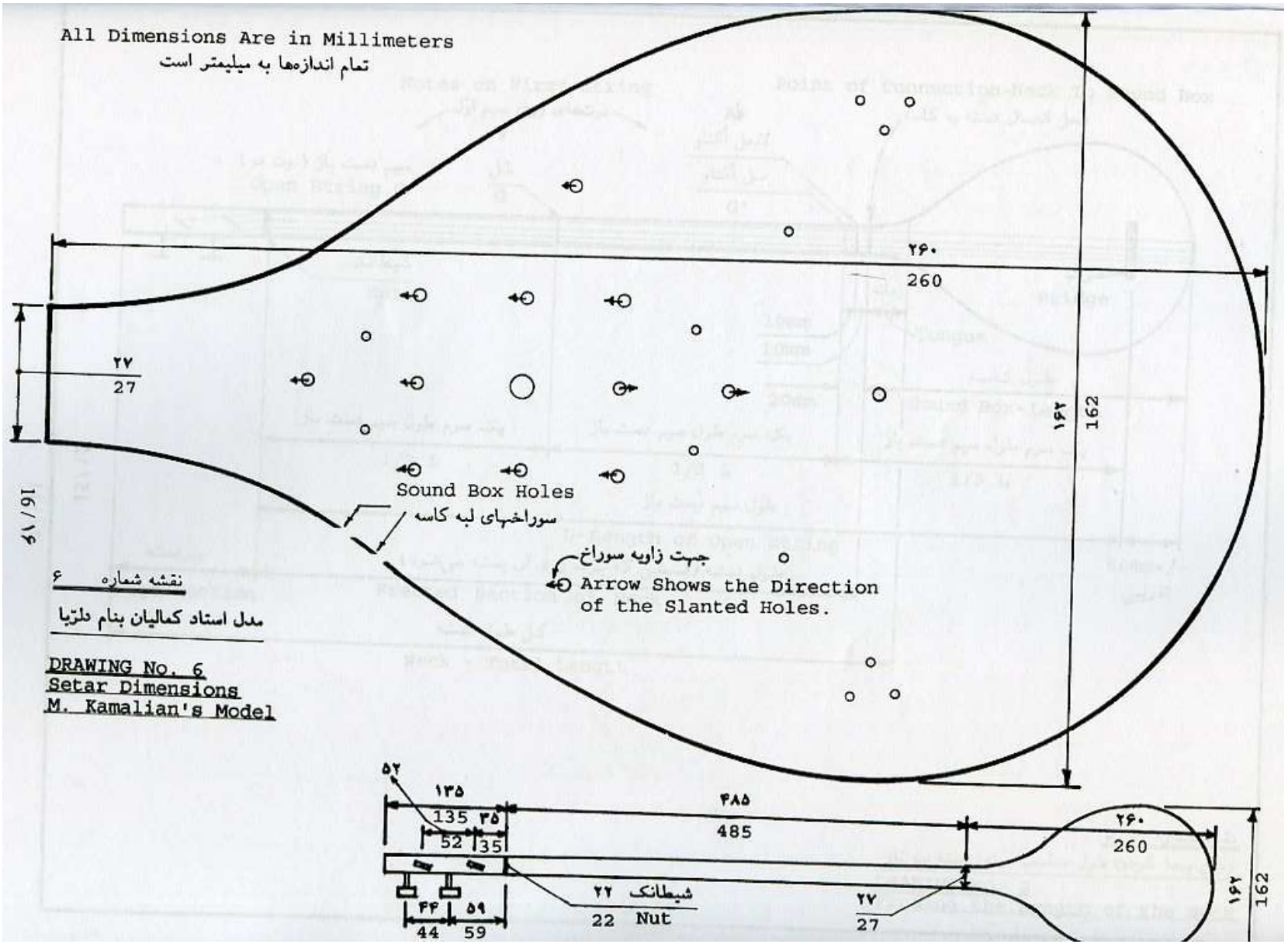
The setar is played by striking the strings with the approximately 3mm long fingernail of the index finger.

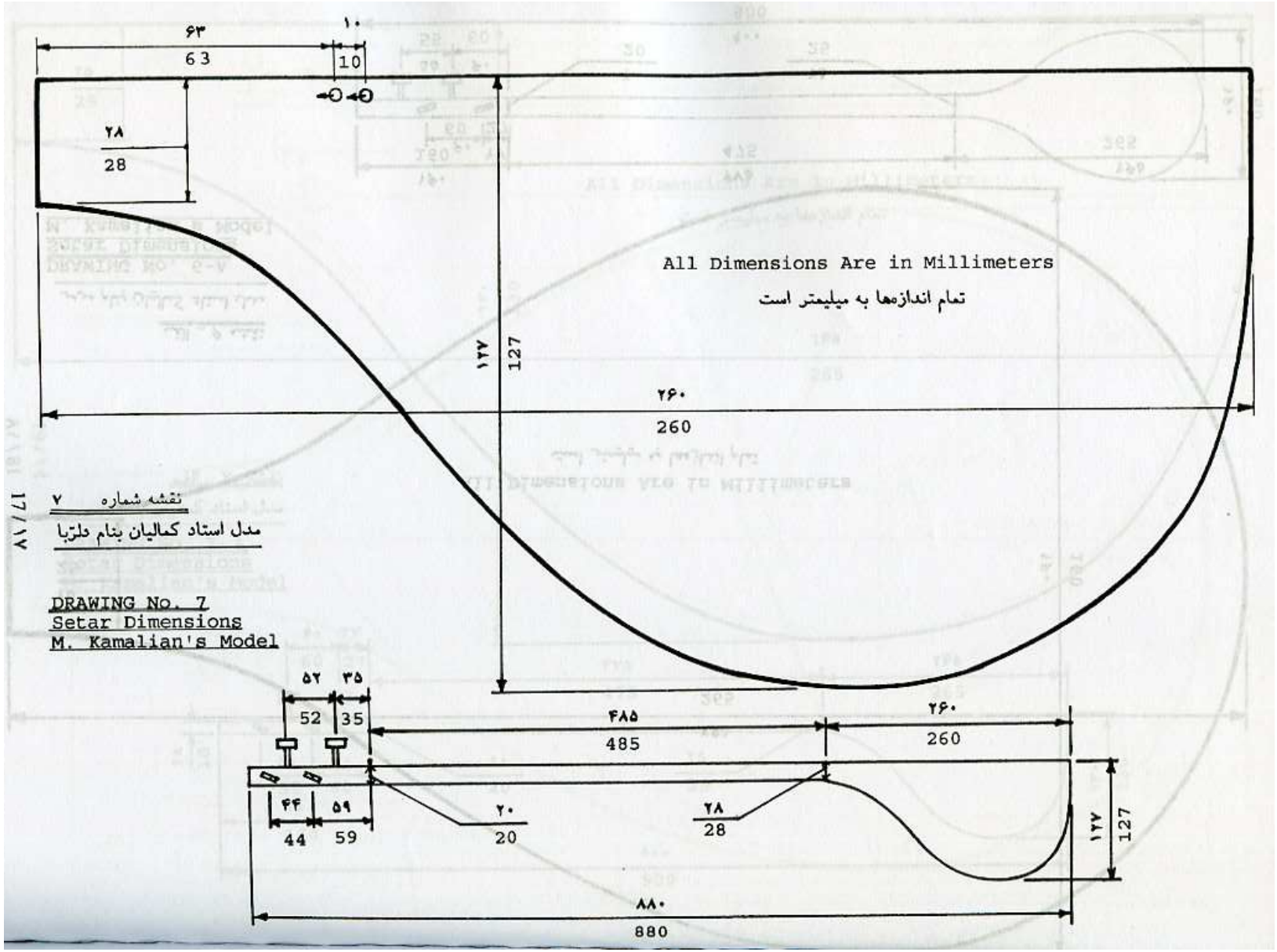
SELECTION OF WOOD

Mulberry wood (the fruit-bearing variety which is grown in hot and dry climates resulting in closer compacted annual rings) is used in the construction of the sound box and the plate. The wood from the hybrid mulberry tree which grows in humid areas and is fast growing is not recommended because the spaces between the annual rings are too large. The recommended spacing between the annual rings should be about 2 millimeters, but should not exceed 4 millimeters. (Photos No. 1 & 2). Walnut wood is usually used for the neck and tuning pegs. Drawings No. 3 and 4 show the method of cutting the wood from a tree trunk as follows. First, the tree trunk is split and its rough surface planed. It is then quarter sawn into pieces about 5mm thick. Heartwood, as indicated, is used in the setar's construction. Wood that has aged approximately five years, drying naturally in the shade with provision for air flow around it, is preferred as it produces a better quality instrument.

SETAR DIMENSIONS

Setars are designed and made in a variety of shapes and dimensions. In this book, the shapes and dimensions are given for four different setars, as built by three master Iranian setar makers. Drawings No. 6, 7, 6A and 7A show the dimensions of two setars made by Master Mehdi Kamalian. Drawings No. 8 and 9 show dimensions of a setar made by Master Mahmoud Hashemi. Drawings No. 11 and 12 show the dimensions of a setar made by Master Mohammad Navai, also known as Eshghi. In Drawing No. 10, the author constructs the curves of the setar's plate, using circular arcs.


All Dimensions Are in Millimeters
تمام اندازه‌ها به میلیمتر است
۲۶۰
260
۲۷
27
۱۶۲
162
۱۶/۹۱
Sound Box Holes
سوراخهای لبه کاسه
جهت زاویه سوراخ
Arrow Shows the Direction
of the Slanted Holes.
نقشه شماره ۶
مدل استاد کمالیان بنام دلربا
DRAWING No. 6
Setar Dimensions
M. Kamalian's Model
۵۲
۱۳۵
135
۳۵
52
35
۴۸۵
485
۲۶۰
260
۱۶۲
162
۴۴
۵۹
44
59
شیطانک ۲۲
22 Nut
۲۷
27



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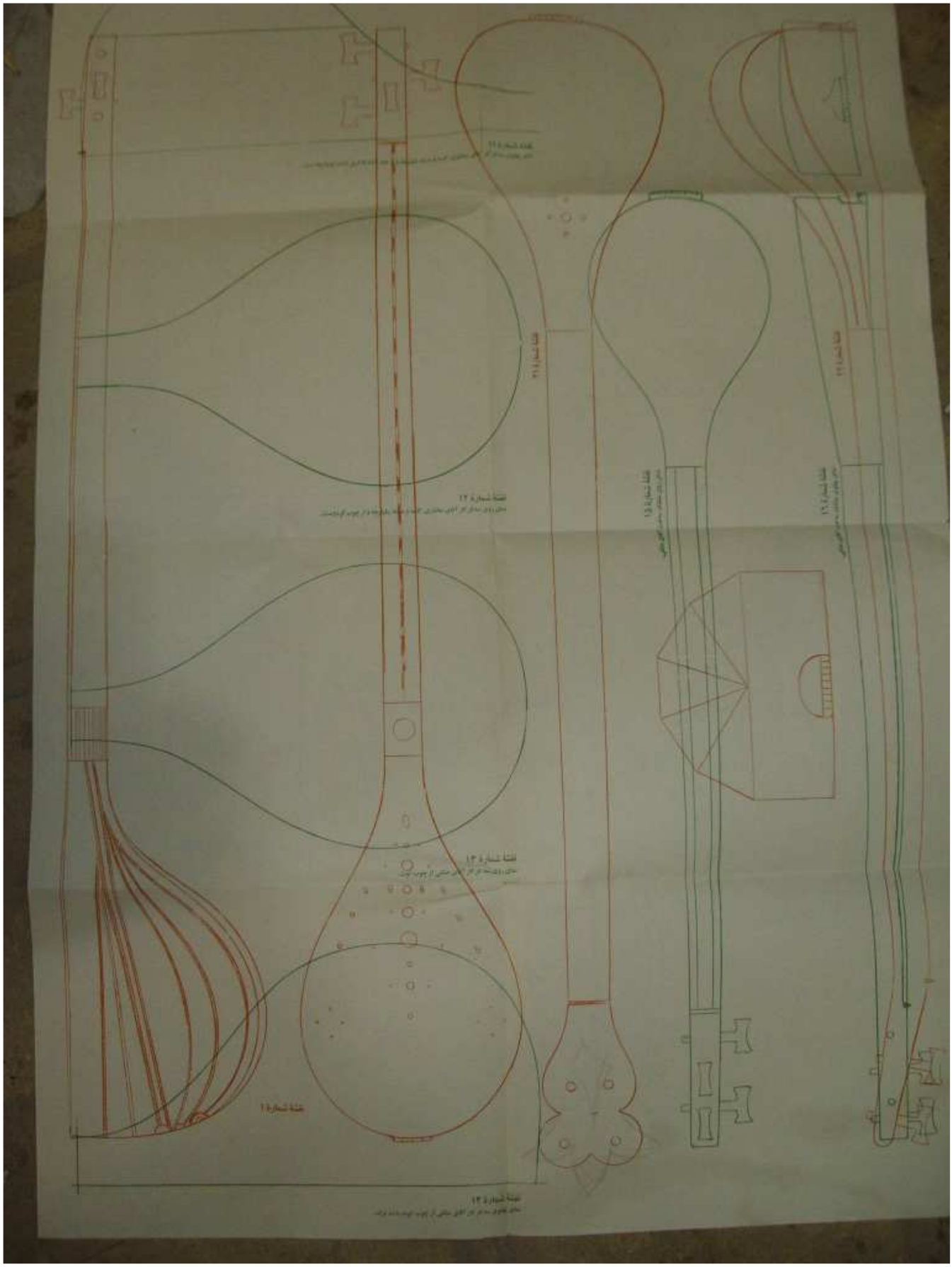
نقشه شماره ۷

مدل استاد کمالیان بنام دلربا

DRAWING No. 7
Setar Dimensions
M. Kamalian's Model

- INSERT 00014 -

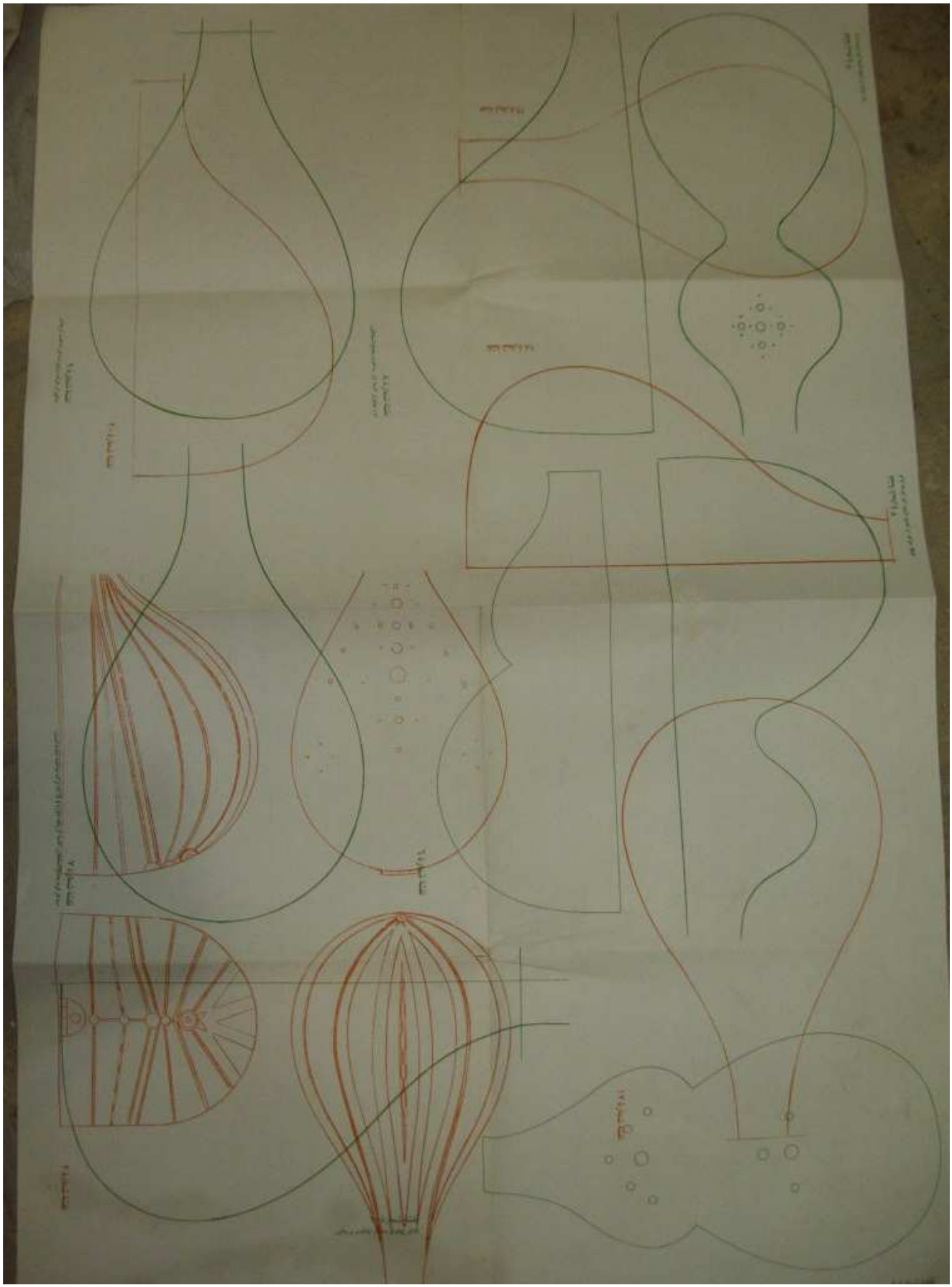
ALTERNATE DESIGN PATTERNS (MOSLEM MIRZAZADEH , YAZD)



Lute maker ***Moslem MIRZAZADEH***, Alexander's prison gallery, Old Yazd

- INSERT 00015 -

ALTERNATE DESIGN PATTERNS (MOSLEM MIRZAZADEH , YAZD)



Lute maker ***Moslem MIRZAZADEH,*** Alexander's prison gallery, Old Yazd

CALCULATING NECK LENGTH FOR A GIVEN SOUND BOX LENGTH

In order to find the proper length of the neck for a given sound box length, the following method is recommended (refer to Drawing No.5):

Assumptions:

* The length of the neck should be just long enough so the last fret (Ab) is located 10mm from the point of connection of the neck to the sound box.
* The distance between G' fret and A'b is 10mm.
* The distance between the bridge and the end of sound box (string holder) is 50mm.

We know that if the first string (tuned to note C) is divided into three equal segments, the locations of G and G' frets are found on the neck. Based on the above, the length of the neck for a sound box 260mm long is found as follows:

Example: Sound box length = 260mm
260mm - 50mm = 210mm
210mm + 10mm + 10mm = 230mm is one-third of open string
230mm x 3 = 690 mm is length of open string
690mm - 210mm = **480mm** is the distance from the nut to the point of connection of neck to the sound box.

If the segment which holds the pegs is **140mm** and the segment inside the sound box (tongue) is **40mm**, then the total length of the neck is:

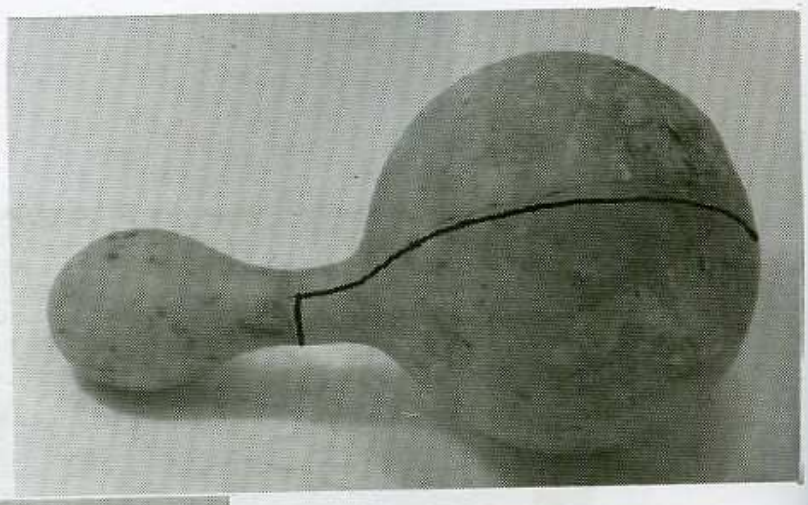
140mm + 480mm + 40mm = 660mm.

SOUND BOX

Three methods are used in sound box construction.

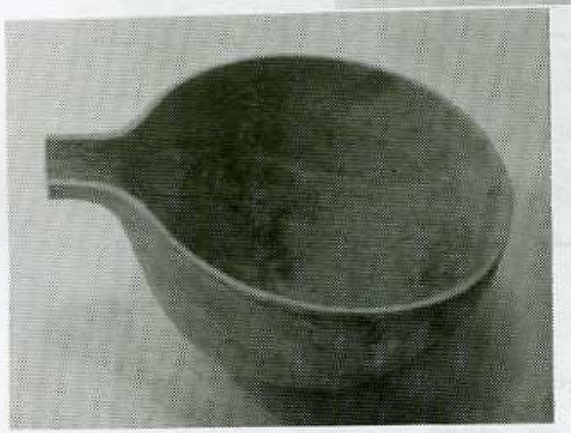
Gourd Sound Box

In this method, a dried gourd is selected that is as close as possible in shape and size to a given setar sound box. Dimensions are marked on the gourd and it is cut very carefully with a hand saw and the seeds are cleaned from the inside. Then, tape a sheet of rough sandpaper (#60) to a flat surface. Rub the opening of the gourd across the sandpaper until the gourd's opening edges become smooth and level. The thickness of the lip of the gourd at the opening should be about 3mm (Photos No. 3 and 4).



