Oct. 28, 1930. M. P. HITE 1,780,078

CALCULATING DEVICE

Filed April 23, 1929

Fig. 1.

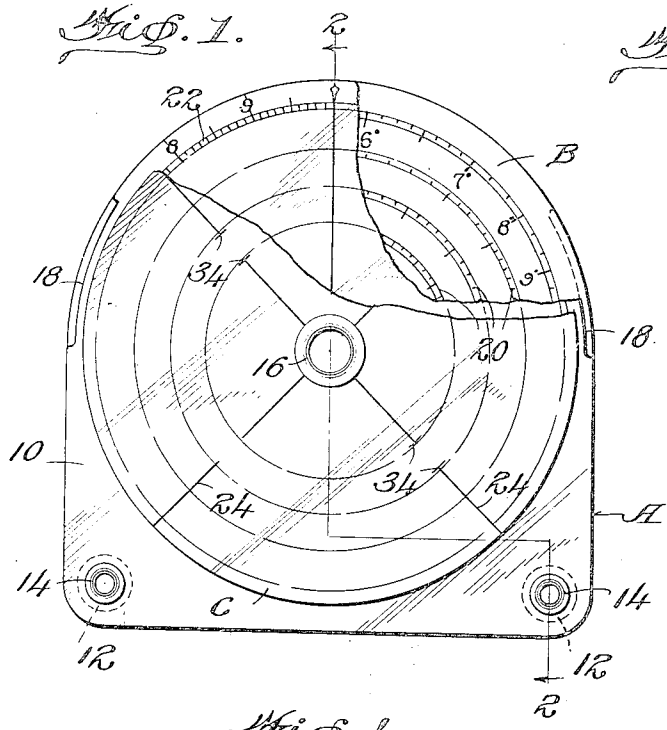


Fig. 2.

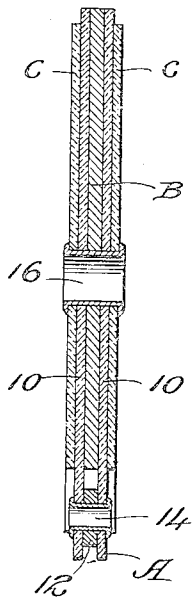


Fig. 4.

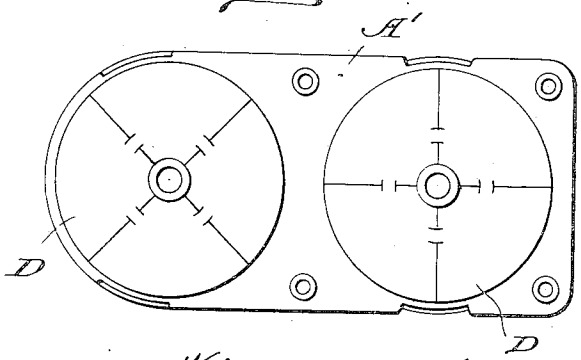


Fig. 3.

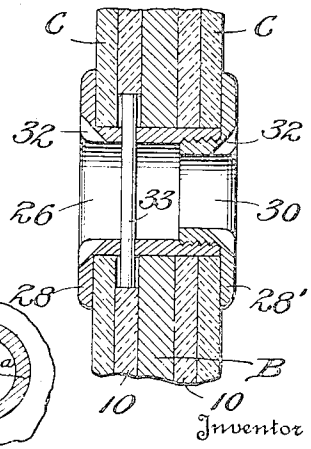


Fig. 5.

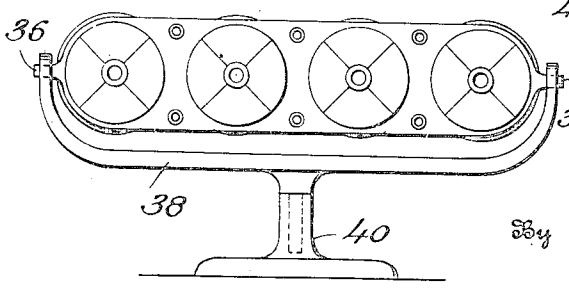
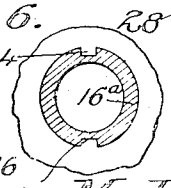


Fig. 6.



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UNITED STATES PATENT OFFICE

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CALCULATING DEVICE

Application filed April 23, 1929. Serial No. 357,549.

My invention relates to calculating devices of the well known slide rule type, and has particular reference to an improved calculating device of this type consisting essentially of a plurality of superimposed members connected together for relative rotation.

An object of my invention is to provide a calculating device, operating on the general principle of a slide rule, which is compact in form, conveniently portable and economical in manufacture.

A further object is to provide a calculating device which may be used and operated entirely by one hand.

A further object is to provide a calculating device so shaped that one end may be readily distinguished from the other by touch or by sight to facilitate use of the device.

A further object is to provide a calculating device which may be made in forms wherein many different scales may be grouped in operative relation.

A further object is to provide a calculating device partially or wholly demountable at will.

With the foregoing and other objects the invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described and illustrated in the accompanying drawings, and defined in the appended claims.

