THE BRAIDER

APPENDIX 1998

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A quarterly publication
for
the braiding artisan

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(Regular) Band Knots

In *The Braider*, Issue Nos 11 through 16 we discussed a very select set of the **Regular Band Knots** with a Gaucho coding (including the Spanish Ring Knot coding as a special case), a Headhunter's coding, and a Fan coding, which not only evolved from the 3-parts under–over coded Regular Knots, but in which the evolution process also proceeded in unit steps. The essential conditions fulfilled by these knots were as we have seen as follows:

For a **Spanish ring** coding or for a **Gaucho** coding, a Regular Band Knot with $[2m(\alpha+1)+1]$ parts and $[\{2m(\alpha+1)+1\}N+(\alpha+1)]$ bights evolves via Method I from a Regular Band Knot with $[2m\alpha+1]$ parts and $[\{2m\alpha+1\}N+\alpha]$ bights, while a Regular Band Knot with $[2m(\alpha+1)+1]$ parts and $[\{2m(\alpha+1)+1\}N-(\alpha+1)]$ bights evolves via Method II from a Regular Band Knot with $[2m\alpha+1]$ parts and $[\{2m\alpha+1\}N-\alpha]$ bights.†

For a **Headhunter's** coding, a Regular Band Knot with $[(2m+1)(\alpha+1)+1]$ parts and $[\{(2m+1)(\alpha+1)+1\}N+(\alpha+1)]$ bights evolves via Method I from a Regular Band Knot with $[(2m+1)\alpha+1]$ parts and $[\{(2m+1)\alpha+1\}N+\alpha]$ bights, while a Regular Band Knot with $[(2m+1)(\alpha+1)+1]$ parts and $[\{(2m+1)(\alpha+1)+1\}N-(\alpha+1)]$ bights evolves via Method II from a Regular Band Knot with $[(2m+1)\alpha+1]$ parts and $[\{(2m+1)\alpha+1\}N-\alpha]$ bights.††

For a **Fan** coding, a Regular Band Knot with $[(2m+2)(\alpha+1)-1]$ parts and $[\{(2m+2)(\alpha+1)-1\}N-(\alpha+1)]$ bights evolves via Method I from a Regular Band Knot with $[(2m+2)\alpha-1]$ parts and $[\{(2m+2)\alpha-1\}N-\alpha]$ bights, while a Regular Band Knot with $[(2m+2)(\alpha+1)-1]$ parts and $[\{(2m+2)(\alpha+1)-1\}N+(\alpha+1)]$ bights evolves via Method II from a Regular Band Knot with $[(2m+2)\alpha-1]$ parts and $[\{(2m+2)\alpha-1\}N+\alpha]$ bights.†††

There are of course many other Regular Band Knots, with the above mentioned coding forms, which evolve from 3-parts under–over coded Regular Knots or from 2-parts under–over coded Regular Knots.‡ These Regular Band Knots are important in applications where, for the number of bights required, no suitable one of those discussed in *The Braider*, Issue Nos 11 through 16 can be found. If for the indicated reason we would like the braiding process of the Regular Band Knot to go through the 3-parts, or the 2-parts, under–over coding stage, we must ensure, before braiding commemces, that this will be the case. This may be done by assuring that every even half-cycle of the associated 3-parts stage has an $u-o$ (or an $o-u$) coding; or that every even half-cycle of the associated 2-parts stage has an u (or an o) coding. A simple method by which this may be done for a 3-parts stage is shown by the right-hand table in Fig. 1 associated with the Regular Band Knot which is required to have a 2-pass Spanish Ring Knot

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† see Issue No. 11, pp. 234-235.

†† see Issue No. 12, pp. 256-257.

††† see Issue No. 12, pg. 257.

‡ We prefer to braid Regular Band Knots through a 3-parts or 2-parts under–over stage since it is difficult to maintain unaided their form during the initial braiding stages. Refer to *The Braider*, Issue No. 11, pg. 232.

coding (hence $P = 2m(\alpha+1)+1 = 2\cdot 1(1+1)+1 = 5$) with 33 bights. Above the table we set off the **algorithm diagram** of the Regular Band Knot concerned with the aid of its Δ^*-value. The table-heading displays the column-coding arrangement associated with the intersection-columns and the left-hand and right-hand bight-boundaries.

