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Cottage Industry Manuals

Techniques for Plane Woven Bamboo Products

EASTERN AFRICA BAMBOO PROJECT

funded by



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ETHIOPIA

Ministry of Agriculture and Rural Development
Federal Micro and Small Enterprise
Development Agency

KENYA

Kenya Forestry Research Institute

COTTAGE INDUSTRY MANUALS

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This project is being financed by the Common Fund for Commodities, an intergovernmental financial institution established within the framework of the United Nations, headquartered in Amsterdam, the Netherlands.

First published in 2008.

This manual is based on the work of Mr. Yunhua Chen, edited and revised by Dr. Victor Brias, UNIDO Consultant and Dr. Jinhe Fu (INBAR), in cooperation with the EABP-project team and under the supervision of UNIDO Project Manager, Mr. Juergen Hierold.

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Table of Contents

I. DEFINITION OF PLANE BAMBOO WEAVING	1
II. PRIMARY PROCESSING OF MATERIALS.....	1
A. Seven Steps of Primary Processing.....	1
B. Removal of Bamboo Skin.....	5
C. Edge flattening	6
D. Dividing the culm sections into slivers	6
E. Separating the Slivers.....	7
F. Cut the Slivers into Fine Layers	8
G. Separate the layers into Fine Strips.....	10
H. Classifying the strips by Color.....	12
III. SECONDARY PROCESSING	12
A. Dyeing the Bamboo Strips	12
B. Bleaching	13
1. Sulfur Smoking Method	13
2. Hydrogen Peroxide Soaking Method	13
3. Hydrogen Peroxide Boiling Method	13
4. Other Chemical Methods	13
IV. PLANE WEAVING TECHNIQUES FOR BAMBOO	15
A. Basic Terminology: Warp and Weft.....	15
B. The Color of Woven Bamboo Patterns.....	15
C. Woven pattern with 1 dot after every 4 strips.....	16
D. Woven pattern with 1 dot after every 7 strips.....	20
E. Woven pattern with 1 dot after every 10 strips.....	23
F. Weaving with Underlying Patterns or Images	26
1. Example.....	26
2. Material requirements	27
3. Procedure.....	27
G. Applying Contrastive Colors to Woven Bamboo	32
1. Example.....	32
2. Material requirements	32
3. Procedure.....	32
H. First Rate Plane Bamboo Woven Items	37

I. DEFINITION OF PLANE BAMBOO WEAVING

Plane bamboo weaving is the method for making two dimensional or *plané* products such as woven mats, which can be of varying lengths and widths.

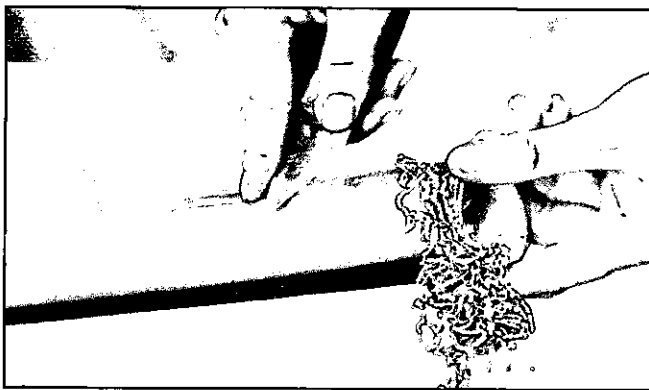
Plane woven products are distinguished from three dimensional woven products such as baskets, caps, lampshades, and figurines.

Evidently, plane woven bamboo products also include a third spatial dimension, which depends on the thickness of the bamboo strips. But for all intents and purposes, plane bamboo products are distinguished from 3 dimensional woven bamboo products because they are designed for flat surfaces.

II. PRIMARY PROCESSING OF MATERIALS

A. *Seven Steps of Primary Processing*

There are 7 steps in the primary processing of materials needed for weaving bamboo. These are shown in the pictures below and will be explained step by step in the next section.



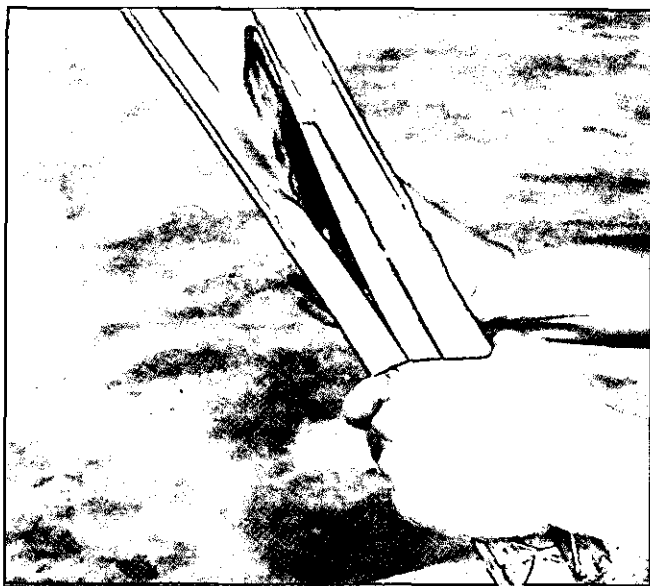
Step 1: Scrape off the green skin of the culm



