THE BRAIDER

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CONTENTS

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Transitions from two Round Braids to one Round Braid, and vice versa

We continue with the transitions between two 6-string round braids and one 12-string round braid.

BRAIDING TYPE											
12 STRING								6 STRING			
→				←				→		←	
U	O	U	O	O	U	O	U	U	O	O	U
2	1	2	1	2	1	2	1	2	1	2	1

Fig. 496 :

The 6-string round braid has at one end the strings A, B, C, D, E, F and at the other end the strings 1, 2, 3, 4, 5, 6.

Form the crossings between the strings A, C, E, 2, 4, 6.

Bring 1 from the right around the back to the left, then along the front from left to right under B and D, over F, under 2 and 4, over 6.

Bring B from the left around the back to the right, then along the front from right to left under 3, over 5 and A, under C, over E and 1.

Bring 3 from the right around the back to the left, then along the front from left to right under D and F, over 2, under 4 and 6, over B.

Bring D from the left around the back to the right, then along the front from right to left under 5, over A and C, under E, over 1 and 3.

Bring 5 from the right around the back to the left, then along the front from left to right under F and 2, over 4, under 6 and B, over D.

Bring F from the left around the back to the right, then along the front from right to left under A, over C and E, under 1, over 3 and 5.

Bring A from the right around the back to the left, then along the front from left to right under 2 and 4, over 6, under B and D, over F.

Bring 2 from the left around the back to the right, then along the front from right to left under C, over E and 1, under 3, over 5 and A.

And so on.

The 12-string round braid has the strings 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Bring 1 from the right around the back to the left, then along the front from left to right under 2 and 4, over 6, under 8 and 10, over 12.

Bring 2 from the left around the back to the right, then along the front from right to left under 3, over 5 and 7, under 9, over 11.

Bring 3 from the right around the back to the left, then along the front from left to right under 4 and 6, over 8, under 10 and 12.

Bring 4 from the left around the back to the right, then along the front from right to left under 5, over 7 and 9, under 11.

Bring 5 from the right around the back to the left, then along the front from left to right under 6 and 8, over 10, under 12.

Bring 6 from the left around the back to the right, then along the front from right to left under 7, over 9 and 11.

Braid the left-hand round braid of 6-strings:

Bring 1 from the right around the back to the left, then along the front from left to right under 8 and 10, over 12.

Bring 8 from the left around the back to the right, then along the front from right to left under 3, over 5 and 1.

Bring 3 from the right around the back to the left, then along the front from left to right under 10 and 12, over 8.

Bring 10 from the left around the back to the right, then along the front from right to left under 5, over 1 and 3.

Bring 5 from the right around the back to the left, then along the front from left to right under 12 and 8, over 10.

Bring 12 from the left around the back to the right, then along the front from right to left under 1, over 3 and 5.

Bring 1 from the right around the back to the left, then along the front from left to right under 8 and 10, over 12.

And so on.

Braid the right-hand round braid of 6-strings:

Bring 7 from the right around the back to the left, then along the front from left to right under 2 and 4, over 6.

Bring 2 from the left around the back to the right, then along the front from right to left under 9, over 11 and 7.

Bring 9 from the right around the back to the left, then along the front from left to right under 4 and 6, over 2.

Bring 4 from the left around the back to the right, then along the front from right to left under 11, over 7 and 9.

Bring 11 from the right around the back to the left, then along the front from left to right under 6 and 2, over 4.

Bring 6 from the left around the back to the right, then along the front from right to left under 7, over 9 and 11.

And so on.

BRAIDING TYPE													
12 STRING								6 STRING					
→				←				→			←		
U	O	U	O	O	U	O	U	U	O	U	U	O	U
2	1	1	2	2	1	1	2	1	1	1	1	1	1

Fig. 497:

The 6-string round braid has at one end the strings A, B, C, D, E, F and at the other end the strings 1, 2, 3, 4, 5, 6.

Form the crossings between the strings B, D, F, 1, 3, 5.

Bring 2 from the right around the back to the left, then along the front from left to right under A and C, over E, under 1, over 3 and 5.

Bring A from the left around the back to the right, then along the front from right to left under 4 and 6, over B, under D, over F and 2.

Bring 4 from the right around the back to the left, then along the front from left to right under C and E, over 1, under 3, over 5 and A.

Bring C from the left around the back to the right, then along the front from right to left under 6 and B, over D, under F, over 2 and 4.

Bring 6 from the right around the back to the left, then along the front from left to right under E and 1, over 3, under 5, over A and C.

Bring E from the left around the back to the right, then along the front from right

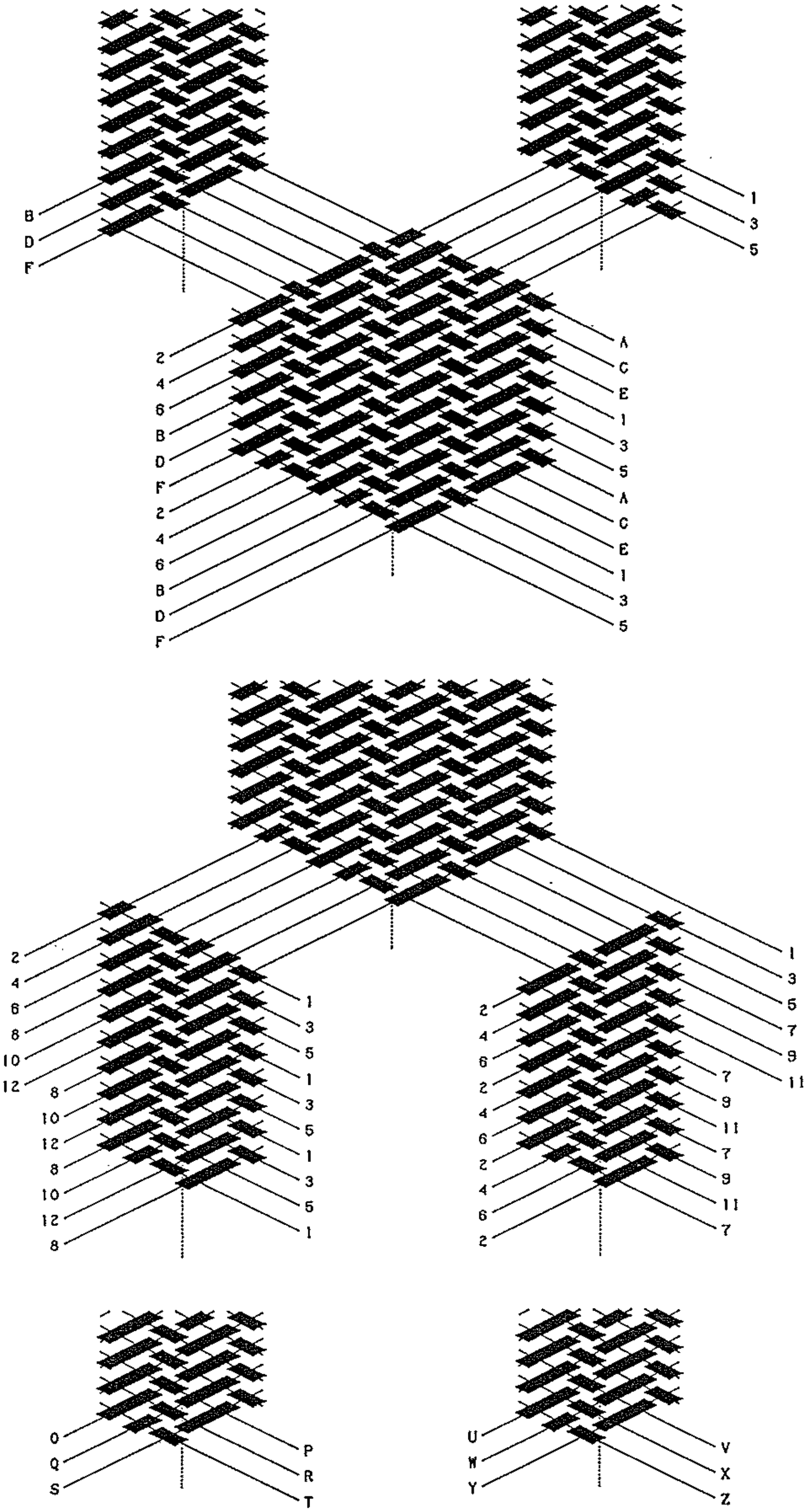

Fig. 496 — Transition between two 6-string round braids and one 12-string round braid.

to left under B and D, over F, under 2, over 4 and 6.

Bring B from the right around the back to the left, then along the front from left to right under 1 and 3, over 5, under A, over C and E.

Bring 1 from the left around the back to the right, then along the front from right to left under D and F, over 2, under 4, over 6 and B.

Bring D from the right around the back to the left, then along the front from left to right under 3 and 5, over A, under C, over E and 1.

And so on.

The 12-string round braid has the strings 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Bring 1 from the right around the back to the left, then along the front from left to right under 2 and 4, over 6, under 8, over 10, under 12.

Bring 2 from the left around the back to the right, then along the front from right to left under 3 and 5, over 7, under 9, over 11.

Bring 3 from the right around the back to the left, then along the front from left to right under 4 and 6, over 8, under 10, over 12.

Bring 4 from the left around the back to the right, then along the front from right to left under 5 and 7, over 9, under 11.

Bring 5 from the right around the back to the left, then along the front from left to right under 6 and 8, over 10, under 12.

Bring 6 from the left around the back to the right, then along the front from right to left over 7, under 9, over 11.