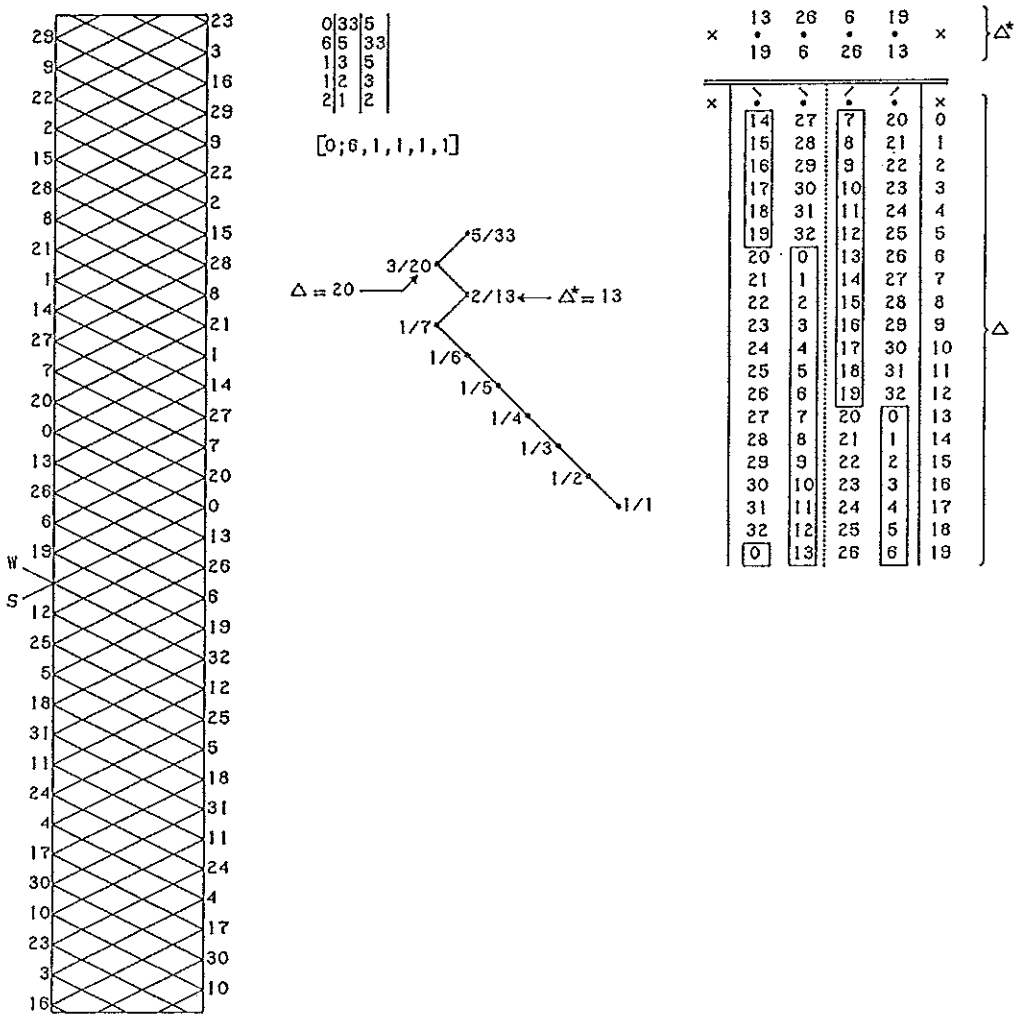

Fig. 1 — The $P/B = 5/33$ 2-pass Spanish Ring Knot.

From the algorithm diagram we determine (from its bottom line, hence from the right to left half-cycles) the maximum i-value associated with its 3-parts stage. This is in general 1 less than the highest of the three lowest i-value entries; it is equal to the highest of the three lowest i-value entries when this highest entry is the leftmost entry of the three lowest i-value entries since it is then the leftmost intersection with the Standing End and hence lies on the left-hand bight-boundary of the associated 3-parts Regular Knot. Thus in the case associated with Fig. 1, the maximum i-value associated with the 3-parts stage is 19.

Below the right-hand bight-boundary indicator in the table-heading we set off the i-values of 0 to 19 inclusive. To the left of each of these i-values we set off a sequence of i-values obtained by adding (in modular fashion to B, hence in our case to 33) the Δ-value to each successive i-value. Hence the sequence of i-values associated with the i-value 0 on the right-hand bight-boundary is $|0+20|_{33} = 20$; $|20+20|_{33} = 7$; $|7+20|_{33} = 27$; $|27+20|_{33} = 14$.

