(12) UK Patent Application (19) GB (11) 2 321 985 (13) A

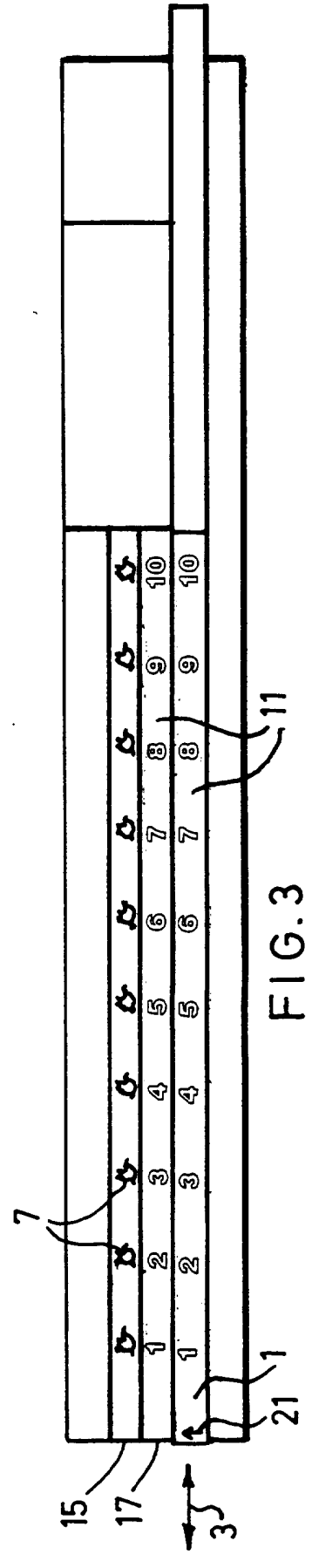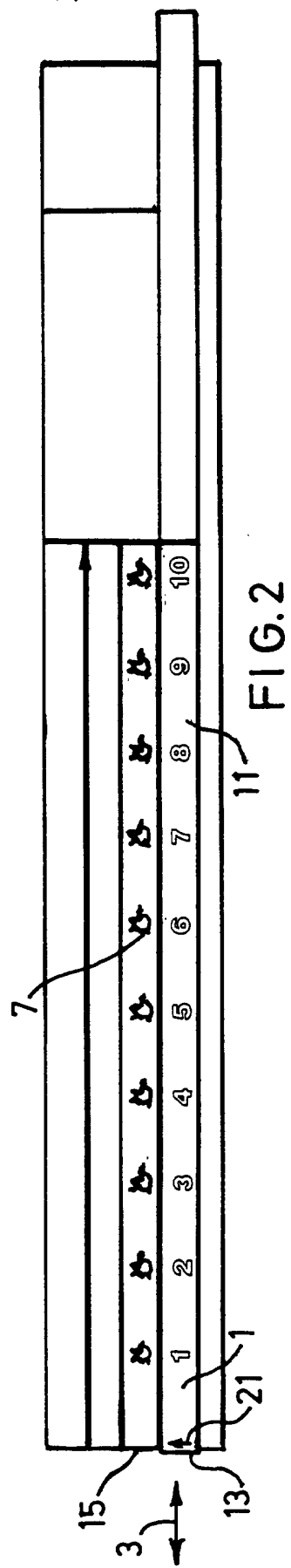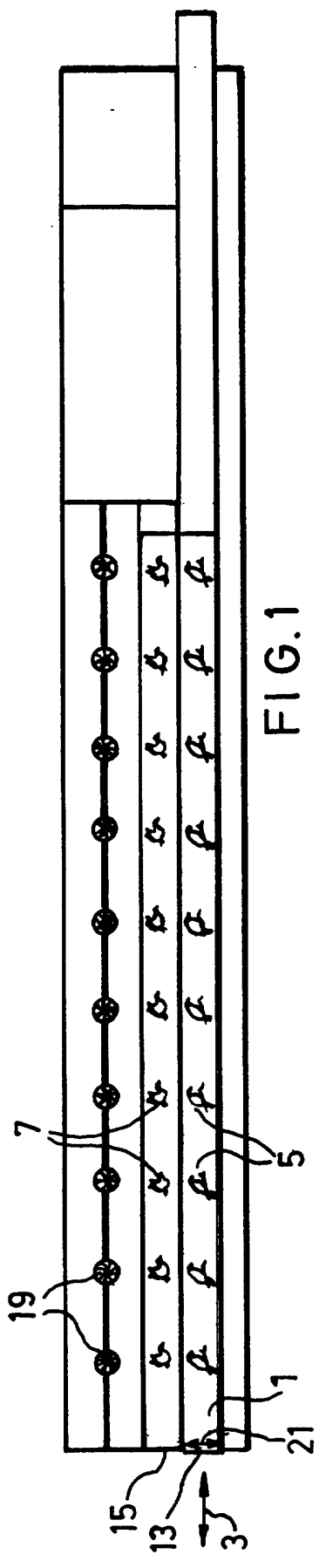(21) Application No 9802309.6