Braid the left-hand round braid of 6-strings:

Bring 8 from the left around the back to the right, then along the front from right to left under 1, over 3, under 5.

Bring 1 from the right around the back to the left, then along the front from left to right under 10, over 12, under 8.

Bring 10 from the left around the back to the right, then along the front from right to left under 3, over 5, under 1.

Bring 3 from the right around the back to the left, then along the front from left to right under 12, over 8, under 10.

Bring 12 from the left around the back to the right, then along the front from right to left under 5, over 1, under 3.

Bring 5 from the right around the back to the left, then along the front from left to right under 8, over 10, under 12.

Bring 8 from the left around the back to the right, then along the front from right to left under 1, over 3, under 5.

And so on.

Braid the right-hand round braid of 6-strings:

Bring 2 from the left around the back to the right, then along the front from right to left under 7, over 9, under 11.

Bring 7 from the right around the back to the left, then along the front from left to right under 4, over 6, under 2.

Bring 4 from the left around the back to the right, then along the front from right to left under 9, over 11, under 7.

Bring 9 from the right around the back to the left, then along the front from left to right under 6, over 2, under 4.

Bring 6 from the left around the back to the right, then along the front from right to left under 11, over 7, under 9.

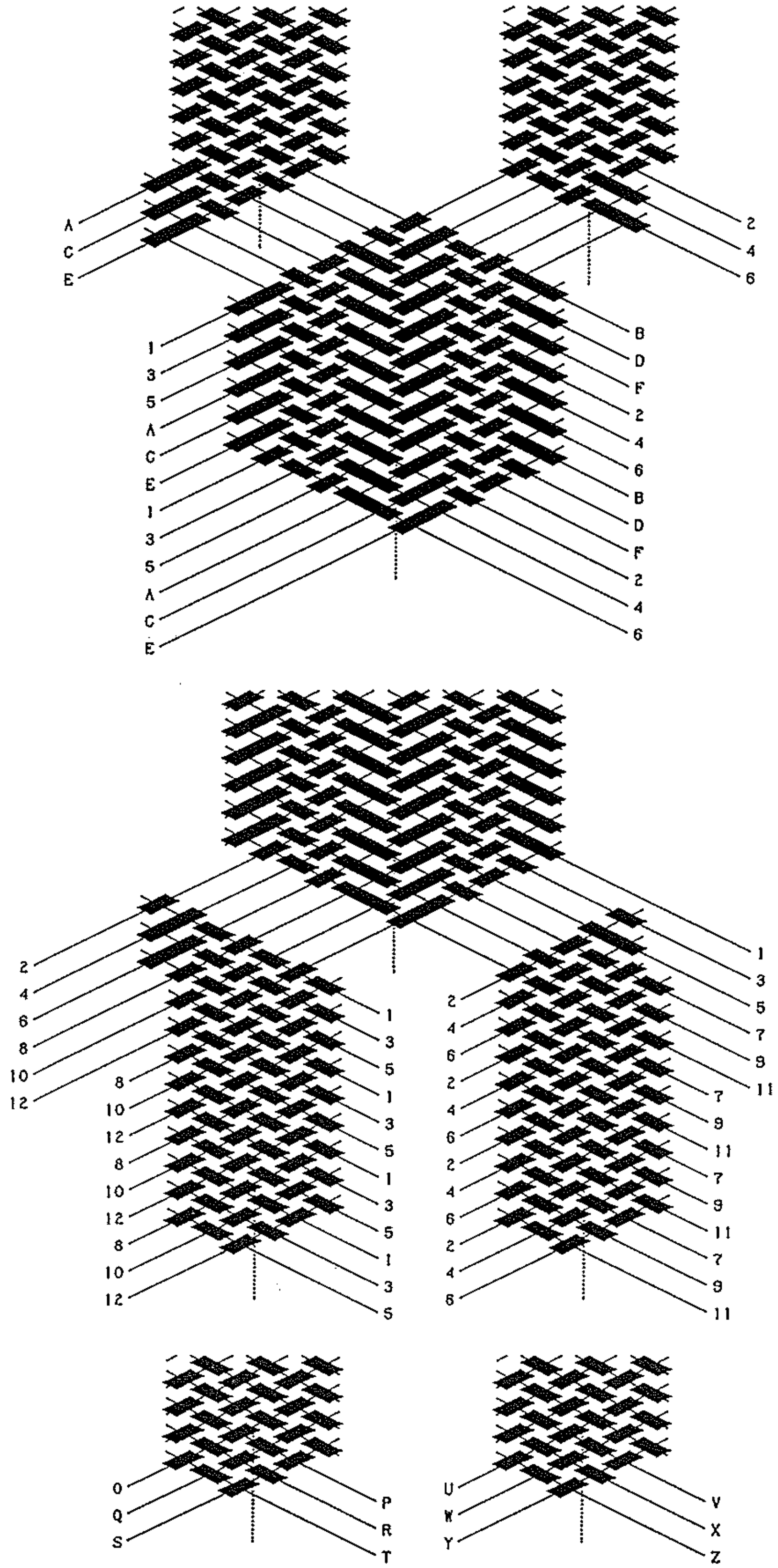

Fig. 497 — Transition between two 6-string round braids and one 12-string round braid.

Bring 11 from the right around the back to the left, then along the front from left to right under 2, over 4, under 6.

Bring 2 from the left around the back to the right, then along the front from right to left under 7, over 9, under 11.

And so on.

A transition between two 6-string round braids and one 8-string round braid with a 4-string round braid core.

BRAIDING TYPE																	
8 STRING MANTLE								4 STRING CORE				6 STRING					
→				←				→		←		→			←		
U	O	U	O	O	U	O	U	U	O	O	U	U	O	U	U	O	U
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figs. 498, 499 and 500:

The 6-string round braid has at one end the strings A, B, C, D, E, F and at the other end the strings 1, 2, 3, 4, 5, 6.

The strings A, B, 1, 2 go over into the 4-string round braid core, the preparation of which is depicted in the upper part of Fig. 498; bring A around the back of the left-hand 6-string round braid from left to right, and bring 2 around the back of the right-hand 6-string round braid from right to left. Note that in the 4-string round braid core the flesh-side of the strings is outermost. The braiding of this core continues as follows:

Bring 2 from the left around the back to the right, then along the front from right to left under 1, over A.

Bring 1 from the right around the back to the left, then along the front from left to right under B, over 2.

Bring B from the left around the back to the right, then along the front from right to left under A, over 1.

Bring A from the right around the back to the left, then along the front from left to right under 2, over B.

And so on.

The strings C, D, E, F, 3, 4, 5, 6 go over into the 8-string round braid mantle.

Form the crossings between the strings D, F, 3, 5 as depicted in the lower part of Fig. 498.

Next bring 4 from the right around the back to the left, then along the front from left to right under C, over E, under 3, over 5.

Bring C from the left around the back to the right, then along the front from right to left under 6, over D, under F, over 4.

Bring 6 from the right around the back to the left, then along the front from left to right under E, over 3, under 5, over C.

Bring E from the left around the back to the right, then along the front from right to left under D, over F, under 4, over 6.

Bring D from the right around the back to the left, then along the front from left to right under 3, over 5, under C, over E.

Bring 3 from the left around the back to the right, then along the front from right to left under F, over 4, under 6, over D.

