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H. VON FORSTER ET AL

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CALCULATING DEVICE

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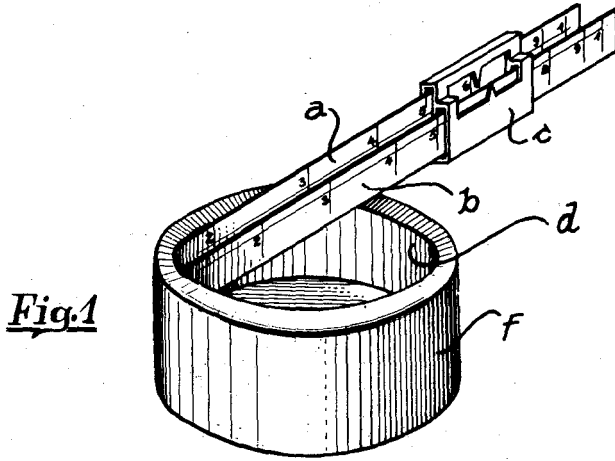


Fig. 1

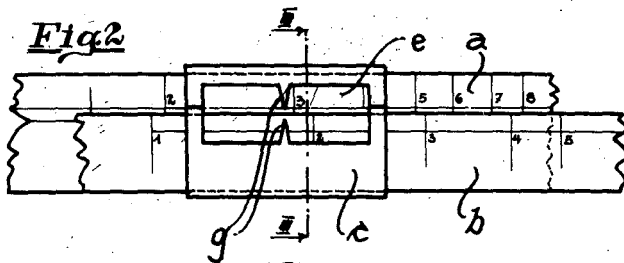


Fig. 2

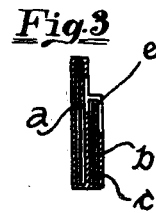


Fig. 3

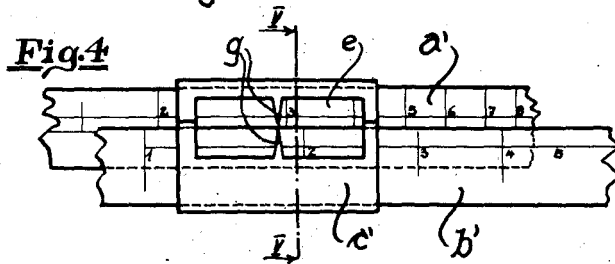


Fig. 4

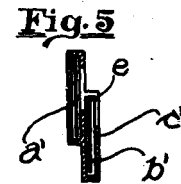


Fig. 5

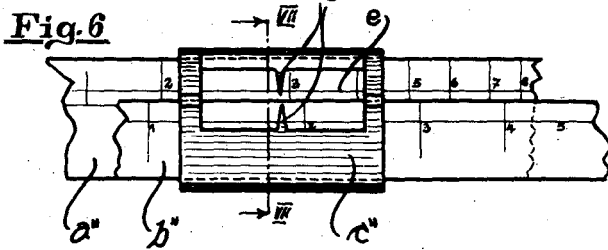


Fig. 6

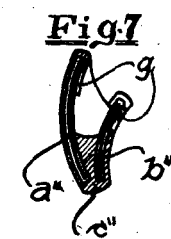


Fig. 7

INVENTORS  
HERMANN V. FORSTER  
LEOPOLD GRILL  
BY *Mika Kehlener*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE

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## CALCULATING DEVICE

Hermann von Forster and Leopold Grill, Frankfort-on-the-Main, Germany

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5 Claims. (Cl. 235—70)

This invention relates to a calculating device, especially for calculating with logarithmic scales and adapted to be carried in the pocket when not required for use.

5 The object of the invention is to produce a calculating device which meets, in a more satisfactory manner than heretofore, the requirements which must be fulfilled by a pocket calculating device. Such a device must have the greatest degree of accuracy, this is attained by making the carrier available for applying the scale as long as possible, the guiding of the two similar, mutually shiftable scales or scale carriers relatively to each other must be as accurate as possible, and the device must be as handy and simple as possible, especially as regards the shifting of the scale carriers and the adjustment of the guide member.