The string-run diagram on the left in Fig. 1 shows the i-values associated with its

half-cycles. Observe that the 2^{nd} half-cycle, hence the half-cycle associated with $i = 0$ intersects the half-cycles immediately preceding those associated with $i = 20$; $i = 7$; $i = 27$; $i = 14$, and that similarly the half-cycle associated with $i = 10$ for example intersects the half-cycles immediately preceding those associated with $i = 30$; $i = 17$; $i = 4$; $i = 24$. Since we have in our 3-parts Regular Knot only the i-values from 0 to 19 inclusive, we neglect any i-value greater than 19 and obtain the positions of the intersections on each half-cycle from right to left. These positions have been framed in the table. We see now that each right to left half-cycle in the 3-parts Regular Knot has the coding sequence $u-o$, and hence the 3-parts Regular Knot is a 3-parts **under–over coded** Regular Knot.†

For the examination of a 2-parts stage we follow a similar procedure.

In Fig. 2 we have examined for the 2-pass Spanish Ring Knot with $P/B = 5/34$ first the 3-parts stage (left table) and observed from this table that in the 3-parts stage not all right to left half-cycles have an $u-o$ coding (the right to left half-cycles associated with $i = 0$ to and including $i = 5$ have a $2u$ coding, and the right to left half-cycles associated with $i = 13$ to and including $i = 19$ have a $2o$ coding).

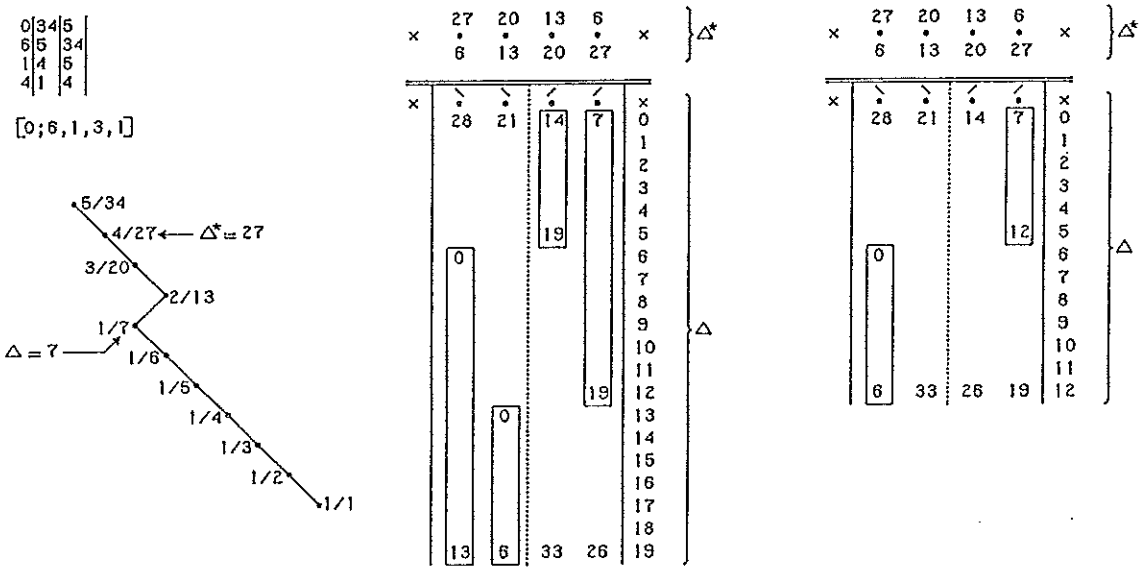

Fig. 2 — The $P/B = 5/34$ 2-pass Spanish Ring Knot.

Next we examined the 2-parts stage (right table) and observed that in this stage also not all right to left half-cycles have either an u or an o coding. Consequently this 2-pass Spanish Ring Knot is more cumbersome to braid and hence we would not employ it in an application.