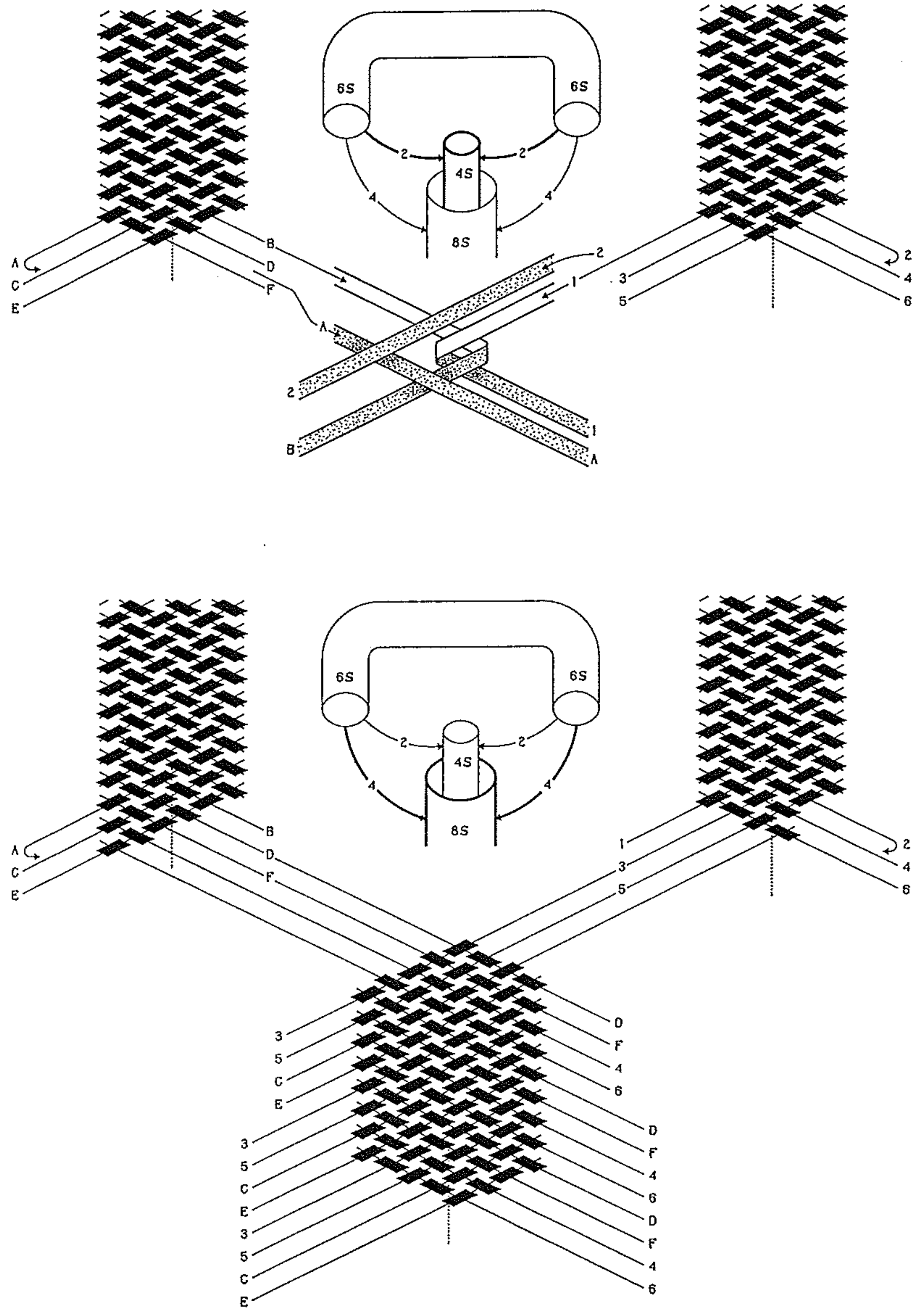

Fig. 498 — Transition from two 6-string round braids to 8-string round braid with core.

Bring F from the right around the back to the left, then along the front from left to right under 5, over C, under E, over 3.

Bring 5 from the left around the back to the right, then along the front from right to left under 4, over 6, under D, over F.

Bring 4 from the right around the back to the left, then along the front from left to right under C, over E, under 3, over 5.

Bring C from the left around the back to the right, then along the front from right to left under 6, over D, under F, over 4.

Bring 6 from the right around the back to the left, then along the front from left to right under E, over 3, under 5, over C.

Bring E from the left around the back to the right, then along the front from right to left under D, over F, under 4, over 6.

And so on.

The 4-string round braid core has the strings 1, 2, 3, 4 (see Fig. 499 upper part, and Fig. 500), the 8-string round braid mantle has the strings A, B, C, D, E, F, G, H (see Fig. 499 lower part, and Fig. 500).

The preparation of the 4-string round braid core (Fig. 499 upper part and Fig. 500):

Bring 1 around the back from right to left with the hair-side up on left. Place 1 between 2 and 4.

Bring 2 around the back from left to right with the hair-side up on right. Place 2 below 3.

The preparation of the 8-string round braid mantle (Fig. 499 lower part and Fig. 500):

Bring A from the right around the back to the left, then along the front from left to right under B, over D, under F, over H.

Bring B from the left around the back to the right, then along the front from right to left under C, over E, under G.

Bring C from the right around the back to the left, then along the front from left to right under D, over F, under H.

Bring D from the left around the back to the right, then along the front from right to left under E, over G.

Braiding the two 6-string round braids (see Fig. 500):

Braid the left-hand round braid of 6-strings:

Bring 1 over 4, then along the front from right to left over A, under C.

Bring 4 around the back from the right to the left, then along the front from left to right under F, over H, under 1.

Bring F from the left around the back to the right, then along the front from right to left under A, over C, under 4.

Bring A from the right around the back to the left, then along the front from left to right under H, over 1, under F.

Bring H from the left around the back to the right, then along the front from right to left under C, over 4, under A.

Bring C from the right around the back to the left, then along the front from left to right under 1, over F, under H.

Bring 1 from the left around the back to the right, then along the front from right to left under 4, over A, under C.

Bring 4 from the right around the back to the left, then along the front from left to right under F, over H, under 1.

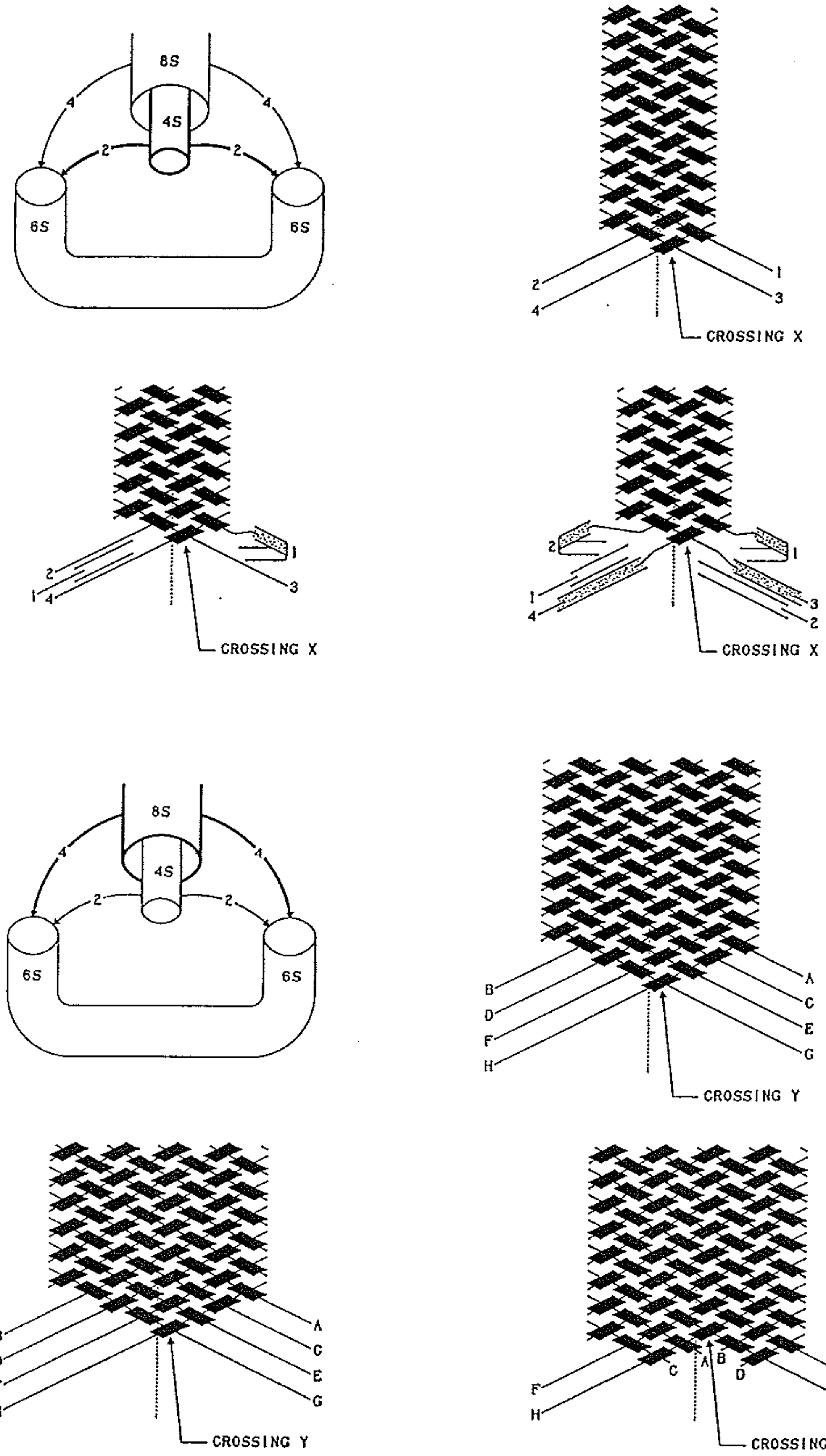

Fig. 499 — Transition from 8-string round braid with core to two 6-string round braids.

Before starting the preparation of the 8-string round braid mantle, continue braiding this mantle until crossing "Y" of the mantle is at the same level as crossing "X" of the core.

