Jan. 6, 1942. F. J. McNAMARA 2,268,886

CALCULATING DEVICE

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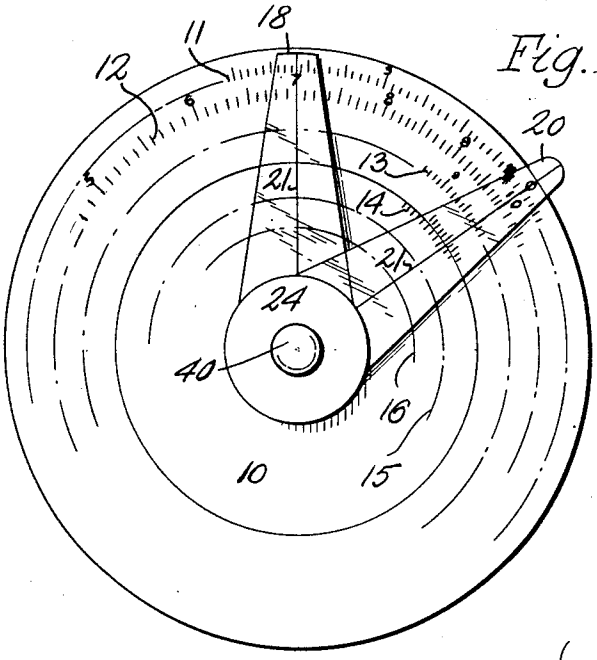


Fig. 1.

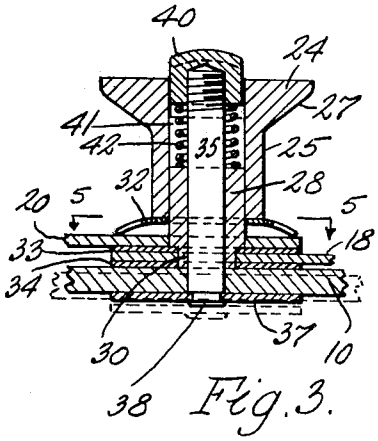


Fig. 3.

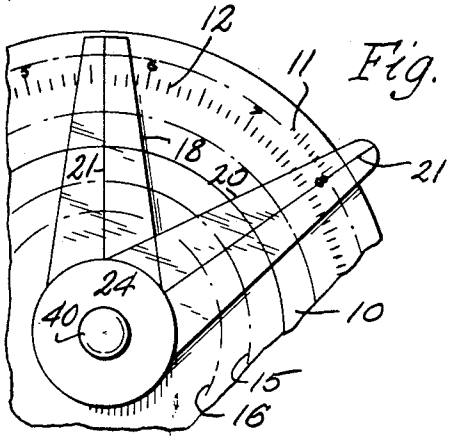


Fig. 2.

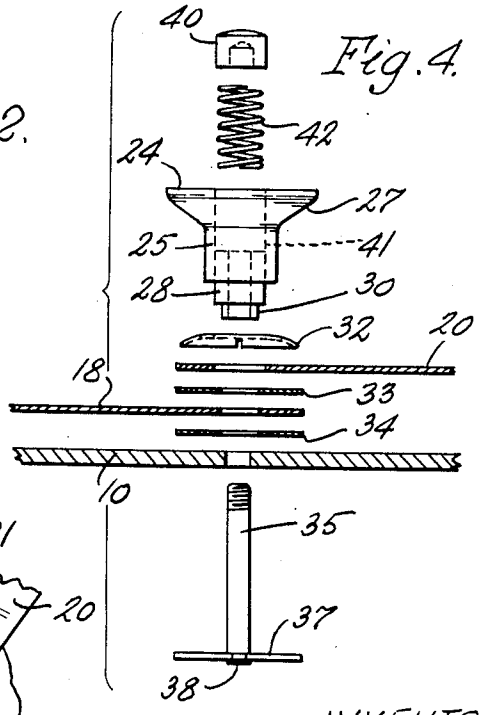


Fig. 4.