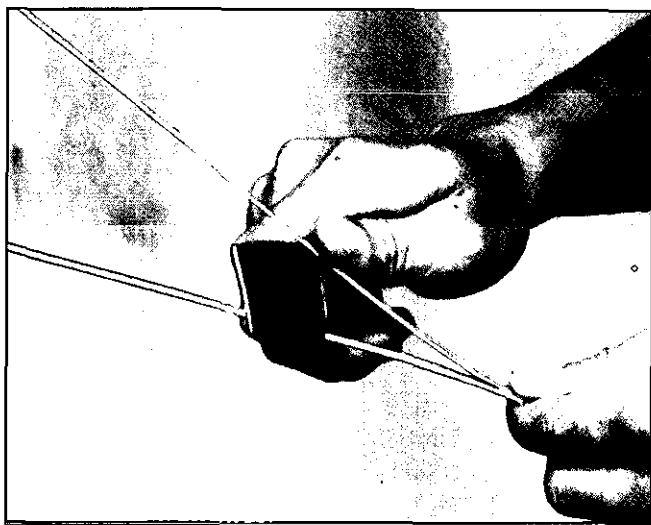
Step 2: Flatten the edge of the culm



Step 3: Divide the culm into slivers of an equal width



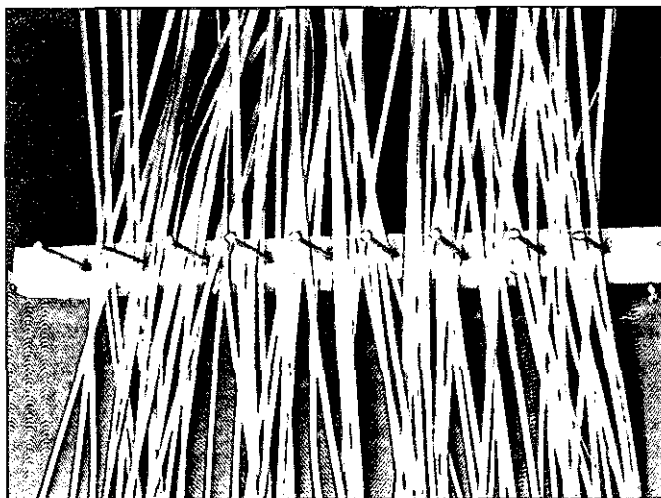
Step 4: Separate the slivers



Step 5: Cut the slivers into fine layers



Step 6: Separate the layers into fine strips



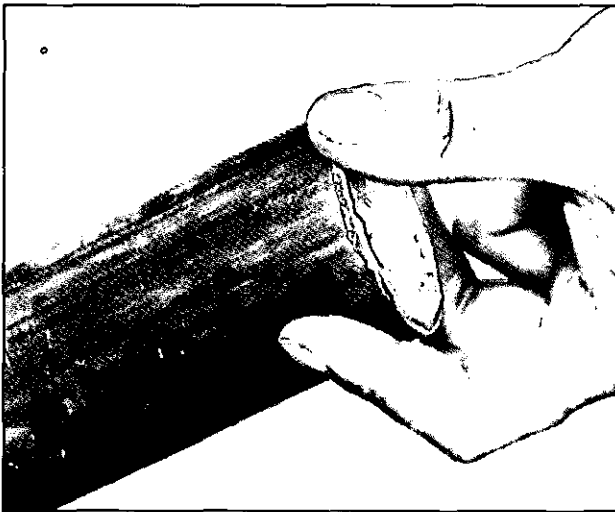
Step 7: Classify and group the strips by color

B. Removal of Bamboo Skin

Removing the green skin of the bamboo culm is the first step in the primary processing of materials required for woven bamboo products.

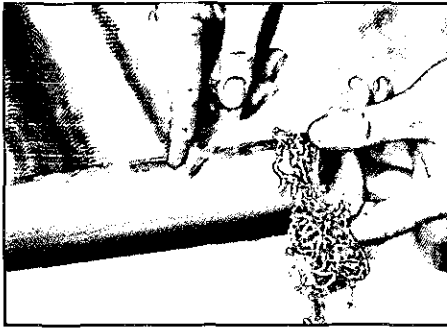
The removing the green skin involves scraping off the green colloid on the surface of bamboo culms as follows:

1. Place a section of bamboo culm at the angle of 45° on the ground
2. Press your thumb of the left hand on the edge that has been sawed, and use your first finger and second finger to hold the section. Three fingers should be placed in the shape of a triangle to increase the stability.

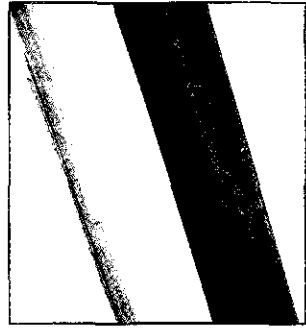


The right way of holding bamboo

3. Slide the blade in a downward motion along the culm section without scratching the skin; then position the blade to scrape the skin in an upward motion along the culm section.
4. In other words, the technique involves sliding the blade downwards and do the scraping in the upward motion.
5. When scraping the skin, apply force evenly along the culm surface in order to ensure a uniform color.



The right way of scraping



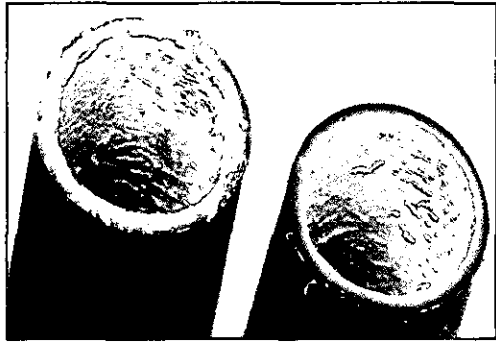
Before and after

C. Edge flattening

After removing the green skin, the next step is to flatten the edge of the culm section to facilitate stripping. To do this, hold the bamboo section firmly, and use a sharp knife to cut evenly around the edge so that it becomes flat and smooth.



Flattening the culm edge



Before and After flattening

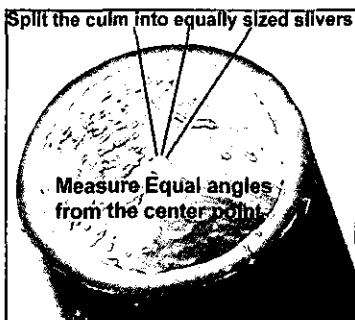
D. Dividing the culm sections into slivers

The next step is to divide the culm section into slivers of an equal width.

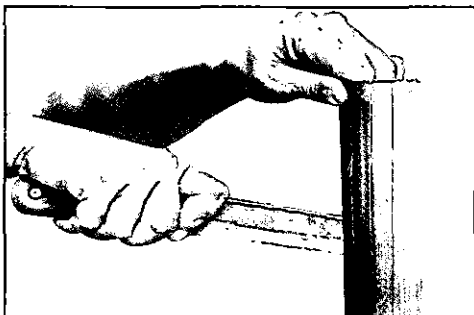
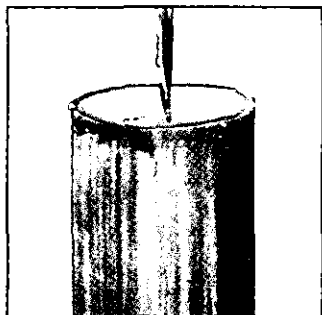
The number of slivers will depend on the diameter of the culm. It is important that the slivers are as flat as possible.

1. Before cutting measure equal sections that cross the central point of the culm section.

2. Each section should be divided at equal angles from the center of the culm to the edge. This method will help ensure that the culm is split into slivers of the same width.



3. Cutting should be done carefully from the edge downwards along the length of the culm section.

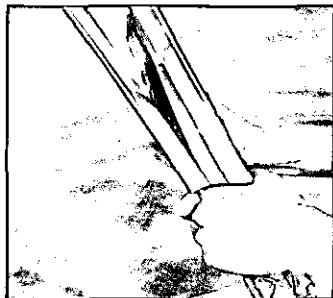


Splitting the culm section into slivers

E. Separating the Slivers

After the culm has been divided, the slivers should be completely separated into individual pieces.

This should be done carefully in order to have slivers of a uniform width.



F. Cut the Slivers into Fine Layers

The next step is to strip the slivers into fine layers.

1. Hold the sliver using your thumb and index finger about 1 cm away from the flattened edge.
2. Hold the knife with the blade horizontally against the upper 1/3 of the cross section sliver.

3. Make the first cut by nipping the blade into the sliver, as shown in the image to the right.

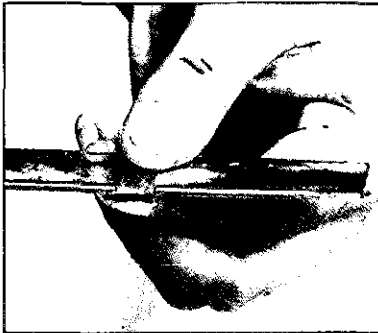


The 1st Cut

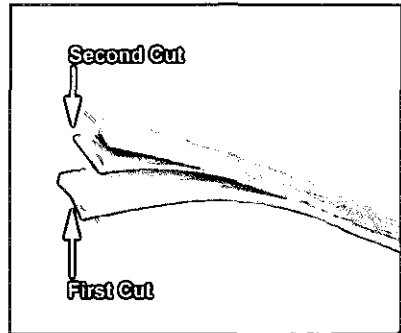
4. Be very careful in manipulating the knife. Your fingers can be easily injured if you cut too deep into edge of the sliver.