(22) Date of Filing 03.02.1998

(30) Priority Data
(31) 9702343 (32) 05.02.1997 (33) GB

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(51) INT CL^6
G06G 1/10 1/06 // G09B 19/02

(52) UK CL (Edition P)
G4B BAD
G5G G17 G5B

(56) Documents Cited
GB 1113256 A   GB 0706807 A   GB 0318150 A
WO 95/25993 A1   US 4292507 A   US 3790074 A

(58) Field of Search
UK CL (Edition P) G4B BAD , G5G G17
INT CL^6 G06G 1/00 1/02 1/04 1/06 1/10 , G09B 19/02
ONLINE:WPI

(54) Abstract Title
Slide rule

(57) In a slide rule used for addition/subtraction at last one of the scales 13, 15 uses symbols 5, 7 rather than numbers to allow the rule to be used by people unfamiliar with the meaning of numbers. As shown the rule has two outer scales 13, 15 and a middle scale comprising a series of pin-receiving holes 19A. A numerical scale may be provided in the channel 12 in which the sliding scale moves. Some of the numbers/symbols may be distinguished by colour.

FIG.8

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FIG.1

FIG.2

FIG.3
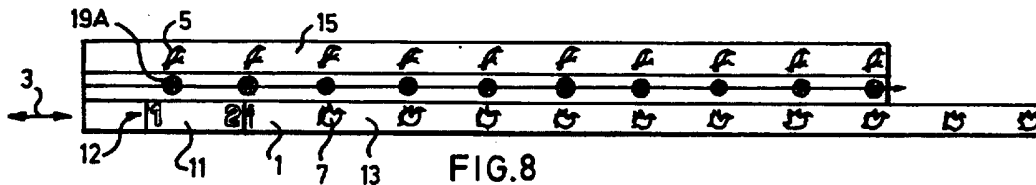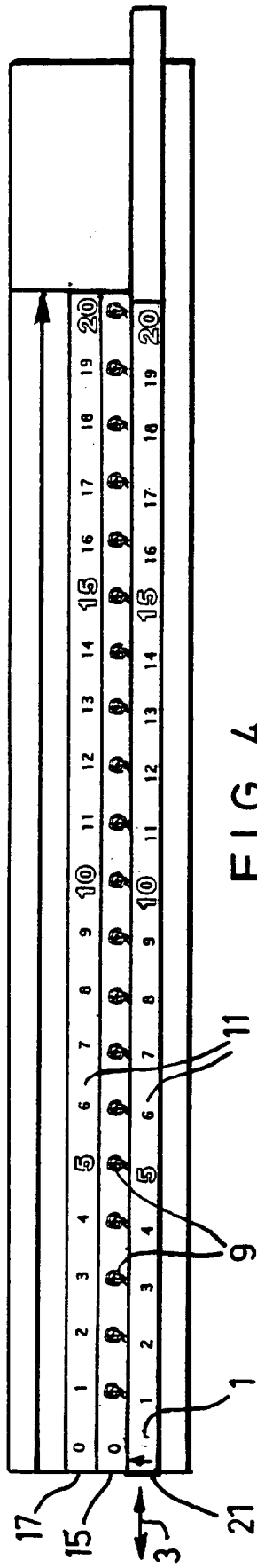
FIG. 4
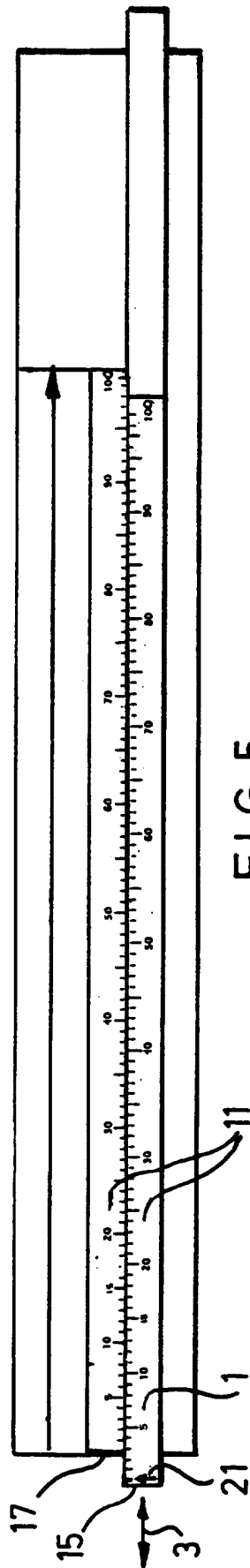
FIG. 5

