July 26, 1932. J. R. DEMPSTER 1,868,816

DISK SLIDE RULE

Filed Sept. 24, 1928

FIG. 2.

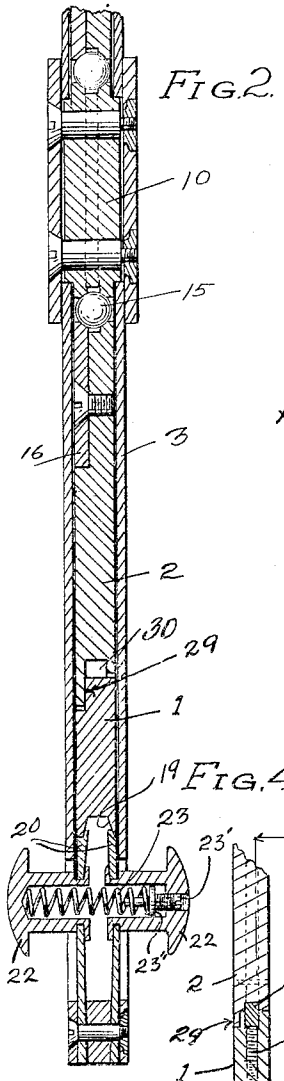


FIG. 1.

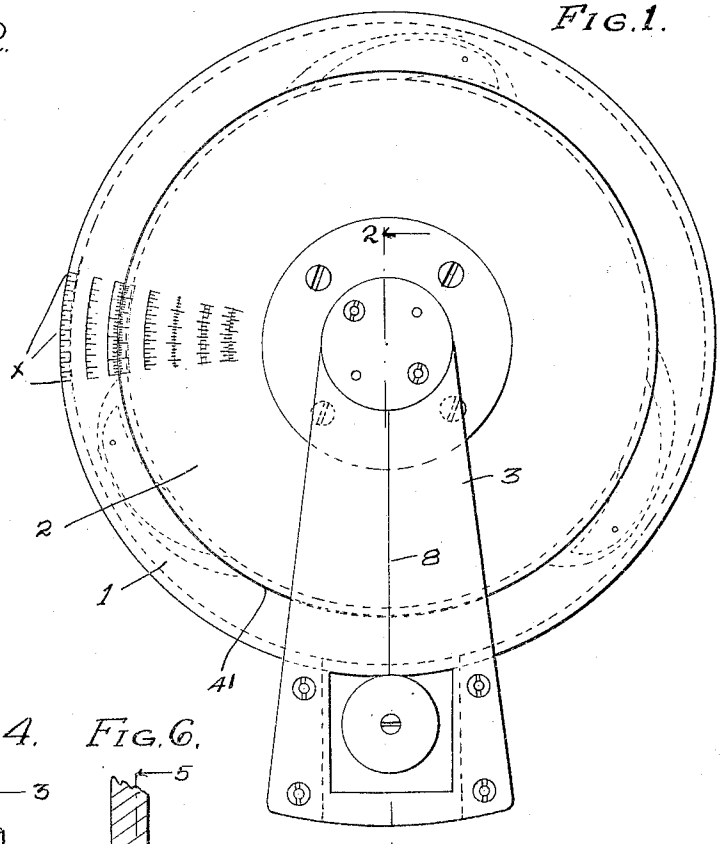


FIG. 4.

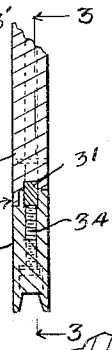


FIG. 6.

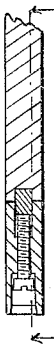


FIG. 5.

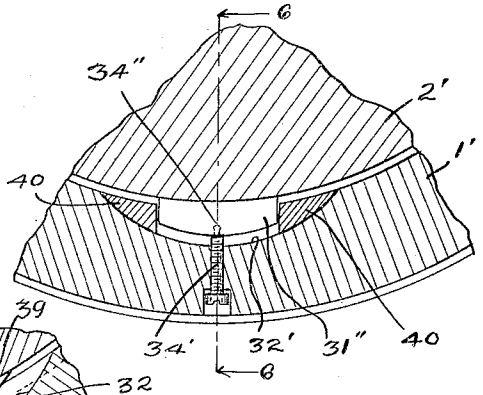
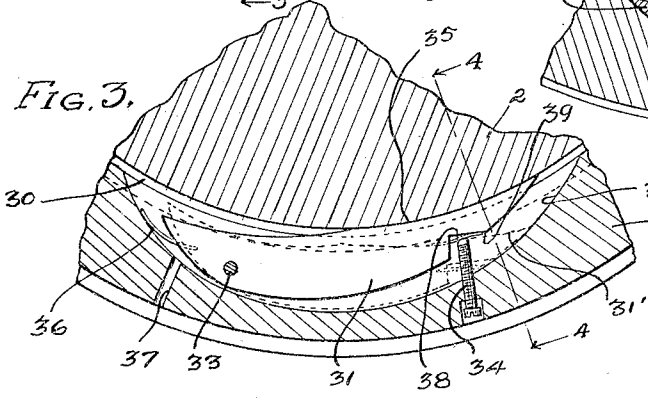


FIG. 3.