5. Press the bamboo sliver firmly, and twist the knife to cut the first layer.

6. Position the blade 0.5 mm to 1 mm away from the first layer along the radian in order to cut another layer of an equal thickness as the first one.

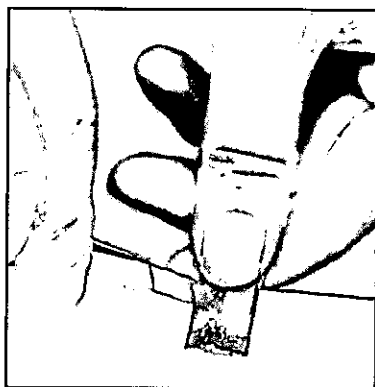
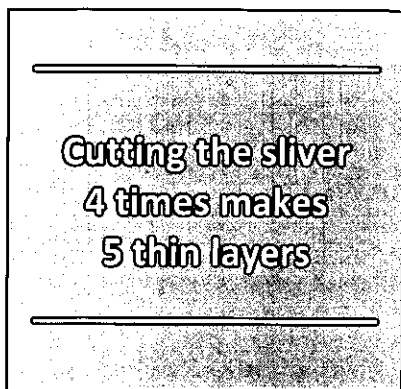


The 2nd cut

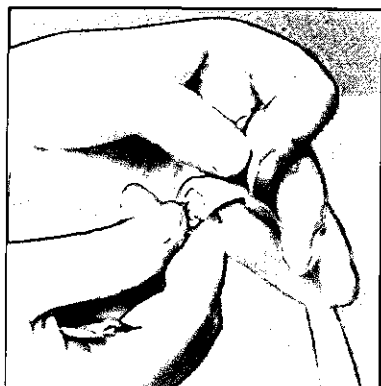


After the first two cuts

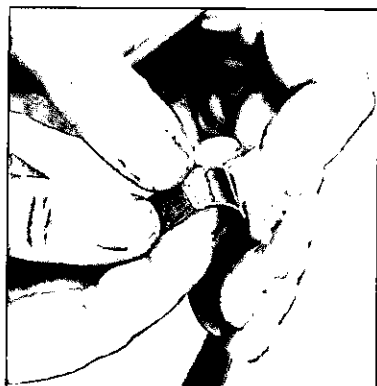
7. Hold the layer for further stripping; keep the end without flattening upwards; and use your thumb and index finger to twist the front 2 cm to make it soft.
8. Make a cut 2 cm into the sliver and then carefully peel off the first layer with measured force in order to avoid breaking it.
9. Strips will be thicker if the cut is deep, and strips will be thinner if the cut is shallow. The thickness of the strips will depend on the requirement of the woven products.



Make cuts into the sliver



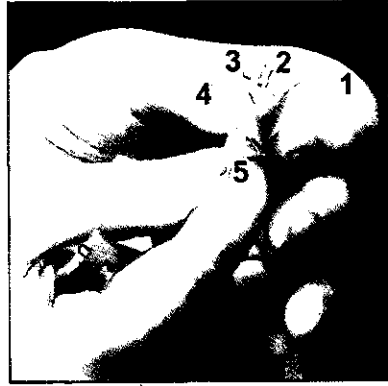
After the 1st cut



After the 2nd cut



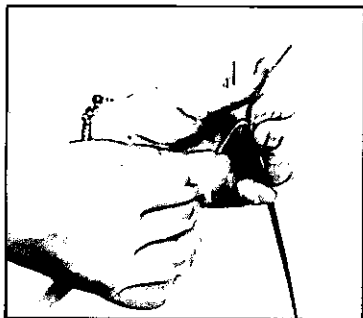
After the 3rd cut



After the 4th cut there are 5 layers

G. Separate the layers into Fine Strips

1. In order to strip the layers without breaking them:
 - Pay attention to the coordination between left hand and right hand in stripping, the angle of the index finger of the right hand in pressing.
 - Make sure that the cut length of each layer protrudes by about 2 cm in order to have a firm grip and separate each layer properly.
2. Separate the layers using 2 hands:
 - Use the thumb and the index finger of **left hand** to hold the 4 layers together and pull them.
 - Use the thumb and the index finger of **right hand** to hold the fifth layer, and the middle finger and the little finger to hold the bottom part of the strip to adjust the direction during stripping.

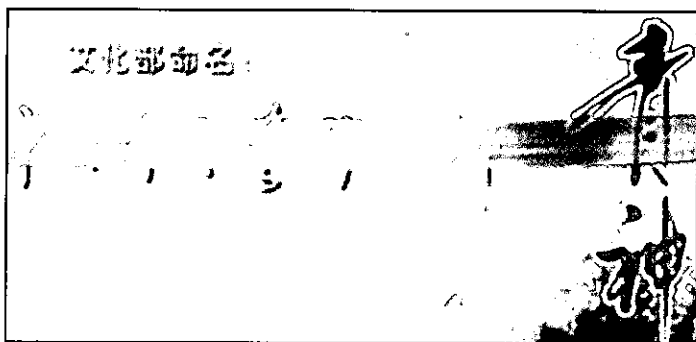


Stripping with both hands



Use 4 fingers

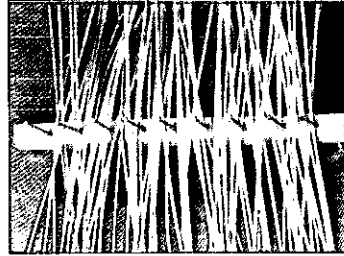
3. Use 4 fingers to separate the layers into fine strips as follows:
- Hold the 1st and 2nd layers using the index finger and the middle finger of the left hand.
 - Hold the 3rd and 4th layers using the thumb and the third finger of the left hand.
 - Hold the bottom part of the strip with the right hand.
 - Simultaneously move the left hand downwards and the right hand upwards to strip the layers.



A very fine bamboo strip can be translucent!

H. *Classifying the strips by Color*

1. After making the strips arrange them properly
2. Some strips may be lighter or darker than others.
3. Separate and classify them according to their color.



III. SECONDARY PROCESSING

A. *Dyeing the Bamboo Strips*

1. Dyestuff needs to be diluted with water. The concentration of the mixture will determine the darkness of the color.
2. Normally 10g of dyestuff can be mixed with 1 kg of water to dye 500 g of bamboo strips.
3. If necessary, liquefy the dyestuff using alcohol, and then mix it with water in a boiler. Blend the mixture well.
4. Dip bamboo strips into the mixture in the boiler.
5. Use bricks to hold down bamboo strips in the boiler to prevent them from floating.
6. Boil the bamboo strips for 30 minutes and then turn them over in the boiler, and keep them boiling for another 30 minutes. The time period of boiling can be adjusted according to the thickness and the original color of the bamboo strips. It is necessary to regularly check the color change during the boiling process and to adjust the heat accordingly in order to achieve the desired color.
7. After boiling, take the strips out and rinse them with water until the unstable colors fadeout.
8. Dry the bamboo strips in a shaded area

B. Bleaching

Bleaching bamboo strips can be achieved by several methods as discussed below.