20 Contrary to the known construction of pocket calculating devices two or more tapes are provided according to the invention, which have logarithmic scales and, in view of the desired accuracy, have a certain relatively long length. These tapes are made of elastic material, such as steel, and are of suitable cross-sectional shape, so that, on the one hand, they are sufficiently strong to resist bending when the device is used, and, on the other hand, can nevertheless be wound into a coil of small radius for the purpose of saving space. Provision is made for enabling the said tapes to be wound during or after use and for accommodating the coils in a housing which can be carried in the pocket. In certain forms of construction the individual tapes are wound separately, independently of each other. For stiffening the tapes they are made in the preferred form of curved cross section, in a known manner.

40 By means of the aforementioned arrangement it is possible to slide the individual scale carriers, that is the individual tapes, with respect to and independently of each other and to push the tapes after or during use entirely or partly into the housing for the purpose of winding without breaking or bending the tapes. Consequently, no pull spring for effecting the winding of the tapes is necessary, and also no means for temporarily reducing the pulling effect of the spring when such a spring is used. Thus, the construction of the device and also its manipulation are greatly facilitated. By the employment of separate tapes for each of the scales to be brought into register, it is likewise no longer necessary to bend during use the scale carrier into the form of a loop. Therefore, the handling of the device is simpler

and the entire length of the individual scale is always available for the calculating operation.

Provision is also made for the employment of a guide member serving as a common guide for all the tapes of the calculating device, so that, at least at the point where this guide member is situated, the scales are accurately guided in the prescribed position relatively to each other. The individual tapes are slidable in this guide member independently of each other.

The guide member is preferably provided with reading marks, which facilitate the accurate mutual adjustment of different scales.

15 It is generally very advisable to guide the individual tapes so that their longitudinal edges overlap at least along the portion situated on both sides near the place where the mutual adjustment takes place. This facilitates the adjustment and reading if no reading marks are provided on the guide member. However, it is primarily thus made easier to simultaneously shift several scale carriers relatively to the housing and to the guide member without changing their mutual positions. If, for example, the guide member or the housing is held in the left hand, the tapes to be jointly shifted can, owing to the overlapping edges, be pressed together with the fingers of the right hand and, thus coupled, shifted together to the right or left. If the edges of the tapes do not overlap along a long portion or their entire length, the desired object can also be attained by providing a projection or the like at only one or at several points on one of the tapes, this projection extending over the edge of the neighbouring tape, so that the above mentioned coupling of the tapes to be jointly shifted can be carried out at least at such point or points.

This mutual overlapping along a long portion of the tapes may be attained by conducting tapes of the same or different widths mutually so displaced in transverse direction that none of their edges overlap. Moreover, the arrangement may be such that tapes of different widths run parallel at one edge.

45 For fulfilling the above mentioned purpose it is not absolutely necessary to arrange the guiding member, serving for mutually guiding the tapes, loosely on the tapes, but this member may advantageously be provided with a suitable reading device and rigidly connected with the housing.

50 As a rule the tapes, that is the scale carriers, are for calculating removed from the housing in which they are normally wound, but constructions may be provided in which the one end of the tape

always remains fixed in the interior of the housing.

Further details of the inventive idea are set forth in the following description.

5 Several embodiments of the invention are illustrated by way of example in the accompanying drawing in which:—

Fig. 1 is a perspective view of a device in position for use.

10 Fig. 2 is a front elevation on an enlarged scale showing a portion of the tapes in the guide member.

Fig. 3 is a cross-section on line III—III of Fig. 2.

15 Fig. 4 shows in part front elevation a modified form of construction.

Fig. 5 is a cross section on line V—V of Fig. 4.

Fig. 6 is a part front elevation of a third form of construction.