تصویر شماره ۳

Photo No. 3

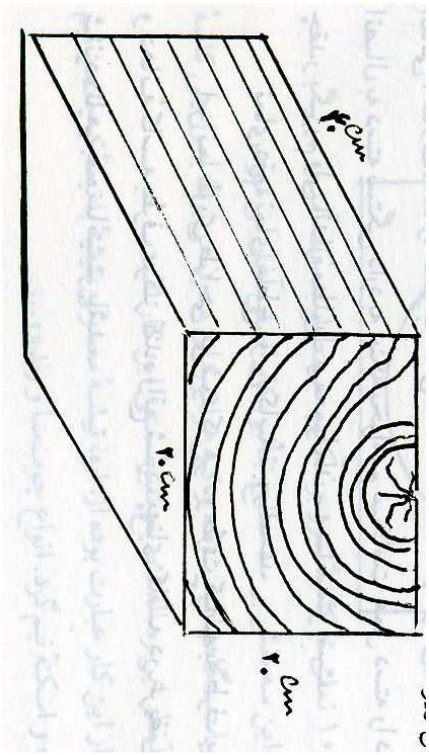


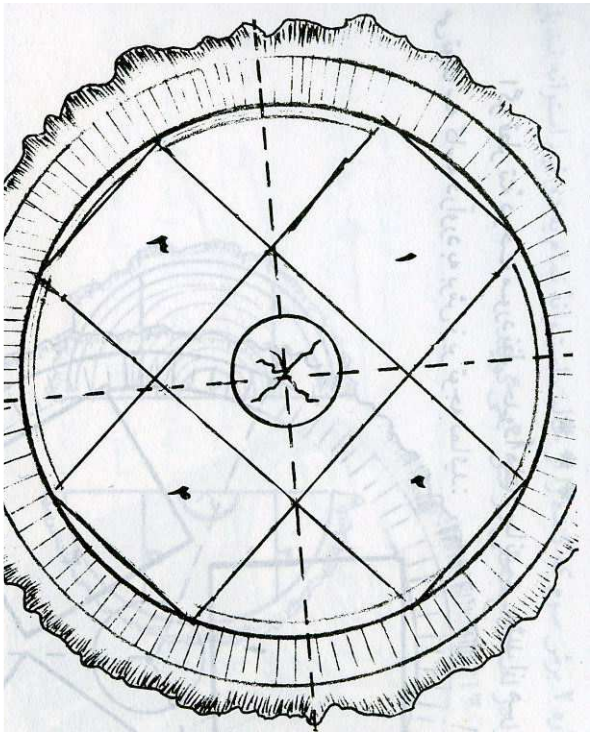
تصویر شماره ۴

Photo No. 4

- INSERT 00015 -

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX)





Same carving technology as ***Setar*** is used for kordi ***Tanbur*** construction. One wide trunk is enough for 3 or 4 sound boxes. Schemes by ***Seyyed Khalil ALINEJAD***.

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX, ***TANBUR***)

In Kordestan, same carving technology as ***Setar*** is used for ***Tanbur*** and ***Saz*** construction. Lutemaker ***KHALEDI*** , Shohada street, Sanandaj.

- INSERT 00015 - SHAPING THE SOUND BOX (DOTAR, NORTH KHORASAN)

Carving the soundbox by combination of the gouge and driller (source web x).

Carving the soundbox by combination of the gouge and driller (source web x)..

- INSERT 00016 - SOUND BOX ALTERNATE DESIGN (DOTAR)

Carving the soundbox by combination of the gouge and driller (source web x).

Carving the soundbox by combination of the gouge and driller (source web x)..

- INSERT 00017 -

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX, ***TANBUR***, KORDESTAN)

Lutemaker ***Vahid KILANI*** (Tehran) used to carve monoxyle ***tanbur*** soundboxes. (Instagram)

Lutemaker ***Vahid KILANI*** (Tehran) while carving ***tanbur*** soundboxes. Noticeable fixture (Instagram)

- INSERT 00018 -

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX, ***TANBUR***, KORDESTAN)

In Kerend village (Dalahu, Kermanshan), lutemaker ***Fereydun KAMALI*** used to carve his best monoxyle ***tanbur*** soundboxes in a conformal fixture. Each carving lasts up to 10 days.

- INSERT 00019 -

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX, ***TANBUR***, KORDESTAN)

Lutemaker ***Ghobad GHOBADI*** used to carve monoxyle ***tanbur*** soundboxes. (Instagram)

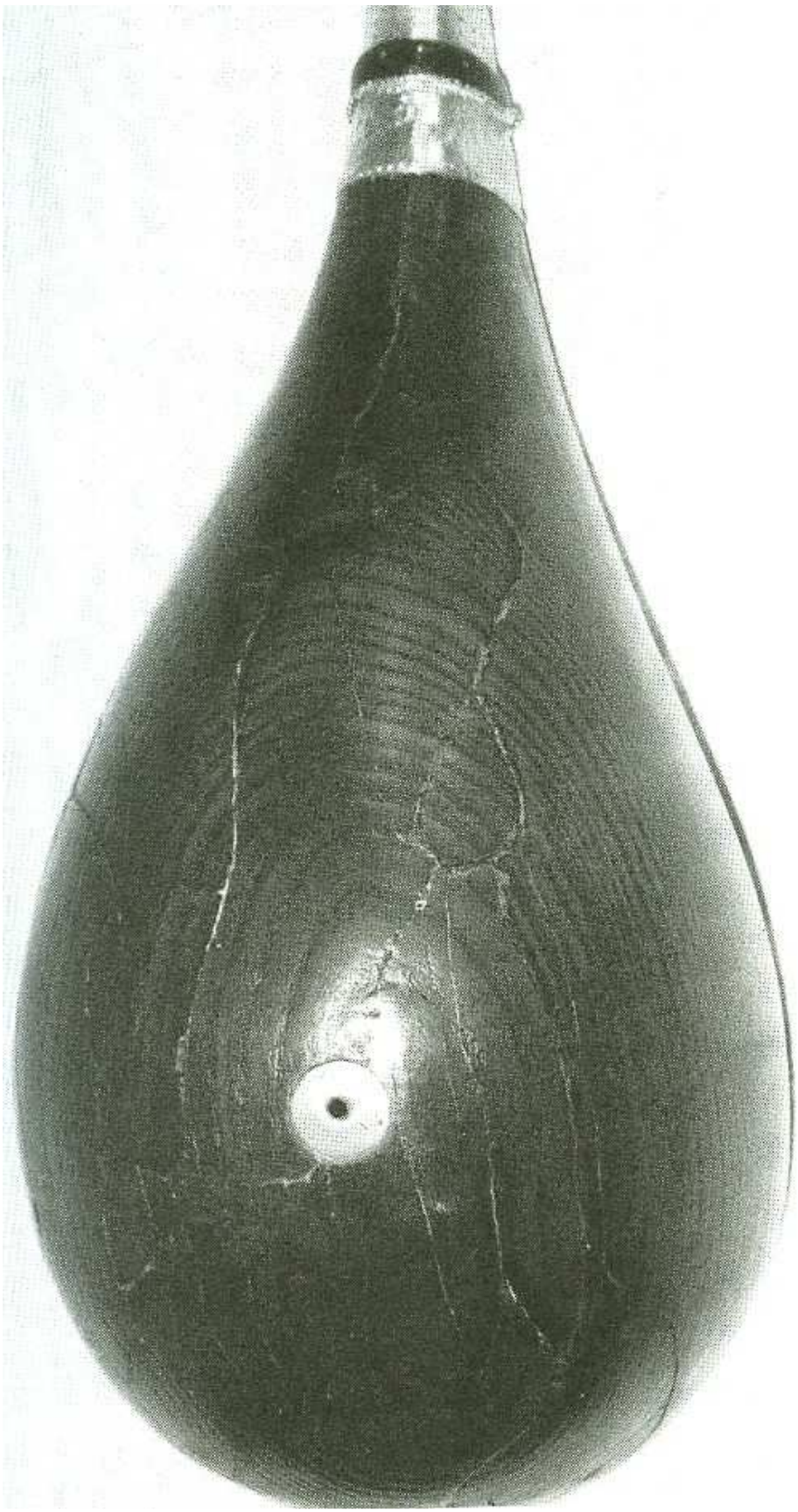
- INSERT 00020 -

SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX, ***TANBUR***, KORDESTAN)

Lutemaker ***Ghobad GHOBADI*** used to carve monoxyle ***tanbur*** soundboxes. (Instagram)

Lutemaker Ghobad GHOBADI used to carve monoxyle tanbur soundboxes. (Instagram)

- INSERT 00021 - SOUND BOX ALTERNATE DESIGN (CARVED OUT BOX , ***DOTAR***, KHORASAN)



In Khorasan, same carving technology as ***Setar*** is used for ***Dotar*** construction. Wood circles mean here the khorasani use is different from earlier indications - INSERT 020 . Illustrated by YOUSSEFZADEH .

Carved Sound Box

Select a block of mulberry wood with no wood defects such as knots or cracks. In this method, freshly cut logs are used for carving as they are easier to carve and do not split as easily as dry wood. To begin, draw the top view and side view of the setar on the block of wood (photo No. 5). The extra wood is cut by band saw. Then, using a mallet, chisel and other carving tools, the outside and the inside are carved until the desired sound box form is achieved. The thickness of the sound box is about 4mm to 5mm, and the thickness should be approximately 7mm at the throat.

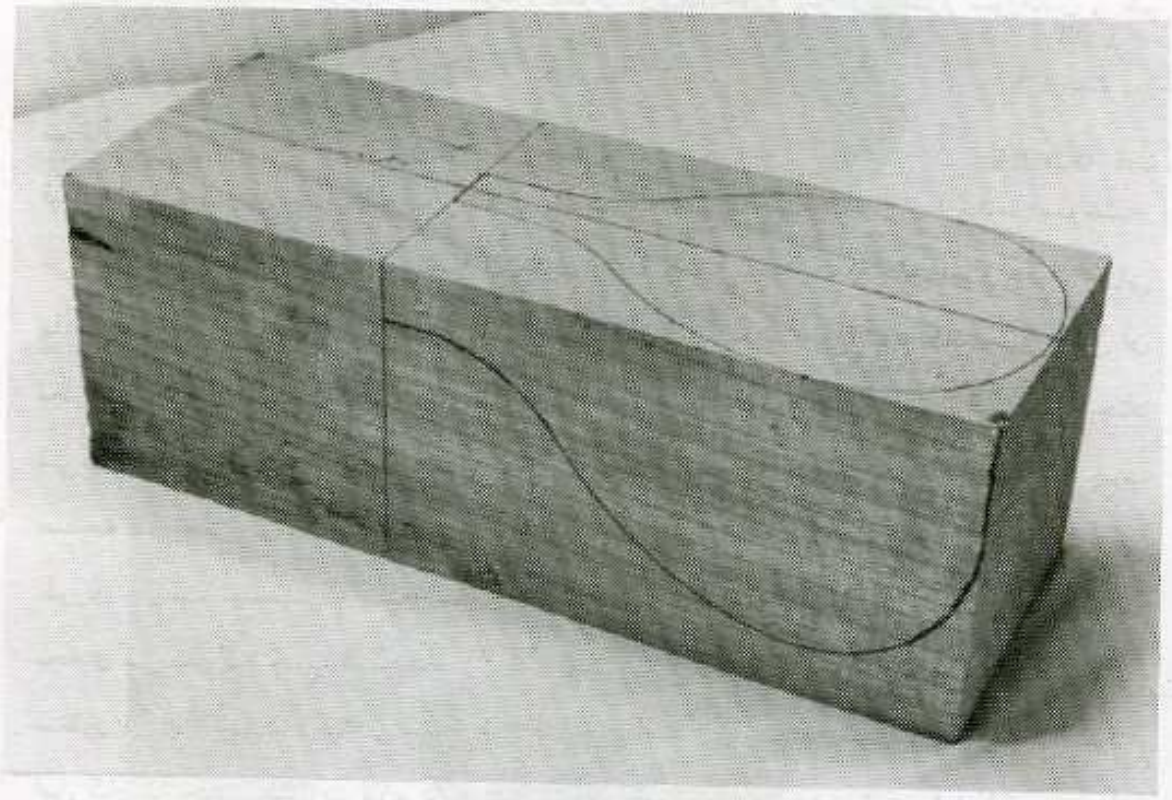
In order to prevent the wood from cracking due to sudden loss of moisture, the carving process should be done in several phases. After each phase, place the wood inside a plastic bag and seal the bag. The wood should be kept in the bag for 3-4 days. Then the wood is taken out and carving is continued. Repeat the above process several times until the desired shape is achieved (Photo No. 6).

Sound Box Made from Thin Wooden Ribs

This is the most widely used method in setar construction and is very similar to lute and mandolin construction. The sound box is made of several strips of aged wood (ribs) which have been bent on a mold to shape and then glued together. The thickness of the wood rib is 2.5-3mm. The rib which is adjacent to and connects to the plate is larger in width than the other ribs. Drawing No. 31 shows a typical cross-section of a sound box. The number of smaller ribs vary from model to model. Odd numbers of ribs such as 5, 7, 9 and 11 have been used, with 9 and 11 ribs being the most common. In the example presented in this book, eleven ribs have been used. (Photos No. 20 and 21).

RIB SIZE (PATTERN)

In order to find the size of the small rib and side rib, a three-dimensional analysis of the sound box is necessary and is presented below. The dimensions discussed in the following paragraph are on X, Y and Z axis. It should be kept in mind that some of these dimensions are projected dimensions and are not the true dimensions of specific parts of the setar sound box.



تصویر شماره ۵

Photo No. 5

تصویر شماره ۶

Photo No. 6

- INSERT 00025 -

Lutemaker ¨ ***KHALEDI***, Sanandaj used to carve setar box from spongious wood. The wood was first kept in water for months; then dried for 2 months.

Carved box, lutemaker ¨ ***KHALEDI***, Sanandaj.

- INSERT 00026 -

Polishing the soundbox of a ***tanbur.***

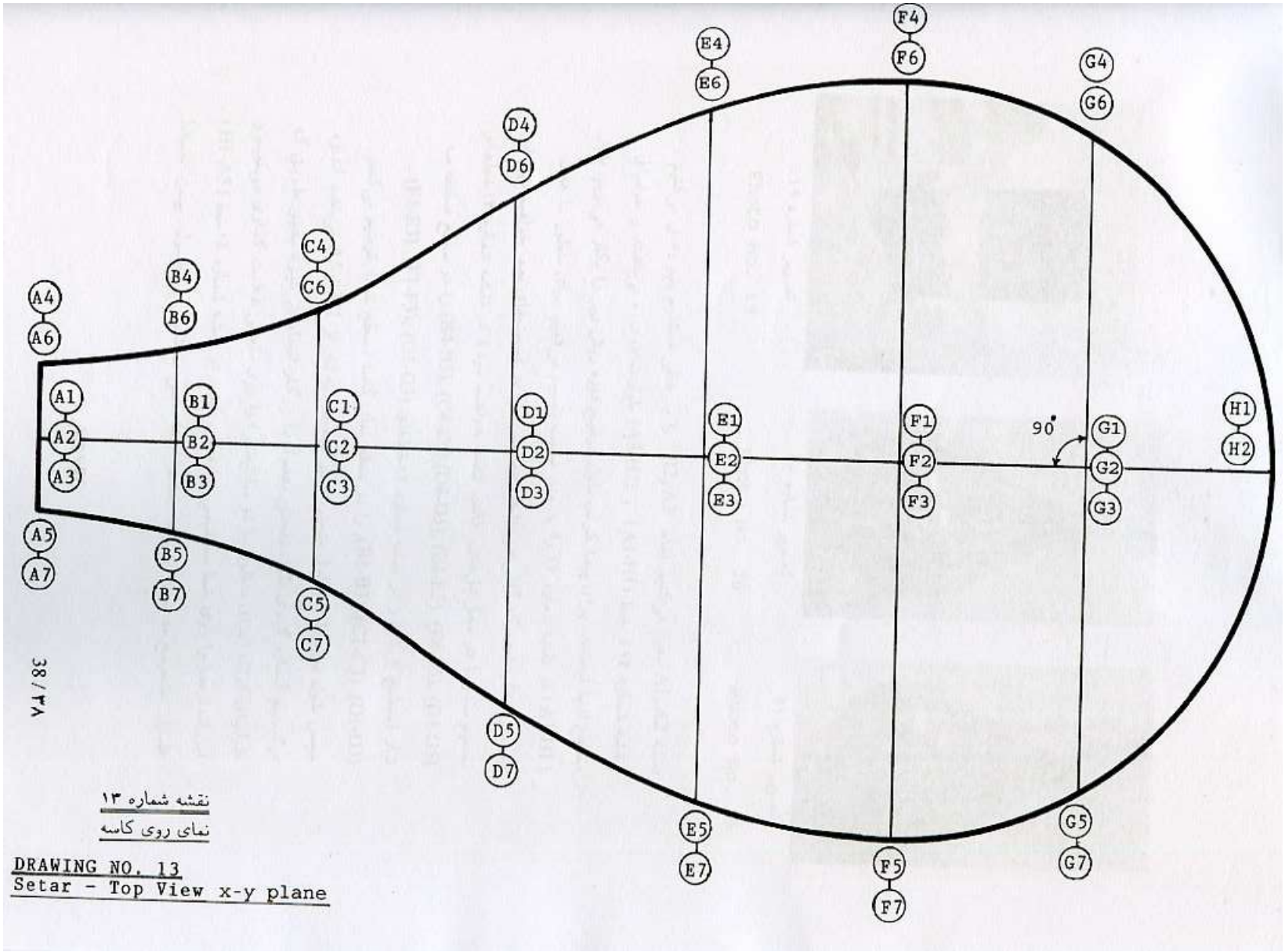
First, the top view and side view of the sound box are drawn in true scale (Drawings No. 13 and 14). Then, the width of the side rib H1-H2 at the string holder side and A1-A2 at the connection to the neck is drawn. Points A2 and H2 are connected by a straight line (Drawing No.14). Lines A1-H1 and A2-H2 are the projected lengths, not the true lengths of these lines. To find the true length of these lines, their projected lengths A1-H1 are divided into some equal segments (example: H1 to G1, G1 to F1, etc.) (Drawing No. 14). In this case, seven segments have been selected. Later, we will see that these points, G1, F1, etc., will be used as the locations of the sound box mold bridges.

In Drawing No. 13, lines G4-G5, F4-F5, E4-E5, D4-D5, C4-C5 and B4-B5 are drawn in X-Y plane (setar plate's plane). In Drawing No. 14, lines G1-G3, F1-F3, E1-E3, D1-D3, C1-C3 and B1-B3 are drawn in X-Z plane respectively. Then, the true length of the side rib which on Drawing No. 13 is from H1, along the edge of top plate to A5 is measured. This is done by using a compass or divider set at about 20mm to mark along the curve and the numbers of these 20mm segments are transferred to a straight line (refer to Drawing No. 15). In this drawing, line A1-H1 is the true length of the side rib. Using Drawing No. 14, lines H1-H2, G1-G2, F1-F2, E1-E2, D1-D2, C1-C2, B1-B2, and A1-A2 are transferred to Drawing No. 15, and points H2, G2, F2, E2, D2, C2, B2 and A2 are connected. The four-sided shape defined by A1, H1, H2, A2 is the true size (pattern) of the side rib.

NOTE: In Drawings No. 13, 14, and 15, the points shown in the circles are located in X-Y plane (Setar's plate) and X-Z plane (side view of sound box). For example, points F5, F1, and F4 are three points on X-Y plane (Drawing No. 13) (Setar's plate plane), but when projected on X-Z plane (Drawing No. 14), they all fall on one point.

In Drawing No. 15, axis of rib, line H2-A3 is assumed to be the true length of H2-A7 and is drawn parallel to line A2-G2 as shown. Then points B3, C3, D3, E3, F3, and G3 are indicated on it. Then the width of the rib is found as follows. As previously indicated, this model has 11 ribs and here we assume that in the cross-sections of the sound box these are positioned over the side ribs in a circular shape (Drawing No. 16).