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UNITED STATES PATENT OFFICE

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DISK SLIDE RULE

Application filed September 24, 1928. Serial No. 307,970.

This invention relates to slide rules of the disk type as shown particularly in my copending patent application filed under Serial No. 273,795 on April 30, 1928 and has for its objects the improvement of the construction of such rules whereby the operation is better and adjustments of the working parts may be effected.

The general construction of the present rule being substantially the same as in the copending case no unnecessary explanation of parts previously described will be included herein, but the case condensed to the salient features constituting the improvements.

In the drawing, Fig. 1 is a plan view of my improved disk slide rule.

Fig. 2 is an enlarged section of the device as seen from the lines 2—2 of Fig. 1.

Fig. 3 is an enlarged section of a portion of the device taken at a point above one of the retaining shoes as seen from the line 3—3 of Fig. 4.

Fig. 4 is a cross section of the device as of Fig. 3 as seen from the line 4—4 thereof.

Fig. 5 is a sectional view similar to that of Fig. 3 but showing a modified form of retaining shoe.

Fig. 6 is a cross section of Fig. 5 as seen from the line 6—6 thereof.

In further detail, and with parts numbered to correspond with the similar parts shown in my copending case aforesaid, 1 is the outer ring revolvable around an inner ring 2 from the center of which a runner 3 is pivotally supported so as to be revolvable around the rings for reading of the rule graduations against the hair line 8 of the runner, it being understood that the disk rings are graduated all over with any desired divisions as indicated at X, and preferably on both sides of the disks.

The pivotal mounting of the runner 3 in the present case is shown to include special features claimed in the copending case such as a hub 10, row of balls 15 and flange 16, and the outer edge of ring 1 is grooved in any manner but here shown at 19 as slightly beveled and frictionally gripped by a pair of plates 20 resiliently forced apart by a spring 23 which may be compressed by finger grips or buttons 22 for releasing the plates to permit free revolution of the runner, and for locking the same upon release of these grips.

Since the absolute control of the runner is vital to fine readings I provide means for determining at all times the effective pressure of the plates 20 upon the sides of the groove and which comprises a screw 23′ threadedly passing through one of the grips 22 and impinging upon a rivet head 23″ loosely positioned within the coils of spring 23.

Rings 1 and 2 instead of being mortised into one another as in the copending case, are formed with a flange as at 29 on either member overlying the other and seated flush in a step therein, so that the rings may easily be assembled by simply dropping one into the other.

In the edge of either one of the adjacent surfaces of the rings a groove is cut as at 30 into which a shoe 31 carried by the other ring is adapted to engage for splining the rings together so that they are held in surface relation while free to rotate one within the other.

Several of these shoes are used, preferably three or four around the circumference of the device and in Fig. 3 the shoe 31 is shown as a curved segment or crescent shoe piece lying within a curved recess 32 milled out of the outer ring 1, and the shoe pivoted at 33 preferably through one wall only of the ring, so as to interfere as little as possible with the graduations of the disk, it being proper to remark here that the rings are usually constructed of celluloid or similar material, the shoes and pins of other material, preferably metal, though they may be of the same material as the rings if desired.

Means, such as a screw 34 extending through the outer ring is provided for controlling the force with which each shoe presses against the bottom of groove 30 and the shoe is curved concentrically with the inner ring along its contacting portion as at 35. Screws 34 may be of celluloid so that no change in adjustment of the shoes will

result from differences in expansion and contraction of the parts through temperature and/or humidity variations.

The crescent shoe and milled housing recess 32 are of such relative sizes as to permit the shoe being backed completely out of the groove 30 to the dotted position 31′ so that the inner members 1 and 2 may easily be assembled or disassembled, and to facilitate which I provide a very fine wire spring 36 in the heel of the shoe bearing against the housing recess 32 and tending to force shoe to released position when screw 34 is backed out. Also provided is a hole 37 in ring 1 adjacent the heel of the shoe arranged to permit the insertion of a wire or tool for tipping the shoe back on its pivot in case the spring 36 should fail to work.

In some cases it is desirable to provide a small leaf spring 38 on the shoe under the end of the screw 34 adjacent the step 39 formed in the segment so that there will be a slight give to the screw pressure, though the spring may be forced down against the step if desired.