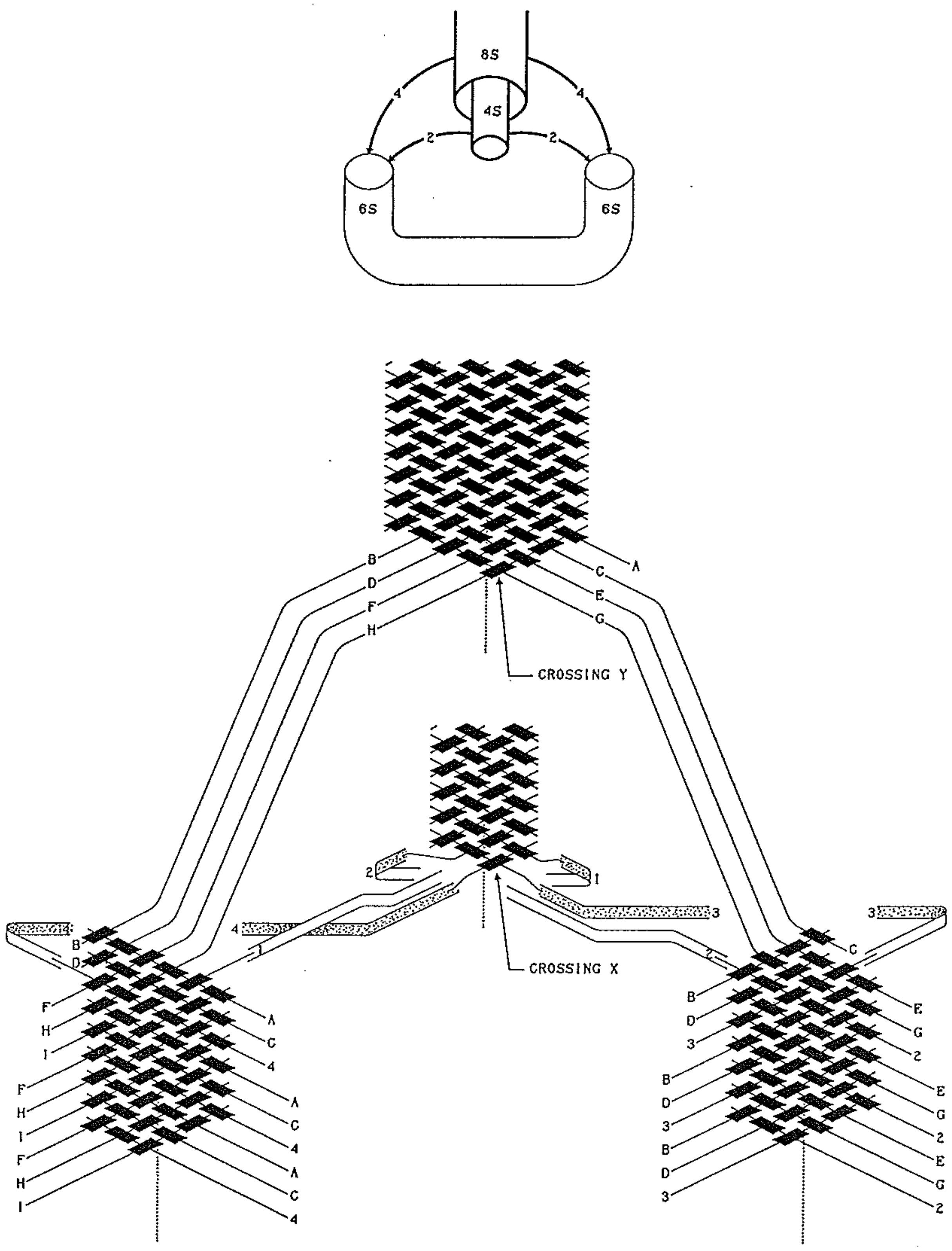

Fig. 500 — Transition from 8-string round braid with core to two 6-string round braids.

And so on.

Braid the right-hand round braid of 6-strings:

Bring 3 around the back from the left to the right, then along the front from right to left over E, under G.

Bring 2 along the front from left to right under B, over D, under 3.

Bring B from the left around the back to the right, then along the front from right to left under E, over G, under 2.

Bring E from the right around the back to the left, then along the front from left to right under D, over 3, under B.

Bring D from the left around the back to the right, then along the front from right to left under G, over 2, under E.

Bring G from the right around the back to the left, then along the front from left to right under 3, over B, under D.

Bring 3 from the left around the back to the right, then along the front from right to left under 2, over E, under G.

Bring 2 from the right around the back to the left, then along the front from left to right under B, over D, under 3.

And so on.

Nested Cylindrical Braids

We have seen that the minimum x-value in the string-run of **Regular Nested Cylindrical Braids** is equal to $2 - A$ (see *The Braider*, Issues No. 24 and 25), and that for this x-value $y_{min} = y_{max} = A$. Since there are for this case no string-crossings, the 'braid' will fall apart, hence for practical applications the value of x must always be greater than $2 - A$. The minimum x-value for practical applications, however, depends on the superimposed coding.

In *The Braider*, Issue No. 23, we have already discussed some aspects of the **Standard** and **Semi-Standard Herringbone Pineapple Knots**, and in this Issue we will have a look at their colour-patterns when strings of a different colour are being used in their construction.

For the Standard and Semi-Standard Herringbone Pineapple Knots the minimum x-value for practical applications is $A + 2$. For their string-run $\gamma = A$, $y = A$ and $\Delta = 0$.

Since $\gamma = A$, their string-run consists of A components.

g.c.d. $(P_c, B^*) = 1$ for every component of a **Standard Herringbone Pineapple Knot**, hence the total number of essential strings in a **Standard Herringbone Pineapple Knot** is equal to $\gamma = A$. The coding-pattern of each component consists of one or more circumferential chains of B^* "$<$", in which all "$<$" are of the same colour. When a component consists of more than one circumferential chain, then its consecutive parallel circumferential chains are A chains apart.

There is in a **Semi-Standard Herrringbone Pineapple Knot** at least one component which consists of two or more sub-components (at least for one component g.c.d. $(P_c, B^*) \neq 1$). The coding-pattern of each component consists of one or more circumferential chains of B^* "$<$", in which all "$<$" are of the same colour only for components with g.c.d.$(P_c, B^*) = 1$. When a component consists of more than one circumferential chain, then its consecutive parallel circumferential chains are A chains apart.

The coding-pattern of the **Standard** and **Semi-Standard Herringbone Pineapple Knots** thus consists of B^* circumferential sets of V regularly horizontally stacked "<", where $V = \dfrac{A+x-2}{2} = \dfrac{P-A}{2}$.

For practical applications of the Standard and Semi-Standard Herringbone Pineapple Knots we thus obtain the following formulae:

$$V = \frac{A+x-2}{2} \longrightarrow x = 2V+2-A \rightarrow k = |V|_A .$$

$$V = \frac{P-A}{2} \longrightarrow P = A+2V = 2A+x-2 .$$

$$x_{min} = A+2 \longrightarrow V_{min} = A .$$

$$P_{min} = 3A .$$

$$A_{max} = V .$$

$$P_{max} = 3V .$$

Since $y = A$ it follows that $y' = 2A - y = A$ and hence $\Delta' = A$.† Thus the first set of components (the components in which $l_i + r_i = k+1$, where $1 \le k < A$) contains

$$\left|\frac{x+\Delta'-2}{2}\right|_\gamma = |V|_A \text{ components,}$$

with each component having a number of parts equal to

$$P_c = \frac{2V - 2|V|_A}{A} + 3 .$$

And the second set of components (the components in which $l_i + r_i = k+1+A$, where $1 \le k < A$) contains

$$\gamma - \left|\frac{x+\Delta'-2}{2}\right|_\gamma = \gamma - |V|_A \text{ components,}$$

with each component having a number of parts equal to

$$P_c = 1 + 2\left\lfloor\frac{V}{A}\right\rfloor = \frac{2V - 2|V|_A}{A} + 1 .$$

When $k = A$ (hence $V = nA$, where $n = 1, 2, 3, \cdots$), the first set of components is empty and the second set of components contains

$$\gamma = A \text{ components,}$$

with each component having a number of parts equal to

$$P_c = 1 + 2\left\lfloor\frac{V}{A}\right\rfloor = \frac{2V - 2|V|_A}{A} + 1 .$$

The colour-pattern of a **Standard Herringbone Pineapple Knot** is thus represented by the colour-pattern of the V regularly horizontally stacked "<".

After we have designed for a **Standard Herringbone Pineapple Knot** a suitable colour-pattern for the in our application required V regularly horizontally stacked "<", we can then determine the valid A-values for such a colour-pattern.

† See *The Braider*, Issue No. 25, pp. 570 - 571.

Say the regularly horizontally stacked "<" have the following pattern of two colours:

$$\boldsymbol{<} < < < \boldsymbol{<} \boldsymbol{<} < < \boldsymbol{<} < < \boldsymbol{<} \boldsymbol{<} < < < \boldsymbol{<}$$

Since $V = 17$, it follows that $2 \leq A \leq 17$. The examination of each A-value in association with the given colour-pattern of the seventeen horizontally regularly stacked "<" is presented in Fig. 501. We see that:

$A = 2$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 3$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 4$ is not possible: although the colour-repetition of the first "<" agrees with the required colour-pattern, the colour-repetition of the second "<" does not agree with the required colour-pattern.

$A = 5$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 6$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 7$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 8$ is not possible: although the colour-repetition of the first, the second and the third "<" agrees with the required colour-pattern, the colour-repetition of the fourth "<" does not agree with the required colour-pattern.

$A = 9$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 10$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 11$ is not possible: although the colour-repetition of the first "<" agrees with the required colour-pattern, the colour-repetition of the second "<" does not agree with the required colour-pattern.

$A = 12$ is possible: the colour-repetition of the first twelve successive "<" does agree with the required colour-pattern.

$A = 13$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 14$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 15$ is not possible: already the colour-repetition of the first "<" does not agree with the required colour-pattern.

$A = 16$ is possible: the colour-repetition of the first sixteen successive "<" does agree with the required colour-pattern.

$A = 17$ is possible: the colour-repetition of the seventeen successive "<" does agree with the required colour-pattern.

Hence the only valid A-values for our required two colour colour-pattern are 12, 16 and 17.

For $A = 12$, the rightmost "<" which is associated with the first "<" is the fifth "<" from the right. Hence $k = 5$. Thus the first half-cycles of the components are:

$$1 \nearrow^{5},\ 2 \nearrow^{4},\ 3 \nearrow^{3},\ 4 \nearrow^{2},\ 5 \nearrow^{1},\ 6 \nearrow^{12},\ 7 \nearrow^{11},\ 8 \nearrow^{10},\ 9 \nearrow^{9},\ 10 \nearrow^{8},\ 11 \nearrow^{7},\ 12 \nearrow^{6}.$$

The P_c-values of these respective components are: $5, 5, 5, 5, 5, 3, 3, 3, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

Note also that k may be calculated with the formula $|V|_A = |17|_{12} = 5$.