1. Sulfur Smoking Method

- Choose a place far away from households.
- Cover the bamboo strips using a plastic sheet.
- Burn the sulfur in a bowl (wear masks during the operation) and cover the fire so that only smoke come outs.
- Put the bowl under the plastic sheet with the bamboo strips.
- Immediately seal the plastic sheet using mud and allow the smoking process to continue for 12 hours.
- Open the plastic sheet and fan out the smoke, and then take out the bamboo strips.
- The result of the bleaching is directly affected by the size of the covering area, the amount of bamboo strips and the burning condition of the sulfur.

2. Hydrogen Peroxide Soaking Method

- Mix 30% hydrogen peroxide (H_2O_2) solution with water using a proportion of 1:2 (e.g. 1 liter H_2O_2 for every 2 liters of water).
- Dip bamboo strips into the mixture and allow them to soak.
- Use bricks to hold down bamboo strips in the liquid to prevent them from floating.
- Allow the strips to soak for 24 hours and then wash them with water.
- Dry the strips in a shaded area.

3. Hydrogen Peroxide Boiling Method

- Mix 30% H_2O_2 solution with water using a proportion of 1:3, (e.g. 1 liter H_2O_2 for every 3 liters of water).

- Dip the bamboo strips into the mixture and boil the mixture for approximately 30 minutes, or until they are fully bleached.
- Use bricks to hold down bamboo strips in the mixture to prevent them from floating.
- During the boiling process turn the strips over twice so that both sides of the strip are bleached properly.
- After bleaching, wash the strips with water.
- Allow the strips to dry in a shaded area.



Heating Tank for H₂O₂ Bleach



Boil strips in H₂O₂ mixture



Washing Dyed Strips



Air Drying Strips

4. Other Chemical Methods

Bamboo strips can also be bleached with other chemical bleaching agents. If other chemical methods are used, follow the instructions provided by the manufacturer of the bleaching agent.

IV. PLANE WEAVING TECHNIQUES FOR BAMBOO

A. Basic Terminology: Warp and Weft

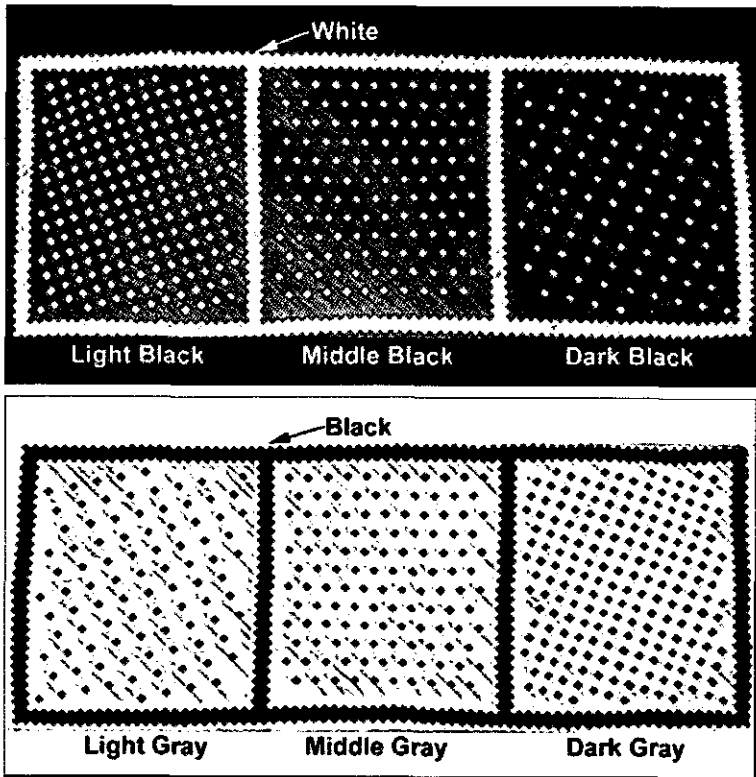
Warp and *weft* are 2 basic terms used for weaving in general. For plane bamboo weaving, these terms are defined as follows:

1. Warp is the set of parallel bamboo strips that provide a basis for weaving patterns. In plane bamboo weaving, the warp strips are positioned vertically on the workbench.
2. The weft is made up of the bamboo strips that are inserted perpendicularly under and over the warp to create a design. In plane bamboo weaving the weft strips are positioned horizontally on the workbench.

B. The Color of Woven Bamboo Patterns

Weaving dots into patterns is the basic technique for plane bamboo weaving. This weaving technique involves combining 2 colors (light and dark) of bamboo strips along the warp and weft of the bamboo strips. The level of color intensity and contrast in the patterns can be created by changing the density of the dots that are woven over and under the warp.

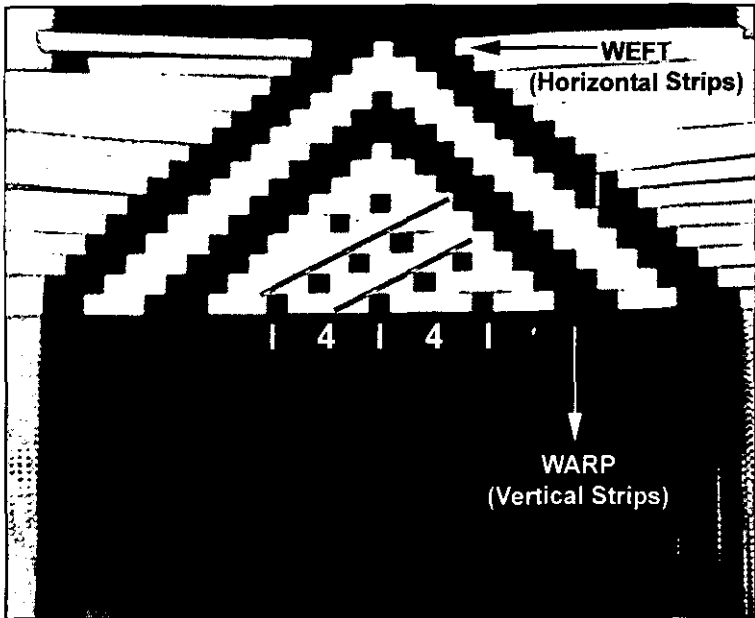
There are 8 color shades used in the dot pattern weaving: (1) Black; (2) Light gray; (3) Middle gray; (4) Dark gray; (5) White, (6) Light black; (7) Middle black; and (8) Dark black. These colors are illustrated in the 2 bamboo woven products below:



C. Woven pattern with 1 dot after every 4 strips

Weaving patterns with 1 dot after every 4 strips on the warp is a technique which creates contrast by using dark and light colored bamboo strips.

When there is more than one dot along the weft, the space between two dots are 4 strips from the warp, as illustrated below.

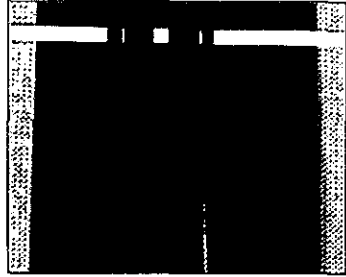


Notice that the dots in the pattern follow parallel diagonal lines.