In Figs. 3 and 4 we examine the 13-pass Spanish Ring Knot with $P/B = 27/181$. First we examine the associated 3-parts stage and observe that this gives us a 3-parts $u-o$ coded Regular Knot with $\frac{(2\times19+2)}{2} = 20$ bights. Then we might examine the $7/47$ stage to see whether or not this gives us a 3-pass Spanish Ring Knot; which it does as we see from the lower table in Fig. 3.

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† We could for the example in Fig. 1 also have determined from its $P/B = 5/33$ specification that this 2-pass Spanish Ring Knot goes through the 3-parts under–over coding stage from the formulae $P/B = [2m(\alpha+1)+1]/[\{2m(\alpha+1)+1\}N-(\alpha+1)]$ with $m = 1$; $\alpha+1 = 2$; $N = 7$.

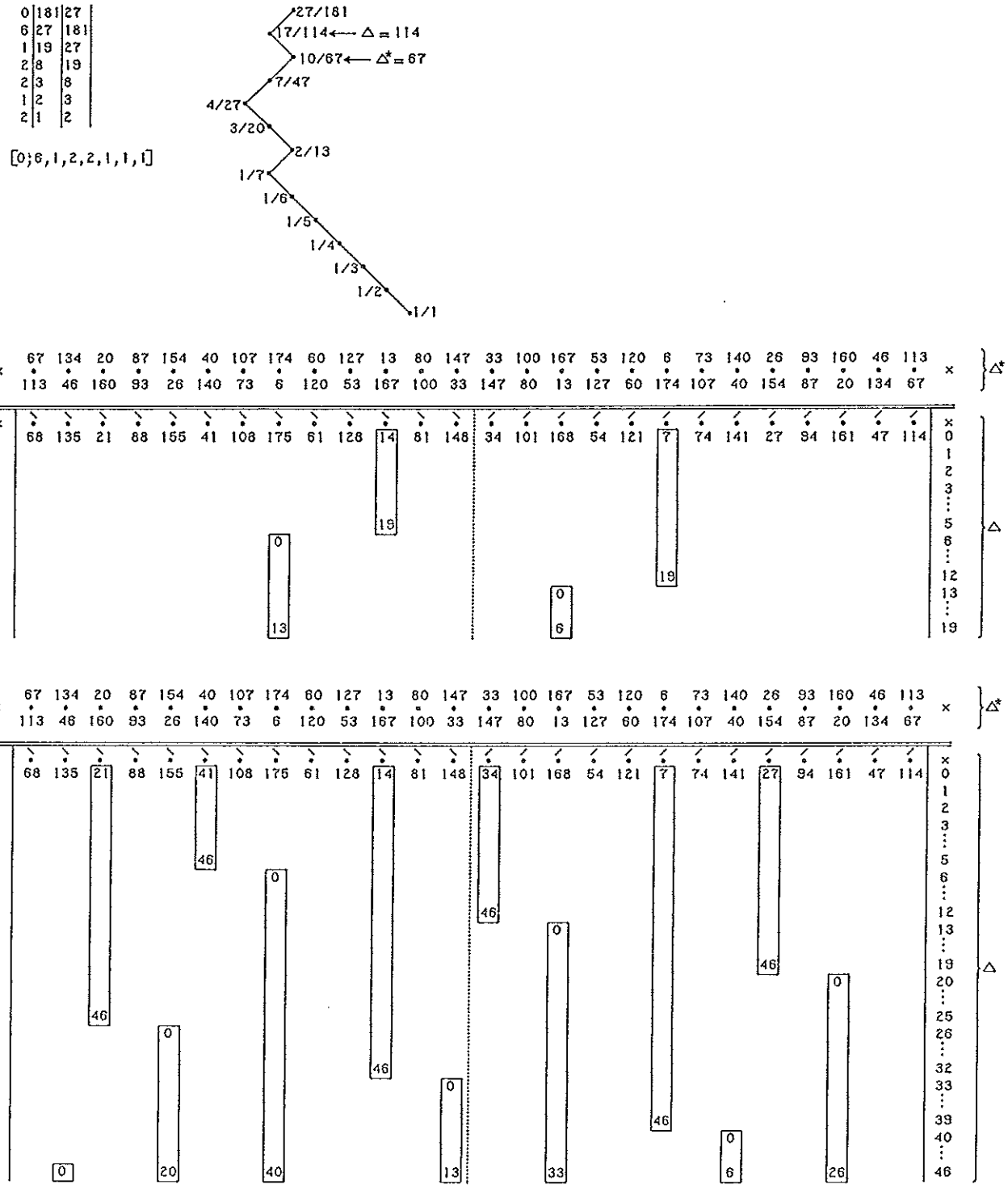

Fig. 3 — The $P/B = 27/181$ 13-pass Spanish Ring Knot.