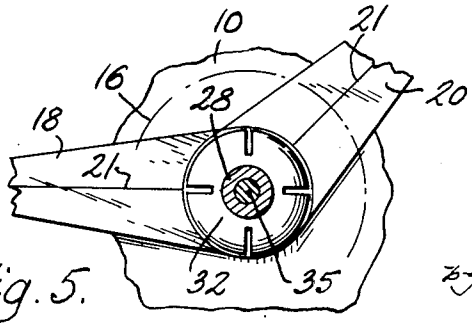


Fig. 5.

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CALCULATING DEVICE

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7 Claims. (Cl. 235—83)

This invention relates to improvements in calculating devices of the type including a graduated disk and a pair of hands or indicators adjustable to be set in accordance with graduations on the disk. This invention relates more particularly to means for adjusting the hands or indicators relatively to each other and to the disk.

One of the objects of this invention is to provide a calculating device of this kind having improved means for adjusting the arms or indicators relatively to each other and to a disk. Another object is to provide a device of this kind in which the disk is rotatably adjustable relatively to the indicators, whereby the operation of the calculating device is greatly facilitated. A further object is to provide an improved clutch mechanism by means of which the disk and indicators may be releasably held in frictional engagement with each other to facilitate rotary adjustment of the disk and indicators relative to each other. Another object of this invention is to provide a calculating device of this kind with a holding member having one of the hands or indicators secured thereto and having the other hand or indicator held in frictional engagement therewith. A further object is to provide a calculating device having a holding member on which the hands or indicators are mounted, and which may be clutched to or declutched from the disk.

A further object is to provide a device of this kind with an indicator assembly consisting of a holding member having one of said indicators secured thereto and having said other indicator held in frictional engagement therewith to facilitate rotary adjustment of said indicators relatively to each other.

Other objects of this invention will appear from the following description and claims.

In the accompanying drawing:

Fig. 1 is a plan view of a calculating device embodying this invention and of the disk on which only a portion of the graduations are shown.

Fig. 2 is a fragmentary plan view thereof, showing the hands or indicators in different positions relatively to the disk.

Fig. 3 is a fragmentary central sectional elevation thereof on an enlarged scale.

Fig. 4 is a similar fragmentary central sectional elevation thereof showing the various parts of the calculating device in separated relation to each other.

Fig. 5 is a sectional plan view thereof, on line 5—5, Fig. 3.

The calculating device includes a graduated plate or disk 10 which may be of any desired form, that shown being circular. The disk is preferably composed of a rigid basic material having a comparatively flexible material secured to one or both faces thereof. A disk of unitary structure may, however, be employed. The bottom face of the disk may be provided with any desired reference data thereon and the top face of the disk may be provided with any number and types of mathematical scales thereon. The scales are preferably arranged concentrically about a central point on the disk having the extremities of each scale coinciding with a radial line assumed to extend outwardly from the central point.

Each scale may be represented by a series of short radial graduations spaced at annular intervals according to the predetermined decimated portions of the scale and designated according to the type and purpose thereof. The designations are preferably arranged with their top extremities outermost from the central point. For example, in the construction illustrated, 11 partially represents a scale having graduations spaced at equal annular intervals, and 12 partially represents a second scale having graduations spaced at annular intervals according to a logarithmic scale. Any additional scales may be provided, such as partially represented at 13 and 14 and indicated by broken circular lines at 15 and 16. Scales of this type are well known in connection with slide rules and other calculating devices for various uses, such for example as adding and subtracting, multiplying and dividing, proportions, percentages, reciprocals, common and natural logarithms of numbers, roots and powers of numbers, trigonometric functions of angles and any desired combinations thereof.

Calculating devices of this kind have heretofore been provided with a pair of hands or indicators which are pivoted to rotate about the central point of a disk and relatively to each other to act more or less in the nature of dividers. Two such hands or indicators 18 and 20 preferably made of transparent material are shown on the accompanying drawing, and each is provided with a hairline 21 formed lengthwise thereon. These hands or indicators are preferably arranged with the hairlines adjacent to the top face of disk 10 and extend radially from an axis which passes through the point about which the scales are arranged on disk 10.