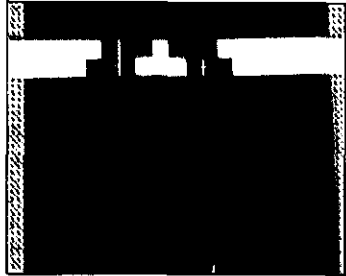
Also notice that the each dot is created by weaving over 4 strips of the warp

The illustrations and instructions in the following pages demonstrate the method of weaving dotted patterns such as the one shown above.

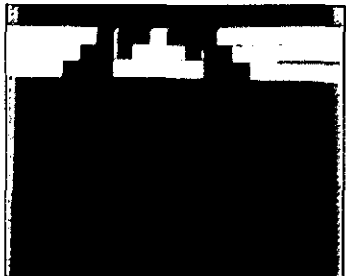
- Create a warp by fastening dark colored strips using the pressing rod on the workbench. Then insert the 1st white strip into the warp horizontally.



- You have now started weaving!



- Now weave the 2nd white strip to create a pattern.

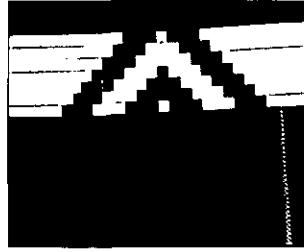


- Weave the 3rd white strip.

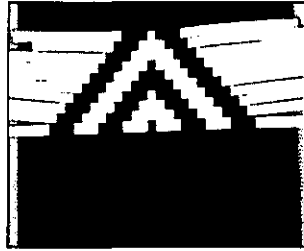


- Weave the 4th, 5th and 6th white strips.

- Weave the 7th white strip to start a new internal pattern.



- Weave the 8th and 9th strips. Then weave the 10th strip to create the first black dot on the pattern.



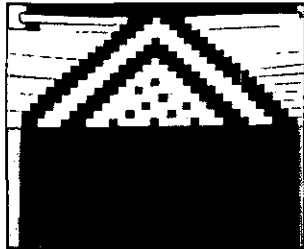
- Weave another strip to create a second dot. Note that the 2 dots represent a diagonal segment in relation to the adjacent design.



- Use the line of the first 2 dots as a reference point for weaving subsequent dots in diagonal parallel lines.

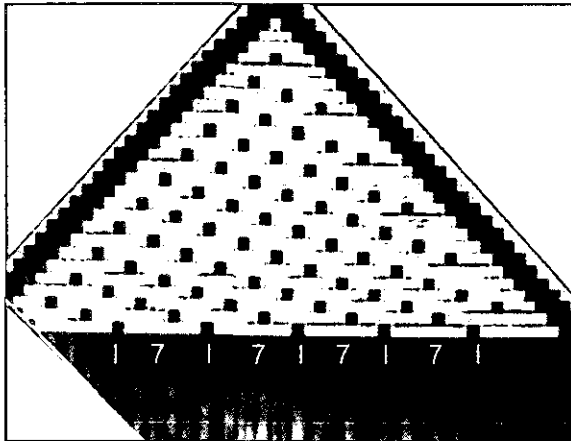
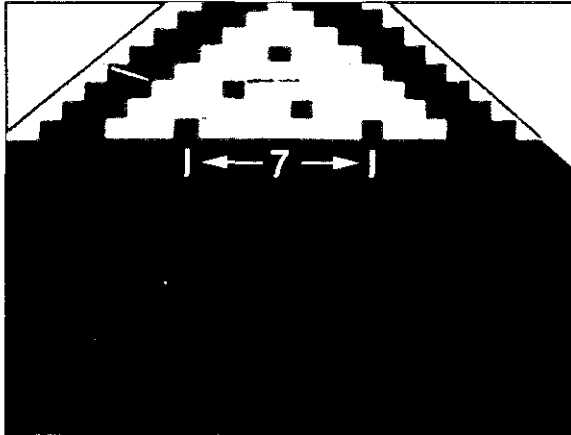


- The design will start to look like this!



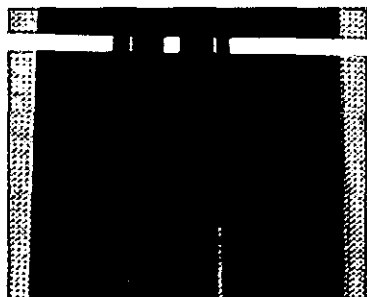
D. Woven pattern with 1 dot after every 7 strips

Weaving patterns with 1 dot after every 7 strips on the warp is another technique for weaving plane bamboo products. The difference between this technique and the previous one is that when there is more than one dot along the weft, the space between two dots are 7 strips from the warp, as illustrated below.

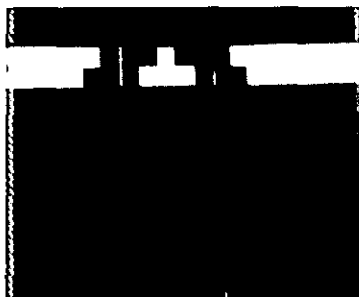


The method of weaving is identical to the method previously described. The following illustrations should serve as a guide.

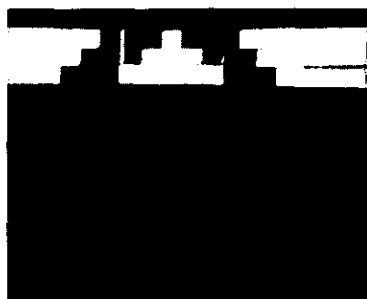
1. Insert the 1st strip



2. Insert 2nd strip



3. Insert 3rd strip



4. Insert 4th, 5th, and 6th strips



5. Weave a new pattern with the 7th strip

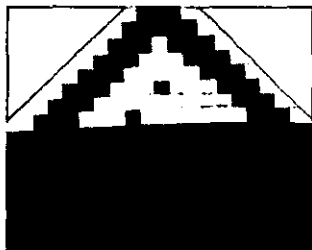


6. Continue weaving the pattern up to the 9th strip.

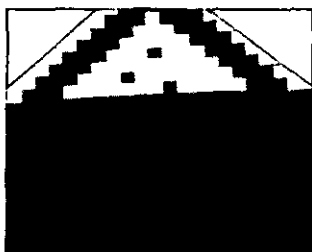




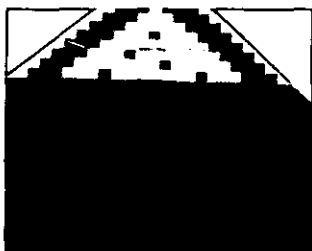
7. Insert the 10th white strip. The first dot is created by placing the black strip from the warp at the center of the pattern over the inserted white strip.



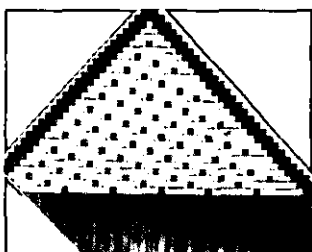
8. Weave another black dot, using the first dot as the diagonal reference point. Put the black strip on top of the inserted white strip after the black strip to the left of the reference line.



9. To create the third dot, use the second dot as the reference line. Put the black strip from the warp on the top of the woven white strip two colored threads to the right of the reference line.



10. When there is more than one dot along the weft (i.e., the horizontal line), the space between two dots are 7 strips of the warp.