FIG.6A

FIG 6B

FIG.7

FIG.8

19A   5   15

21   1   7   13

12   11

FIG.9

2+3=v   v+6=15   11-3=v   1/2+1/3=v/v
7+v=10   v+9+2=17   14-6=v   0,1+0,01=v
7+8=v   (17-v)-9=6   15-v=9   0,01+0,2=v

v×4=12   2+0+2=v
3×v=18   (5÷0)-2=v
21:7=v   1/2+1/5=v/v

FIG.10

23 25 23 27

5 10 15 20

29

25 25 25 25 25 25 25 25

30 40 50 60 70 80 90 100

31

25
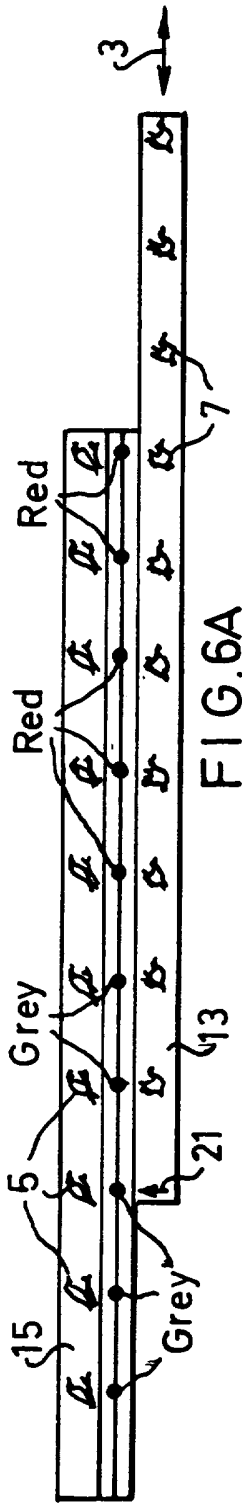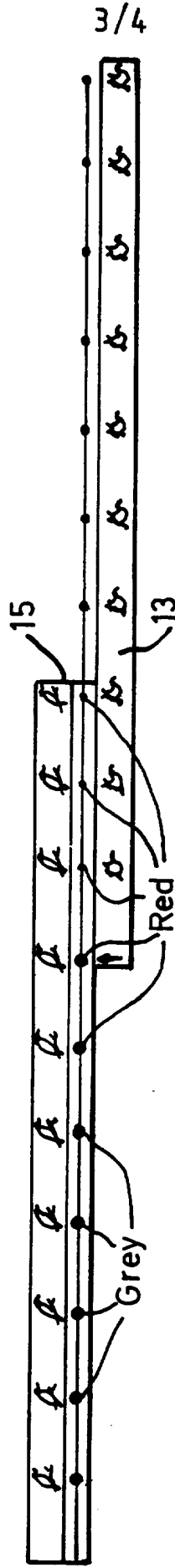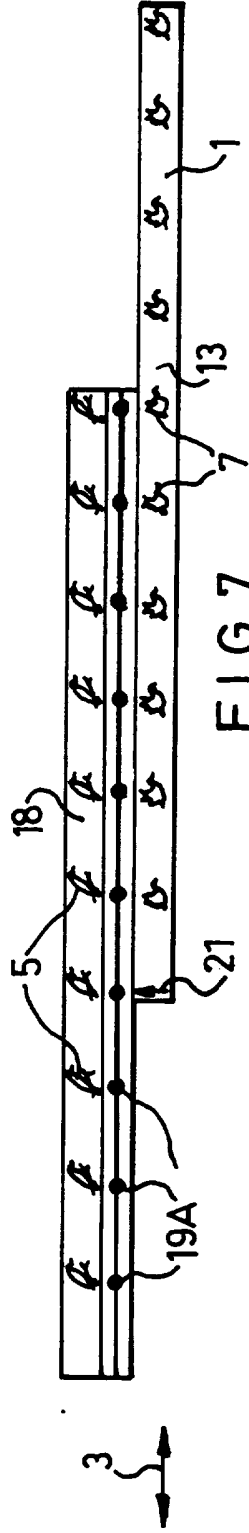
SLIDE RULE

In the conventional slide rule, two scales are arranged side by side for longitudinal relative movement. When an arithmetical operation is to be performed on the
5 numbers represented by the respective scales, the scales are arranged in an arithmetical progression, that is with equal intervals arranged between adjacent numbers. To make an addition, the first scale is moved longitudinally relative to the second scale so that its start position is