Next we might examine the 17/114 stage to see whether or not this gives us an 8-pass Spanish Ring Knot; which it does as we see from the table in Fig. 4.

Hence the 13-pass Spanish Ring Knot with $P/B = 27/181$ goes during its construction through the 3/20 $u-o$ coded Regular Knot stage, the 7/47 3-pass Spanish Ring Knot stage and through the 17/114 8-pass Spanish Ring Knot stage.

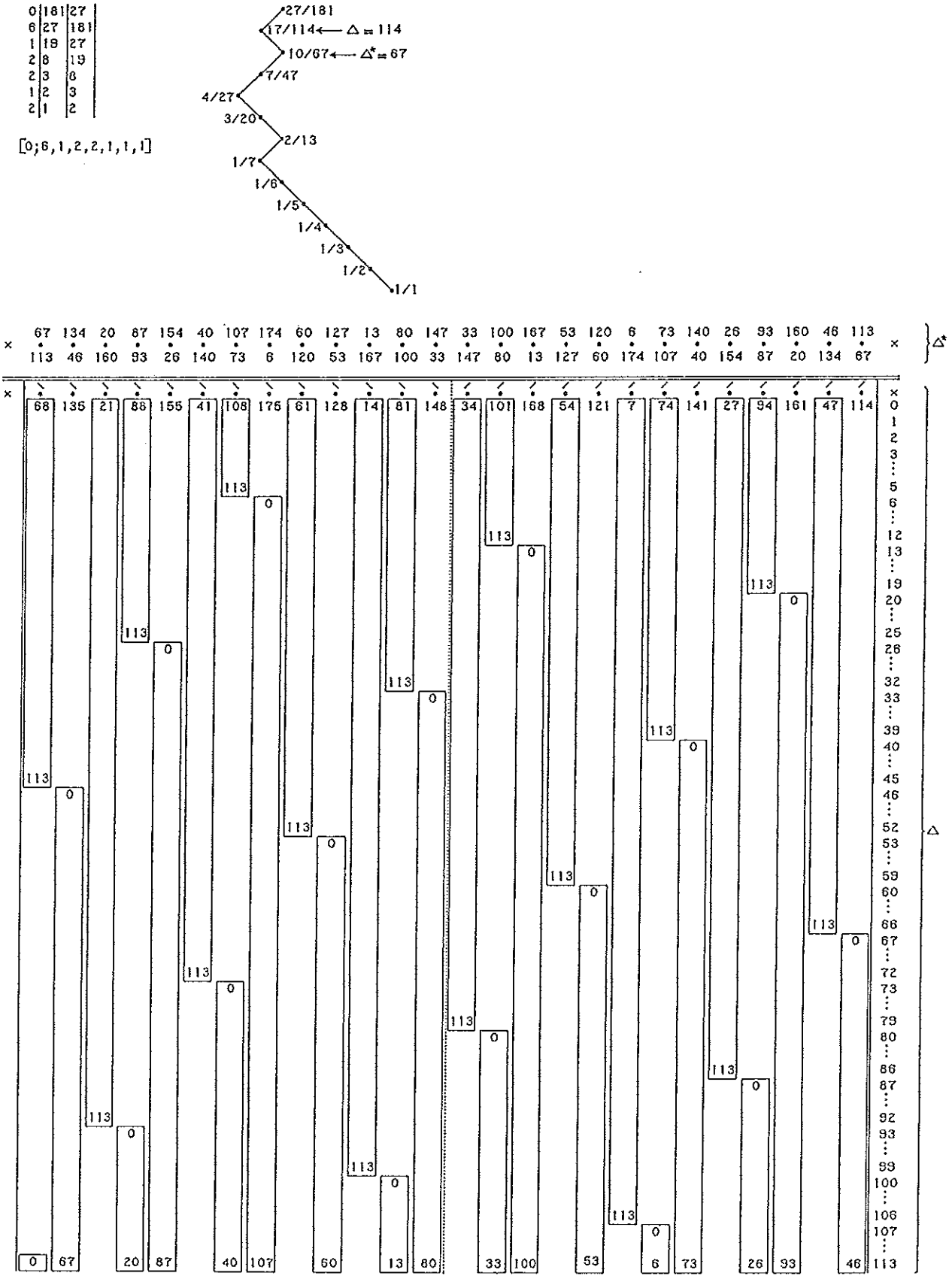

Fig. 4 — The $P/B = 27/181$ 13-pass Spanish Ring Knot.