It is desirable in connection with the use of this device to readily adjust the hands or indicators 18 and 20 relatively to each other and to

the disk 10, and this adjustment is facilitated in the construction illustrated by making one of the hands shorter than the other. In the particular construction illustrated, the hand 18 terminates within the periphery of the disk or plate 10, while the hand or indicator 20 extends beyond this periphery, so that the portion extending beyond the periphery may easily be manipulated for adjustment relatively to the other hand or indicator 18.

In order to facilitate the use of the calculating device, I provide suitable holding means, such as a centrally arranged knob or handle 24 which may be of any suitable or desired form and to which one of the hands, preferably the shorter hand 18 is rigidly secured while the longer hand or indicator 20 is frictionally held relatively to the knob 24 so that it may be turned about the knob. It is not essential that the hand 18 be immovably secured relatively to the knob 24, since it is sufficient if the short hand 18 is considerably more difficult to turn relatively to the knob 24 than the hand 20. The knob 24 is constructed so that the disk or plate 10 may swing relatively to the knob and a releasable clutch is preferably provided for this purpose, the clutch being so constructed that when released, the disk may turn freely relatively to the knob, and when the clutch is in engaging position, the disk will be frictionally held in fixed relation to the knob.

Any suitable or desired means for carrying out this relationship between the knob or holding member, the disk and the two hands may, of course, be employed. In the construction illustrated, I have shown by way of example, one embodiment of my invention, but it is understood that it is not intended to limit this invention to the particular construction shown.

The holding member, such for example as the knob or handle 24, may, of course, be of any suitable or desired shape for conveniently holding the calculating device during the use of the same, that shown having a shank 25 provided with an enlargement or flange 27 at the outer end thereof so that the knob may be easily held between two fingers of a hand. The knob is provided with an extension or insert 28 which may be formed integral therewith, and which extends below the shank portion thereof. In the particular construction illustrated, an extension 28 is formed separately and pressed into tightly fitting engagement in a central aperture or bore 41 extending axially through the knob or handle 24, or the knob may be molded about the extension or insert. By making these two parts in separate pieces, the concentric machining of the extension or insert 28 is facilitated to ensure concentricity of the bore of this extension 28 with the periphery thereof and with the portion 30 thereof, and also the knob or handle 24 may be made of a non-metallic material or composition, while the extension 28 thereof may be in the form of a metal sleeve or hollow cylinder. The extension 28 is of smaller diameter than the shank 25 of the knob and extends below the same as shown in Figs. 3 and 4, thus forming therewith an annular shoulder, and extension 28 is also provided at its lower end with a portion 30 of reduced diameter, thus forming another shoulder.

The long hand or indicator 20 is provided with an aperture which fits snugly about the portion of the extension 28 above the reduced portion 30, the fit being such that the hand 20 may be turned about the knob and the extension 28. 32 represents a spring washer which is interposed between the long hand 20 and the shoulder formed by the lower end of the shank 25 of the knob, the spring washer yieldingly engaging the long hand or indicator 20.

The short hand or indicator 18 may be rigidly secured to the knob or handle 24 in any suitable or desired manner, and in the construction illustrated, this hand is provided with an aperture through which the portion 30 of reduced diameter extends. A pair of disks or washers 33 and 34 are arranged above and below the hand or indicator 18 and also fit on the portion 30 of reduced diameter. In order to secure the hand or indicator 18 on the knob or handle, the outer or lower end of the reduced neck portion 30 may be riveted or swaged over so as to bind the washers 33 and 34 and the short hand 18 securely on the neck portion 30 of the extension 28. When these parts are assembled in this manner, it will be noted that the upper washer 33 also forms a bearing surface against which the lower face of the longer hand 20 is forced into frictional engagement by means of the spring washer 32. Any other means for securing the short hand 18 on the knob or handle may, of course, be employed.