10 located against the number on the second scale which is the first figure to be added. The sum of the two numbers is the figure on the second scale adjacent the number on the first scale which represents the second figure to be added.
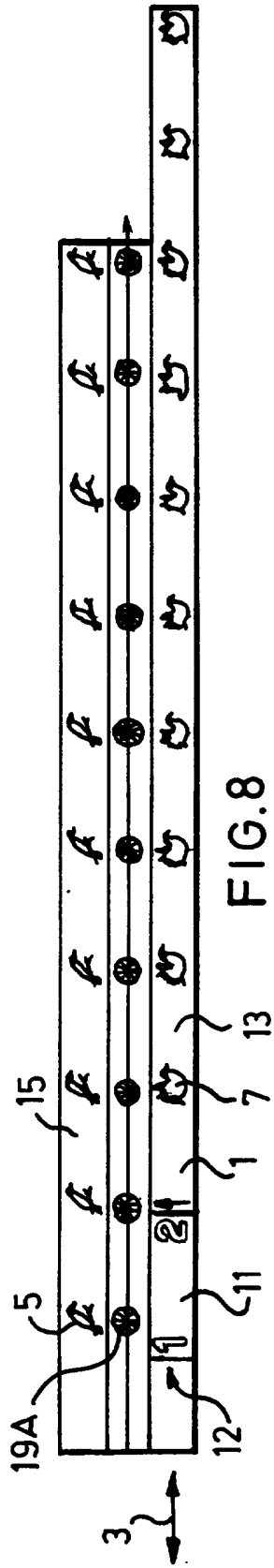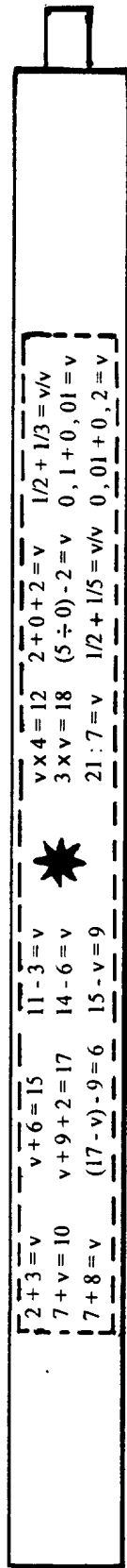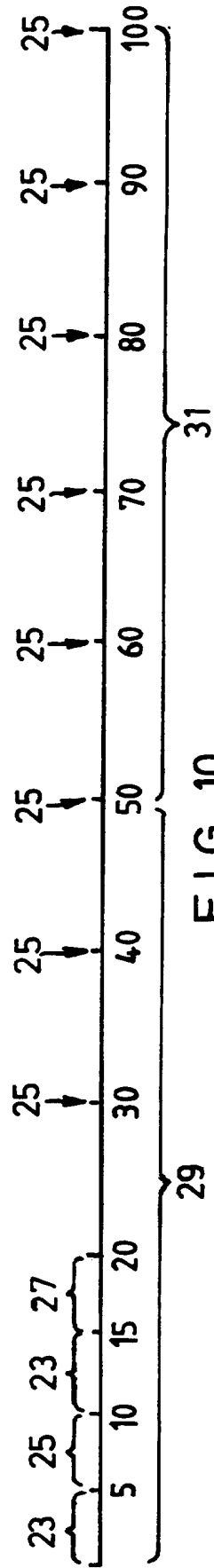
When multiplication operations are to be performed,
15 one of the scales is arranged logarithmically. Its start position is positioned adjacent the figure on the second scale representing the first figure to be multiplied and the position on the second scale of the multiplier figure on the first scale represents the product of the two
20 numbers.