In the upper part of Fig. 5 we examine the 4-pass Gaucho Knot with $P/B = 17/114$ and in the lower part of Fig. 5 we examine the $P/B = 7/47$ 2-pass Headhunter's Knot.

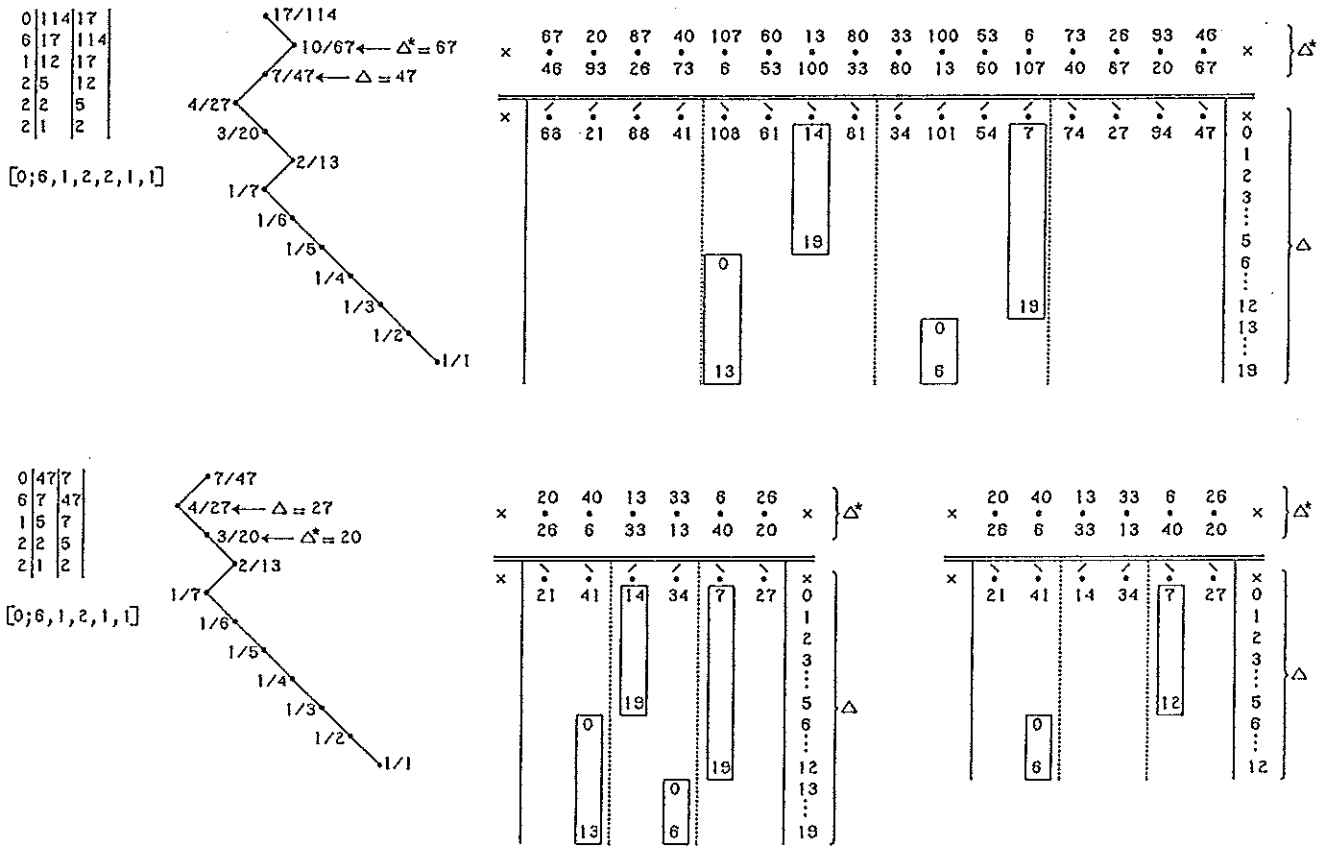

Fig. 5 — The $P/B = 17/114$ 4-pass Gaucho Knot and the $P/B = 7/47$ 2-pass Headhunter's Knot.