Drawings No. 16 through 22 show the transversal cross sections of the sound box in seven different places. The size of these cross sections will be used as the bridges for the sound box mold and also to find



نقشه شماره ۱۳

نمای روی کاسه

DRAWING NO. 13

Setar - Top View x-y plane

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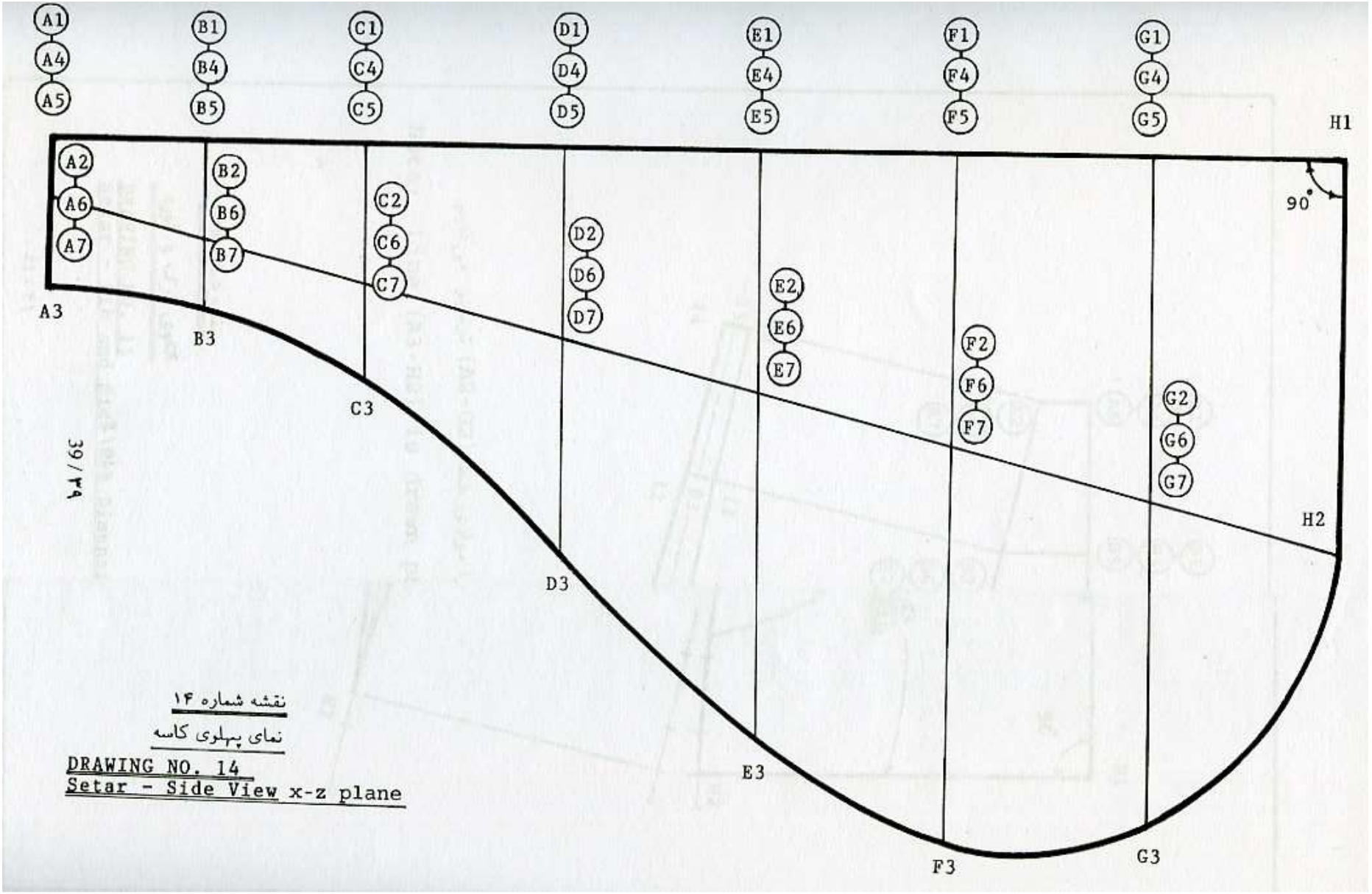

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نقشه شماره ۱۴

نمای پهلوی کاسه

DRAWING NO. 14

Setar - Side View x-z plane

the widths of the ribs at these sections and eventually the size (pattern) of the rib.

In Drawing No. 16, first, line G4-G5 is drawn. Then G1-G3 is drawn perpendicular to line G4-G5 at its mid-point, and point G2 is marked on it. Then line G6-G7 is drawn parallel to G4-G5 and lines G5-G7 and G4-G6 are drawn. Points G6, G3 and G7 are connected together by a circular arc as discussed below. Measure line G2-G6 from point G3 along line G3-G1 to find point O, the center of the circular arc. Using point O as the center, a radius equal to line O-G6, draw a partial circle that goes through points G6, G3 and G7. Divide this arc into eleven equal segments (eleven ribs). Line 1-2 is the width of the rib at this section. In Drawing No. 15, draw line 1-2 perpendicular to line H2-A3 at point G3 in such a manner that point G3 divides line 1-2 into two equal segments or, in other words, line 1-G3 is equal to 2-G3.

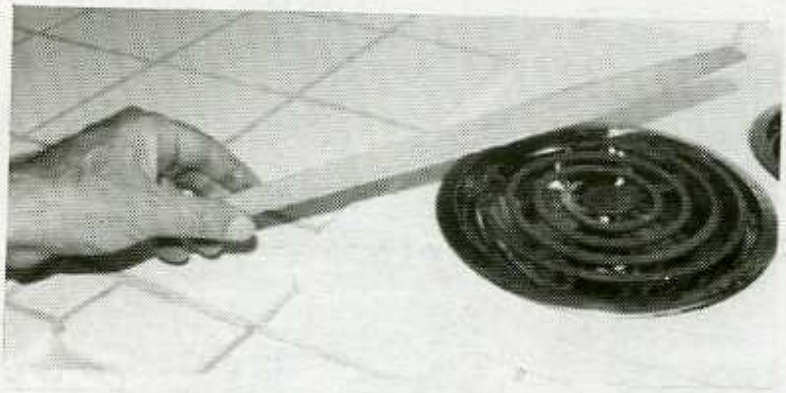
Repeat the above process for other sections (F4-F5), (E4-E5), (D4-D5), (C4-C5), (B4-B5) and (A4-A5) to find rib width and the size of the sound box mold for other sections (Drawings No. 16-22). Connect points H2, 1, 3, 5, 7, 9, 11, 13 and H2, 2, 4, 6, 8, 10, 12, 14 to find the size (pattern) of the rib (Drawing No. 15).

HEATING AND BENDING THE SOUND BOX RIBS

In setar construction, it is common practice to heat the sound box and plate wood before it is used. Heating, or as it is called in Persian "burning", is a process in which the temperature of the wood is raised by holding it over a heating element until the sap inside the wood boils and comes to the surface. The heating should be done in such a manner that the wood does not actually burn and lose its elasticity and structural strength. (Photos No. 7, 8 and 9).

The ribs are bent by placing them in boiling water until they become soft. Then, they are taken out of the water and very quickly bent and clamped onto molds that previously have been built to the desired shape and size. (Instructions for building the mold itself will be discussed in the following pages). The ribs are kept clamped on the molds until they are dry, about two days. This will ensure that they keep their shape (Photos No. 10 through 18).

Another method for bending the ribs is to soak them in water at room temperature for a few days and place and

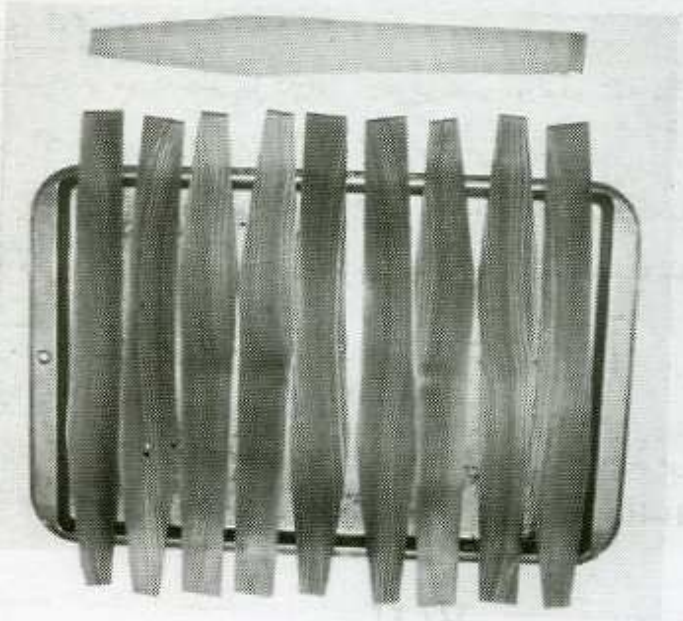


تصویر شماره ۷

Photo No. 7

تصویر شماره ۸

Photo No. 8



تصویر شماره ۹

Photo No. 9

- INSERT 00030 -

Lutemaker ***Ali Reza RAHNIM*** used to boil ribs before bending.
Iron patterns (background) are necessary for the rib shaping.

Bended Ribs at ***Ali Reza RAHNIM*** s , Qasvin.

clamp them on a heated metal (e.g. aluminum) mold. A bending iron widely used in western countries can also be used for this purpose (Photo NO. 19).

MAKING A SOUND BOX MOLD USING BRIDGES

Drawings No.16 through 22 give us the size of the bridges that will be used in the construction of the sound box mold. Select a flat piece of wood, 400mm x 250mm x 20mm to be used as a base, and referring to Drawing No. 13, mark the locations of the bridges on it (Drawing No. 23). Then, using Drawings No. 16 through 22, mark bridge sizes on a flat piece of wood (thickness of 3mm+/-) and cut it to the exact size (Photos No. 22 and 23). Glue these bridges perpendicular to the surface of the bottom wooden base at marked locations (Photo No. 24). Fill the portion next to the side ribs with wood (Photos No. 25, 26, and 27). Fixed and movable wedges are secured around the mold to hold the side rib in place. Please refer to Drawings No. 23, 24, 25, and Photos No. 28 and 29 for more detail.

MAKING A SOLID SOUND BOX MOLD

In this alternative method of making a mold, a solid piece of wood is carved to the shape and size of the desired setar, and is secured by a few screws to a wooden base (Photo No.30).

Note: In the above methods, the mold dimensions are for the inside of the sound box, not its outside.

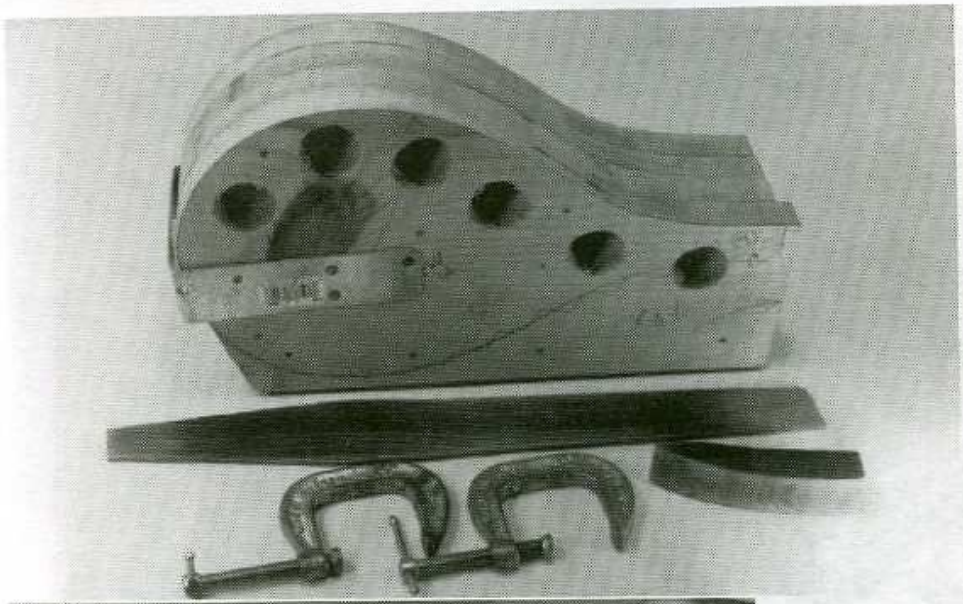
ASSEMBLING THE SOUND BOX

Method Using Mold with Bridges.

First, cut rib patterns from thin aluminum using the smaller rib and side rib sizes shown in Drawing No. 15. Secure the patterns with masking tape on the wood that has been prepared, cut and bent for this purpose. Using a sharp pencil, draw a line transferring the pattern's size to the wood (Photo No. 31). Draw another line about 2mm outside of the pattern line. Then cut the wood to this outer line using a luthier's knife, or shave it on a block plane (Photo No. 32).

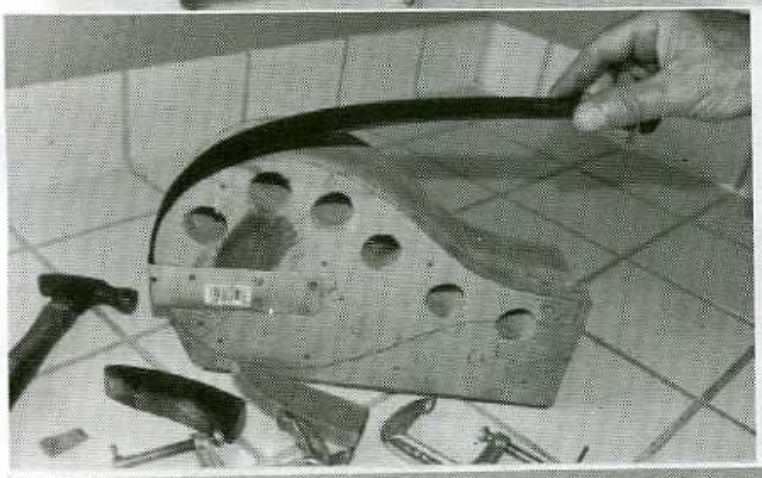
Place a sheet of #60 sandpaper (8-1/2"x11" or larger on a flat piece of wood and secure it with masking tape

SOLID SOUND BOX MOLD ALTERNATE METHOD



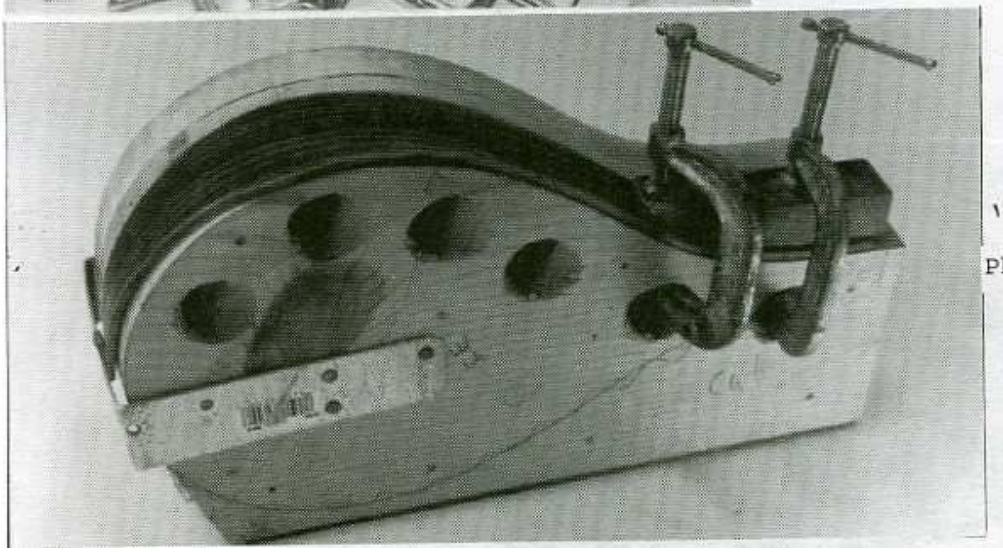
تصویر شماره ۱۰

Photo No. 10



تصویر شماره ۱۱

Photo No. 11

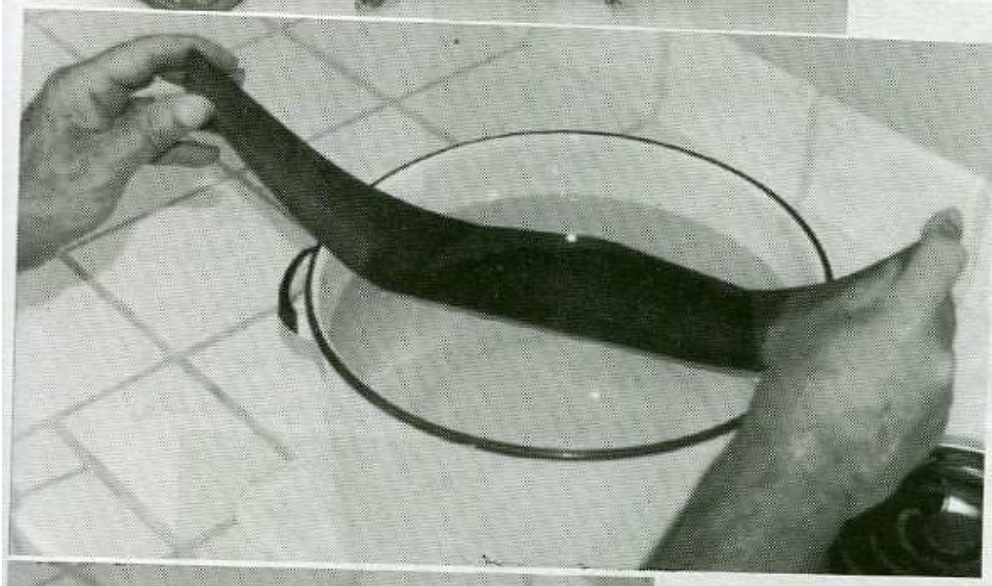


تصویر شماره ۱۲

Photo No. 12

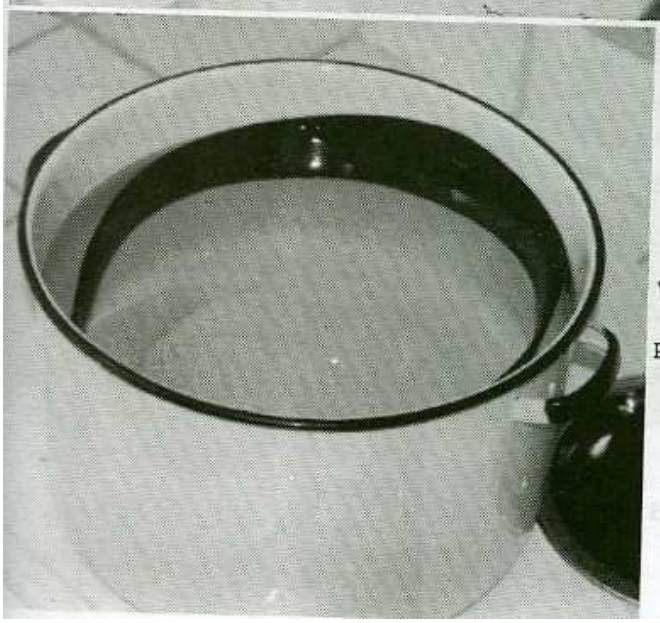
تصویر شماره ۱۳

Photo No. 13



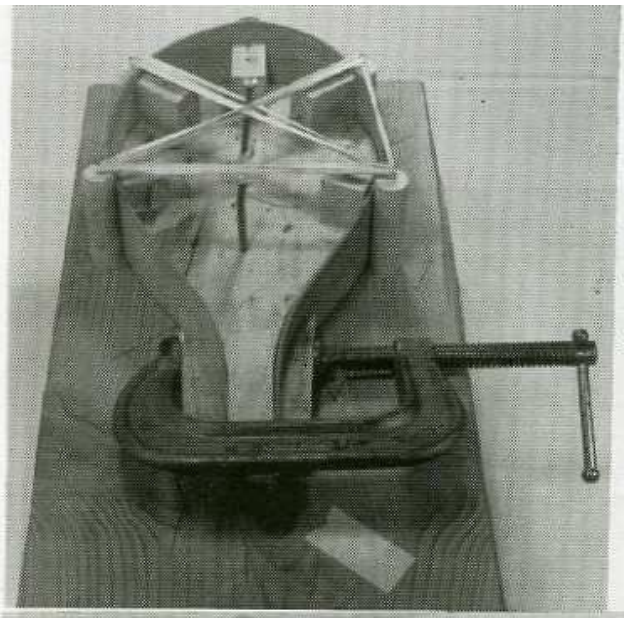
تصویر شماره ۱۴

Photo No. 14



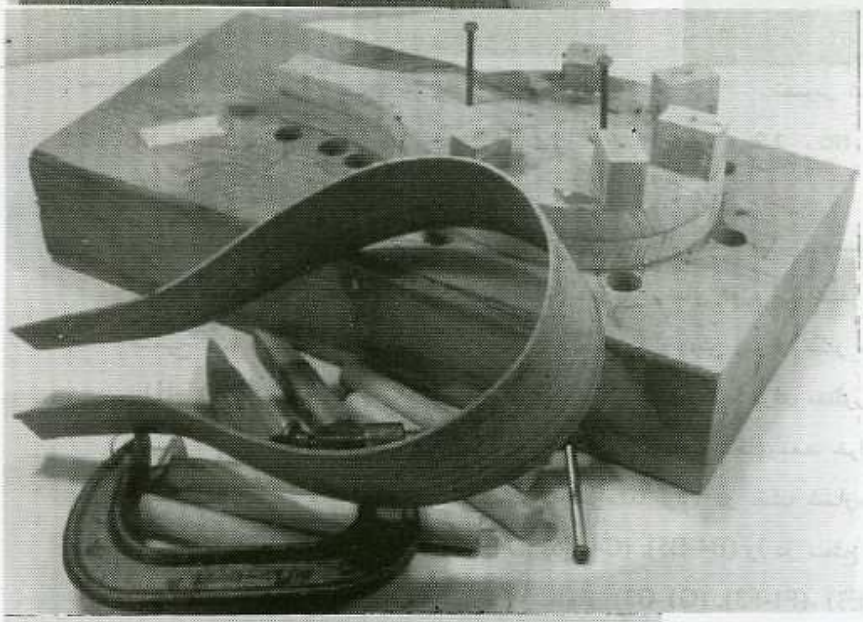
تصویر شماره ۱۵

Photo No. 15



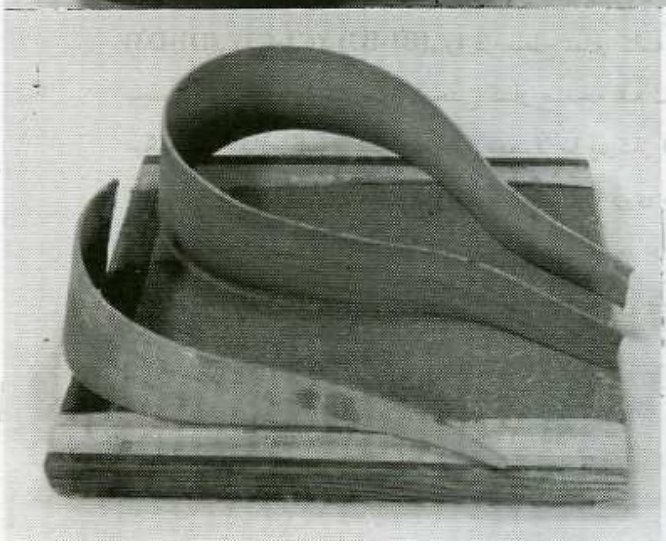
تصویر شماره ۱۶

Photo No. 16



تصویر شماره ۱۷

Photo No. 17



تصویر شماره ۱۸

Photo No. 18

- INSERT 0045 -

SOLID SOUND BOX MOLD ALTERNATE METHOD (ALTERNATE SHAPE TOOLING)

Bridged Mold by H. MASOUD . The tongue section is screwed on a removable plate.