The extension or insert 28 of the knob or handle 24 is provided with a central bore or aperture in which a pivot pin 35 is slidably arranged. This pivot pin also extends through the central aperture in the disk 10, in such a manner that the disk may rotate freely about the pivot pin 35. The lower end of the pivot pin has a friction disk or washer 37 rigidly secured thereto in any suitable or desired manner, for example, by forming the end of the pivot pin of reduced diameter to extend through an aperture in the friction disk or washer 37. The end of this reduced portion of the pivot pin may then be riveted or peened over as indicated at 38, so that the friction disk or washer 37 will be rigidly secured to the pivot pin 35 and will bear against the underface of the disk or plate 10.

The means provided for frictionally holding the disk or clutch member 37 yieldingly and releasably in engagement with the disk 10 are, in the particular construction illustrated, formed as follows: The pivot pin 35 extends above the extension 28 of the knob or handle 25 into an aperture 41 thereof, which is of larger internal diameter and the pivot pin is provided at its upper end with an enlargement such, for example, as a button or nut 40, the upper end of which extends beyond the top surface of the knob or handle 24. The button 40 may be secured in any suitable manner to the pivot pin, for example, by providing a screw thread at the upper end of the pivot pin which may engage with an internal screw thread on the button 40. The button is formed to slidably fit the aperture 41 extending through the knob or handle 24, and a coil spring 42 is interposed between the button and the upper end of the extension 28. It will thus be seen that the spring 42 yieldingly urges the pivot pin 35 in an upward direction, thus causing the friction disk or washer 37 to be urged into frictional engagement with the bottom surface of the disk or plate 10. When the button 40 is pressed against the action of the spring 42 into the recess or aperture 41 of the knob 24, the pivot pin 35 will move downwardly so that the friction disk or washer 37 moves out of gripping engagement with the disk or plate

10, thus making it possible for this plate or disk to easily turn about the pivot pin.

In the use of my improved calculating device, the knob 24 is preferably held between the middle and index fingers of the hand with the thumb positioned against the button 40. The device is preferably held in such a manner that the short hand 18 which is secured to the knob extends upwardly or away from the user. This manner of holding has the advantage that the numbers or designations on the scales will always be in an upright position on the top portion of the disk when held in front of the user, which greatly facilitates the use of the calculating device. In the use of the device, the button 40 is then pressed inwardly by the thumb so that the disk 10 may be rotated so that the desired graduation thereon is directly under the hairline 21 of the short hand 18. When this has been done, the pressure on the button 40 is released, thus clutching the hand 18 to the disk in the desired position. The longer hand 20 may then be moved to another graduation on the disk, by pushing the outer end thereof projecting beyond the periphery of the disk and moving the same about the knob 24 and the disk 10. This adjustment of the long hand 20 is made possible by the fact that this hand is held frictionally on the knob by the spring washer 32, and adjustment of this hand is effected while the short hand 18 is clutched to the disk. Consequently, relative movement of the long hand about the knob or handle will not change the adjustment of the short hand relatively to the disk. In this manner, the two hands or indicators 18 and 20 are positioned at the desired angle relatively to each other. In order to move both hands simultaneously, the button 40 is pressed, and the disk may then be rotated to place the desired graduation under either hairline.

For example, if it is desired to multiply 7 by 8, the button 40 is pressed and the disk 10 turned until the hairline on the short hand 18 lies in registration with the graduation designated by the number 7 on the scale 12. When this hairline is correctly positioned, pressure on the button 40 is released so that the short hand 18 is clutched to the disk 10. The long hand 20 is then moved about the knob 24 until the hairline thereon lies over the graduation designated by the number 10 on scale 12. The parts will then be in the position shown in Fig. 1. When this has been done, the button 40 is again pressed and the disk turned until the hairline on the hand or arm 20 registers with graduation designated by the number 8 on scale 12, as shown in Fig. 2. When this is done, it will be noted that the hairline on short arm 18 indicates the answer 56 on scale 12.