Such conventional slide rule is comprehensible to people experienced in mathematics, but inexperienced people may have difficulty in identifying the two scales.

According to a first aspect of the present invention,
25 there is provided a slide rule, wherein symbols are provided which are associated with intervals of at least one scale of the slide rule.

According to a second aspect of the present invention, there is provided a slide rule having two outer
30 scales and a middle scale between the two outer scales, both of the outer scales having symbols provided which are

associated with intervals therealong, and the middle scale
comprising a series of pin-receiving holes or dots.

The present invention therefore provides, in one
aspect, a coding system for the two scales of a slide rule,
5 providing symbols associated with the intervals on the
scales so as to aid their identification. For example, a
sitting bird symbol could be shown at the positions of the
figures on the first scale or adjacent the figures on the
first scale if the figures are shown as well as the
10 symbols. Similarly, a flying bird symbol could be arranged
at or adjacent the figure positions on the second scale.
The inexperienced user of the slide rule would then be
instructed to move one scale relative to the other so that
its starting position was located adjacent the fourth
15 flying bird symbol and the number of flying birds needed to
reach the position on the sitting bird scale would
represent the sum of the two numbers. In the embodiments
described, the lower scale slides while the upper scale is
fixed.

20   It would be possible to provide one scale with
conventional numbers and the second scale only with coded
symbols. It would also be possible to code the scales by
colour, rather than or in addition to the provision of
symbols.

25   For a better understanding of the invention,
embodiments will now be described with reference to the
accompanying drawings, in which
        Figures 1 to 8 are overhead views of different
configurations of the slide rule;
30   Figure 9 is a view of the underside of a slide rule;
and
        Figure 10 shows a scheme for colouring a scale of the
slide rule.

Each of the embodiments of the slide rule includes a movable slide 1 which is movable in the directions indicated by double-headed arrow 3. Intervals on the scales of the slide rule are indicated with sitting bird symbols 5, flying bird symbols 7 and flower symbols 9. In the embodiments of the slide rule illustrated in Figures 2 to 5 a numerical scale 11 is also provided. To increase versatility, the movable slide 1 may have a numerical scale on one side and symbols on another side, the slide 1 being reversible. A numerical scale 11 may also be provided in the channel 12 in which the slide 1 moves. Figure 8 shows such an arrangement. The numbers will be revealed as the slide 1 is moved along the channel 12. To simplify the use of the slide rule the rows of symbols and numbers may be coloured. Row 13 is coloured green, row 15 is coloured red and row 17 is coloured yellow. The answer to calculations is given on the red (and yellow) row.