In the drawings, wherein like characters of reference denote corresponding parts in the different views:—

Figure 1 is an elevation with parts broken away to show details of the arrangement of a preferred form of my calculating device.

Figure 2 is a section on the line 2—2 of Fig. 1 in which the lateral dimensions are considerably exaggerated to more clearly illustrate the construction.

Figure 3 is a sectional detail of a demountable form of central mounting for connecting the disk elements with the frame of my device.

Figure 4 is an elevation of another form of my device.

Figure 5 is an elevation of still another form of my device; and

Figure 6 is a detail sectional view illustrating an alternative form of mounting for connecting the disk and frame elements of my device.

Referring first to Figures 1 and 2 of the drawings, it will be observed that according to one embodiment of my invention a frame A is provided and that said frame consists of a pair of relatively thin plates 10, 10 of suitable transparent material, such for example as celluloid, secured together in overlying spaced relation with respect to one another. These plates 10, 10 are duplicates of one another in all physical respects, each preferably having spaced parallel side edges, one straight end edge and an opposite end edge which is of arcuate shape, this latter edge being curved from a center located midway between the side edges and any suitable distance from the straight end edge. The side edges and the straight end edges of the plates preferably are joined by rounded corners and near these corners, also at other points if desired, spacing members 12, 12 are placed between the plates to maintain them in spaced relation, said plates being secured together by rivets or other suitable fasteners 14, 14 engaged through said plates and said spacing members.

Disposed between the frame members 10, 10 is a disk B of any suitable opaque material, while disposed against the outer face of each of said frame members is a thin, transparent disk C. These disks B and C are apertured at their centers and rotatably mounted on a rivet or other suitable form of pintle 16 which extends through the frame members 10 at the centers of the arcuately curved end portions thereof and which serves to secure said disks in assembly with said frame, said rivet frictionally engaging said frame members whereby it is held against rotation with respect to the frame.

The opaque disk B is of the same or of slightly less radius than the radii of the curved end portions of the respective frame elements 10, and said frame elements are provided at one or more points with alined pe-

ripheral recesses 18 to expose a peripheral portion or portions of said disk for finger engagement to effect its rotation. The disks C, C on the other hand are of sufficiently less radius than the disk B so that their peripheries are disposed inwardly of the recesses 18 whereby the likelihook of a person's fingers engaging and unintentionally rotating either disk C during rotation of the disk B is avoided. In this connection it will be observed that due to the pintle 16 being held against rotation relative to the frame, rotation of any given disk will not rotate the pintle and thereby rotate any other disk.

Circular scale graduations 20 are placed on either or both sides of the opaque disk B and other relating or cooperating scales 22 are placed on the frame members 10, 10 in concentric relation with the scale graduations of the opaque disk B. The scale graduations, numberings, etc. on the frame members 10, 10 are preferably placed on the inner faces of said members next to the opaque disk B so that the graduations of the frame elements and the opaque disk lie as closely as possible in the same plane.

The transparent disks C, C bear one or more radial indicating or runner lines 24. I find that by placing more than one runner line on each disk C the amount of rotation of said disk necessary to effect a given computation is considerably reduced; hence, I prefer to employ a plurality of runner lines on each disk C.

My device is adapted for operation by touch from the outside, that is, the transparent frame A is intended to be held in the palm of the hand and the opaque disk B is adapted to be rotated by placing the thumb and one finger of the same hand on opposite sides of the edge of the opaque disk B as permitted by the recesses 18. As the thumb and finger are thus in a position of opposition the disk B may be turned in either direction and be very accurately positioned. While the device is held in one hand the thumb may be dropped from the former position to one on the face and near the edge of the runner disk B being used and said disk thus moved as desired.

The transparent parts of my device may be of glass, quartz or other transparent material but celluloid is preferred. By experiment I have found that the runner disks C, C, when formed of celluloid, have a tendency to become concave and dish their edges outward away from the transparent frame. As these runner disks are circular in shape it would be practicable to reverse them at will to change their concavity if the device were demountable; also the device could be more easily cleaned when demounted. I find that cleaning is desirable because dust and dirt tends to collect between the various members, particularly when the device is carried loose in the pocket. Accordingly, I have devised a simple demountable mounting for the disks as shown in Fig. 3 of the drawing. The demountable form of central mounting shown in Fig. 3 consists of a tube 26 with an interior thread at one end and a flange 28 at the other end. Another tube 30, exteriorly threaded at one end and having a flange 28′ at the other end, is adapted to be screwed into the tube 26 so that the frame elements and the disk are confined between the flanges of said tubes. Slots 32 for the reception of a screw driver are placed at the base of the flanges of each tube to facilitate turning thereof, and a pin or pins 33 is or are passed through holes in the tube 26 into slots cut in one or both of the frame elements 10 for the reception of said pin or pins whereby rotation of the central mounting relative to the frame is prevented. By reason of this demountable mounting the device may be disassembled at will either for cleaning purposes or for reversal of the disks.