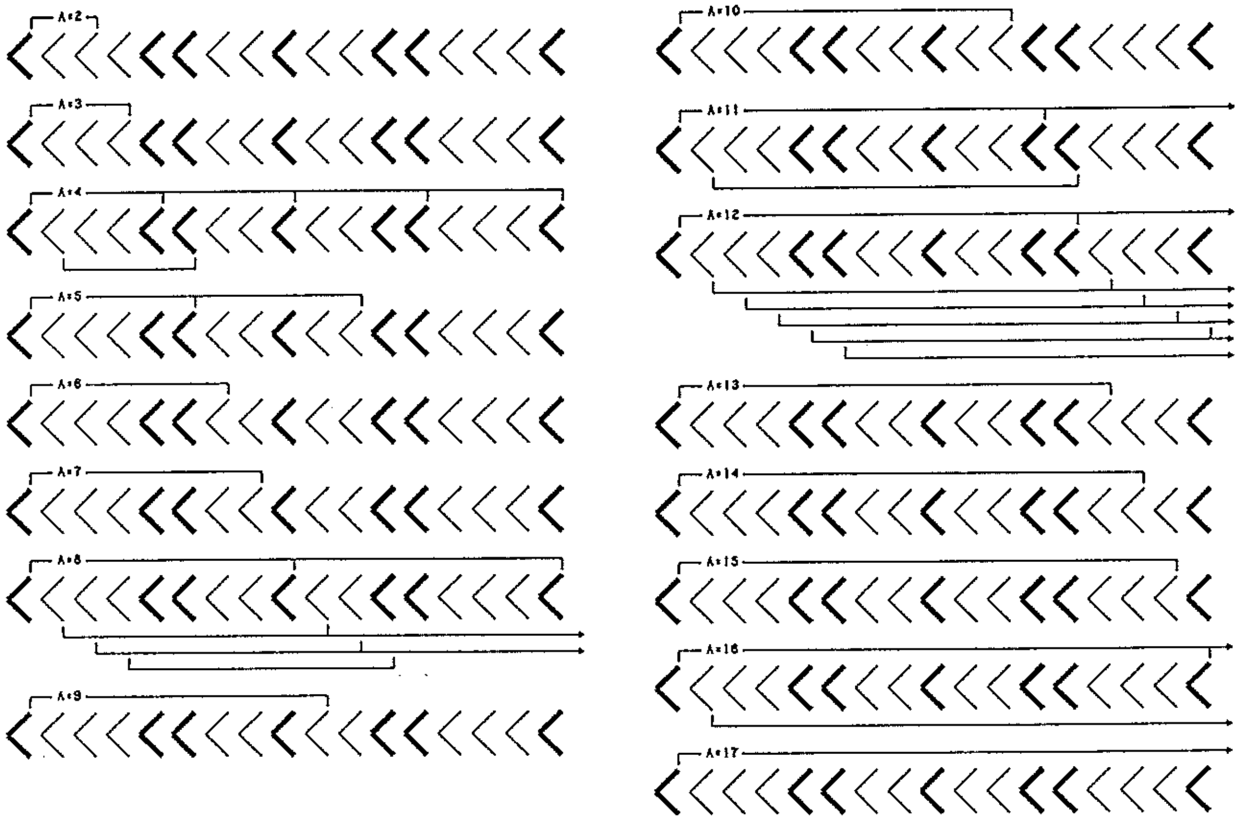

Fig. 501 — The examination of the A-values in the interval $2 \leq A \leq V$.

For $A = 16$, the rightmost "<" which is associated with the first "<" is the first "<" from the right. Hence $k = 1$. Thus the first half-cycles of the components are:

$1 \nearrow 1$, $2 \nearrow 16$, $3 \nearrow 15$, $4 \nearrow 14$, $5 \nearrow 13$, $6 \nearrow 12$, $7 \nearrow 11$, $8 \nearrow 10$, $9 \nearrow 9$, $10 \nearrow 8$, $11 \nearrow 7$, $12 \nearrow 6$, $13 \nearrow 5$, $14 \nearrow 4$, $15 \nearrow 3$, $16 \nearrow 2$.

The P_c-values of these respective components are: 5, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3.

Hence B^* should not be divisible by 3 and/or 5.

Note also that k may be calculated with the formula $|V|_A = |17|_{16} = 1$.

For $A = V$, the value of k is equal to A. Hence $k = 17$. Thus the first half-cycles of the components are:

$1 \nearrow 17$, $2 \nearrow 16$, $3 \nearrow 15$, $4 \nearrow 14$, $5 \nearrow 13$, $6 \nearrow 12$, $7 \nearrow 11$, $8 \nearrow 10$, $9 \nearrow 9$, $10 \nearrow 8$, $11 \nearrow 7$, $12 \nearrow 6$, $13 \nearrow 5$, $14 \nearrow 4$, $15 \nearrow 3$, $16 \nearrow 2$, $17 \nearrow 1$.

Each component has a P_c-value of 3.

Hence B^* should not be divisible by 3.

Note also that k may be calculated with the formula $|V|_A = |17|_{17} = A$.

Example 1:

The pattern of two colours of the $V = 12$ regularly horizontally stacked "<" is :

< < < **<** **<** < < **<** **<** < < **<**

Since $V = 12$, it follows that $2 \leq A \leq 12$. The examination of each A-value in association with the given colour pattern of the twelve horizontally regularly stacked "<" shows that only $A = 4$, $A = 8$, $A = 11$ and $A = 12$ are possible.

$k = 4$ for $A = 4$. Furthermore $x = 22$ and $P = 28$. Thus the first half-cycles of the components are:

$1 \nearrow^{4}, 2 \nearrow^{3}, 3 \nearrow^{2}, 4 \nearrow^{1}$.

Each component has a P_c-value of 7.

Hence B^* should not be divisible by 7.

$k = 4$ for $A = 8$. Furthermore $x = 18$ and $P = 32$. Thus the first half-cycles of the components are:

$1 \nearrow^{4}, 2 \nearrow^{3}, 3 \nearrow^{2}, 4 \nearrow^{1}, 5 \nearrow^{8}, 6 \nearrow^{7}, 7 \nearrow^{6}, 8 \nearrow^{5}$.

The P_c-values of these respective components are: $5, 5, 5, 5, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

$k = 1$ for $A = 11$. Furthermore $x = 15$ and $P = 35$. Thus the first half-cycles of the components are:

$1 \nearrow^{1}, 2 \nearrow^{11}, 3 \nearrow^{10}, 4 \nearrow^{9}, 5 \nearrow^{8}, 6 \nearrow^{7}, 7 \nearrow^{6}, 8 \nearrow^{5}, 9 \nearrow^{4}, 10 \nearrow^{3}, 11 \nearrow^{2}$.

The P_c-values of these respective components are: $5, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

$k = A = 12$ for $A = V = 12$. Furthermore $x = 14$ and $P = 36$. Thus the first half-cycles of the components are:

$1 \nearrow^{12}, 2 \nearrow^{11}, 3 \nearrow^{10}, 4 \nearrow^{9}, 5 \nearrow^{8}, 6 \nearrow^{7}, 7 \nearrow^{6}, 8 \nearrow^{5}, 9 \nearrow^{4}, 10 \nearrow^{3},$
$11 \nearrow^{2}, 12 \nearrow^{1}$.

Each component has a P_c-value of 3.

Hence B^* should not be divisible by 3.

Example 2:

The pattern of two colours of the $V = 8$ regularly horizontally stacked "<" is :

< < < **<** **<** < < **<**

Since $V = 8$, it follows that $2 \leq A \leq 8$. The examination of each A-value in association with the given colour pattern of the eight horizontally regularly stacked "<" shows that only $A = 4$, $A = 7$, and $A = 8$ are possible.

$k = 4$ for $A = 4$. Furthermore $x = 14$ and $P = 20$. Thus the first half-cycles of the components are:

$1 \nearrow^{4}, 2 \nearrow^{3}, 3 \nearrow^{2}, 4 \nearrow^{1}$.

Each component has a P_c-value of 5.

Hence B^* should not be divisible by 5.

$k = 1$ for $A = 7$. Furthermore $x = 11$ and $P = 23$. Thus the first half-cycles of the components are:

$1 \nearrow^{1}, 2 \nearrow^{7}, 3 \nearrow^{6}, 4 \nearrow^{5}, 5 \nearrow^{4}, 6 \nearrow^{3}, 7 \nearrow^{2}$.

The P_c-values of these respective components are: $5, 3, 3, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

$k = A = 8$ for $A = V = 8$. Furthermore $x = 10$ and $P = 24$. Thus the first half-cycles of the components are:

$$1 \nearrow 8,\ 2 \nearrow 7,\ 3 \nearrow 6,\ 4 \nearrow 5,\ 5 \nearrow 4,\ 6 \nearrow 3,\ 7 \nearrow 2,\ 8 \nearrow 1.$$

Each component has a P_c-value of 3.

Hence B^* should not be divisible by 3.

Example 3:

The pattern of two colours of the $V = 7$ regularly horizontally stacked "<" is :

$$\boldsymbol{<}\ \boldsymbol{<}\ \boldsymbol{<}\ <\ \boldsymbol{<}\ \boldsymbol{<}\ \boldsymbol{<}$$

Since $V = 7$, it follows that $2 \leq A \leq 7$. The examination of each A-value in association with the given colour pattern of the seven horizontally regularly stacked "<" shows that $A = 4$, $A = 5$, $A = 6$ and $A = 7$ are possible.