To add, say, 3 + 4, the green row 13 is moved three places to the right, for example so that the arrow 21 is aligned with the third sitting bird symbol (Figure 6A). Then, to add 4, the green row 13 is moved four further places to the right. The red row 15 (or yellow row 17) then gives an indication of the answer (for example, seven sitting birds can be counted - Figure 6B). If the movable green row 13 has numbers rather than symbols, then the further movement of the green row 13 to add 4 is not necessary, and the user can count the number of sitting birds which correspond to numeral 4 on the green row 13 to arrive at the answer. Subtraction can be performed in a similar way, but in reverse.

As an alternative to the sitting bird, flying bird and flower symbols illustrated, other symbols could be used such as fruits, leaves, children, lamps, candles, heads, hats, pencils, eggs and chickens.

To assist a user in counting the symbols along the
rows of the slide rule in Figure 1, a plurality of holes 19
are provided at intervals corresponding to the intervals at
which the symbols are present on the slide rule. To
5   facilitate counting, pins (not shown) are inserted in the
holes 19 by the user. The holes from 1 to 5 may be
coloured grey, and from 6 to 10 may be coloured red. The
pin inserted in each hole corresponds to the colour of the
relevant hole. Figure 7 shows a different embodiment, in
10 which holes 19A are provided between the scales of the
slide rule. In either embodiment, addition, for example,
can be performed as follows. If, say 3 + 4 is to be
calculated, first, the user will insert three pins in the
holes (starting from the left of the slide rule). The
15 movable slide 1 is then moved to align the arrow 21 with
the third hole. To add four, four further pins are added.
The total number of pins is then counted to give the
answer. The use of pins of different colours can assist
the user. The "4" to be added will be in two colours: two
20 grey and two red. This indicates to the user that the
total is two more than 5 (pins 1 to 5 being grey), so that
the user may more quickly and more safely arrive at the
result. The result "7" must not only be calculated by
connecting the added pins, but also by _moving_ the slide
25 rule to align the arm 21 with the 7th hole.

In an alternative embodiment pin-receiving holes may
be replaced with ten symbols (such as ten dots), with
appropriate colouring to ease use.

The slide rule illustrated in Figure 1 may be used by
30 a person who cannot recognise numbers, whereas the slide
rule illustrated in Figure 2 can only be effectively used
by a person who can recognise numbers. A person, as they
became more familiar with the meaning of numbers and gained
an understanding of counting would be able to use the slide
35 rules illustrated in progressively higher numbered figures

2 to 5. The slide rules illustrated in Figures 1, 2 and 3 may be given to pupils who have already learnt how to use the slide rule of Figure 7. Numbers may be taught by the rulers with two scales (numbers and symbols).

5   The aim is to facilitate the thinking of how and why we add, subtract, multiply or divide and what may be the result of one exercise even without reading or writing numerical symbols, especially for children with low mental ability to understand. For instance with regard to the
10 calculation 3x7=21, even if somebody does not know to write 21, he may well possess that 21 means 21 units or 2 tens and 1 unit and perhaps he may express in his own way e.g., (11.) (two bars plus one dot).

    The non numerical symbols used in the first rulers,
15 though gradually the numbers are used, by which, besides its symbolic meaning, a pupil can use the rulers not having in mind the numbers (digits). (Numbers may be hidden, if desired, under the moving ruler.)

    For a ruler which is partly numerated, we may use
20 similar parts of our scales without any number and by counting their small spaces or putting them above the first scale, we find results in adding, subtraction, multiplication or division up to 100. By doing so we also manage to understand numbers up to 100 not only as units of
25 the multiplication of one (repetition counting one by one).