U shaped tool for rib bending.

Bridged Mold by Hosein MASOUD.

- INSERT 00046 -

SOLID SOUND BOX MOLD ALTERNATE METHOD

Bending patterns for ***Setar*** ribbed soundbox. These items allow adjusting the neck alignment too. Cultural Heritage Organization Center, Tehran

Bending patterns for ***Setar*** ribbed soundbox. These items allow adjusting the neck alignment too. Cultural Heritage Organization Center, Tehran

- INSERT 00047 -

SOLID SOUND BOX MOLD ALTERNATE METHOD

Tanbur application: shaping pattern & clamp for ***Tanbur*** ribbed soundbox. Maker ***Fereydun KAMALI***, Kerend, Dalahu

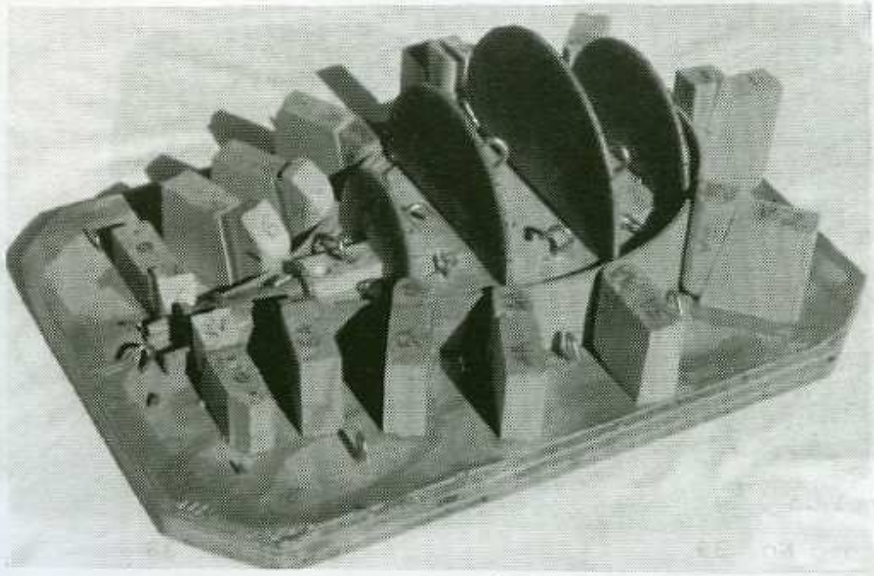
Adjusting ribs fore glueing (Cultural Heritage Organization Center, Tehran)

- INSERT 00048 -

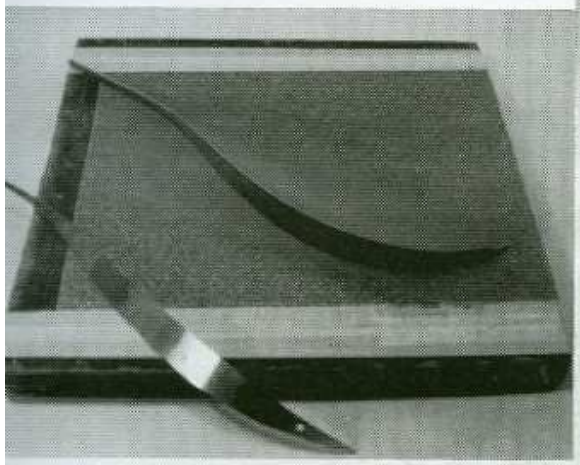
SOLID SOUND BOX MOLD ALTERNATE METHOD

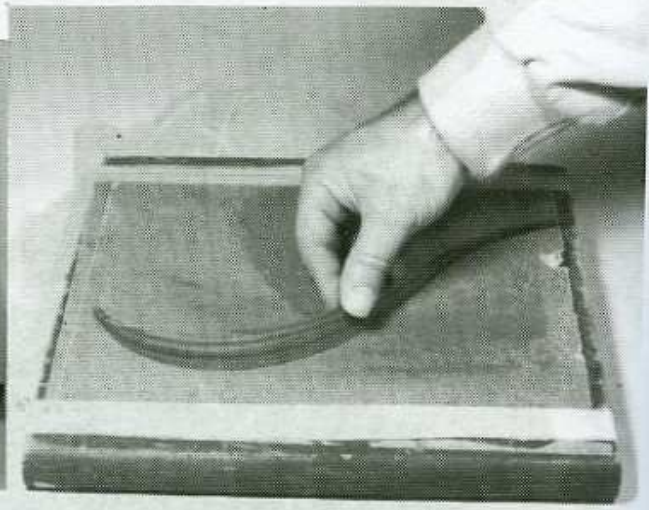
Bending pattern & heaters for ***Setar*** ribbed soundbox. Cultural Heritage Organization Center, Tehran

Tanbur application: shaping pattern and clamp for ***Tanbur*** ribbed soundbox. Maker ***POURAM***, Kermanshah.



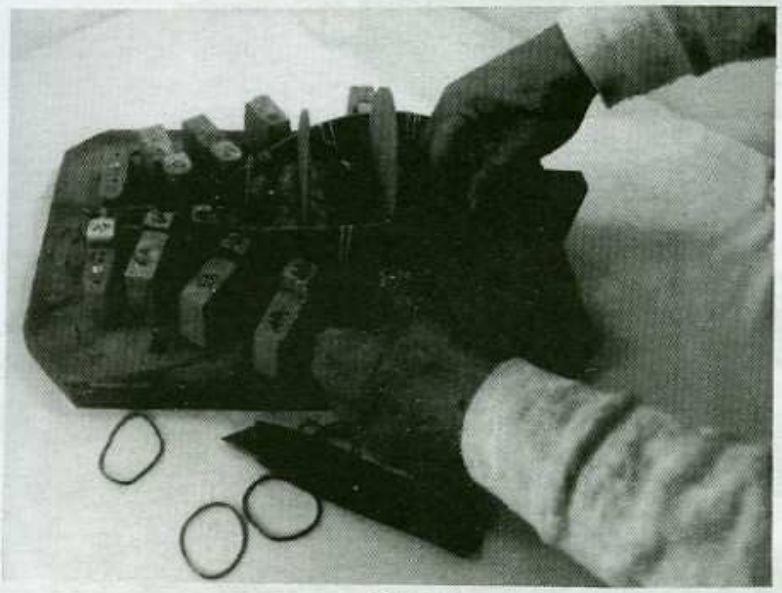
تصویر شماره ۳۴
Photo No. 34





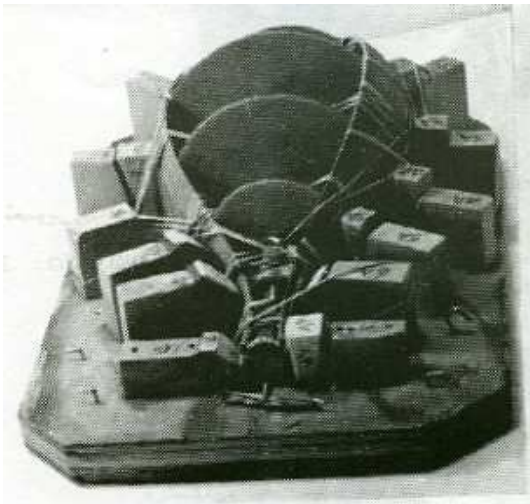
تصویر شماره ۳۵
Photo No. 35

تصویر شماره
oto No. 36



تصویر شماره ۳۷
Photo No. 37

« BRIDGED » SOUND BOX MOLD ALTERNATE METHOD

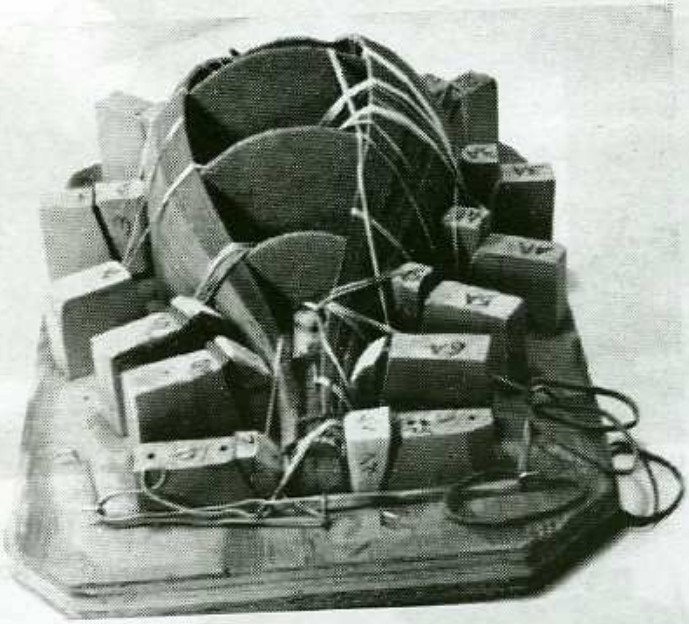


تصویر شماره ۳۹

Photo No. 39

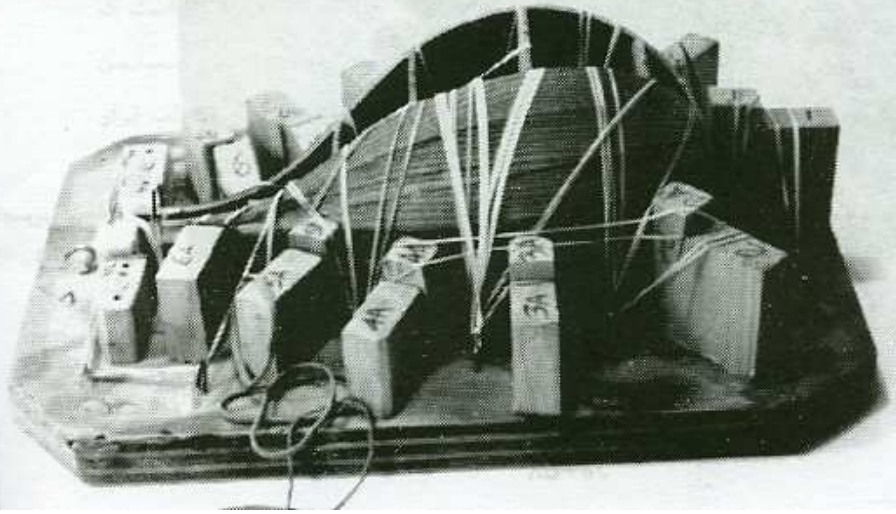
تصویر شماره ۳۸

Photo No. 38



تصویر شماره ۴۰

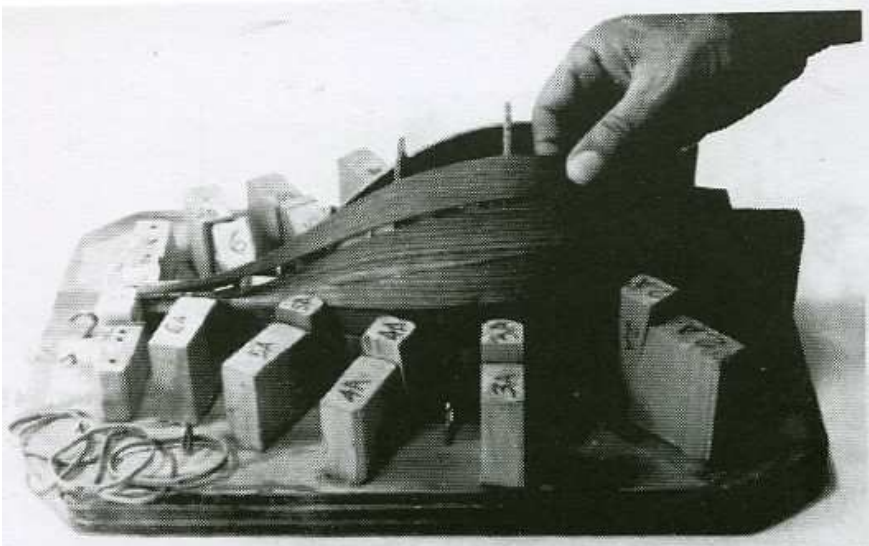
Photo No. 40



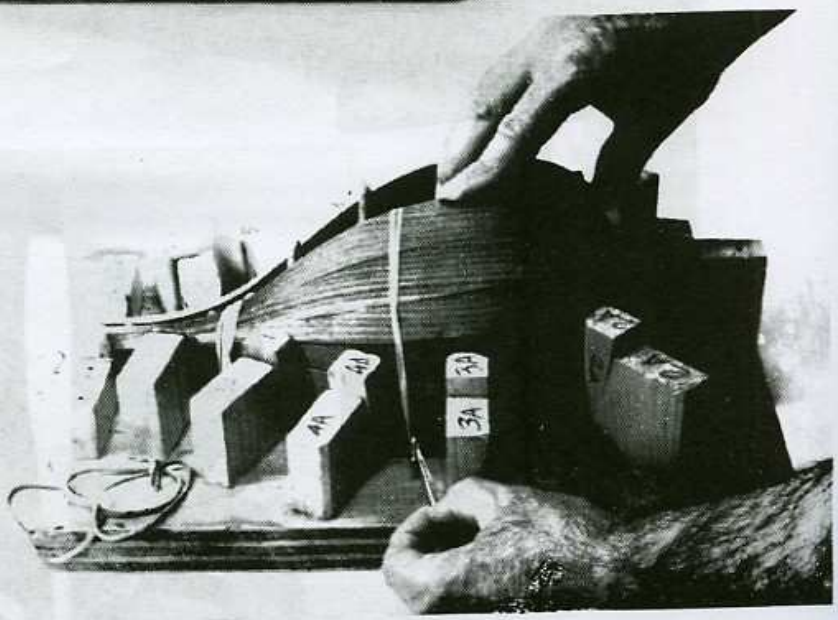
تصویر شماره ۴۱

Photo No. 41

D



تصویر شماره ۴۲
Photo No. 42



تصویر شماره ۴۳
Photo No. 43

تصویر شماره ۴۴
Photo No. 44

(Photos No. 33, 35 and 36). Place the bent smaller rib or side rib on it and sand both edges until a smooth angled edge (Drawing No. 16) and the pattern size are achieved.

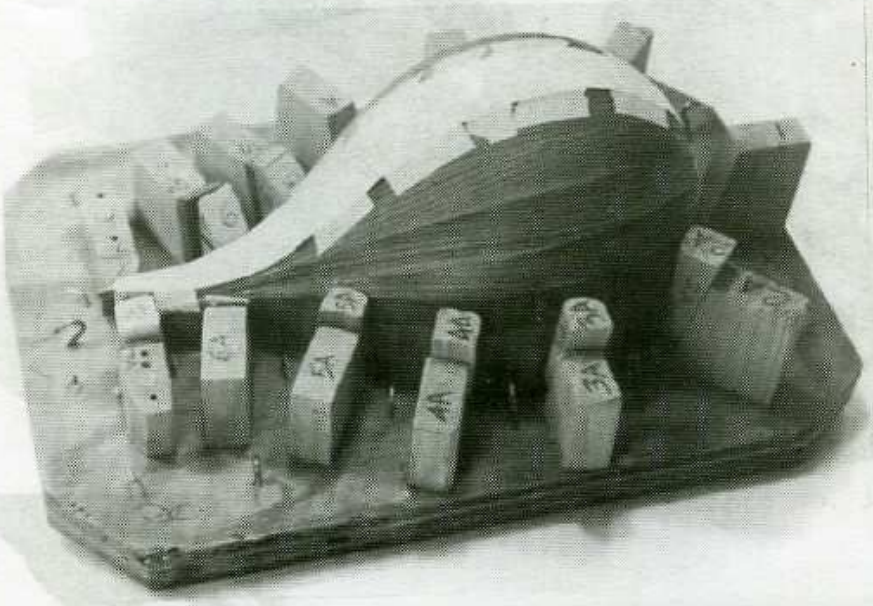
Begin to assemble the sound box by placing the side rib (which can be made as either one piece or two pieces glued together) into the mold and holding it in place with wedges. Check to make sure that all edges match the lines on the mold bridges (Photo No. 34). Next, the smaller rib is placed on the side rib. If it has been prepared properly, as previously discussed, it should have the proper bend and the edges should fit with no space between them. If it does not fit, sand it again until a proper fit is attained. Then apply glue to the smaller rib edge and place it onto the side rib, starting from the string holder end. Secure it in place, using rubber bands and hooks (Photos No. 37 through 43). This process is repeated from both sides until all the ribs are in place except for the last one on top of the mold.

To find the exact size of this last rib, place a piece of paper on the opening and secure it with masking tape. Mark the paper by running your fingernail along the edges of the already assembled ribs. Remove the paper, cut it along the marked edges and place it on a bent rib. Cut the rib to size. Test the rib's fit to make sure it is good before applying glue to it. Then apply glue to the edges and insert it in place. Hold it in place with strips of masking tape (Photos No. 44 through 48).

NOTE: Before placing the last rib on, it is recommended that the sound box be removed from the mold to make sure that it has not been glued accidentally to the mold. Cover the top of the mold with a piece of paper to prevent rib from sticking to the mold. Then place the sound box back onto the mold.

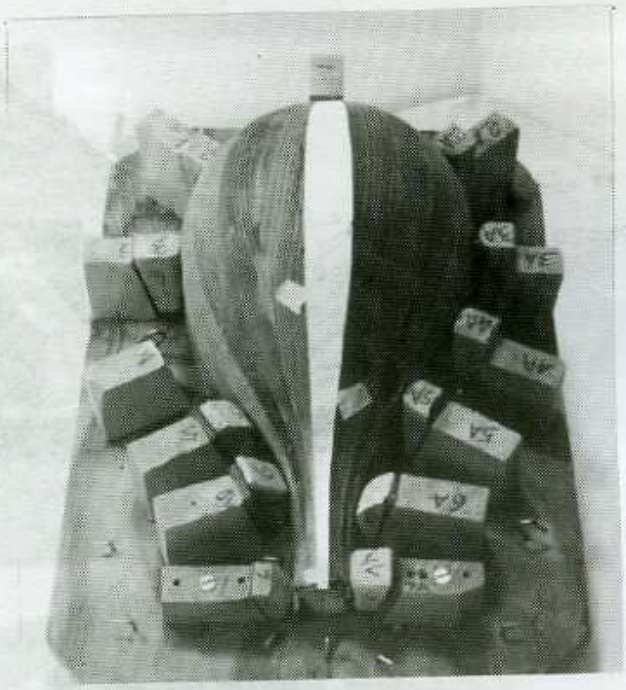
Allow two days for the glue to dry Then remove the sound box from the mold. Cut the length of it to size. Then clean the inside removing all the excess glue and smooth the rough edges (Photo No. 49). Finally, sand the outside, using #300 sandpaper first and then #600 sandpaper, until it has a smooth finish. Now place the sound box on the sandpaper and sand the edges until smooth (Photo No. 50).

NOTE: Glue used in setar construction is the traditional hot hide glue. Other glues such as carpenters wood glue also may be used.



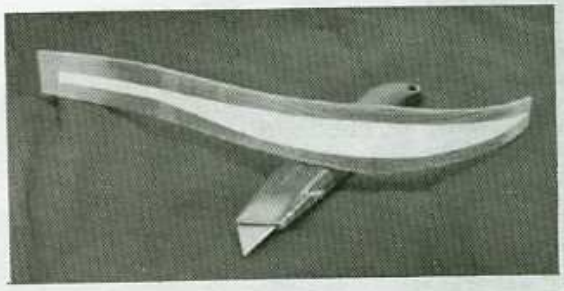
تصویر شماره ۴۵

Photo No. 45



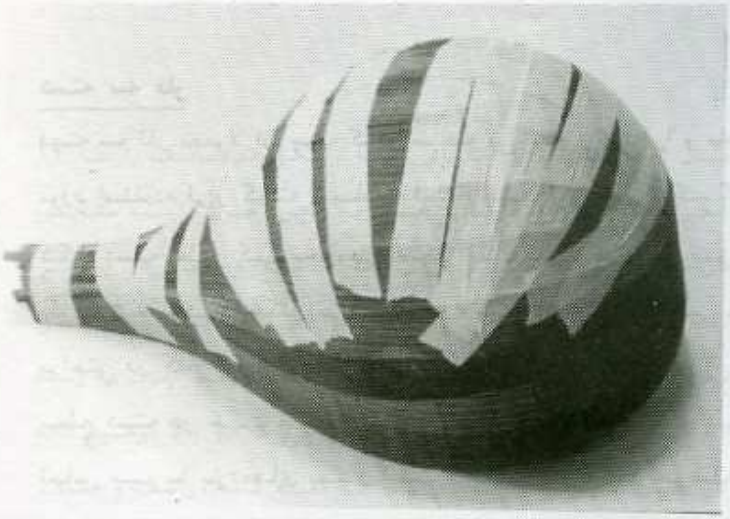
تصویر شماره ۴۶

Photo No. 46



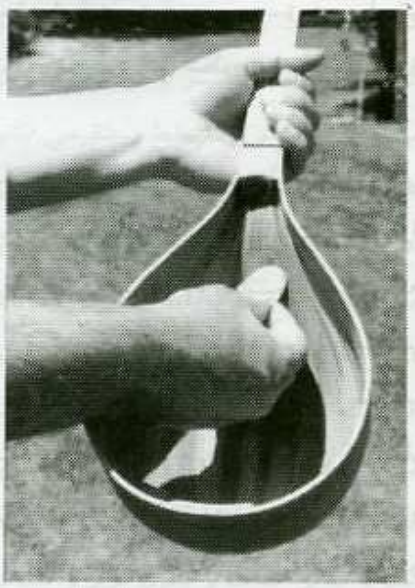
تصویر شماره ۴۷

Photo No. 47



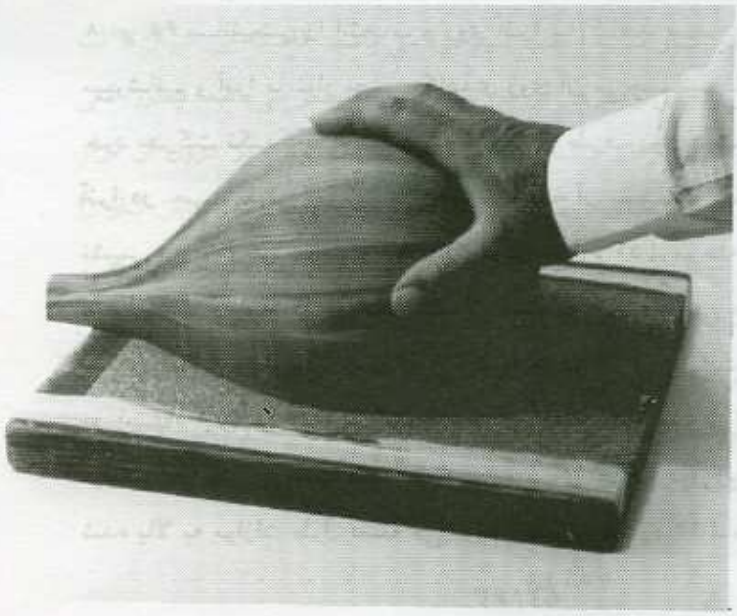
تصویر شماره ۴۸

Photo No. 48



تصویر شماره ۴۹

Photo No. 49



تصویر شماره ۵۰

Photo No. 50

- INSERT 00066 -

SOLID SOUND BOX MOLD ALTERNATE DESIGN (***SETAR***)

Page 8 ¨*Smooth the rough edges*¨. Few words for this technical challenge! Sometimes the ribs are thick and the maker skilled enough , so that the final box to be smoothed round. Picture was shot before any smoothing at Lutemaker ***¨Manzema¨ KHALEDI*** , Sanandaj.