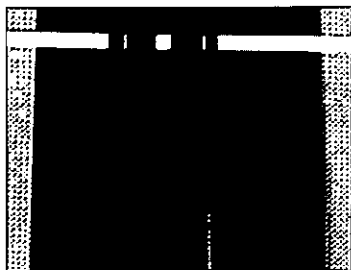


11. This is what the design will look like as you continue weaving.

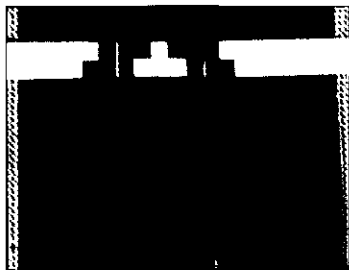
E. Woven pattern with 1 dot after every 10 strips

This technique is similar to the previous one except that, when there is more than one dot along the weft, the space between two dots are 10 strips from the warp.

1. Insert the 1st strip



2. Insert 2nd strip



3. Insert 3rd strip



4. Insert 4th, 5th, and 6th strips



5. Weave a new pattern with the 7th strip



6. Continue weaving the pattern up to the 11th strip.





7. The first black dot is created by inserting the twelfth white strip. Place the black strip from the warp over the inserted white strip after three black strips to the right of the frame.



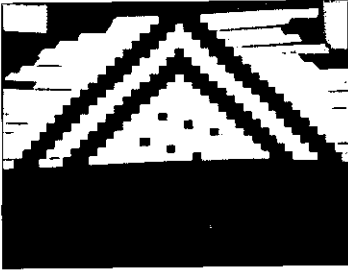
8. Weave another black dot, using the first dot as the diagonal reference point. Put the black strip on top of the inserted white strip after the 2 black strips to the right of the reference line.



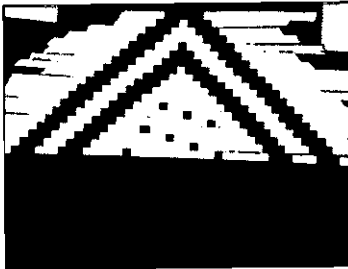
9. To make the 3rd dot, use the 2nd dot as the reference line. The 3rd dot will be 2 black strips to the right. The 4th dot is created by placing the black strip on the top of the inserted white strip after 4 black strips to the right of the frame.



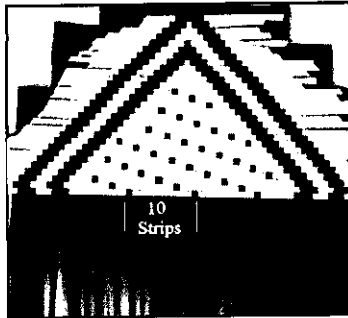
10. To create the 5th dot, use the position of the 4th fourth dot as the reference line. Place the black strip on the top of the inserted white strip 2 black strips to the right of the reference line.



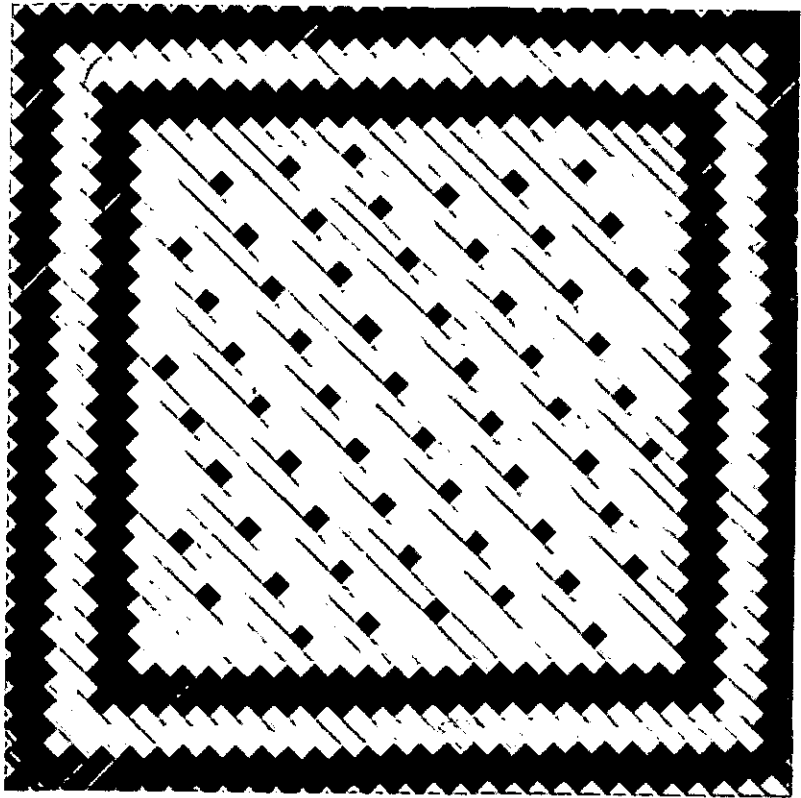
11. To create the 6th dot, use the 5th dot as the reference line. Put the black strip on the top of the inserted white strips after 2 black strips to the right of the reference line.



12. Use as a reference the position of 6th dot to make the 7th dot by putting the black strip on top of the inserted white thread 2 black strips to the right. Then, on the same horizontal line of the 7th dot, create the 8th dot after 10 black strips to left.



13. In this weaving pattern, the dots are in diagonal lines that are parallel to the frame. The space between corresponding dots in the neighbor rows is two strips. The space between two dots in the same row is 10 strips.



A 10 x 10cm sample of the weaving pattern using 1 dot every 10 strips

F. Weaving with Underlying Patterns or Images

Plane woven bamboo designs can be made using underlying patterns or images. This technique is common in China for reproducing calligraphic images into a woven format.

1. Example

The following images show what can be achieved using the technique of weaving with an underlying image. The example is of a Chinese

calligraphic image which has been transformed into a woven bamboo design.



Chinese calligraphy used
as an underlying image



Finished Woven
Bamboo Design

The Chinese calligraphy above will be used as an example to explain the process of weaving bamboo designs using an underlying image.

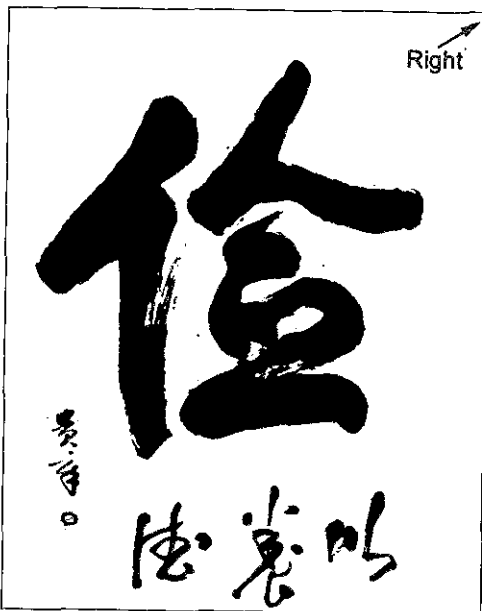
2. Material requirements

- Split bamboo strips using a standard of 12 threads per 1 cm.
- If there are very small and delicate patterns in the picture, it is necessary to split the bamboo into 16 threads per 1 cm.

