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2,701,687

SLIDE RULE

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FIG. 1.

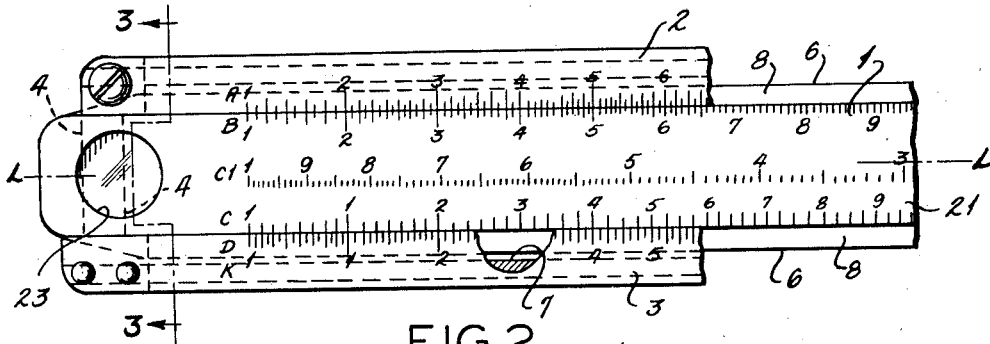


FIG. 2.

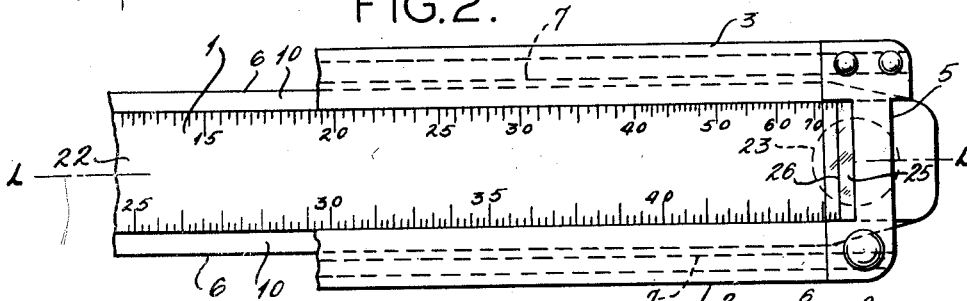


FIG. 3.

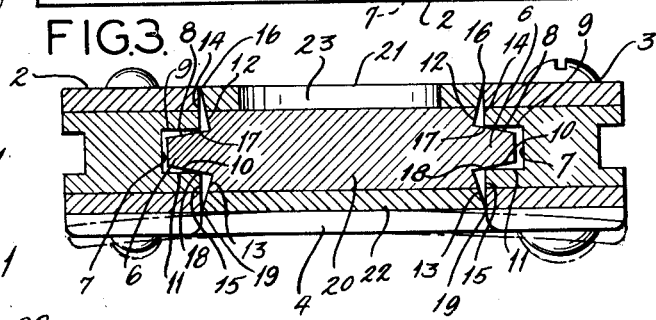


FIG. 5.

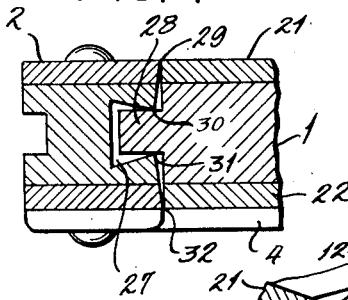
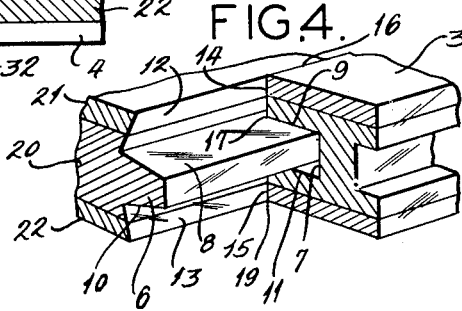


FIG. 4.



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SLIDE RULE

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8 Claims. (Cl. 235—70)

This invention relates generally to slide rules of the type wherein a slide is arranged to be moved longitudinally between two rails, all having indicia thereon.

In slide rules of the character referred to, it is desirable that the slide be made as freely movable as possible lengthwise of the side rails and, at the same time, that the slide retain a set position between readings from one scale to another. As heretofore constructed, any increase in retentivity of setting has been at the sacrifice of free running and vice versa.

The object of the present invention, generally stated, is to provide a slide rule wherein the slide is freely manipulatable, yet highly retentive of setting.

In order to accomplish these results and others which will be apparent to those skilled in the art as the following description proceeds, the invention contemplates that the usual tongue-and-groove connection between the slide and the rails, as well as the usual cooperating shoulders between the slide and the rails, be formed so as to confine their contact with each other substantially to a point at any given cross-section.

This is accomplished by forming the cooperating surfaces so that they are deliberately out of parallel relationship with each other. By so doing, spaces are provided adjacent the points of contact, and these spaces may be charged with lubricant. Moreover, the invention contemplates that the side rails be fixedly connected with each other in such manner as to provide slight yieldability in the spaced relationship between said rails, and consequently the grip exerted by the rails upon the slide therebetween may be adjusted without releasing any fastening. The invention further contemplates the provision of a thumb grip on the end of the slide.