    Due to much more experience on how much easier pupils may be guided on improving abstract thinking in maths, all the rulers especially the first 1-3, may take out their upper scale and put independent units of one - up to ten or
30 sticks having four options (each one in different colour, bars, and by working them enough at the very beginning and then we come to numbers associated, but leave it for the future).

In order to perform multiplication using these slide rules, addition is simply performed a necessary number of times. For example, to calculate 2 x 3, the user would perform the calculation to 2 + 2 + 2 on the slide rule.
5 Division is performed in a similar way by performing repeated subtractions.

Figure 9 shows the underside of a slide rule in accordance with an embodiment of the present invention, which indicates a number of learning exercises which may be
10 performed by the user of the slide rule.

The rows 13, 15 and/or 17 may be coloured differently along their lengths. For example, row 15 may have the symbols/numerals from 1 to 5 coloured grey. The symbols/numerals from 6 to 10 may be a red (rose) colour.
15 Further, where provided, the symbols/numerals from 11 to 15 may be grey, and from 16 to 20, blue. Additionally, or alternatively the scale from 1 to 50 may be coloured orange, and the scale from 51 to 100 may be coloured green. Also, each tenth symbol/numeral may be coloured red (10,
20 20, 30, etc.). This will enable the user to associate a colour with a range of numbers, so that the answer to an arithmetic operation can be determined more quickly. For example, the answer of 6 will appear as five symbols in grey colour and one symbol in red. The user will associate
25 grey with 5, and will know the answer is 5 + 1 (= 6). In these embodiments the colours associated with the number ranges correspond to those used in E.C.U. notes (Euro-money).

Thus, in the user's mind, grey will be associated
30 with 1 to 5, red will be associated with 10, blue will be associated with 20, orange will be associated with 50, and green will be associated with 100 (or 51-100).

In Figure 10, 23 designates the grey areas, 25 designates the red areas, 27 designates the blue area, 29 designates the orange area and 31 designates the green area.

5   In another arrangement the middle series of the ruler from 1-100 may have different colours associated with numbers 1, 2, 3, 10 and 20. For example, black could be associated with 1, brown could be associated with 2 and green could be associated with 3.

10   Figure 7 shows basic ruler in which all the three scales are symbols with the following characteristics:
     a) The first upper scale in a series of pictures of whatever it is (sitting birds here)
     b) The underneath scale (outer) also with respective
15 number of something relative to the first scale plus the third more important the middle scale with the holes or dots, upon which area pupils must begin the practical steps of the presentations of the data of one problem, coming out of the series of pictures from the rest scales.
20

An example
Problem Which it may be the thesis (No) along the series of two sitting birds, if another three may come and sit nearby, from why not from the down series of the flying
25 birds?
     The answer is the fifth and not five.

What we do is that we (pupils) insert two pins under the first two sitting birds, we move the arrow of the moving ruler adjacent to the two sitting birds, then we put
30 another three for those (flying) came to be united with the first series and only at the end we move again the arrow under the fifth pin or respective 5th sitting bird.

Now if the problem was submitted as "how many birds we may
have, if we take two of the series of the sitting birds,
plus another three which we caught after their flight of
the series of flying birds, and put them in a cage, then we
5 should repeat what we did before but the answer will be 5
birds (if we like we take out the pins and put them in a
small box which takes the place of the cage).

So we see the difference use for two kinds of numbers five
and fifth (απόλυτος - τακτικός) in Greek.

10 We could also show our answer five or fifth, by putting our
starting point (look at arrow) in the left edge of this
sliding rule) at first under the second sitting birds and
by moving it to the right to reach the fifth.

In this way we separate our work for and from figures,
15 (digits) stressing the importance of the middle series, in
its relation with the other two.

We want to be punctual for what and how we work (steps from
concrete or pictures and then to the abstract meaning of a
number especially digits).

20 More probably it could be the problem as "how many sitting
birds on the first scale if we add another three, which
came from three former flying, plus the two already
sitting?

Here we have an addition of the same units of something
25 (e.g. only sitting birds or only boys and not children).