According to the soundboard drawings 13-14 (pp. 38-39), the wide, lateral rib has a special design (here illustrated for the "proeminent tongue" soundbox design, a kordi variant by ***Seyyed Khalil ALINEJAD***, Sahneh.

- INSERT 00067 -

SOLID SOUND BOX MOLD ALTERNATE DESIGN (***SETAR***)

Strengthening the soundbox with additional glued rib inside Lute maker ***Moslem MIRZAZADEH***, Alexander's prison gallery, Old Yazd.

Standard design soundbox Lute maker ***Moslem MIRZAZADEH***, Alexander's prison gallery, Old Yazd.

- INSERT 00068 –

SOLID SOUND BOX MOLD ALTERNATE DESIGN (***TANBUR***, SOUTH KORDESTAN)

Rib-made ***tanbur*** soundbox. The usual technics for ***setar*** was extended to cheap ***Tanbur*** constructions. Maker ***Fereydun KAMALI***, Kerend, Dalahu.

Tanbur soundboxes: ***tanbur pashneh*** box (from maker ***RAHNAMA***, Sahneh, left), glued ***tanbur*** box (from maker ***Fereydun KAMALI***, Kerend, right).

- INSERT 0069 -

KORDI TANBUR MAKING: SOUND BOX ALTERNATE DESIGNS

In " *L ame des Sons*" , Jean DURING reports the alternate technics of Tanbur making, according to lutemaker NAZERSARE and Nur Ali ELAHI.

"Two kinds of tanbur exist: monoxyle soundbox (carved in a woodblock) and glued ribs (tarki) just like mandolins. The first one is prominent among some other tanbur families , named dotar, as found among Turkmens, Turks, Kordi and Khorasani - N-E Iran, Afghanistan -. As this depends on the properties of the original woodblock , so its manufacturing technics and size are various. The Rib glueing technology wa s recently applied on tanbur. This is used for the large uzbeki : uighruri dotar and the azeri tchoghur (a.k.a. saz) . The major difference is the wooden tongue they use when joining the neck and the ribs, despite ribs don't require any tongue for the other kinds of tanbur.This artifact was inherited from the Iranian setar, but was formerly applied formerly in Turkey in some Saz lute construction. Lutemaker NARIMAN presumately adopted this first when making some lutes for Ostad ELAHI .

The results of the rib glueing technics are not especially better than the monoxyle technics, but once you know it, it is much faster . Moreover this inducts standardizing the dimensions, so the quality of the production is more homogeneous. Some Tanbur players claim that such tanbur sound well in their early years , but turn less loud then. By comparison, a carved soundboxed tanbus is presumed sounding better and better as this played for years , just like an enriching shape. After experiencing a lot of parameters, lutemaker Shahram NAZERSARE is still applying same dimensions as NARIMAN . These are exactly conform with original technical instructions by ELAHI to NARIMAN for construction in the 1960's. As old items still prove, standards were various before. Accoustic tests proved that current dimensions are optimum now. The soundbox shape was optimized for the best results. Famous lutemaker QANBARI is reported to have created the early conveniant aluminium patterns of the soundbox glueing technics.

Variations are permitted, but when parameters vary too much, the tune of the instrument, even not bad, gives up the acoustic kordi standard. For example , the deepest soundboxes retain the sound inside.; if the neck is too long, this looks too much like a khorasani Dotar; if the soundboard is to thick, this sounds like a turkmeni dotar, so on…As most of the instrument of this faily, the soundboard is made of blueberry wood, that sounds very characteristic. For soundbox, alternate wood do not alterate the sound but alternate woods are nor usual.

Soundboard Width : 16 -17 cm	*Vibing length of the string : 63 cm*
Soundboard Length : 35 cm	*Total length of Neck : 47 cm*
Neck length (including sillet) : 35 cm	*Length from bridge to bottom: 7 cm*
Total length : about 80 cm	*Soundbox depth : 15 cm*
Soundbox thickness : 3 mm	*Ribs : 9*
Neck width (top) : 22 mm	*Neck thickness (top) : 24 mm*

The fingerboard is slightly rounded, so that the frets are don't move.

Wood boards of the table are first shaped 5 mm thick. Then they are backed between two holed aluminium plates, for some 12 hrs. Alternate traditional backing technology exist such as chalk, putrescence, or flames, depending on the dry wood. Then the Soundboard is planed up to 4 mm thick. Thickness is reduced then as long as the table to be adjusted conveniently.So 3 mm thick is usual in the central area and down to 1.5 in the edges. Unlike the rumors, the convexe bend of the soundboard (due to the reduction of the edges) is not mandatory for a good sonority. As most setar lutes, the joint between the soundbox and the table is covered with a reed end for both decorative and proctection purpose.This prevents the board to split out the box". (see more details, INSERT 00090)

(During, Jean, „L ame des sons", Le Relie publ., ISBN 2-909698-71-8 . Gordes, 2001.)

Read more details about soundboard finisher, INSERT 00090. Jean DURING reports also excellent monoxyle tanbur makers in Gahvare, near to Dalahu (near Kerend), including Asadollah GAHVARE'I the son of Shamsollah FARMANI. Despite they are not standard at all, these instruments sound slightly like torkmeni dotar. String length spans up to 72 cm.

- INSERT 00073 -

COMPOSITE SOUND BOX ALTERNATE DESIGN – "***TANBUR PASHNEH***" - SAHNEH, KERMANSHAH – -

Preparation of the proeminent wooden tongues.

Preparation of the proeminent wooden tongues. Illustrations by ***Seyyed Khalil ALINEJAD***.

- INSERT 00074 -

COMPOSITE SOUND BOX ALTERNATE DESIGN – "***TANBUR PASHNEH***" - SAHNEH, KERMANSHAH – -

Lute maker ***RAHNAMA,*** in Sahneh, Kermanshan. The alternate rib shape (Kermanshah) consists in fixing the ribs on a proeminent tongue. The technic was observed also on Dotar construction among Uyghurs and some Torkmens.

The alternate rib shape (Kermanshah) consists in fixing the ribs on a proeminent tongue. Illustrated by ***Seyyed Khalil ALINEJAD***, Sahneh.

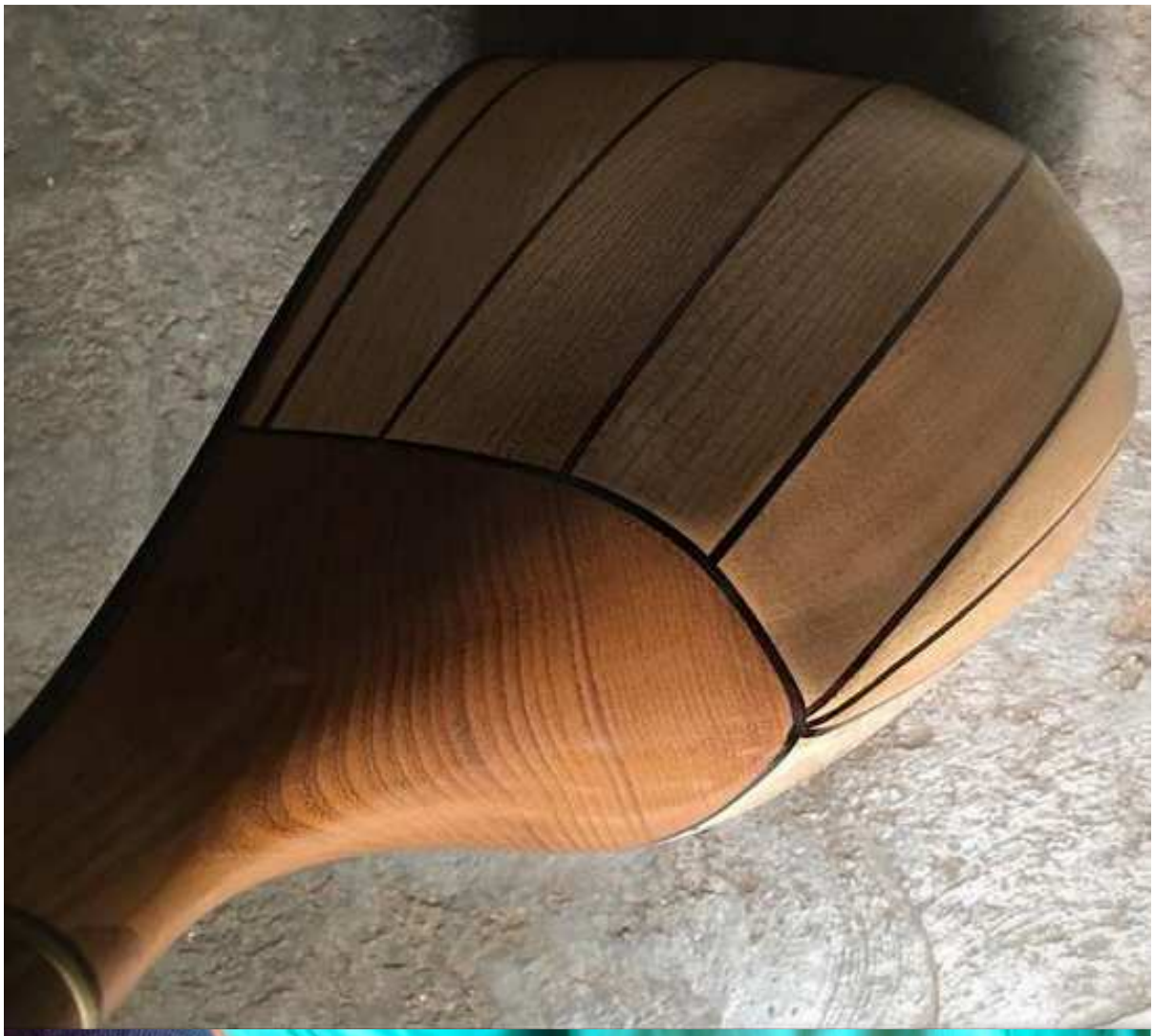
- INSERT 0075 -

COMPOSITE SOUND BOX ALTERNATE DESIGN – "***TANBUR PASHNEH***" - SAHNEH, KERMANSHAH -

Some ***pashneh*** variants. TOP: Gourd made-soundbox (traditional).
BELOW: Picture at ***Omid DEHRAZ***, a kordi maker exiled in Shiraz.

- INSERT 00078 -"***TANBUR PASHNEH***" - SAHNEH, KERMANSHAH –

-



The very same rib technic and shape is very widespread also in ***Tanbur*** and ***saz*** construction. An alternate rib shape exists in the area of Kermanshah - see picture -. This consists in fixing the ribs on a proeminent tongue, so that the size of the sounbox to be huge. Such loud, oversized instruments are appreciated among the religious players of Sahneh and Guran, Kordestan (***Ahl e haqq***). This construction technic was extensively illustrated and described in the technical book by ***Seyyed Khalil ALINEJAD*** – see bibliography below- . Below: notice the drills for additional frets.

- INSERT 00080 -

ANTIQUE SOUND BOX ALTERNATE RIB DESIGN (FLAT BOX A.K.A. ¨***OBAYI***¨)

Another rare design of the setar soundbox is the « ***Âbayi*** », an antique version of the ***Setar***. The flat box was formerly appropriated when hidding this in the mantle («***Âba***») .

Left : Lutemaker ***Omid DERAZ***, Shiraz, replays the hidding gesture, presumately as old as the Abassides ….

- INSERT 00081 -

A modern innovation is the ***botejigheh*** variant of ***Abai*** by Cultural Heritage Center, Tehran.

In ***botejigheh*** design, carved cavities are glued in main box. (Cultural Heritage Center, Tehran).

Method Using Solid Mold

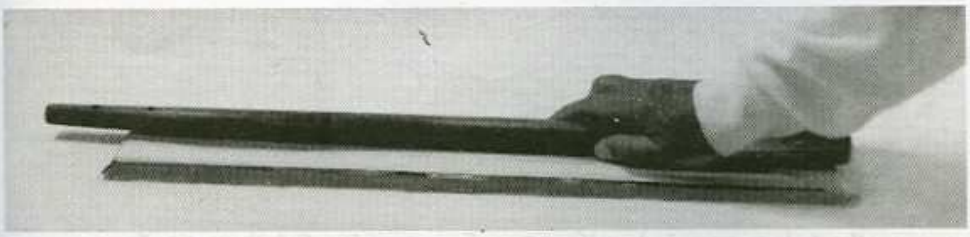
Having carved a solid wooden mold to the shape of the sound box, first cover the mold with paper to prevent glue from sticking to the mold (Photo No. 30). (Placing the paper in water before applying will make it fit more easily and tightly on the mold). Bent ribs are prepared as described above and glued together, fitting them around the solid wooden mold. Small nails (tacks) are driven into the mold at the edge of the ribs to hold the ribs in place until the glue is dry.

MAKING THE SETAR NECK

The neck is usually made from a solid piece of walnut wood. However, other woods such as maple, apricot, or mahogany can also be used. The form of the neck is flat along the length of the top, and rounded along the length of the back. It tapers from the sound box towards the nut; or, in other words, both width and depth become smaller towards the nut. Drawing No. 27 shows the details of a typical cross section. (Refer to previous sections for finding the length of the neck).

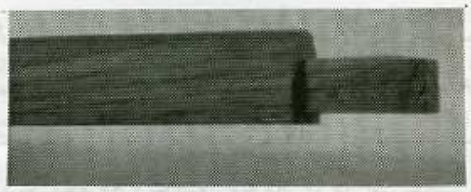
After the neck has been cut and planed to proper size, peg holes 6mm in diameter are drilled (Drawing No. 26). The surface of the neck is then sanded by rubbing it back and forth on a piece of #60 sandpaper, cut long enough for this purpose, until it is smooth (Photo No. 51). The tongue is cut to proper size by cutting away about 3mm from around the neck (Photo No. 52). Later, when the neck is connected to the sound box and plate is installed, the surface of the neck from nut to the connection to the sound box is made concave in such a manner that it is approximately 2mm lower mid way between nut and sound box (Photo No. 72). Also, the surface of the neck should be slightly curved transversely. This is done by using a wood scraper which has had its edge filed to the right curvature, about 2mm higher in the middle of the neck surface from the edges (Photo No. 73).

A groove is then cut along the side of the neck (fourth string side) as shown in Drawing No. 27 and Photo No. 54, using a simple tool made from two pieces of wood glued together and a screw for cutting the wood (Photo No. 53). As stated above, it is recommended that the longitudinal and transversal curves on the surface of the neck be made after the neck has been connected to the sound box and the plate installed.

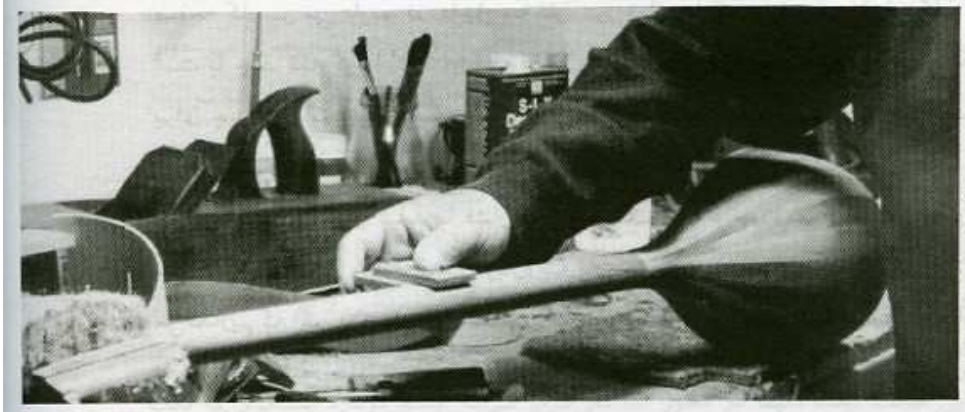


تصویر شماره ۵۱
Photo No. 51

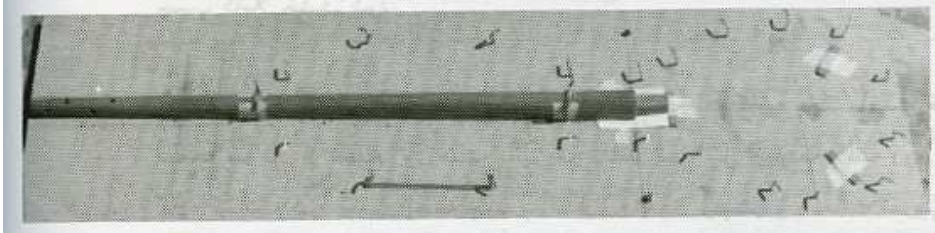
تصویر شماره ۵۳
Photo No. 53



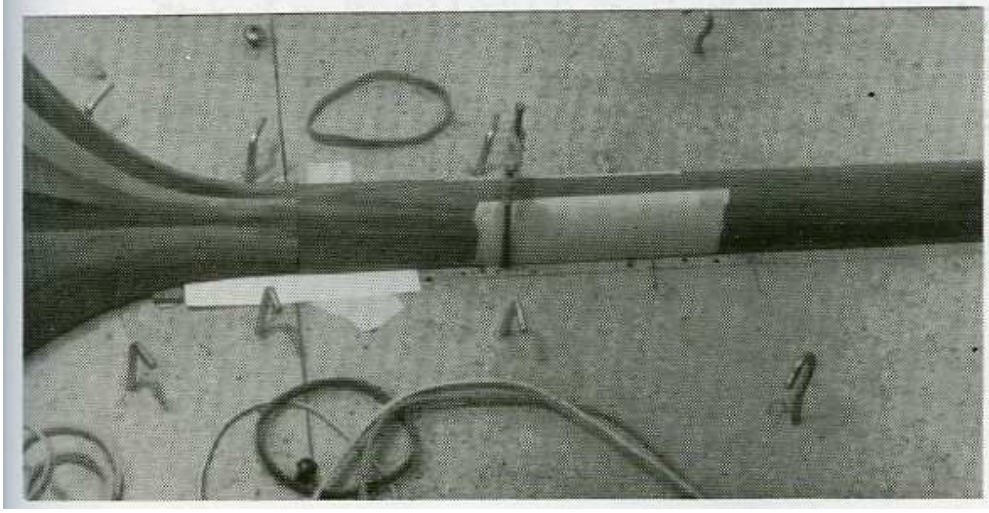
تصویر شماره ۵۲
Photo No. 52



تصویر شماره ۵۴
Photo No. 54



تصویر شماره ۵۵
Photo No. 55



تصویر شماره ۵۶
Photo No. 56

- INSERT 00082 -

ADJUSTING DOVETAIL-LIKE HOUSING ON THE WEDGE

The strenghtened housing of this ***setar*** soundbox is adjusted as tight. Maker ***POUSHAGHAGHI***, possibly Tehran

ADJUSTING DOVETAIL-LIKE NECK ON THE SOUNDBOX

The dovetail of this ***setar*** neck is adjusted as tight. Maker ***POUSHAGHAGHI***, possibly Tehran

JOINING THE NECK TO THE SOUND BOX

Select a piece of flat wood (950mm x 300mm x 20mm) to use as a working surface. Draw a straight line in the middle of it. This line will be the longitudinal axis of the setar. On the side of this line, draw the width of the neck at the nut and at the point of connection to the sound box. Place the neck face down on this working surface, making sure it is properly located on the axis (Photo No. 55). Hold the neck in place with nails driven at its sides at the two ends and also by using rubber bands and hooks installed on the working surface (Photo No. 56). Before driving the nails, place two layers of masking tape on the side of the neck to prevent nail marks from marring the neck wood.