The upper table, associated with the $P/B = 17/114$ 4-pass Gaucho Knot shows that during its construction we pass through the $3/20$ $u - o$ coded Regular Knot.

The left lower table, associated with the $P/B = 7/47$ 2-pass Headhunter's Knot shows that the 3-parts stage does neither have an $o - u$ nor an $u - o$ coding. The lower right table shows that its 2-parts stage has an o coding. Hence this $P/B = 7/47$ 2-pass Headhunter's Knot can easily be braided via the $2/13$ o coded Regular Knot.

ERRATA—*The Braider*

The updated errata list below lists the typing errors which were noted in at least some copies of the following Issues of *The Braider*.

No. 1

pg. 3, line 9 — **it** is
pg. 3, line 10 — **unnecessarily**
pg. 3, line 17 — in order **to** present
pg. 12, line 5 under "An Introduction to Flat Braids" — Four pages are devoted **to**
pg. 16, line 9 under "Reviews" — **instructor**

No. 2

pg. 21, line 2 — delete **that**
pg. 28, line 6 — However, **a** one colour
pg. 38, line 18 under "Reviews" — **they** are first class

No. 3

pg. 42, line 2 — Naturally, **queries** not directly

No. 4

pg. 76, line 5 — **phenomenon**
pg. 81, line 16 — **phenomenon**

No. 5

pg. 87, line 3 from bottom of page — **exclude**
pg. 106, line 11 — **locality**

No. 6

pg. 129, line 15 — 2-**colour**

No. 7

none

No. 8

pg. 158, line 3 — Hence **the** number of bights
pg. 161, line 12 — In Fig. 144 are depicted the **parts-raising** processes

No. 9

none

No. 10

pg. 213, line 2 — **choose**

No. 11

pg. 232, line 17 — in **general**
pg. 245, line 8 — in **general**

No. 12

pg. 257, line 6 — or $B = \{(2m+2)(\alpha+1)-1\}N-(\alpha+1)$ bights
pg. 257, line 7 — Those with $B = \{(2m+2)(\alpha+1)-1\}N-(\alpha+1)$ bights
pg. 257, line 9 — $b = \{(2m+2)\alpha-1\}N-\alpha$ bights. Those with $B = \{(2m+2)(\alpha+1)-1\}N+(\alpha+1)$ bights
pg. 257, line 10 & 11 — with $p = \{(2m+2)\alpha-1$ parts and $b = \{(2m+2)\alpha-1\}N+\alpha$ bights
pg. 257, line 7 from bottom — delete **thinspace**

No. 13

pg. 276, line 7 — in **general**

No. 14

pg. 308, line 3 — in **general**

No. 15

pg. 338, line 1 — **independent**

No. 16

pg. 347, line 3 — $P = 2m(\alpha + 1) + 1$
pg. 353, line 16 — **screw**
pg. 356, line 3 — **two**
pg. 359, line 5 under Fig. 310 — **boundary**
pg. 361, line 3 from bottom — **Headhunter's**-coded
pg. 366, line 30 — **braided**

No. 17

pg. 369, line 12 — **mathematical**
pg. 372, lines 8, 9, 10, 13 — **positive**
pg. 383, line 13 — Figs. **326–328**
pg. 387, line 2 below Fig. 332 — in **general**
pg. 387, line 13 below Fig. 332 — **cases**

No. 18

pg. 393, the right-hand brace } immediately before the second equal sign is missing in the three lines above the upper ..... line, and the right-hand brace } immediately before the third equal sign is missing in the first line below the upper ..... line.
pg. 395, line 4 — **additionally**
pg. 396, bottom line — in **general**
pg. 397, line 4 from bottom — in **general**

No. 19

pg. 419, lines 2 & 3 from bottom — in **general**
pg. 430, lines 3 & 5 — in **general**

No. 20

pg. 446, line 14 — A few **simple** examples
pg. 446, line 3 from bottom — in **general**
pg. 447, Footnote — **These** are the
pg. 450, last line — delete **thinspace**
pg. 464, line 20 — Brion **Toss**