When my device is assembled either by means of the rivet 16 or the members 26 and 30, the graduations on each side of the opaque disk B will appear and be read through two transparent mediums, viz, one of the transparent frame elements 10 and one of the runner disks C. The graduations on the inner face of each transparent frame element 10 will likewise be read through that frame element and one of the transparent runner disks. This means of course that my device embodies two distinct calculating means, one at each side of the frame A, the opaque disk B being common to both.

Usually the runner lines 24 are placed on the back or inner face of the transparent runner disks to avoid shadows. Accordingly, reversal of these disks would require that the runner lines be placed on both faces of said disks so that no matter which face of either disk was turned inward, that face would bear the runner lines. In some cases it is desirable to have a short break in the continuity of the runner lines so that any particular runner line may be more exactly set over another line positioned beneath it on the transparent frame or on the opaque disk, the lower line appearing through the opening in the runner line more distinctly than elsewhere. I preferably form this break in all of the runner lines of each transparent runner disk, making the breaks the width of and coincident with a graduated scale beneath. This has the value of causing that particular scale to stand out and to assist in distinguishing other scales where a great many scales are concentrically arranged as is usually the case. To assist this effect I provide a short segment of a circle as indicated at 34 at the ends of the break in each runner line and dispose these circular segments slightly out of registry with the limiting circle of the scale.

In practice I find that the whole frame may

tend to warp slightly, causing the transparent disk to leave the frame at one point while hugging it at others. If a plurality of runner or indicating lines are used the runner disks may remain in some advantageous position and need be rotated only a small distance either direction.

By the reason of the irregular shape of the frame A of my device correct positioning of the device for use is greatly facilitated.

Figure 6 of the drawings illustrates an alternative structural arrangement for locking the frame against rotation relative to the pintle on which the disks are rotatable. The pintle 16^a is exteriorly grooved as indicated at 42 and one or both of the frame elements 10 is or are provided with a spline or splines 44 fitting into said groove or grooves.

In the form of my invention shown in Fig. 4 of the drawings, two complete devices D, D are embodied in a single frame A', it being apparent from the disclosure of this figure that any desired plurality of devices may be embodied in a single frame. This form is readily portable and may be made in pocket size.

In the form of my invention shown in Fig. 5 of the drawing, a plurality of devices are embodied in a single frame and this frame has its ends extended and formed into trunnions 36 which are received in bearings in the end of a U-shaped standard 38 so that the whole device may be rotated on its axis, this U-shaped standard 38 in turn being rotatably mounted on a base 40. This latter form of my invention is contemplated for desk use and may be of considerable size.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:—

1. A calculating device comprising a transparent frame element of irregular shape inclusive of a portion of arcuate form provided with a peripheral recess, a pair of disks disposed, respectively, against opposite faces of said frame element with their peripheries concentric with the arcuate portion of said frame element, and means providing a common axis of rotation for said disks and mounting the latter on said frame element, one of said disks being of a radius such that its periphery is disposed inwardly of the recess in said frame element, and the other of said disks being of no greater radius than the arcuate portion of said frame element and of such radius that its periphery is exposed at the peripheral recess in the arcuate portion of the frame element.

2. A calculating device comprising a transparent frame element of irregular shape and inclusive of a portion of arcuate form provided with a peripheral recess, a pair of disks disposed respectively against opposite sides of said frame element with their peripheries concentric with respect to the arcuate portion of said frame element, one of said disks having a radius less than the radius of the arcuate portion of said frame element and the other having a greater radius than the first disk and no greater than the radius of the arcuate portion of said frame element, said disks and said frame element being provided with cooperating calculating means.

3. A calculating device comprising a transparent frame element, an opaque disk disposed against one side of said frame element, a transparent disk disposed against the other side of said frame element, means connecting said disks to said frame element for rotation with respect thereto and with respect to one another, cooperating calculating means on said frame element and said disks inclusive of circular scale graduations concentrically arranged on said frame element and on said opaque disk, and a radially disposed interrupted runner line on said transparent disk.

4. A calculating device comprising a frame, a disk rotatably mounted on said frame, said disk and said frame being provided with cooperating calculating means, said frame when held upright being inclusive of a top portion disposed above a substantially central horizontal plane and a bottom portion disposed below said plane and providing a hand grip for holding the device, said frame being provided with a peripheral recess in each of two opposite side portions thereof to afford access for thumb and finger engagement, respectively, of one hand with the periphery of said disk while the device is held in the palm of the same hand, said recesses being disposed substantially entirely above said central horizontal plane whereby the lower portion of the frame immediately adjacent to said plane is adapted to be gripped by the third finger of the hand for steadying the device during operation thereof.

5. In a calculating device, a scale element, a runner line carrying element arranged in superimposed relation to said scale element and movable with respect thereto, at least one of said elements being transparent, scale graduations on the scale element, and a runner line on the second mentioned element interrupted to expose portions of the scale graduations thereby to facilitate registration of the end portions of said runner line adjacent to the interruption with the scale graduations of the scale element.

In testimony whereof I hereunto affix my signature.

MELVILLE P. HITE.