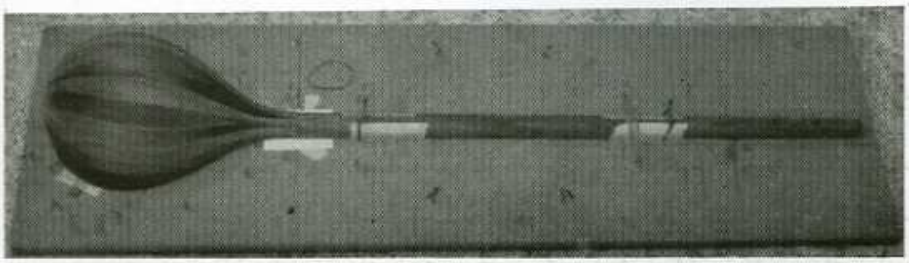
The next step is to place the sound box throat on the neck's tongue in such a manner that the sound box axis is on the longitudinal setar axis line. Be sure that the neck and sound box connection is a fit. Make corrections as necessary. Then tape a piece of paper to the working surface at the point of connection to prevent the neck from becoming stuck to the work surface once glue has been applied. Also place four pieces of wood 3mm thick (same thickness as sound box plate) under the edges of the sound box to raise the sound box above the working surface before placing the sound box on the tongue. This leaves a space which will be filled later on with plate when attaching it to the sound box.

When satisfied with the fit, glue the end of the sound box to the neck and position it in place. Secure the sound box in place using rubber bands and hooks (Photos No. 57, 58 and 59, and Drawing No. 28).

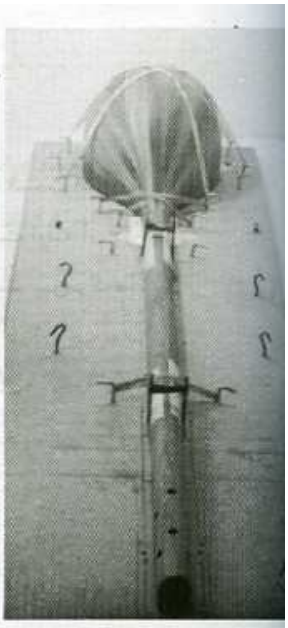
After allowing a few days for the glue to dry, remove the setar from the working surface. Fill up the open space between the tongue and the sound box wall with wedges covered in glue (Photo No. 60 and Drawing No. 29). Again, reposition the setar on the working surface making sure the sound box and neck are still positioned on the axis. Let the glue dry for a few more days.

ATTACHING THE PLATE

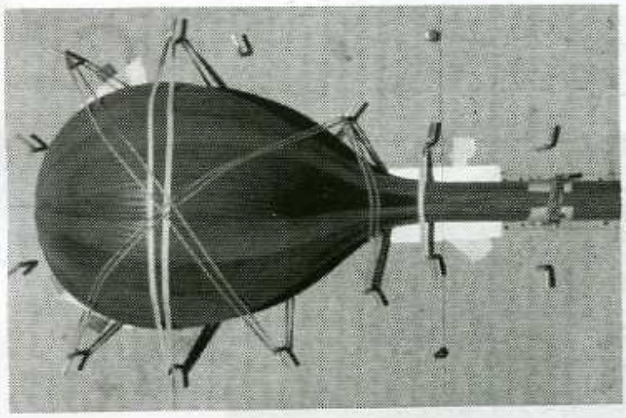
Wood for the plate is chosen as we discussed in the wood selection chapter of this book. Generally speaking, the space between the wood's annual rings should be about 2mm apart. The wood should be free of knots, cracks or other defects. The plate at this stage is 2.8mm thick. Submerge the plate in boiling water for approximately 15



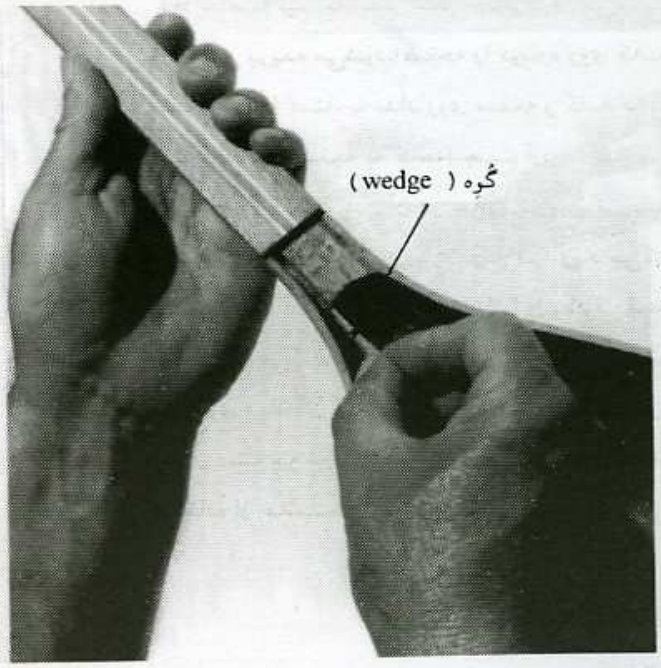
تصویر شماره ۵۸
Photo No. 58



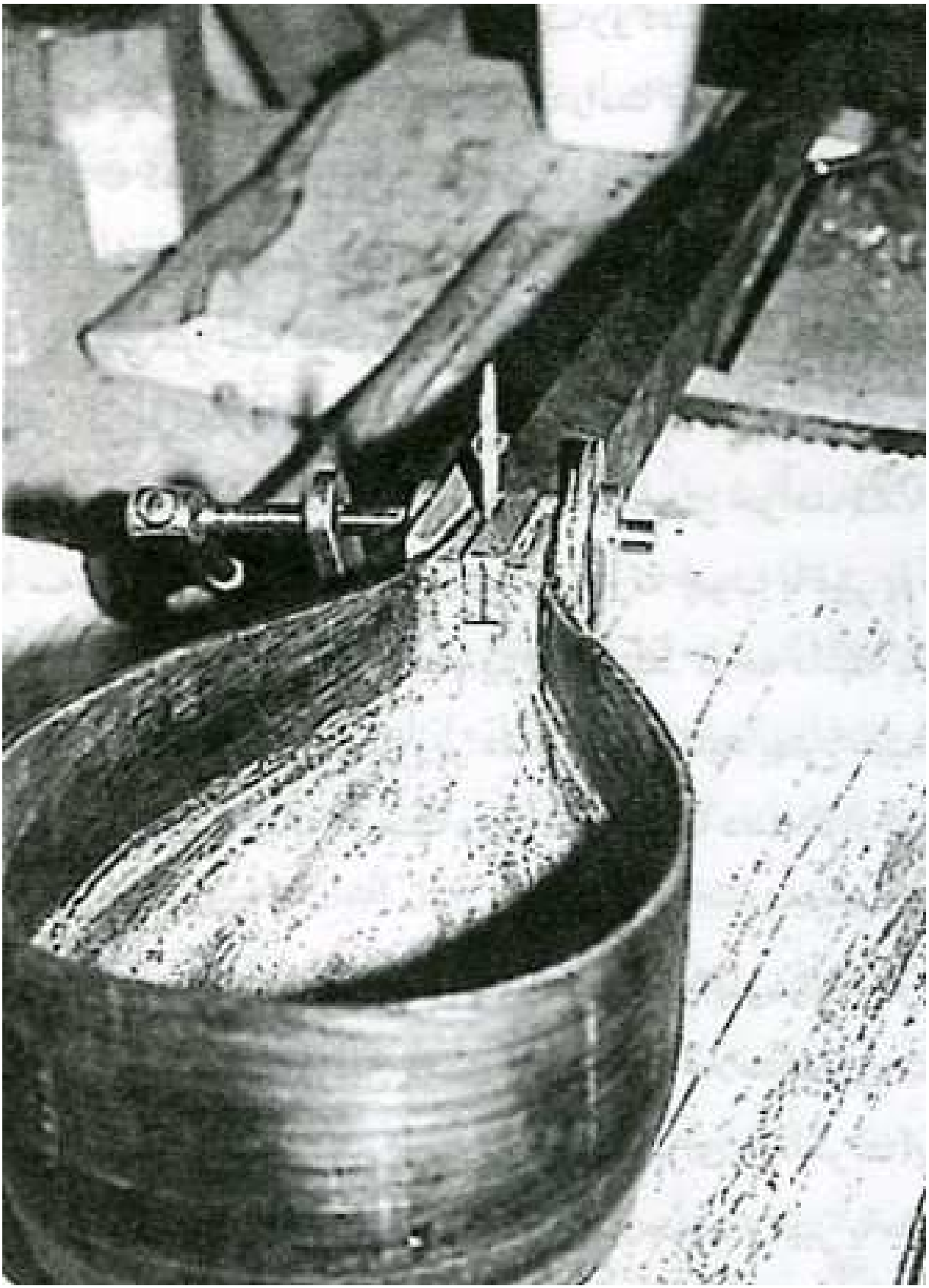
تصویر شماره ۵۷
Photo No. 57



تصویر شماره ۵۹
Photo No. 59



تصویر شماره ۶۰
Photo No. 60



Joining Sounbox & Neck : alternate fixing technic featuring clamp (Hosein MASOUD).

INSERT 00086

Joining Sounbox & Neck (glue) : As observed at ***Ali Reza RAHNIM*** s , Qasvin. Considering the absence of strengthener, the junction structure is much more simple than the design by POURSHAGHAGHI for rib-made box (see INSERT 0082).

- INSERT 00088 - INSERTED ORNAMENTATIONS IN UPPER NECK

Ornamentations are carved in ivory with a micro-saw. Then the ivory plate is adjusted in the cavity. (Cultural Heritage Organization Center, Tehran)

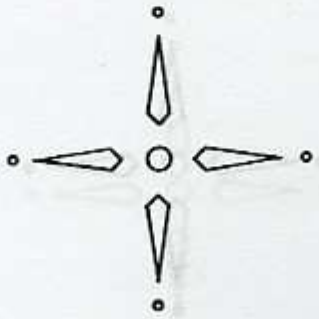
PURFLING AND OTHER ORNAMENTATION

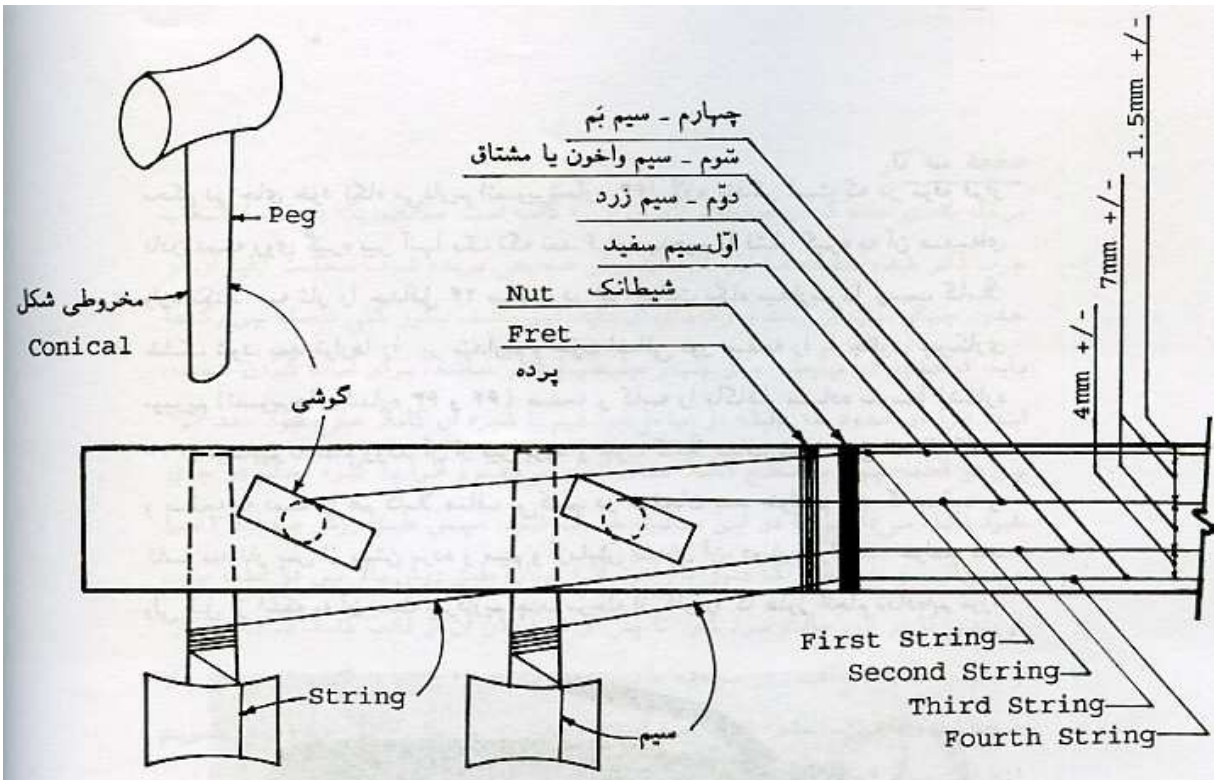
A long,thin strip of wood (maple or similar wood) 2mm x 1mm is glued to the edge of the sound box before varnishing (Drawing No. 31).

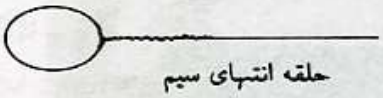
For ornamentation, pieces of mother-of-pearl or bone inlay in a rectangular, circular or diamond shape is inlaid with glue on the peg section of the neck and at the connection point of the neck to the sound box (see photos of completed setar).

Varnish the sound box and place the strings on it. The instrument is now ready to be played. **ENJOY IT!**

A Final Note: When not being played, protect your setar by storing it in a dry place, preferably in a wooden case lined with a soft padded fabric.







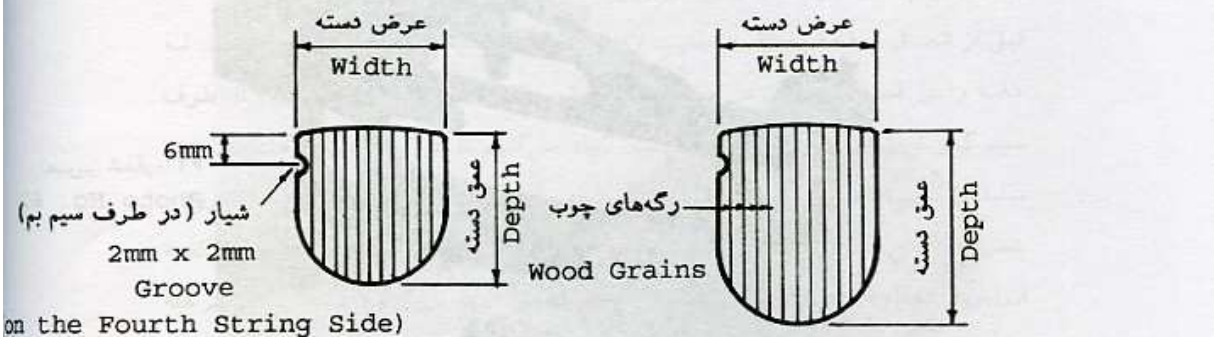
حلقه انتهای سیم

Loop at the End of String

نقشه شماره ۲۶

DRAWING NO. 26

Pegs' Positions on the Neck



برش دسته در محل شیطانک

Cross Section of Neck at Nut

برش دسته در محل اتصال به کاسه

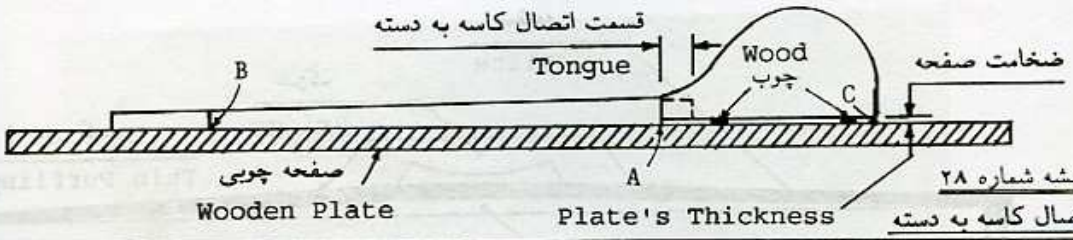
Cross Section of Neck at Sound Box

نقشه شماره ۲۷

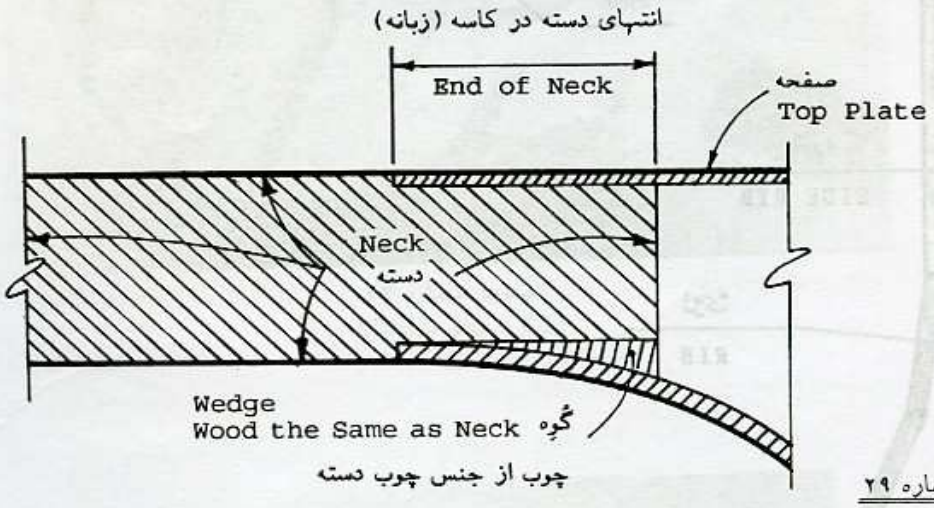
DRAWING NO. 27

Neck Cross Section and the Location of the Groove

DRAWING NO. 28
Connection of Sound Box to Neck

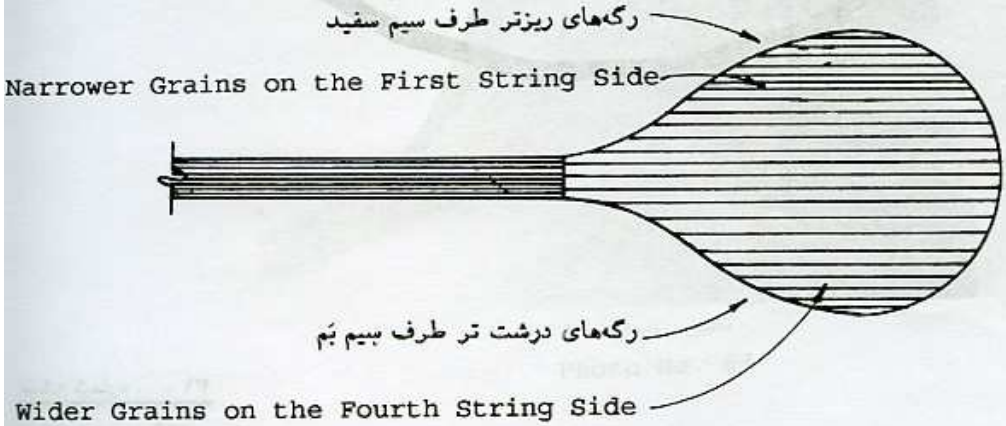


نقشه شماره ۲۸
اتصال کاسه به دسته



نقشه شماره ۲۹
اتصال دسته به کاسه

DRAWING NO. 29
Connection of Sound Box to Neck (Wedges)



نقشه شماره ۳۰
جهت رگه‌های چوب در صفحه و دسته

DRAWING NO. 30
Top Plate - Position of Wood Grains

minutes. Remove it from the water and immediately place it between two flat boards. Clamp it and leave in place for two days or until dried. Remove the plate from the clamped boards and heat it to remove the sap as described previously.

Sand the plate to a thickness of 2.8mm (Photos No. 61 and 62). Place the plate on the sound box opening and line it up as shown in Drawing No. 30. In this position, draw a line around the sound box on the plate indicating the size of the opening on the plate. Cut the plate's excess wood about 5mm outward from this line.

Before attaching the plate, the two sides of the sound box edge are lowered by cutting 2mm maximum at the widest point to no cut at the two ends (Drawing No. 31). This will allow the top plate to be slightly arched, hence structurally stronger. Check to make sure the plate sits precisely on the sound box with no space between. When this is done, hold the setar steady by placing the neck on the bench vise, and then apply glue to the edge of the sound box and place the top plate in its correct position. Hold it in place using strips of masking tape (Photo No. 63). Allow to dry for 24 hours. Then remove the masking tape and cut the excess wood from the edge of the plate (Photo No. 64). At this stage the thickness of the plate's entire surface is 2.8mm.

The next step is to start shaving the plate on the outer edge starting from 20mm from the edge in a manner so the thickness decreases from 2.8mm at 20mm from the edge to 0.5mm at the edge. Finally, sand the surface to a smooth finish with #600 sandpaper.

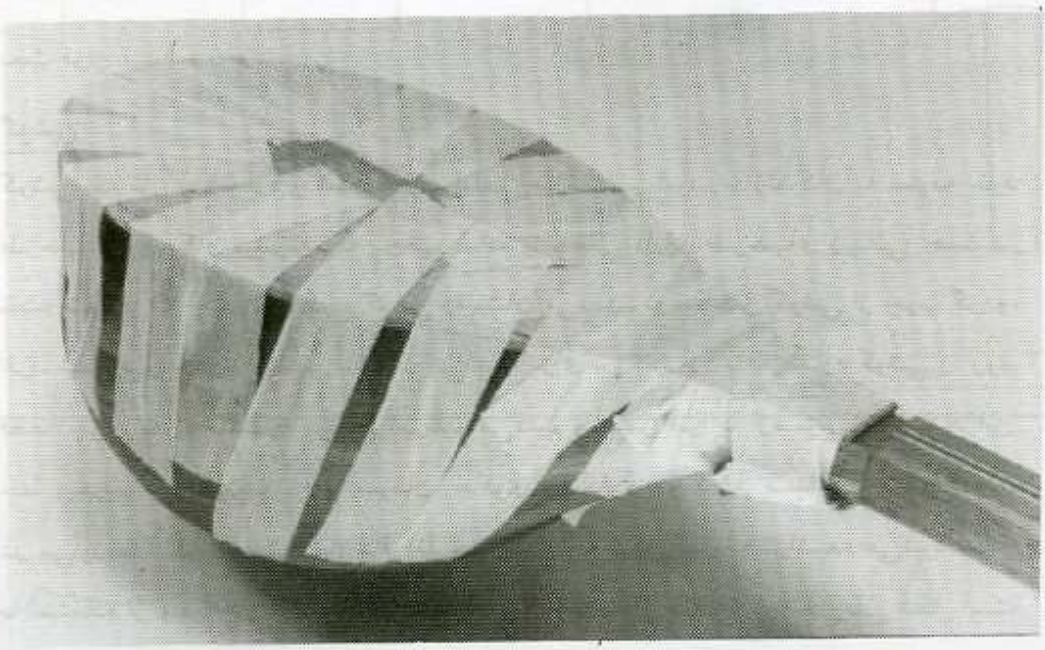
TUNING PEGS

Walnut wood is used for making the tuning pegs. Other wood such as maple or boxwood may be used also. Drawing No. 32 shows four different patterns for pegs. First draw the outline of the peg on a piece of wood 8mm thick. Cut the excess wood away. The stem is rounded using the peg shaver and the head is cut to the desired design. Using a peg reamer, shave the peg hole (previously drilled in the neck) to the proper size for the peg's stem. To ensure a good fit, rub the surface of the peg stem with dry soap and place it in the peg hole and test. If the fit is not satisfactory, take the peg out and sand the shiny spots on the stems using #600 sandpaper and test again to achieve a good fit (Photos No. 65, 66 and 67).