20 Fig. 7 is a cross section on line VI—VI of Fig. 6.

In the form of construction illustrated in Fig. 1 two tapes *a* and *b* are employed, portions of which are shown on an enlarged scale in Figs. 2 and 3. The two tapes *a* and *b* are of different widths but at the same level, at their lower edge. Both tapes *a* and *b* are wound to form a double coil *d* by simply pushing them into the interior of a housing *f*. For the sake of clearness no lid is shown for the housing. A guide member *c* with scales is arranged freely shiftable on the two tapes *a* and *b*. As shown in the drawing, this guide member ensures the accurate mutual guiding of the tapes *a* and *b* at least at the portion where the calculation is carried out. The guide member *c* has a suitable reading window *e* and preferably also reading marks *g*. Owing to the provision of reading marks *g* for the different tapes it is immaterial if the tapes *a* and *b* are in different planes and not directly in contact with each other.

The construction illustrated in Figs. 4 and 5 differs from that shown in Figs. 1 to 3 in that two bands *a'* and *b'* of the same width are employed which are guided in offset relation in a guide member *c'* adapted for this purpose.

The form of construction shown in Figs. 6 and 7 differs from the previously described constructions in that the tapes *a''* are guided in such a manner as to have curved cross sections at the guided portions, as the guide member *c''* is correspondingly shaped for this purpose. Moreover, the two tapes are at an angle the one to the other so that it is possible to also observe a relatively large width of the rear tape *a''* within the guide member *c''*.

In use the calculating device is manipulated in the following manner. As the tapes are not rigidly connected with the housing, the tapes are capable of being completely pulled out of the housing together with the guide member connecting them so as to separate the tapes and guide member from the housing. If the guide member is held in the left hand, the tapes, which now form a straight stiff rod, are indirectly held. To effect the necessary adjustment for calculation, the tapes are gripped with the right hand as far as possible to the right. The tapes can now be

shifted with the right hand either singly or jointly in both directions through the guide member.

If, for example it is desired to multiply 425 by 160, the rear tape *a* is first shifted until the number 425 appears under the corresponding mark *g*, whereupon the front band *b* is shifted until the line at the beginning of its scale appears under the lower reading mark *g*. The two bands are coupled by pressing them together and shifted jointly in the guide member until the second number 160 appears on the scale of the front tape *b* under the lower mark *g*. The product (68000) can now be read on the rear band *a* under the upper reading mark *g*. When it is desired to multiply more than two numbers, the procedure is repeated without it being necessary to read the intermediate products.

If, however, the number 680 is to be divided by 425 the number 680 is first set on the one tape and the second number 425 on the other tape. The tapes are then coupled and shifted together through the guide member until the first or last mark (1) of the second tape appears under its reading mark. The result can then be read on the first mentioned tape.

Consequently, there is the following difference as compared with the usual slide rule. In the case of rigid slide rules the tongue is shifted relatively to the bar according to the desired adjustment and left in this position, whereas the guide member is moved over the two bars to obtain the final reading. In the device according to the invention, however, the tapes are first brought into the relative position necessary for making the calculation, the index mark of the guide member being preferably used, hereupon for obtaining the final reading, the tapes are jointly shifted relatively to the guide member, which is held tightly with the other hand. The joint shifting of the tapes can be carried out easily and reliably by the above described "coupling of the tapes", that is pressing them together with the fingers of the right hand, so that no errors in calculation can occur.

We claim:—

1. A calculating device comprising a plurality of relatively slidable members provided with graduations arranged to cooperate for making calculations and a reading holder having means to engage and guide and maintain in separated position both said members to permit use of the members together for calculating purposes, said members being both freely slidable in said holder and out of contact with each other therein.
2. A device as claimed in claim 1, in which said graduations are arranged on corresponding faces of said members.
3. A device as claimed in claim 1, in which said holder maintains said members generally in planes at an angle to each other.
4. A device as claimed in claim 1, in which said members are of different widths.
5. A device as claimed in claim 1, in which said members are of equal width, and are arranged in partly overlapping relation.

HERMANN VON FORSTER,  
LEOPOLD GRILL.