$k = 3$ for $A = 4$. Furthermore $x = 12$ and $P = 18$. Thus the first half-cycles of the components are:

$$1 \nearrow 3,\ 2 \nearrow 2,\ 3 \nearrow 1,\ 4 \nearrow 4.$$

The P_c-values of these respective components are: 5, 5, 5, 3.

Hence B^* should not be divisible by 3 and/or 5.

$k = 2$ for $A = 5$. Furthermore $x = 11$ and $P = 19$. Thus the first half-cycles of the components are:

$$1 \nearrow 2,\ 2 \nearrow 1,\ 3 \nearrow 5,\ 4 \nearrow 4,\ 5 \nearrow 3.$$

The P_c-values of these respective components are: 5, 5, 3, 3, 3.

Hence B^* should not be divisible by 3 and/or 5.

$k = 1$ for $A = 6$. Furthermore $x = 10$ and $P = 20$. Thus the first half-cycles of the components are:

$$1 \nearrow 1,\ 2 \nearrow 6,\ 3 \nearrow 5,\ 4 \nearrow 4,\ 5 \nearrow 3,\ 6 \nearrow 2.$$

The P_c-values of these respective components are: 5, 3, 3, 3, 3, 3.

Hence B^* should not be divisible by 3 and/or 5.

$k = A = 7$ for $A = V = 7$. Furthermore $x = 9$ and $P = 21$. Thus the first half-cycles of the components are:

$$1 \nearrow 7,\ 2 \nearrow 6,\ 3 \nearrow 5,\ 4 \nearrow 4,\ 5 \nearrow 3,\ 6 \nearrow 2,\ 7 \nearrow 1.$$

Each component has a P_c-value of 3.

Hence B^* should not be divisible by 3.

Example 4:

The pattern of two colours of the $V = 11$ regularly horizontally stacked "<" is :

$$\boldsymbol{<}\ <\ \boldsymbol{<}\ \boldsymbol{<}\ <\ \boldsymbol{<}\ <\ \boldsymbol{<}\ \boldsymbol{<}\ <\ \boldsymbol{<}$$

Since $V = 11$, it follows that $2 \leq A \leq 11$. The examination of each A-value in association with the given colour pattern of the eleven horizontally regularly stacked "<" shows that $A = 5$, $A = 8$, $A = 10$ and $A = 11$ are possible.

$k = 1$ for $A = 5$. Furthermore $x = 19$ and $P = 27$. Thus the first half-cycles of the components are:

${}_1\nearrow^{1},\ {}_2\nearrow^{5},\ {}_3\nearrow^{4},\ {}_4\nearrow^{3},\ {}_5\nearrow^{2}.$

The P_c-values of these respective components are: $7, 5, 5, 5, 5$.

Hence B^* should not be divisible by 5 and/or 7.

$k = 3$ for $A = 8$. Furthermore $x = 16$ and $P = 30$. Thus the first half-cycles of the components are:

${}_1\nearrow^{3},\ {}_2\nearrow^{2},\ {}_3\nearrow^{1},\ {}_4\nearrow^{8},\ {}_5\nearrow^{7},\ {}_6\nearrow^{6},\ {}_7\nearrow^{5},\ {}_8\nearrow^{4}.$

The P_c-values of these respective components are: $5, 5, 5, 3, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

$k = 1$ for $A = 10$. Furthermore $x = 14$ and $P = 32$. Thus the first half-cycles of the components are:

${}_1\nearrow^{1},\ {}_2\nearrow^{10},\ {}_3\nearrow^{9},\ {}_4\nearrow^{8},\ {}_5\nearrow^{7},\ {}_6\nearrow^{6},\ {}_7\nearrow^{5},\ {}_8\nearrow^{4},\ {}_9\nearrow^{3},\ {}_{10}\nearrow^{2}.$

The P_c-values of these respective components are: $5, 3, 3, 3, 3, 3, 3, 3, 3, 3$.

Hence B^* should not be divisible by 3 and/or 5.

$k = A = 11$ for $A = V = 11$. Furthermore $x = 13$ and $P = 33$. Thus the first half-cycles of the components are:

${}_1\nearrow^{11},\ {}_2\nearrow^{10},\ {}_3\nearrow^{9},\ {}_4\nearrow^{8},\ {}_5\nearrow^{7},\ {}_6\nearrow^{6},\ {}_7\nearrow^{5},\ {}_8\nearrow^{4},\ {}_9\nearrow^{3},\ {}_{10}\nearrow^{2},\ {}_{11}\nearrow^{1}.$

Each component has a P_c-value of 3.

Hence B^* should not be divisible by 3.

In a **Semi-Standard Herringbone Pineapple Knot** there is at least one component for which g.c.d.$(P_c, B^*) \neq 1$, and any such a component requires more than one essential string. Unless all the essential strings of a component have the same colour, the colour of the circumferential chain(s) of "<" belonging to such a component is not uniform. Hence for the **Semi-Standard Herringbone Pineapple Knots** we can create further colour-patterns.

Example 5:

First we design a colour-pattern for the components and do as if each component requires one essential string only:

Lets take the following two-tone colour-pattern for the regularly horizontally stacked "<" of such components:

< < < **<** **<** < < <

Since $V = 8$, it follows that $2 \leq A \leq 8$. The examination of each A-value in association with the given colour pattern of the eight horizontally regularly stacked "<" shows that $A = 5$, $A = 6$, $A = 7$ and $A = 8$ are possible.

Lets take $A = 5$, then $k = |V|_A = |8|_5 = 3$, $x = 13$, and $P = 21$. The first half-cycles of the components are:

${}_1\nearrow^{3},\ {}_2\nearrow^{2},\ {}_3\nearrow^{1},\ {}_4\nearrow^{5},\ {}_5\nearrow^{4}.$

The P_c-values of these respective components are: $5, 5, 5, 3, 3$.

The components with the first half-cycles ${}_4\nearrow^{5}$ and ${}_5\nearrow^{4}$ are the components which produce the two central "**<**". If we take $B^* = 6$, then for each of these two components g.c.d.$(P_c, B^*) =$ g.c.d.$(3, 6) = 3$, and hence each consists of three sub-components, thus each requires three essential strings.

Note that g.c.d.$(P_c, B^*) = $ g.c.d.$(5, 6) = 1$ for the components with the first half-cycles ${}_1\nearrow^3$, ${}_2\nearrow^2$ and ${}_3\nearrow^1$, which produce the left three and the right three "<". Hence these components each require one essential string.

We can thus create the colour-pattern depicted in Fig. 502 for our **Semi-Standard Herringbone Pineapple Knot.**

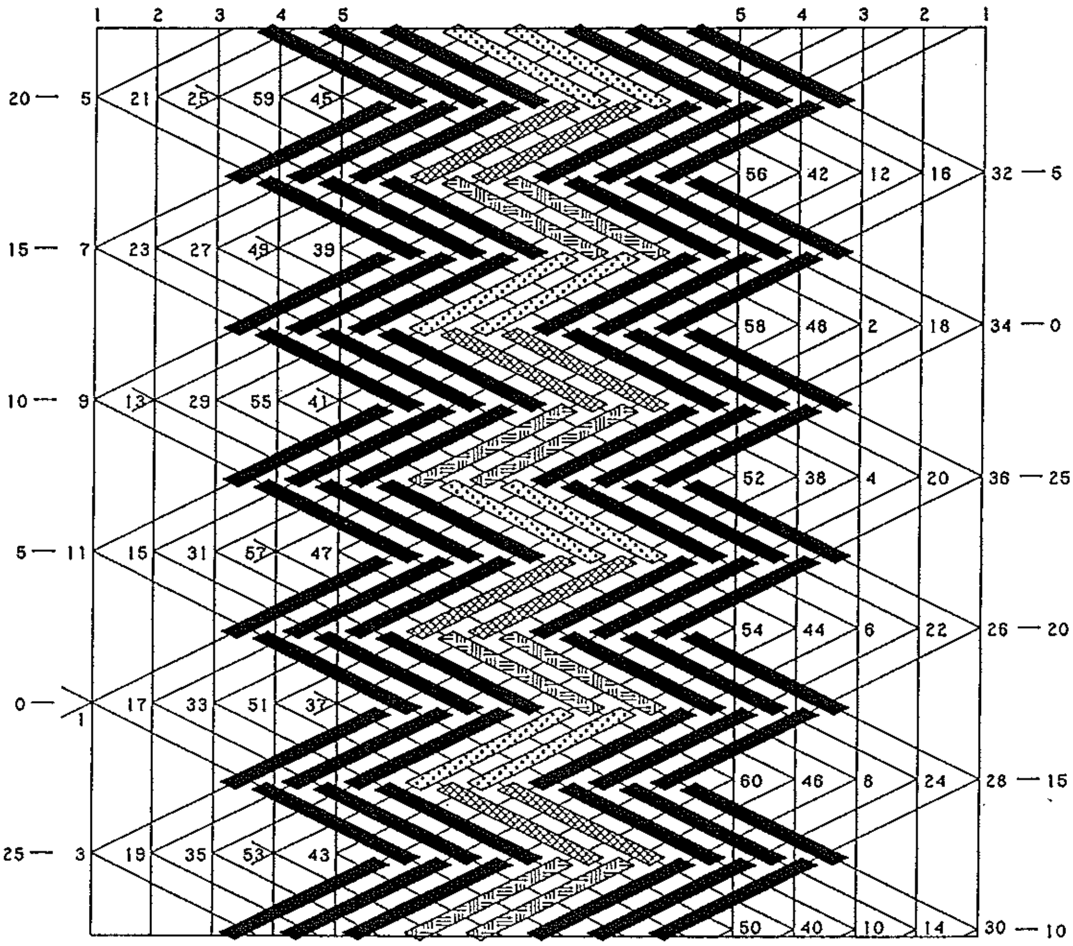

Fig. 502 — The Semi-Standard Herringbone Pineapple Knot with $A = 5$, $V = 8$, $B^* = 6$.