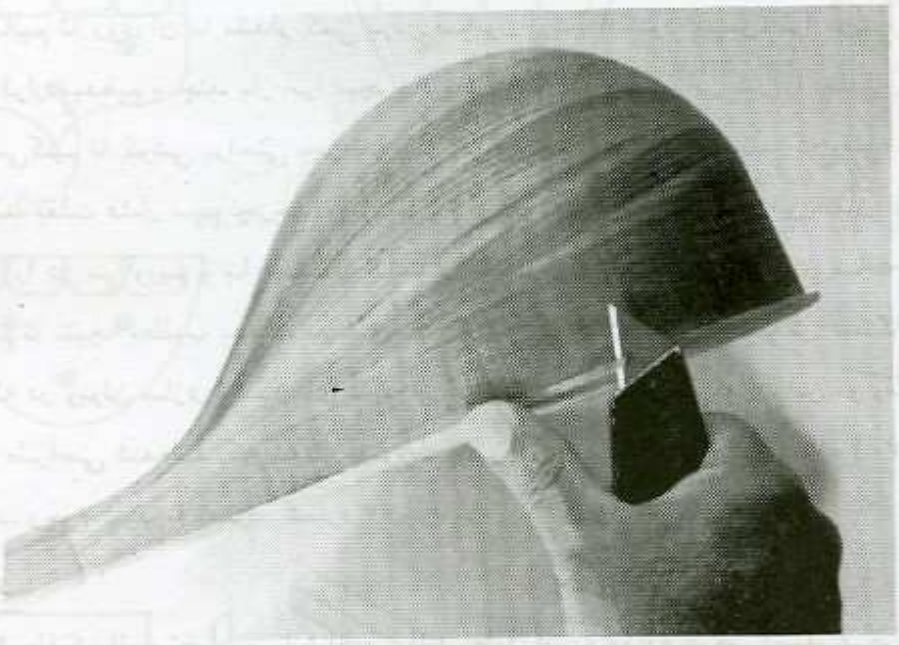
- INSERT 00090 - SOUND BOARD SHAPING (DOTAR, NORTH KHORASAN)

The soundboard is shaped out of flexible wood sheet (source web x).

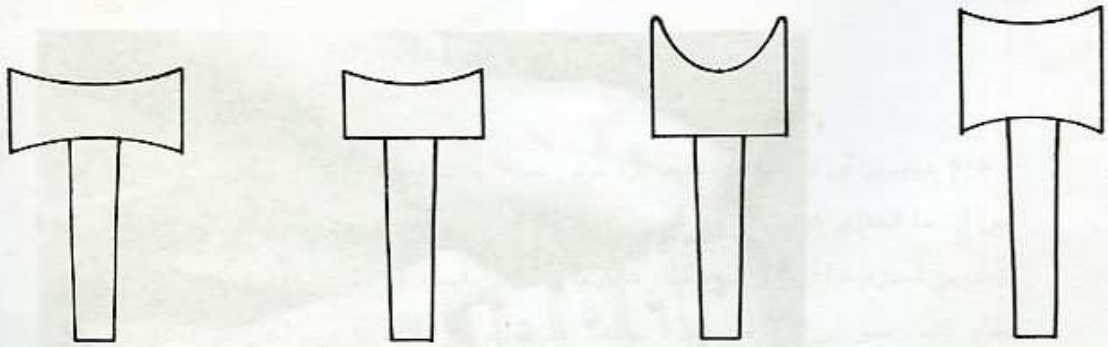
Carving the soundbox by combination of the gouge and driller (source web x)..



تصویر شماره ۶۳
Photo No. 63



تصویر شماره ۶۴
Photo No. 64



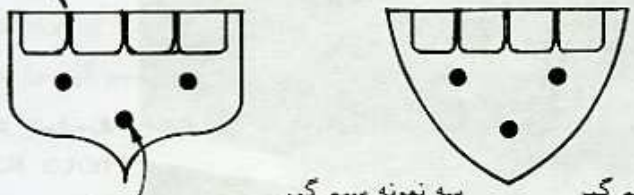
نقشه شماره ۳۲
چهارنوع گوشی

DRAWING NO. 32
Samples of Pegs

دو نمونه خرک
Bridge

برش عرضی خرک
Bridge Cross Section

شیار
Groove



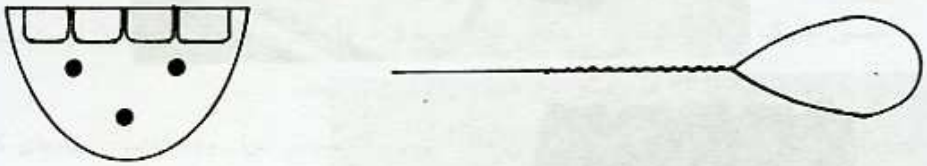
صفحه سه تار
Top Plate

کاسه
Sound Box

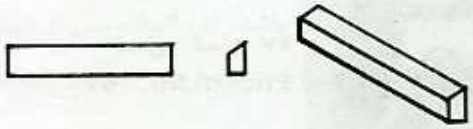
Wooden Dowel میخ چوبی

سه نمونه سیم گیر
String Holder

برش عرضی سیم گیر
Cross Section of String Holder



حلقه انتهای سیم
Loop at the End of String



شیطانک
Nut

نقشه شماره ۳۳
خرک - شیطانک - سیم گیر

DRAWING NO. 33
String Holder, Nut and Bridge

NUT

The nut is made from bone. Its length is equal to the width of the neck. It is 2mm thick and 4mm wide. It is placed (glued) in a groove 2.5mm deep into the neck (Drawings No. 26 and 33, and Photo No. 68).

STRING HOLDER

The string holder is made from ram's horn or other similar materials. Rosewood and boxwood also may be used. Drawing No. 33 shows three different designs for a string holder. The string holder is cut to shape by using a coping saw, wood files, sandpaper and wood worker's knife. To achieve a precise fit between the sound box and string holder, a piece of #60 sandpaper is attached to the sound box and the back of the string holder is rubbed on it (Photos No. 69 and 70). Two or three wooden dowels covered with glue are placed in pre-drilled 2mm holes. The string holder is held firmly in place with masking tape for 24 hours. The width of the string holder is determined in a manner so as to keep all the strings parallel to each other after they pass over the bridge towards the string holder. Grooves are cut on the lip of the string holder to hold the string ends (loops).

BRIDGE

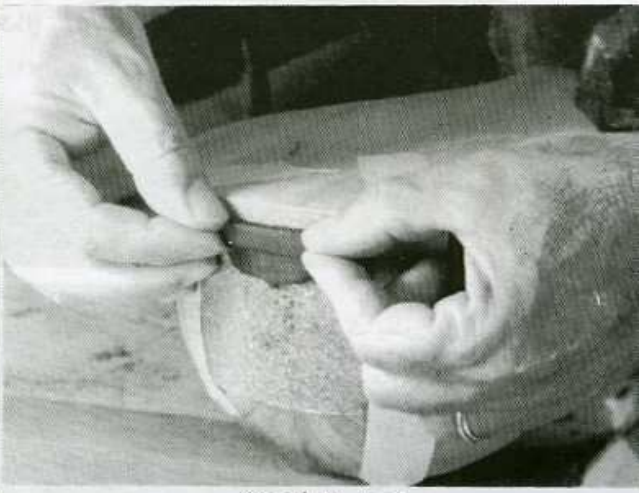
Boxwood or rosewood is used for this purpose. Drawing No. 33 shows two bridge patterns and approximate sizes. The length of the bridge is approximately 50mm. The height of the bridge is determined in such a manner that the distance between strings and the neck surface at the point of connection to the sound box is about 3mm. To find a precise fit between the bridge legs and the plate, tape a small piece of #600 sandpaper to the sound box at the bridge location. Move the bridge on it back and forth slightly along its length until the desired fit is achieved (Photo No. 71).

STRINGS

The first and third strings are steel, 0.20mm in diameter. The second string is phosphorous bronze, 0.22mm in diameter. The fourth string is similar to the second string in material but is 0.35mm in diameter. Other sizes such as 0.18mm for the first string, 0.20mm for the second string, 0.18mm for the third string and

تصویر شماره ۶۸

Photo No. 68

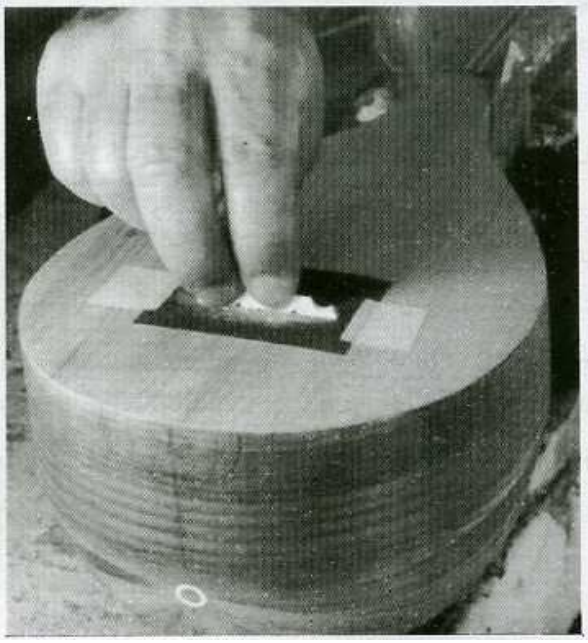


تصویر شماره ۶۹

Photo No. 69

تصویر شماره ۷۰

Photo No. 70



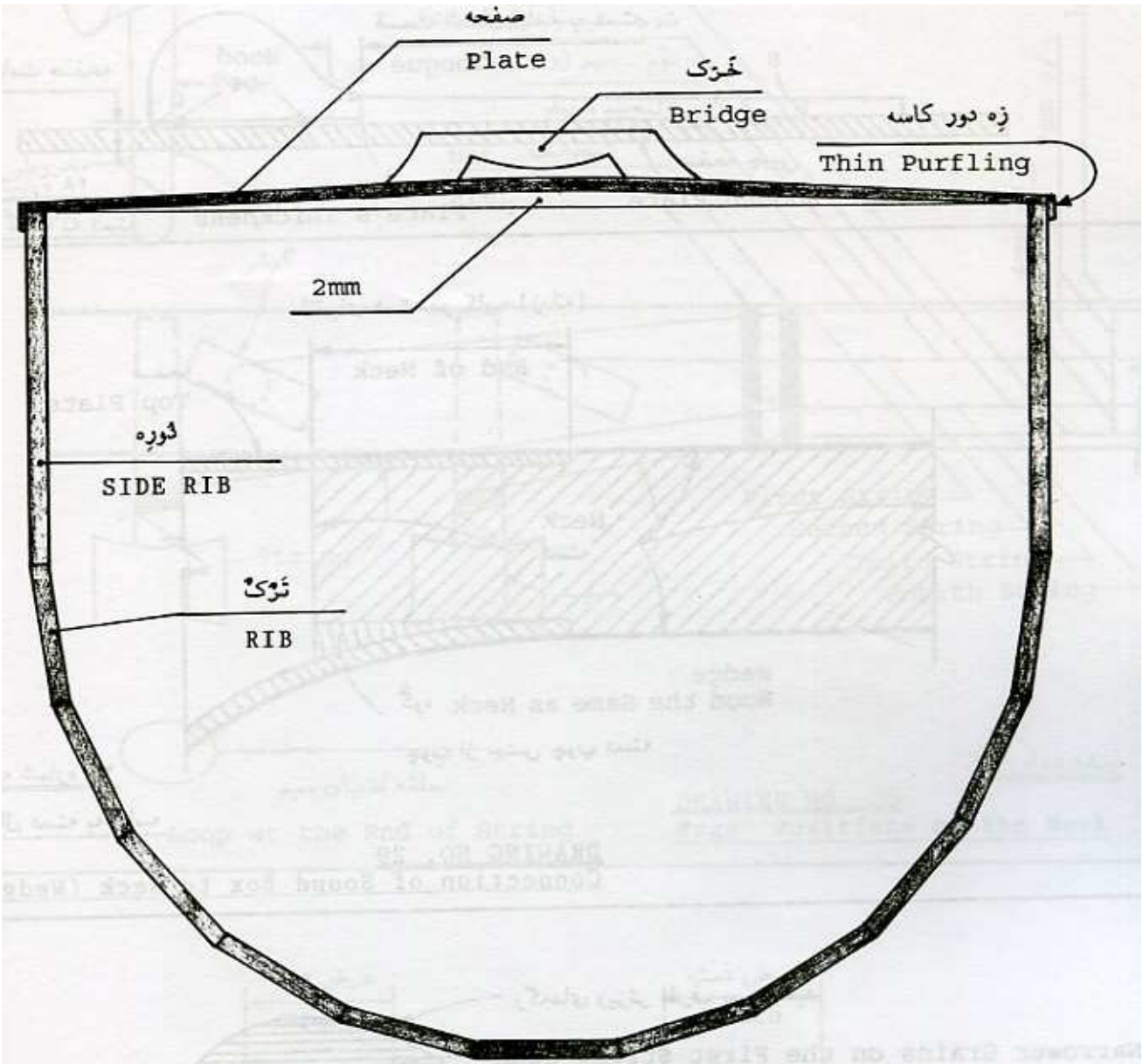
تصویر شماره ۷۱

Photo No. 71

- INSERT 00090 -

*"The **(Tanbur)** wooden bridge is made of hard wood (nut tree, boxwood) 5-6 mm high. The gap between strings and table in the plucking area is about 4 mm high. The tanbur Soundboard is holed , so that the sonority to be led out , and the bass frequencies to be amplified. Ostad ELAHI didn't issued any comments about perforations, but he used to improve the sonority of a tanbur by drilling one or some holes in some area he knew. The ideal location used to depend on each table, but the custom is drilling from 5 to 20 mostly the top area of the soundboard, near to the neck junction and some near to the lateral eclisses. In most other traditions, neck is made of apricot wood, unlike the kordi, that is made in nut wood. Its orientation is slightly climbing comparing to the box axis, so that the string will pend on 1 mm high in the area of the nck-box junction. This avoids unsuitable contacts of the string when playing (same artifact as Tar lute making). (…) As usual in Iranian instrument making, the tanbur are gum-laqued , after dilution of the gum in alcohol, without any pigments."*

(During, Jean, „L ame des sons", Le Relie publ., ISBN 2-909698-71-8 . Gordes, 2001.)



نقشه شماره ۳۱

برش عرضی کاسه

DRAWING NO. 31

Cross Section of Sound Bo

0.30mm to 0.35mm for the fourth string are also used (Drawing No. 26).

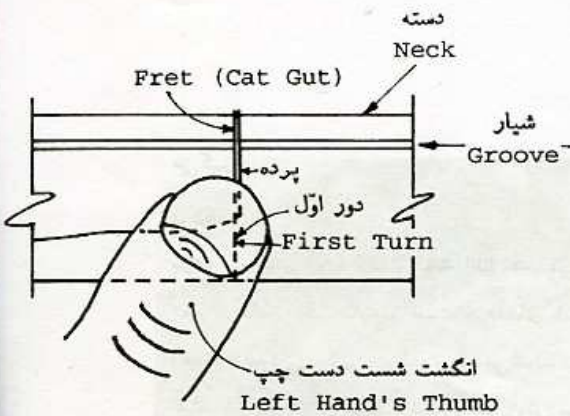
FRETS

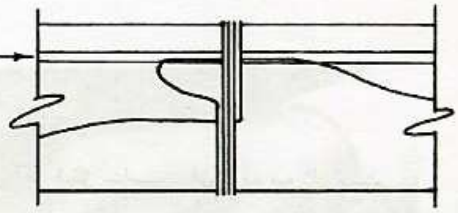
Frets are placed in position around the neck after the setar has been assembled and the neck has been completely finished and varnished. (See wood finishing and varnishing technique described below). Catgut, a tough cord usually made from the intestines of sheep and 0.7mm to 0.8mm in diameter, is used for the frets. The thicker frets are used on the nut end and the thinner ones on the sound box end. The catgut is wound three or four times around the neck (clockwise) and a special knot is made. Drawing No. 34 and Photos No. 74-1 through 74-7 show the method used in winding and tying the frets. Drawing No. 35 shows location of frets.

The special knot is made in the following manner: Cut a piece of catgut long enough for this purpose, approximately 400mm, and place it in warm water for about five seconds. Then dry it with a cloth, leaving it a little bit moist. Holding about 60mm of the left end of it under your left thumb, wind the longer end around the neck (clockwise), pulling it tightly, but not too tight. Make the second turn by going over and placing it to the left of the first turn. Repeat this three or four times. Then pass the right end of the catgut through the groove from the left side. Pull it firmly and bring it out of the groove and down so both ends are in line and parallel to the neck. If this process has been done properly, the fret will stay tight without unwinding when let loose. Then, holding the two ends, make a tight simple knot. The position of the fret is initially placed a little bit flat of its true position and then is pulled up the neck towards the sound box to its final position. Since the neck is tapered, this makes the frets fit tighter around the neck.

FINISHING

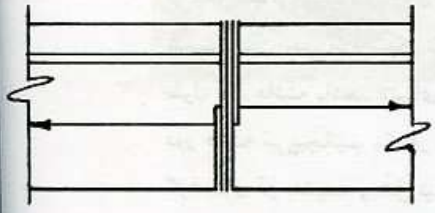
The entire surface of the instrument is cleaned by removing the excess glue with a damp cloth. Then sand it first with #300 sandpaper and then #600 sandpaper. Finish the neck section first and place the frets as described above. Do not apply finish to the sound box until the final shaving, set up and adjustments are made. (See following section on final shaving, set up and adjustment).