I claim as my invention:

1. A calculating device comprising a plate having a series of mathematical graduations arranged thereon about an axis, a pair of indicators extending radially across the graduated face of said plate, a holding member on which said plate is mounted to swing about said axis, one of said indicators being mounted on said holding member to normally move therewith and the other indicator being frictionally held on said holding member to turn about the same relatively to said first mentioned indicator, and means extending through said holding member and operable at will for locking and unlocking said plate relatively to said holding member.

2. A calculating device comprising a plate having a series of mathematical graduations arranged thereon about an axis, a pair of indicators extending radially across the graduated face of said plate, a holding member having a pivot member on which said plate is mounted to rotate about said axis, a clutch member for frictionally gripping said plate to hold the same against rotation about said pivot member, means operable for releasing said clutch member from engagement with said plate, means for rigidly securing one of said indicators to said holding member, and means for frictionally holding said other indicator for rotary adjustment about said holding member.

3. A calculating device comprising a plate having a series of mathematical graduations arranged thereon about an axis, a pair of indicators extending radially across the graduated face of said plate, a holding member, a pivot pin extending through said holding member and on which said plate is mounted to rotate about said axis, a friction disk secured on said pivot pin, means normally urging said pivot pin into a position in which said friction disk engages said plate for holding the same against movement relatively to said holding member, said pivot pin being movable axially relatively to said holding member to move said friction disk out of frictional engagement with said plate, means for rigidly securing one of said indicators on said holding member, and means for frictionally supporting said other indicator on said holding member for rotary movement about the same.

4. A calculating device comprising a plate having a series of mathematical graduations arranged thereon about an axis, a pair of indicators extending radially across the graduated face of said plate and mounted to swing about said axis, a holding member having a shouldered extension to which one of said indicators is rigidly secured, means on said holding member for yieldingly urging the other of said indicators into frictional contact at one side of said first mentioned indicator, means for yieldingly urging said plate toward the other face of said first mentioned indicator for frictionally securing said plate and first mentioned indicator in the desired relationship to each other, and means for releasing said frictional engagement between said plate and said first mentioned indicator during the use of said device.

5. A calculating device comprising a plate having a series of mathematical graduations arranged thereon about an axis, an indicator assembly mounted on said plate to turn about said axis, and including a holding member, an indicator arranged in fixed relation to said holding member, and a second indicator mounted on said holding member and adjustable relatively thereto, means for normally clutching said indicator assembly and said plate to each other, and means operable during the use of said device for declutching said assembly and plate.

6. A calculating device comprising a plate having a series of mathematical graduations thereon arranged about an axis, an indicator assembly mounted on said plate to turn about said axis, and including a holding member, an indicator carried by said holding member, a second indicator mounted on said holding member, each of said indicators extending into operative relation to said graduations, said second indicator being readily adjustable relatively to said holding member and to said first indicator to enable said second indicator to be moved into various angu-

lar relations to said first indicator in accordance with said graduations, a pivot arranged concentric with said axis and connecting said plate and indicator assembly, means for normally clutching said indicator assembly and said plate to each other, and means operable during the use of said device for declutching said assembly and plate, to permit both indicators to be moved relatively to said graduations without changing the spacing of said indicators relatively to each other.

7. A calculating device comprising a plate having a series of mathematical scales arranged thereon about the axis of a hole therein, an indicator assembly including a holding member, an indicator arranged in fixed relation thereto, and a second indicator mounted on said holding member, each of said indicators extending into operative relation to said graduations, said second indicator being readily adjustable about said indicator assembly about the axis of said hole in said plate and relatively to said first indicator to enable said second indicator to be moved into various angular relations to said first indicator in accordance with said scales, a part pivotally connecting said indicator assembly and said plate and fitting snugly in said hole in said plate for axial alinement of said indicator assembly with said hole in said plate, means for normally clutching said plate and indicator assembly to each other, and means operable during the use of said device for declutching said plate and indicator assembly.

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