Intervals (bars) can be put over the first scale e.g. for
the addition (15+15) we may put bars of sticks which have
the longitude of (ten + five + ten + five) of the unit of
our ruler.

So the first (10+5) bars must be put under the first scale,
then we have the moving of the downwards scale fifteen
steps to the right and the same for the other fifteen.

Here we see that what measurement we take from the second
5 scale, at the same time is common to the upper one and thus
its as we have addition in the first scale which also if
can be represented in a stick of thirty units of our ruler.
(In the middle one).

Here we can decide for the thirty ..... with the help of
10 the units of the ruler, even by changing their series,
becoming like (10+10+5+5).

Though we may consider the small intervals as longitude,
height or even seconds of an hour (time measurement),
nevertheless we may calculate them as units of something
15 which is settled in a series after a very small step.

The concrete third scale is the basic characteristic of all
rulers.

At one stage and gradually we use also numbers but always
respective to visual aids, (especially holes, dots, bars).

20 With reference to Figure 8, as it is seen we guess,

      a)   That two flying birds left.
      b)   The same birds might sit over the two dots,
      c)   arrow is showing to the second sitting bird of
the first scale.
25   d)   Arrow perhaps was showing the first or third
sitting bird before.
      e)   Perhaps its the answer of zero sitting birds plus
two birds sitting in a row, etc, etc.

It depends upon the data or the question of a problem.

The two dots may be the first sitting birds. They may be the remaining of five sitting, if three, four, five sitting of the row flew away. We had a substraction with the same result from different situations. Thus, one answer on
5 this ruler can be obtained from many relative problems.

It is one way that we can symbolize quantities, units etc.

It is nearly universal signs but even without them or by giving them another form, we would also express the relations or generally speaking maths problems.

10 Digits simply its a reference point or generalization of especially what we call unit, part of it or multiplication of them.

CLAIMS:

1.   A slide rule, wherein symbols are provided which are associated with intervals of at least one scale of the slide rule.

5   2.   A slide rule according to claim 1, having one stationary scale on the main body of the slide rule and one movable scale on a slide, at least one of the stationary scale and the moveable scale having symbols at intervals therealong.

10 3.   A slide rule according to claim 1, having two stationary scales on the main body of the slide rule and one moveable scale on a slide, at least one of the scales having symbols at intervals therealong.

4.   A slide rule according to claim 1, 2 or 3, wherein
15 one of said scales includes holes at intervals therealong.

5.   A slide rule according to claim 4, in combination with a plurality of pins adapted for being received in the holes.

6.   A slide rule according to any one of claims 1 to 5,
20 wherein at least one scale has different colouring at intervals therealong.

7.   A slide rule according to any one of the preceding claims, wherein the channel in which the moveable slide runs has numbers at intervals therealong which are revealed
25 by movement of the slide.

8.   A slide rule having two outer scales and a middle scale between the two outer scales, both of the outer scales having symbols provided which are associated with

intervals therealong, and the middle scale comprising a
series of pin-receiving holes or dots.

9.   A slide rule marked in a maner as shown in any one of
the drawings, the slide rule being operated in accordance
5 with the instructions given in the specification.

10.   A slide rule substantially as hereinbefore described
and/or as illustrated in any one of or any combination of
the accompanying drawings.

The Patent Office

13

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4B(BAD) G5G(G17)

Int Cl (Ed.6): G06G1/00 1/02 1/04 1/06 1/10 G09B 19/02

Other: ONLINE: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 1113256	(RHONE-POULENC) Whole document relevant	1 to 3
X	GB 706807	(SKOLMATERIELDISTRIBUTION) Whole document relevant	1, 2, 4, 6, 7
X	GB 318150	(BOURGEOIS) Whole document relevant	1, 2
X	WO 95/25993 A1	(RUFOLO) Whole document relevant	1, 2, 6
X	US 4292507	(HOVORKA) Whole document relevant	1 to 5, 8
X	US 3790074	(ZEMANEK) Whole document relevant	1, 2