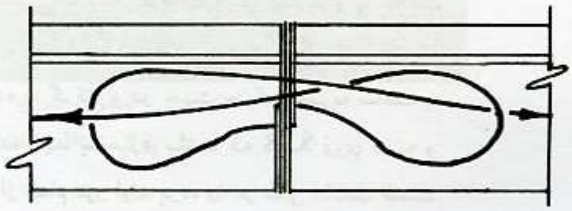


انتهای پرده از سمت چپ از
داخل شیار عبور داده می‌شود
End of fret, from left side,
is passed through the groove.
(۲) (2)

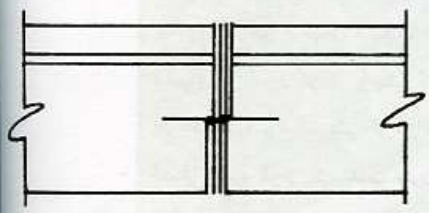
(۱) شروع بستن پرده
Step (1)



انتهای پرده از دو طرف کشیده می‌شود
Pull the two ends.
(۳) (3)



ایجاد دو حلقه برای گِرِه
انتهای پرده از دو طرف در جهت فِلِش کشیده می‌شود
Make two loops as shown,
then pull the ends.
(۴) (4)



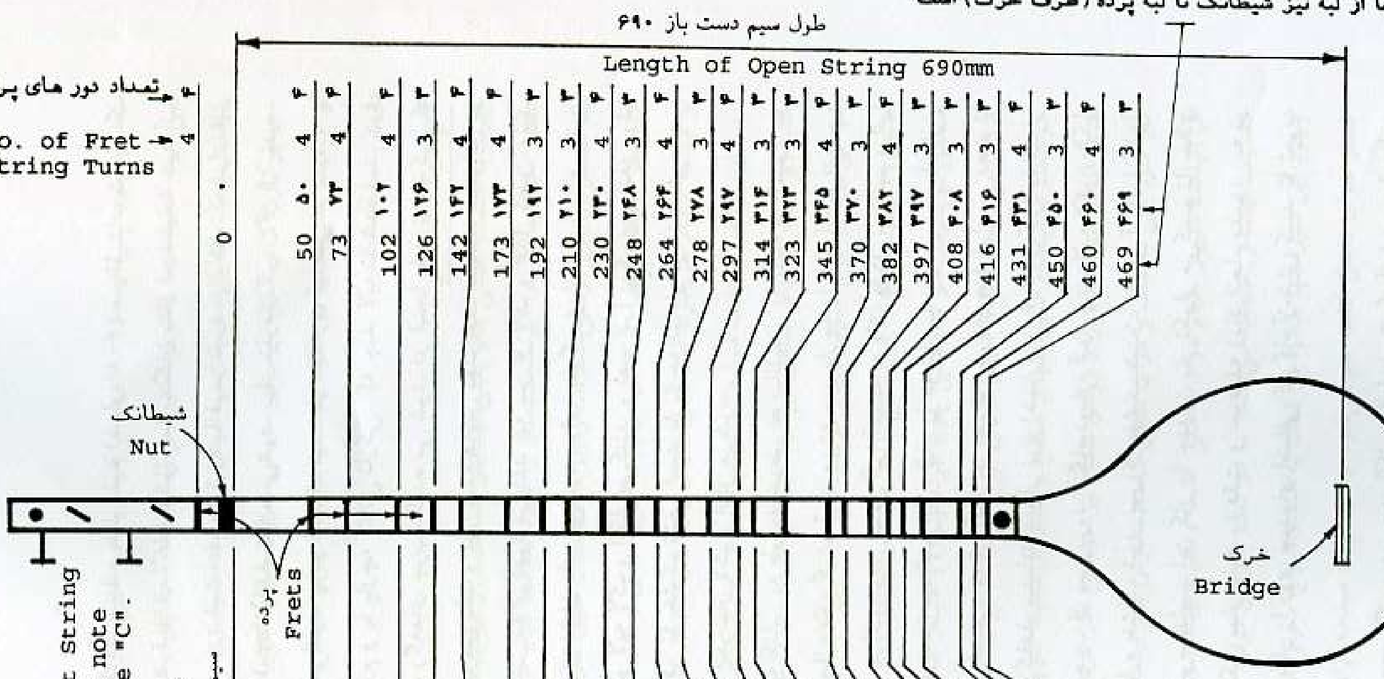
گِرِه از رو
Simple Knot
(۵) (5)

نقشه شماره ۳۴
روش بستن پرده

DRAWING NO. 34
Technique of Tying Frets on Neck

From Lip of Nut to the Fret Edge (Bridge Side)

فاصله‌ها از لبه تیز شیطانک تا لبه پرده (طرف خرک) است



Note	نوت	mm	میلیمتر	No. of Fret String Turns	تعداد دور های پرده
		0	۰	4	۴
C	دو				
D♭ (koron)	رکُرُون	50	۵۰	4	۴
D	ر	73	۷۳	4	۴
E♭	می بِمُل	102	۱۰۲	4	۴
E (koron)	می کُرُون	126	۱۲۶	3	۳
E	می	142	۱۴۲	4	۴
F	فا	173	۱۷۳	4	۴
G♭	سل بِمُل	192	۱۹۲	3	۳
G (koron)	سل کُرُون	210	۲۱۰	3	۳
G	سل	230	۲۳۰	4	۴
A♭	لابِمُل	248	۲۴۸	3	۳
A (koron)	لاکُرُون	264	۲۶۴	4	۴
A	لا	278	۲۷۸	3	۳
B♭	سی بِمُل	297	۲۹۷	4	۴
B (koron)	سی کُرُون	314	۳۱۴	3	۳
B	سی	323	۳۲۳	3	۳
C	دو	345	۳۴۵	4	۴
D′ (koron)	رکُرُون	370	۳۷۰	3	۳
D′	ر	382	۳۸۲	4	۴
E′♭	می بِمُل	397	۳۹۷	3	۳
E′ (koron)	می کُرُون	408	۴۰۸	3	۳
E′	می	416	۴۱۶	3	۳
F′	فا	431	۴۳۱	4	۴
G′ (koron)	سل کُرُون	450	۴۵۰	3	۳
G′	سل	460	۴۶۰	4	۴
A′♭	لابِمُل	469	۴۶۹	3	۳

تمام اندازه‌ها به میلیمتر است

All Dimensions Are in Millimeters

نکته مهم: کلیه اندازه‌ها برای طول سیم «دست باز» ۶۹۰ میلیمتر محاسبه شده است. برای طولهای دیگر سیم «دست باز» این اندازه‌ها را به نسبت مستقیم طولهای مربوطه پیدا کنید.

مثال: اگر طول سیم دست باز را ۶۳۰ میلیمتر فرض کنیم اندازه جدید تا نوت می به طریق زیر پیدا می شود.
۶۳۰/۶۹۰×۱۴۲=۱۳۰ میلیمتر

نقشه شماره ۳۵

محل پرده‌های سه تار روی دسته

Drawing No. 35

Locations of the Frets

If you wish, the setar may be stained with powdered ochre mixed with water before applying varnish. Flakes of shellac are mixed in methanol alcohol (ratio of one part shellac to 3 parts methanol alcohol) and applied with a fine varnish brush.

The traditional method of applying the varnish is as follows: Take a piece of cotton fabric (100mm by 100mm) and place a cotton ball in its center, wrapping it with the cloth. Flatten it by pressing it against a flat surface. Saturate with varnish and quickly rub it on the surface of the wood in the direction of the grains. After two or three applications, let the varnish dry completely and sand it lightly with #600 sandpaper. Repeat this until the desired finish is attained. Since in setar finishing no wood filler is used, the varnished surface of the sound box and neck will still show the natural fine wood cavities. Varnishing should be done in a well ventilated and dust-free environment. Use all safety precautions such as wearing gloves and face mask.

FINAL SET UP AND ADJUSTMENTS

The setar is played by plucking the strings with the index fingernail. The vibrations of the string are transferred to the bridge and then to the plate and the sound box. The thickness of the strings, the length of the strings (which can be varied by moving the bridge back and forth) and , finally, the thickness of the plate and the location of holes made on it all have a major effect on the sound produced by the instrument. The location of the holes on the plate are very important and are made after the plate shaving is completed.

The final adjustment of the instrument is a trial and error process and should be done under the direction of a setar player as the collaboration between the instrument maker and musician plays a very important role in the final product.

First, varnish the neck section only. Then tie the frets, install the pegs and place the strings on the instrument. The location of the frets are shown on Drawing No. 35. In the beginning, place the bridge about 55mm from the string holder. Tune the instrument as follows:

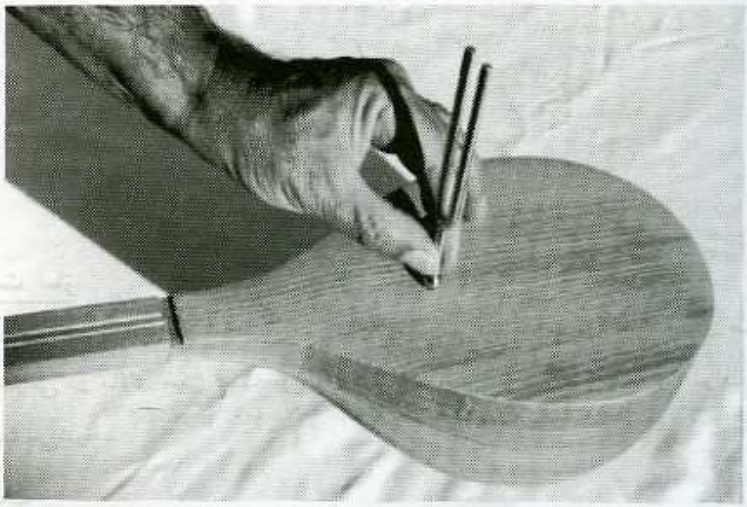
First string - C (523 - Hertz)
Second string - G (392 - Hertz)
Third string - C (523 - Hertz)
Fourth string - C (262 - Hertz)

NOTE: Lower pitches and other tunings are also used when playing the setar.

Play the instrument. Make any minor adjustments to the location of the frets as necessary to find the right tone. An experienced setar player can be of great help in doing this. As previously discussed, the center of the plate about 20mm from the edge of the plate was left at a thickness of 2.8mm. Now, remove the strings and shave the plate slightly with a wood scraper or the edge of a utility blade. Put the strings back on and play it again and note the difference. Try this several times. If the quality of the sound is improving, continue the shaving; but if it is not improving, stop the shaving. In any case, the final thickness of the top plate should not be less than 2.5mm. It is recommended to do this process over several days so as to give the instrument time to settle to its final form under the strings pressure. Also, try adjusting the location of the bridge. Move it back and forth a few millimeters to see if it has any positive effect on the sound.

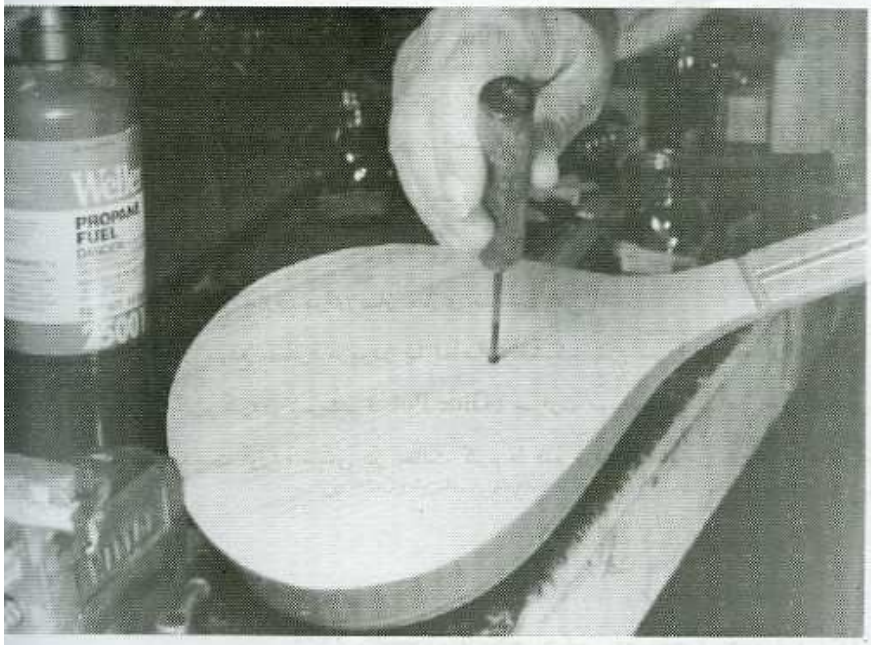
The next important step is to make the holes in the plate. Take a tuning fork (A = 440 Hertz) and strike it against a solid object. Then immediately place it on the plate at the bridge location and move it towards the neck until its highest tone is reached. Mark this point on the axis of the plate and burn a hole at that location by placing a hot rod 6mm in diameter on the plate. Other holes 2mm to 3mm in diameter are made around this central one until the desired sound is achieved. (Photos No. 75 and 76, and Drawing No. 36). Sometimes one or two holes 2mm in diameter are made on the edge of the sound box (Drawings No. 6 & 7).

In order to measure the thickness of the plate at the holes, make a tool by using a large paperclip. Straighten the clip out approximately 150mm in length and hammer one end to flatten it. Then bend the flattened end about 3mm, and make measurement notches on the stem from the bend in millimeters. Four notches are adequate. Bend the opposite end into a large circular hook so it does not accidentally fall inside the sound box. To measure the thickness, place the bent end into the hole, pressing it under the plate and holding it upright from the inside. Read the notches. (Photos No. 77 and 78).



تصویر شماره ۷۵

Photo No. 75

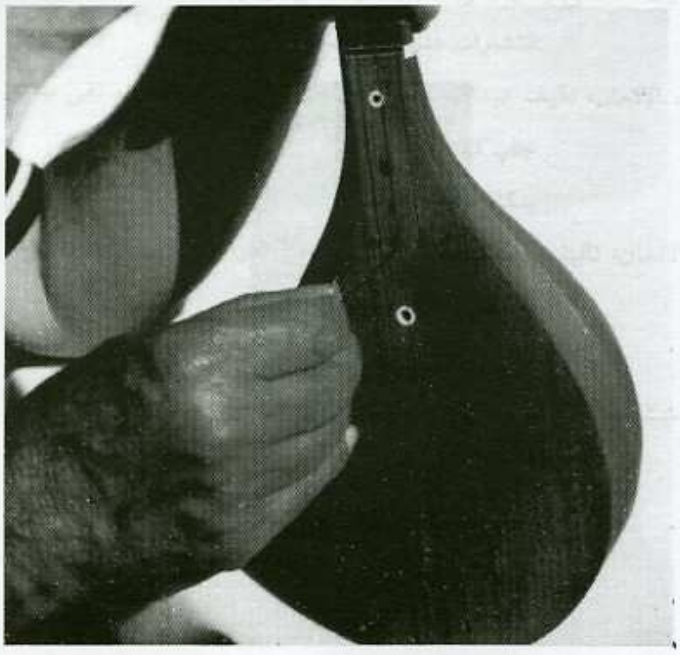


تصویر شماره ۷۶

Photo No. 76

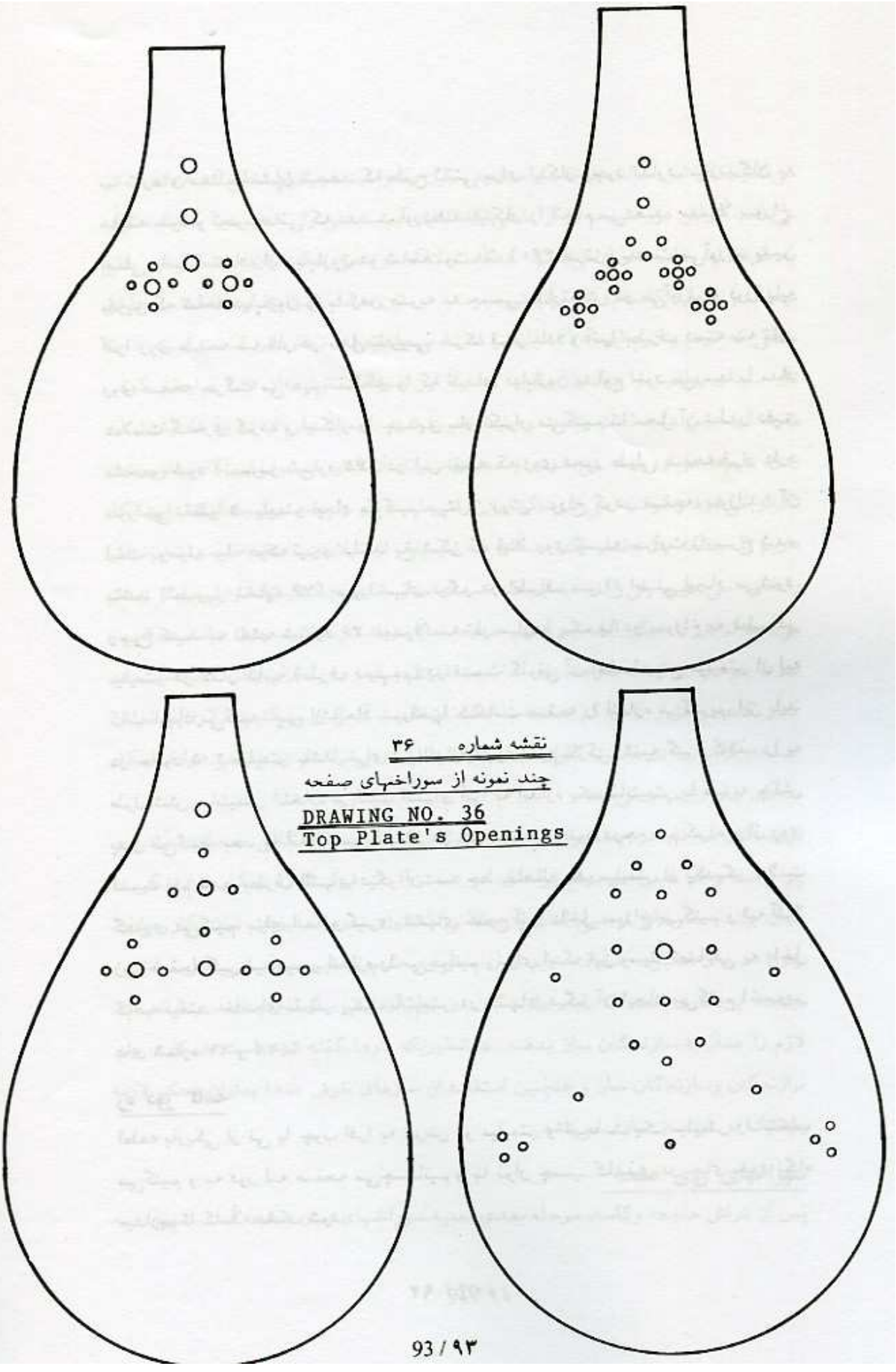
تصویر شماره ۷۷

Photo No. 77



تصویر شماره ۷۸

Photo No. 78



نقشه شماره ۳۶

چند نمونه از سوراخهای صفحه

DRAWING NO. 36

Top Plate's Openings

- INSERT 00096 -

ALTERNATE DESIGN : SKINBOARDED SOUND BOARD + BRIDGE

Lamb skin boarded ***setar*** : this model is not very widespread. Few available by lutemakers ***Ibrahim GAMBARIMEHR*** (Tehran), ***FATHI*** (Sanandaj), ***KHALEDI*** (Sanandaj). The wooden plate is glued on the skin. Item by Lutemaker ***FATHI***, Sanandaj.

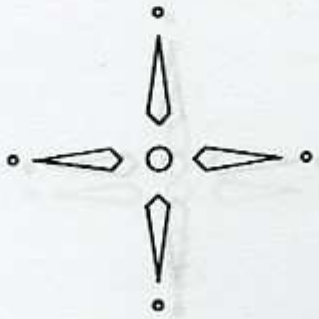
PURFLING AND OTHER ORNAMENTATION

A long,thin strip of wood (maple or similar wood) 2mm x 1mm is glued to the edge of the sound box before varnishing (Drawing No. 31).

For ornamentation, pieces of mother-of-pearl or bone inlay in a rectangular, circular or diamond shape is inlaid with glue on the peg section of the neck and at the connection point of the neck to the sound box (see photos of completed setar).

Varnish the sound box and place the strings on it. The instrument is now ready to be played. **ENJOY IT!**

A Final Note: When not being played, protect your setar by storing it in a dry place, preferably in a wooden case lined with a soft padded fabric.



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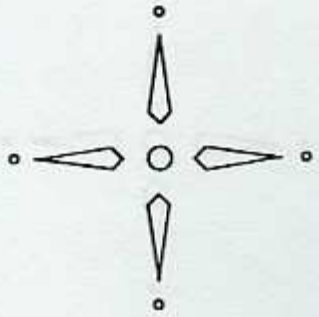
ABOUT THE AUTHOR

Nasser Shirazi was born in 1939 in Tehran, Iran. He came to the United States in 1960 and earned a Bachelor of Science degree in Civil Engineering from the University of Arizona at Tucson in 1963. Since that time he has been working extensively in the field of Civil Engineering and engineering management and currently is Director of Community Development and City Engineer for the City of Pittsburg, California.

Being a student of Persian music and the setar, he developed an interest in the construction of Iranian musical instruments, especially the setar. This book is the result of several years of his research and development on methods of constructing this instrument as well as interviews with Iranian master setar makers and master musicians.

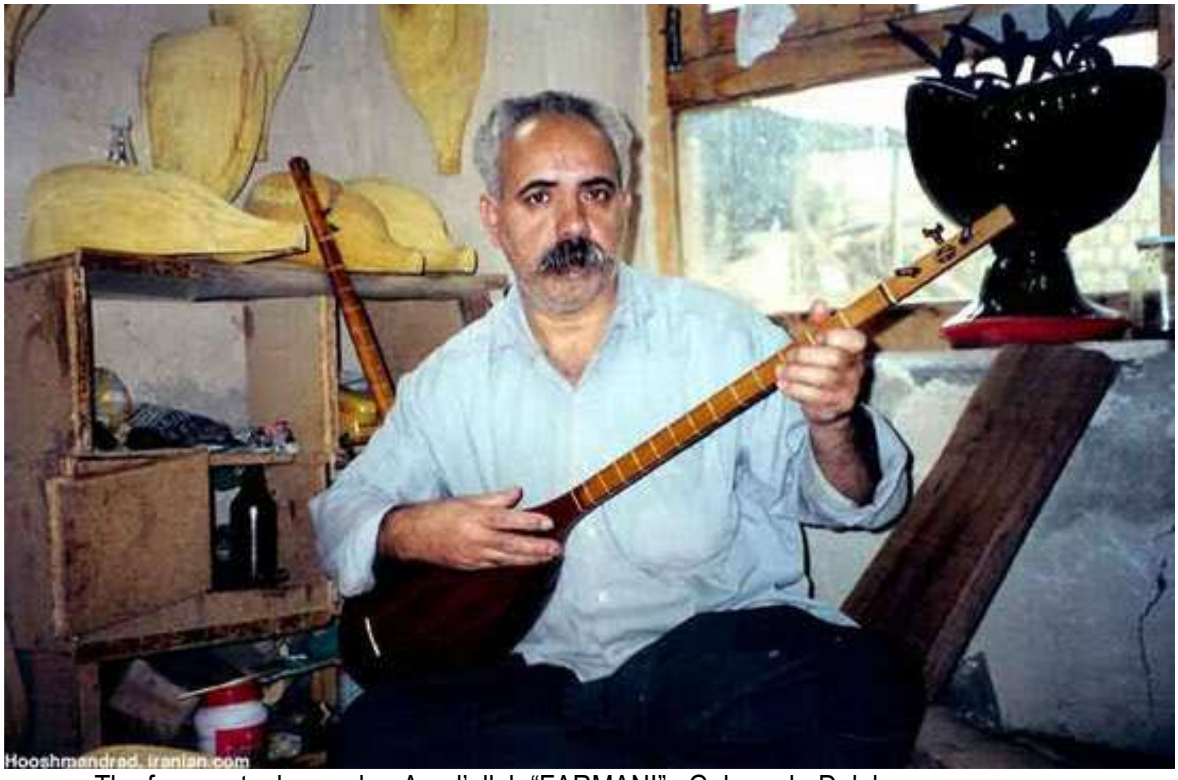
"American Lutherie", Journal of the Guild of American Luthiers, has published articles written by Mr. Shirazi on construction of other instruments - the Iranian Tar, and Iranian Kamanche.



- INSERT 00092 -

TANBUR MAKER

. The famous tanbur maker ***Asad'allah "FARMANI"*** , Gahvoreh, Dalahu.



. The famous tanbur maker Asad'allah "FARMANI" , Gahvoreh, Dalahu.