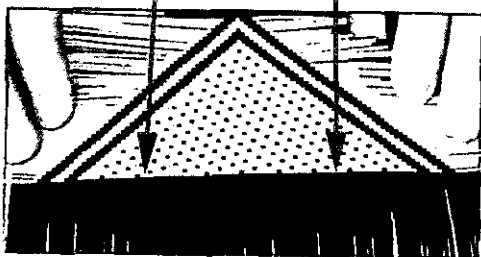
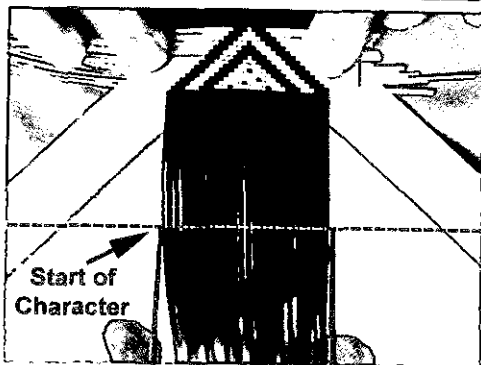
3. Procedure

The procedure for weaving bamboo strips using an underlying design is briefly described in the following pages. Photographs of the actual process that was applied in weaving the Chinese calligraphy shown above are used to illustrate the process.

1. Use the right corner of the design as the starting point for weaving.
2. Apply technique of one dot after every ten strips to fill the empty part of the underlying picture



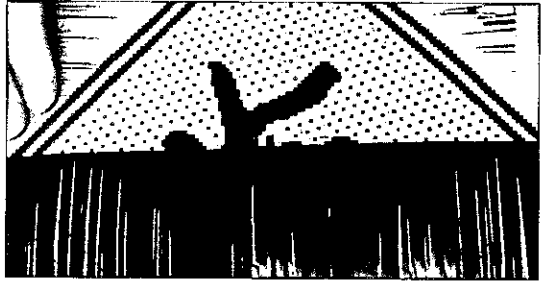
3. Glue the woven pattern to the underlying picture when it is about to reach the start of the underlying character. The weaving frame should completely overlap the frame of the underlying picture. Refer to the image below



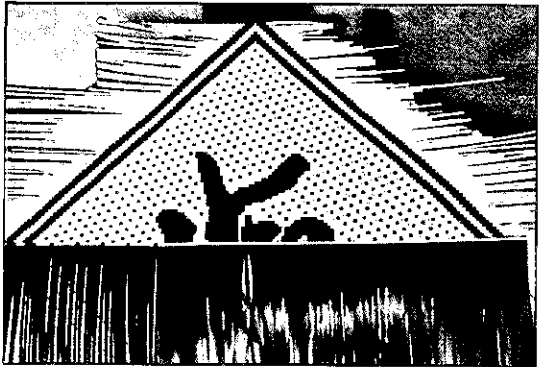
4. Weave the dark strips such that they are on top of the underlying design, and completely overlap the character.



5. The woven design should resemble the underlying picture.



6. Great care and precision is needed in weaving to match the underlying design.



7. Gradually, the woven design becomes a replica of the underlying image.

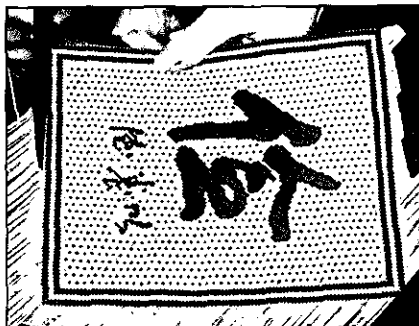


8. When the woven design is completed, the four corners of the frame should be at right-angles and the four sides of the frame should be straight.



9. Adjust the tightness of the threads.

10. Apply a thin coat of latex to the back of the woven design to fix the threads.



11. Cut off any extra parts on the edge of the frame.

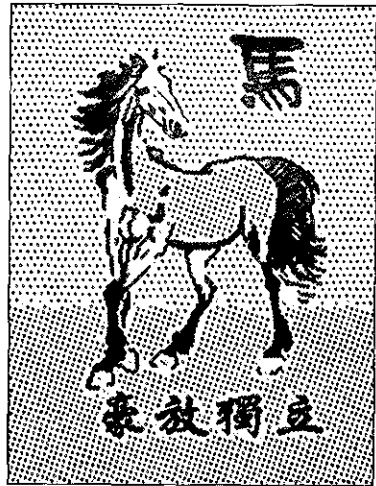
12. The finished woven Chinese calligraphy!



G. Applying Contrasting Colors to Woven Bamboo

1. Example

The images below provide an example of the use of contrasting colors in weaving bamboo strips. The example is of a Chinese calligraphic image of a horse which has been transformed, using the underlying image technique, into a woven bamboo design. Notice however that the woven patterns use a combination of contrasting shades of color to produce a visual effect. The combination of light grey and white are used to represent the sky. The combination of dark grey and white are used to represent ground.



2. Material requirements

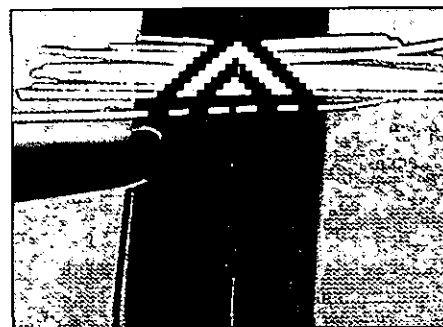
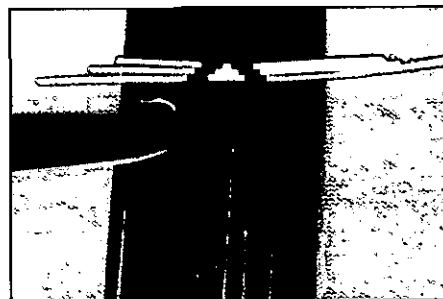
- Split bamboo strips using a standard of 12 threads per 1 cm.
- If there are very small and delicate patterns in the picture, it is necessary to split the bamboo into 16 threads per 1 cm.

3. Procedure

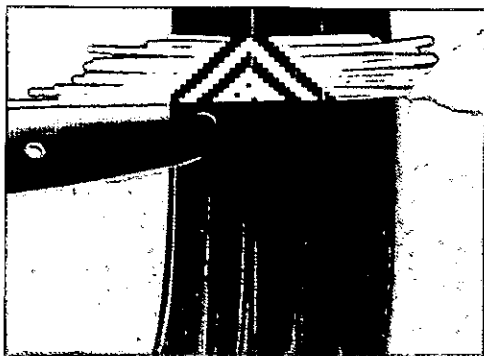
The method of weaving with bamboo strips using contrastive colors on an underlying design is briefly described in the following pages. The

procedure is illustrated using photographs of the actual process that was applied in weaving the calligraphic image of the horse shown above.

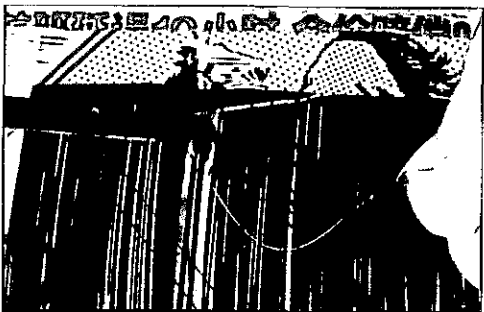
1. Insert the first 10 threads as shown in the following pictures.