The herringbone coding-form depicted in Fig. 502 is that of the general form for nesting-number A depicted in the lower diagram of Fig. 446, pag. 525 (see *The Braider*, Issue No. 23). In this coding-form, a lower-left to upper-right half-cycle running from l_i to r_i has the coding-sequence:

$$(l_i - 1)u - Ao - Au - \cdots - Au - Ao - (r_i)u\,,$$

in which each set of its P_c sets of crossings, except the first set $(l_i{-}1)u$, has one crossing belonging to the string-run of the interbraided knot between the bight-boundaries l_i and r_i.

A lower-right to upper-left half-cycle running from r_i to l_i has the coding-sequence:

$$(r_i - 1)u - Ao - Au - \cdots - Au - Ao - (l_i)u\,.$$

in which each set of its P_c sets of crossings, except the first set $(r_i{-}1)u$, has one crossing belonging to the string-run of the interbraided knot between the bight-boundaries l_i and r_i.

Hence the reference half-cycle sequences, consequently the first lower-left to upper-right half-cycle sequence, are from lower-left l_i to upper-right r_i:

$$(l_i - 1)u - (A-1)o - (A-1)u - \cdots - (A-1)u - (A-1)o - (r_i - 1)u\,.$$

from lower-right r_i to upper-left l_i:

$$(r_i - 1)u - (A-1)o - (A-1)u - \cdots - (A-1)u - (A-1)o - (l_i - 1)u\,.$$

Thus the general form of an algorithm diagram for an imterbraided over–under coded Regular or Semi-Regular Knot between the bight-boundaries l_i and r_i is as follows:

$$\begin{array}{ccccccccccc}
\longrightarrow & l_i-1 & A-1 & A-1 & A-1 & \ldots & A-1 & A-1 & r_i-1 & & \\
 & 0 & \star & \star & \star & \ldots & \star & \star & \star & & \\
 & \backslash & / & \backslash & / & \ldots & \backslash & / & \backslash & / & \\
 & & \star & \star & \star & \ldots & \star & \star & \star & 0 & \\
 & & l_i-1 & A-1 & A-1 & \ldots & A-1 & A-1 & A-1 & r_i-1 & \longleftarrow
\end{array}$$

The positions of the stars are occupied by the i-values of the complementary bight-number scheme associated with the knot to be interbraided. The value above an upper star, or below a lower star, increases by 1 when its associated i-value is applicable to the half-cycle concerned. The first entry for the lower-left to upper-right half-cycles, $(l_i - 1)u$, remains the same for all of them. Similarly for all the lower-right to upper-left half-cycles, the first entry $(r_i - 1)u$ remains the same.

The Semi-Standard Herrinbone Pineapple Knot in our Example is an interbraid of three 5-parts/6-bights over–under coded Regular Knots and two 3-parts/6-bights over–under coded Semi-Regular Knots.

The general algorithm diagram for the three interbraided $P_c/B^* = 5/6$ Regular Knots with $\Delta^* = 1$ is:

$$\begin{array}{cccccccc}
\longrightarrow & l_i-1 & A-1 & A-1 & A-1 & r_i-1 & & \\
 & 0 & 1 & 2 & 3 & 4 & & \\
 & \backslash & / & \backslash & / & \backslash & / & \\
 & & 4 & 3 & 2 & 1 & 0 & \\
 & & l_i-1 & A-1 & A-1 & A-1 & r_i-1 & \longleftarrow
\end{array}$$

The general algorithm diagram for the two interbraided $P_c/B^* = 3/6$ Semi-Regular Knots† with $\Delta^* = 1$ is:

$$\begin{array}{cccccc}
\longrightarrow & l_i-1 & A-1 & r_i-1 & & \\
 & 0 & X & Y & & \\
 & \backslash & / & \backslash & / & \\
 & & Y & X & 0 & \\
 & & l_i-1 & A-1 & r_i-1 & \longleftarrow
\end{array}$$

According to the grid-diagram in Fig. 502 we first braid in the $A = 5$ Semi-Standard Herringbone Pineapple Knot the over–under coded $P_c/B^* = 5/6$ Regular Knot between its left bight-boundary 1 and its right bight-boundary 3. This is the first knot we braid, hence it is the foundation knot, thus $A = 1$ with $l_i = 1$ and $r_i = 1$. Consequently we obtain the following half-cycle algorithms from its associated general algorithm diagram:

half-cycle 1		:	$L \longrightarrow R$	Free Run.
half-cycle 2	$i = 0$	:	$L \longleftarrow R$	Free Run.
half-cycle 3	$i = 0$	:	$L \longrightarrow R$	Free Run.
half-cycle 4	$i \leq 1$	:	$L \longleftarrow R$	o.

† See *The Braider*, Issue No. 8, pp. 173-176.

half-cycle 5	$i \leq 1$	:	$L \longrightarrow R$	o.
half-cycle 6	$i \leq 2$	:	$L \longleftarrow R$	$o - u$.
half-cycle 7	$i \leq 2$	:	$L \longrightarrow R$	$o - u$.
half-cycle 8	$i \leq 3$	:	$L \longleftarrow R$	$o - u - o$.
half-cycle 9	$i \leq 3$	:	$L \longrightarrow R$	$o - u - o$.
half-cycle 10	$i \leq 4$	:	$L \longleftarrow R$	$o - u - o - u$.
half-cycle 11	$i \leq 4$	:	$L \longrightarrow R$	$o - u - o - u$.
half-cycle 12	$i \leq 5$	:	$L \longleftarrow R$	$o - u - o - u$.

Next we braid in the $A = 5$ Semi-Standard Herringbone Pineapple Knot the over-under coded $P_c/B^* = 5/6$ Regular Knot between its left bight-boundary 2 and its right bight-boundary 2. For this knot $P_c/B^* = 5/6$, with $A = 2$ and $l_i = 2$; $r_i = 1$. Hence from its associated general algorithm diagram we obtain the following half-cycle algorithms:

half-cycle 13		:	$L \longrightarrow R$	$u - o - u - o$.
half-cycle 14	$i = 0$	:	$L \longleftarrow R$	$o - u - o - u$.
half-cycle 15	$i = 0$	:	$L \longrightarrow R$	$u - o - u - o$.
half-cycle 16	$i \leq 1$	:	$L \longleftarrow R$	$2o - u - o - u$.
half-cycle 17	$i \leq 1$	:	$L \longrightarrow R$	$u - 2o - u - o$.
half-cycle 18	$i \leq 2$	:	$L \longleftarrow R$	$2o - 2u - o - u$.
half-cycle 19	$i \leq 2$	:	$L \longrightarrow R$	$u - 2o - 2u - o$.
half-cycle 20	$i \leq 3$	:	$L \longleftarrow R$	$2o - 2u - 2o - u$.
half-cycle 21	$i \leq 3$	:	$L \longrightarrow R$	$u - 2o - 2u - 2o$.
half-cycle 22	$i \leq 4$	:	$L \longleftarrow R$	$2o - 2u - 2o - 2u$.
half-cycle 23	$i \leq 4$	:	$L \longrightarrow R$	$u - 2o - 2u - 2o - u$.
half-cycle 24	$i \leq 5$	:	$L \longleftarrow R$	$2o - 2u - 2o - 2u$.

Next we braid in the $A = 5$ Semi-Standard Herringbone Pineapple Knot the over-under coded $P_c/B^* = 5/6$ Regular Knot between its left bight-boundary 3 and its right bight-boundary 1. For this knot $P_c/B^* = 5/6$, with $A = 3$ and $l_i = 3$; $r_i = 1$. Hence we obtain the following half-cycle algorithms from its associated general algorithm diagram:

half-cycle 25		:	$L \longrightarrow R$	$2u - 2o - 2u - 2o$.
half-cycle 26	$i = 0$	:	$L \longleftarrow R$	$2o - 2u - 2o - 2u$.
half-cycle 27	$i = 0$	:	$L \longrightarrow R$	$2u - 2o - 2u - 2o$.
half-cycle 28	$i \leq 1$	:	$L \longleftarrow R$	$3o - 2u - 2o - 2u$.
half-cycle 29	$i \leq 1$	:	$L \longrightarrow R$	$2u - 3o - 2u - 2o$.
half-cycle 30	$i \leq 2$	:	$L \longleftarrow R$	$3o - 3u - 2o - 2u$.
half-cycle 31	$i \leq 2$	:	$L \longrightarrow R$	$2u - 3o - 3u - 2o$.
half-cycle 32	$i \leq 3$	:	$L \longleftarrow R$	$3o - 3u - 3o - 2u$.
half-cycle 33	$i \leq 3$	:	$L \longrightarrow R$	$2u - 3o - 3u - 3o$.
half-cycle 34	$i \leq 4$	:	$L \longleftarrow R$	$3o - 3u - 3o - 3u$.
half-cycle 35	$i \leq 4$	:	$L \longrightarrow R$	$2u - 3o - 3u - 3o - u$.
half-cycle 36	$i \leq 5$	:	$L \longleftarrow R$	$3o - 3u - 3o - 3u$.