A variation of the shoe construction is shown in Fig. 5 and in which the outer and inner rings are designated 1′ and 2′ respectively, shoe 31″ here shown as movable perpendicularly with respect to member 2′ and guided by small shoulder blocks 40 cemented or otherwise secured within the shoe housing recess 32′, and a screw 34′ is arranged to impinge directly upon the shoe or block.

This screw preferably has some swivel or other connection to the shoe so that the latter will be drawn outward upon unscrewing the screw, such for instance as a small protrusion 34″ entering a very small hole in the shoe, the protrusion being just a bit larger at its extreme end so as to offer resistance to withdrawal though not preventing withdrawal so that the unscrewing of the screw will pull the shoe outwardly to clear member 2′, but if desired the screw may be backed out entirely.

It is of course apparent that the shoes of either construction shown in Fig. 3 or 5 could be omitted and the screws 34 directly enter the groove 30, but the shoes have the advantage of greater bearing area on all sides and permit of finer sustained adjustment.

From the above showing it will be evident that still other modifications of the improvements may be made, and any such as come within the spirit of the invention are intended to be covered in the appended claims.

A valuable result of the above construction, apart from a perfect control of the sliding friction of the rings 1 and 2, is had in holding ring 2 slightly eccentric with respect to ring 1 in order to compensate for any slight eccentricity of the rings or graduations relative to the inner and outer peripheries of the rings, a space between the rings designated at 41 of about a hundredth of an inch more or less being provided for the particular purpose of permitting the eccentric adjustment of the rings relative to one another.

Attention is called to the fact that the construction of the inner disk 2 with a flange at 29 (see Fig. 2) and which may be of any desired breadth, produces a different diameter of parting line (41) of the rings 1 and 2 at opposite sides of the rule which is of considerable value with some forms of graduations used on the opposite sides of the rings, and I therefore enter a specific claim to this feature in addition to the other features described.

I claim:

1. In a slide rule of the character described, adjacent slide rule members movable relatively to one another, a groove in the edge of one of the members, and a shoe pivotally secured to the opposite member arranged to fit within said groove for splining the members together, said shoe positioned in a recess in its carrying member, a spring arranged to resiliently force the shoe into the groove and means for adjusting the effective pressure of the spring.

2. In a slide rule of the character described, adjacent slide rule members movable relatively to one another, a groove in the edge of one of the members, a shoe carried by the opposite member arranged to fit within said groove for splining the members together, said shoe secured to the opposite member to insure against circumferential displacement thereto, and means for forcing said shoe in contact with the grooved member.

3. In a slide rule of the character described, adjacent slide rule members movable relatively to one another, a groove in the outer edge of one of the members, a shoe carried by the opposite member arranged to fit within said groove for splining the members together and means for forcing said shoe in contact with the grooved member, and separate means for releasing said shoe when the forcing means is withdrawn.

4. In a disk slide rule of the character described, flat rule members revolvable one within the other, and means arranged and adapted for forcing and maintaining the members into slightly eccentric relation.

5. In a disk slide rule of the character described, flat rule members revolvable one within the other, and means arranged and adapted for forcing and maintaining the members into slightly eccentric relation comprising a plurality of movable devices spacedly positioned around one of the members arranged and adapted to engage the other member while permitting revolvable movement of the members relatively.

6. In a structure as specified in claim 5, said devices comprising each a shoe pivoted to one of said members engaging a peripherical portion of the other, and means for adjusting the position of said shoe.

7. In a structure as specified in claim 5, said devices comprising each a shoe pivoted to one of said members engaging a peripherical portion of the other, and means for adjusting the position of said shoe, said shoe being of crescent form seated in a crescent-shaped housing in its carrying member.

8. In a structure as specified in claim 5, said devices comprising each a shoe pivoted to one of said members engaging a peripherical portion of the other, and means for adjusting the position of said shoe, said shoe being of a crescent form seated in a crescent-shaped housing in its carrying member and a screw in said carrying member impinging against said shoe for adjusting the same on its pivot.

9. In a slide rule of the character described, rule members slidable relatively to one another, a shoe pivoted in a recess in one member arranged to bear at one side of the pivot against the opposite member, means adapted for forcing said shoe against said opposite member, and a spring at the opposite side of the pivot active upon said shoe to force same to released position.

10. In a disk slide rule, inner and outer circular rule members arranged with opposite sides respectively in flush relation, one of said members provided with a flange overhanging the other and seated in a step therein, and a shoe mounted in one of said members arranged to move into engagement with the other of said members for splining the same together.

JOHN R. DEMPSTER.