2. Use the weaving pattern of one dot after every seven threads to fill the "sky" part of the underlying picture.

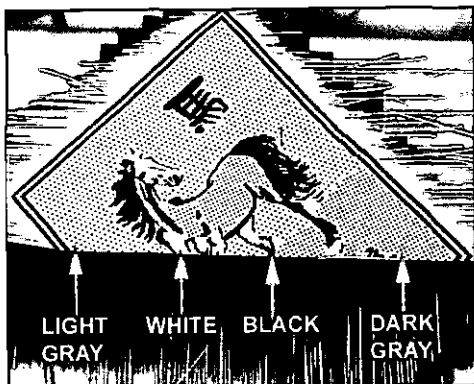


3. Use black color to outline the head and the body part, and fill in the tail of the horse.



4. The body part should be filled by weaving a pattern of one dot after every four threads.

5. Four colors are used in the woven design: black, white, dark gray and light gray.



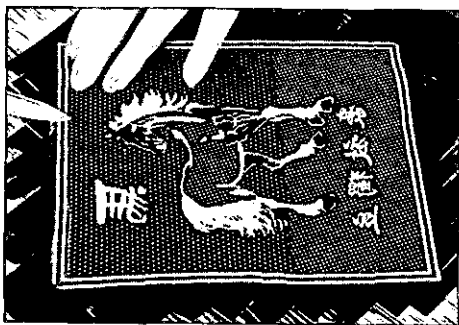
6. While weaving, use one hand to hold a hook in picking up the thread, and use the other hand to insert the new thread.



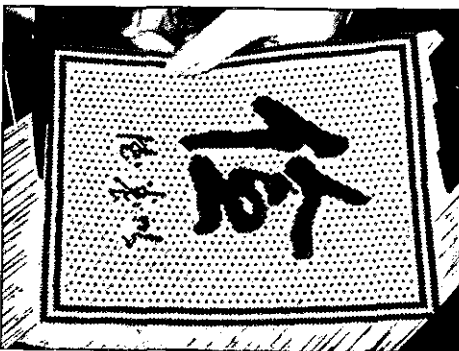
7. When the woven design is completed, the four corners of the frame should be at right-angles and the four sides of the frame should be straight.



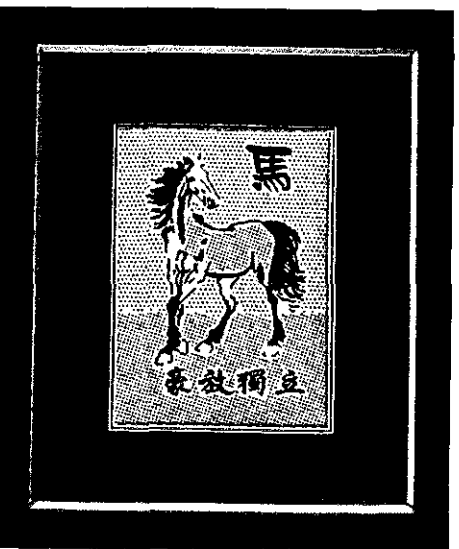
8. Adjust the tightness of the threads.



9. Apply a thin layer of latex on the back of the woven design to fix the threads.



10. Cut off any extra parts on the edge of the frame.

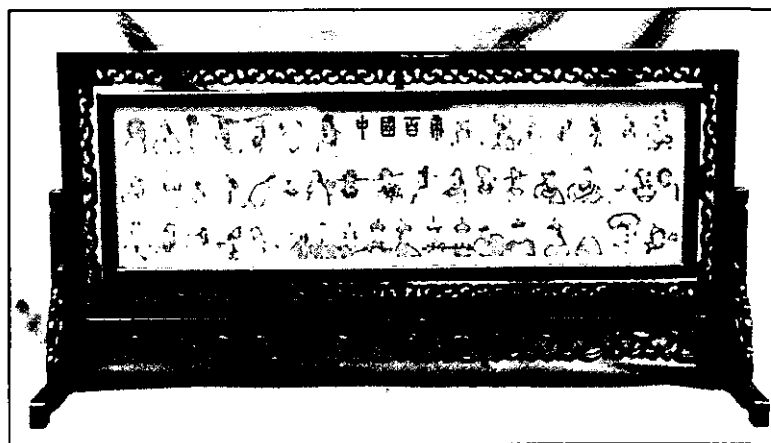


11. The final product!

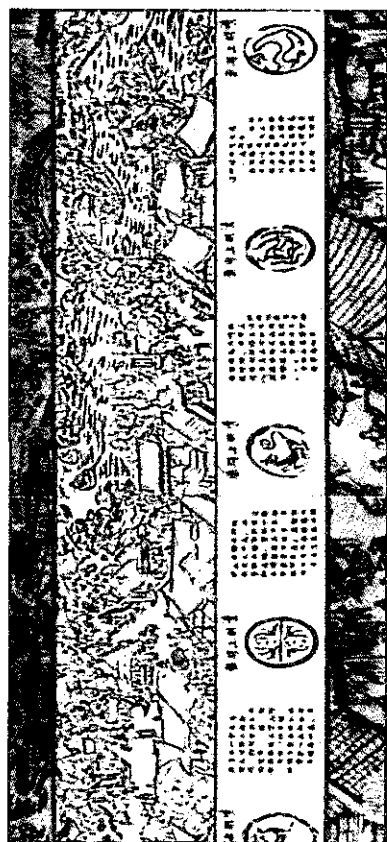
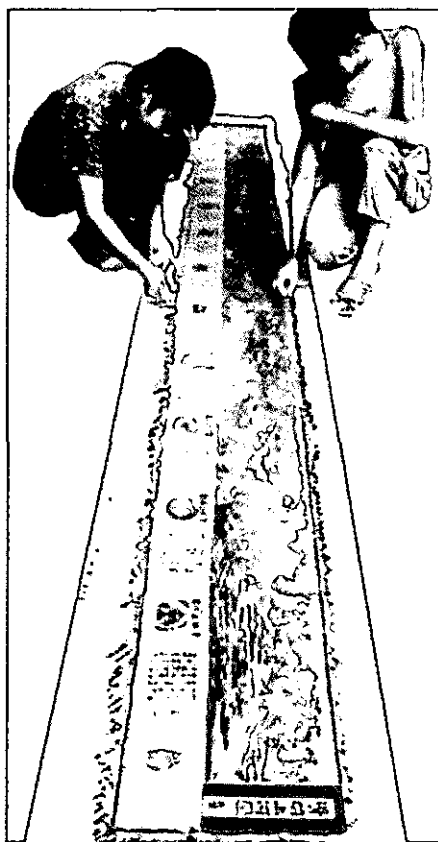
H. First Rate Plane Bamboo Woven Items

The possibilities of plane bamboo weaving techniques are limitless.

This section shows a few of the best examples from China.



Examples of top quality intricate woven designs made of bamboo threads using a standard of 48 threads per 1 cm.



A top class plane bamboo woven design measuring
5.28 m long (using 22 threads per 1 cm.)



Portrait of Chairman Mao (48 threads per cm.)



Portrait of Mr. Deng Xiaoping (22 threads per 1 cm.)

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