Next we braid in the $A = 5$ Semi-Standard Herringbone Pineapple Knot the over-under coded $P_c/B^* = 3/6$ Semi-Regular Knot between its left bight-boundary 5 and its right bight-boundary 4. For this knot $P_c/B^* = 3/6$, with $A = 4$ and $l_i = 4$; $r_i = 4$. Hence from its associated general algorithm diagram we obtain the following half-cycle algorithms:

half-cycle 37		:	$L \longrightarrow R$	$3u - 3o - 3u$.
half-cycle 38	$i = 0$	:	$L \longleftarrow R$	$3u - 3o - 3u$.
half-cycle 39	$i = 0$	:	$L \longrightarrow R$	$3u - 3o - 3u$.
half-cycle 40	$i \leq 1$	:	$L \longleftarrow R$	$3u - 3o - 3u$.
half-cycle 41	$i = X$	:	$L \longrightarrow R$	$3u - 4o - 3u$.
half-cycle 42	$i = 0\,;\, i = X$	:	$L \longleftarrow R$	$3u - 4o - 3u$.
half-cycle 43	$i = 0\,;\, i = X$	:	$L \longrightarrow R$	$3u - 4o - 3u$.
half-cycle 44	$i \leq 1\,;\, i = X$	:	$L \longleftarrow R$	$3u - 4o - 3u$.
half-cycle 45	$i = X, Y$	:	$L \longrightarrow R$	$3u - 4o - 4u$.
half-cycle 46	$i = 0\,;\, i = X, Y$	:	$L \longleftarrow R$	$3u - 4o - 4u$.
half-cycle 47	$i = 0\,;\, i = X, Y$	:	$L \longrightarrow R$	$3u - 4o - 4u$.
half-cycle 48	$i \leq 1\,;\, i = X, Y$	:	$L \longleftarrow R$	$3u - 4o - 4u$.

Finally we braid in the $A = 5$ Semi-Standard Herringbone Pineapple Knot the over–under coded $P_c/B^* = 3/6$ Semi-Regular Knot between its left bight-boundary 4 and its right bight-boundary 5. For this knot $P_c/B^* = 3/6$, with $A = 5$ and $l_i = 4; r_i = 5$. Hence from its associated general algorithm diagram we obtain the following half-cycle algorithms:

half-cycle 49		:	$L \longrightarrow R$	$3u - 4o - 4u$.
half-cycle 50	$i = 0$	:	$L \longleftarrow R$	$4u - 4o - 3u$.
half-cycle 51	$i = 0$	:	$L \longrightarrow R$	$3u - 4o - 4u$.
half-cycle 52	$i \leq 1$	:	$L \longleftarrow R$	$4u - 4o - 3u$.
half-cycle 53	$i = X$	:	$L \longrightarrow R$	$3u - 5o - 4u$.
half-cycle 54	$i = 0\,;\, i = X$	:	$L \longleftarrow R$	$4u - 5o - 3u$.
half-cycle 55	$i = 0\,;\, i = X$	:	$L \longrightarrow R$	$3u - 5o - 4u$.
half-cycle 56	$i \leq 1\,;\, i = X$	:	$L \longleftarrow R$	$4u - 5o - 3u$.
half-cycle 57	$i = X, Y$	:	$L \longrightarrow R$	$3u - 5o - 5u$.
half-cycle 58	$i = 0\,;\, i = X, Y$	:	$L \longleftarrow R$	$4u - 5o - 4u$.
half-cycle 59	$i = 0\,;\, i = X, Y$	:	$L \longrightarrow R$	$3u - 5o - 5u$.
half-cycle 60	$i \leq 1\,;\, i = X, Y$	:	$L \longleftarrow R$	$4u - 5o - 4u$.

The 5-pass Standard Herringbone Pineapple Knot has now been completed.

Although the general algorithm diagram for an interbraided over–under coded Regular or Semi-Regular Knot between the bight-boundaries l_i and r_i in the coding-layout of Fig. 503 for a Standard or Semi-Standard Herrinbone Pineapple Knot is

$$
\begin{array}{ccccccccccc}
\longrightarrow & l_i - 1 & A-1 & A-1 & A-1 & \ldots & A-1 & A-1 & r_i - 1 & & \\
 & 0 & \star & \star & \star & \ldots & \star & \star & \star & & \\
 & \backslash & / & \backslash & / & \ldots & \backslash & / & \backslash & / & \\
 & & \star & \star & \star & \ldots & \star & \star & \star & 0 & \\
 & & l_i - 1 & A-1 & A-1 & \ldots & A-1 & A-1 & A-1 & r_i - 1 & \longleftarrow
\end{array}
$$

where the positions of the stars are being occupied by the i-values of the complementary bight-number scheme associated with the knot to be interbraided, and where the reference value above an upper star, or below a lower star, increases by 1 when its associated i-value is applicable to the half-cycle concerned, excepting the **first** entry $(l_i - 1)u$ which remains the same for each of the lower-left to upper-right half-cycles, and the **first** entry $(r_i - 1)u$ which remains the same for each of the lower-right to upper-left half-cycles, while the general algorithm diagram for an interbraided over–under coded Regular or Semi-Regular Knot between the bight-boundaries l_i and r_i in the coding-layout of Fig. 504 for a Standard or Semi-Standard Herrinbone Pineapple Knot is†

$$\begin{array}{ccccccccc}
\longrightarrow & l_i-1 & A-1 & A-1 & \ldots & A-1 & A-1 & A-1 & r_i-1 \\
0 & \star & \star & \star & \ldots & \star & \star & \star & \\
/ & \backslash & / & \backslash & \ldots & / & \backslash & / & \backslash \\
 & \star & \star & \star & \ldots & \star & \star & \star & 0 \\
l_i-1 & A-1 & A-1 & A-1 & \ldots & A-1 & A-1 & r_i-1 & \longleftarrow
\end{array}$$

where the positions of the stars are being occupied by the i-values of the complementary bight-number scheme associated with the knot to be interbraided, and where the reference value above an upper star, or below a lower star, increases by 1 when its associated i-value is applicable to the half-cycle concerned, excepting the **last** entry $(r_i-1)u$ which remains the same for each of the lower-left to upper-right half-cycles, and the **last** entry $(l_i-1)u$ which remains the same for each of the lower-right to upper-left half-cycles, the final Standard or Semi-Standard Herringbone Pineapple knots for a given A, x and B^* are identical.

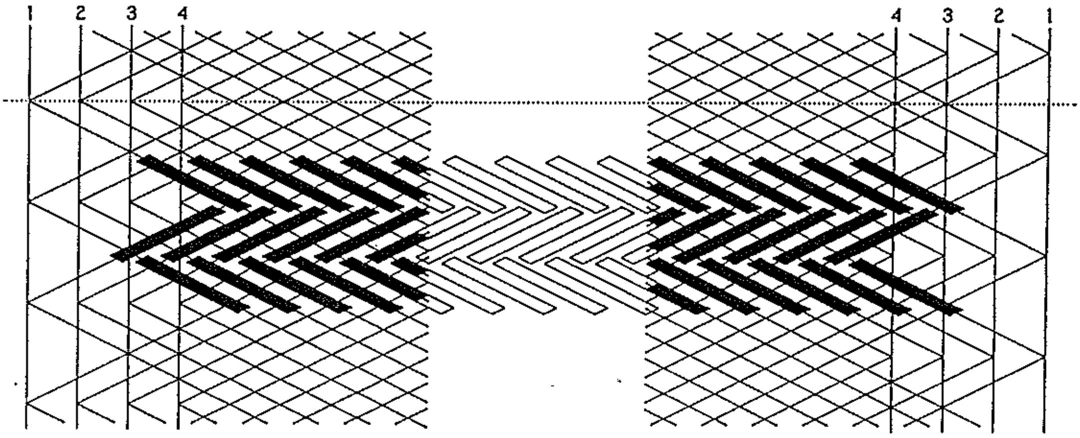

Fig. 503 — The Standard and Semi-Standard Herringbone Pineapple Knots.

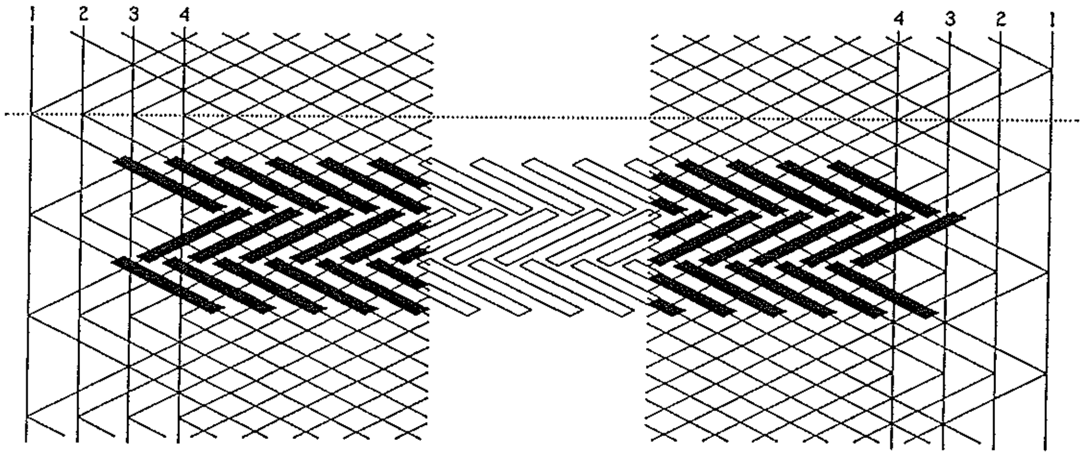

Fig. 504 — The Standard and Semi-Standard Herringbone Pineapple Knots.

† See *The Braider*, Issue No. 23, pp. 525-526.