In the accompanying drawings:

Figure 1 is a plan view of one end of the front of a slide rule constructed in accordance with the present invention;

Figure 2 is a plan view of the back of the rule shown in Figure 1, but at the opposite end;

Figure 3 is a sectional view taken along line 3—3 of Figure 1;

Figure 4 is a perspective view of a portion of the tongue-and-groove connection between the slide and the side rails of the rule shown in Figure 1, said parts being broken away to reveal their cooperating relationship; and

Figure 5 is a sectional view corresponding to Figure 3, but showing a different embodiment.

In the embodiments shown in the drawings, the slide rule of the present invention is illustrated in its application to slide rules of the duplex type, but it is to be understood that some of the features thereof are applicable as well to slide rules of the familiar Mannheim type having a one-piece back.

In the embodiment illustrated in the drawings, the slide rule is provided with a slide 1 arranged to move lengthwise between spaced side rails 2 and 3. The side rails 2 and 3 are connected together by a bracket 4 at one end and a bracket 5 at the other end, said brackets in the embodiment illustrated being on the back of the rule so that the front of the rule is free of interconnections between the two side rails 2 and 3. The brackets 4 and 5 may be formed of metal such as aluminum, stainless steel, or brass, so as to be relatively rigid in the direction which restrains the rails 2 and 3 from movement which would disalign the indicia thereon. In their thickness dimension, however, the brackets 4 and 5 are relatively thin, so as to be yieldable under forces tending

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to bend them about the longitudinal axis L—L of the rule.

The slide 1 has a tongue-and-groove connection with each of the rails 2 and 3. In the embodiment shown, the tongues 6 are formed on the slide to be received within grooves 7 on the inner sides of the respective rails 2 and 3. The present invention particularly contemplates that the planar side walls of the tongues 6 be out of parallel relationship with the planar side walls 9 of the grooves 7. To take full advantage of the present invention, the opposite side walls 10 of the tongues 6 are similarly out of parallel relationship with their cooperating side walls 11 of the grooves 7.

Above and below the tongues 6, the slide 1 has shoulders 12 and 13, which cooperate respectively with shoulders 14 and 15 on the side rails. The invention contemplates that these cooperating shoulders be out of parallel relationship.

With the cooperating side walls and the cooperating shoulders out of parallel relationship, as just described, contact between the slide 1 and the rails is limited at any given cross-section to points 16, 17, 18, and 19, so that, as the slide 1 moves between the rails 2 and 3, the friction between the parts is limited to longitudinal lines of contact coincident with the four points 16, 17, 18, and 19. Between contact points 16 and 17, as well as between contact points 18 and 19, a triangular shaped space is provided. Between contact points 17 and 18, a U-shaped space is provided. In the spaces just described, a charge of lubricant may be packed. A lubricant highly suitable for the purpose is that known on the market as silicone grease.

In the embodiment shown, the slide is composed of a core 20 of wood, magnesium, aluminum, or other suitable material, and the tongues 6 are integral with the core. At the opposite sides of the core 20, facing strips 21 and 22 are adhesively secured. The facing strips may be formed of Celluoid or other cellulose or plastic products, preferably white, so that the usual indicia thereon are clearly visible. Adjacent each one of the facing strips 21 and 22, beyond the indicia thereon, an aperture 23 is provided in said facing strips. As shown, the aperture extends entirely through the respective facing strips, so as to expose thereat the surface of the core 20. Thus an indentation in the surface of the slide is provided, which facilitates gripping by the thumb of a user and thus expedites manipulation of the slide.

As pointed out hereinbefore, the brackets 4 and 5 are relatively more yieldable in the direction which permits them to bend about the longitudinal axis L—L of the rule, whereas they are relatively rigid against bending forces exerted in any other direction. In cooperation with the non-parallel relationship between the side walls 8 and 9 of the tongue and groove, respectively, such flexibility about the longitudinal axis L—L contributes toward free running of the slide without reducing its setting retentivity. In the process of moving the slide 1 longitudinally between the rails 2 and 3, a force applied to the slide in the usual manner has a component, albeit small, in the transverse direction. This transverse-force component tends to bend the brackets 4 and 5 toward the position shown in dotted lines in Figure 3. The dotted lines in Figure 3 depict the bending of the brackets 4 and 5 in greatly exaggerated degree, for clarity of illustration, but it will be understood that, in practical operation, the degree of bending of the brackets 4 and 5 is a very small fraction of that indicated by the dotted lines. When the brackets 4 and 5 bend toward the position shown in dotted lines, the transverse spacing between point 16 at one edge of the slide and the corresponding point at the opposite edge increases. Likewise, the distance between points 17 at the opposite sides increases. To a lesser degree, the transverse spacing between the contact points 18 and 19 increases. Thus the slide is relatively freed of frictional drag during the process of its manipulation, but once the manipulating forces are removed, the brackets 4 and 5 resume the position shown where line contact is made at points 16, 17, 18, and 19, and sufficient grip applied thereat that the slide will retain its setting.

For use in reading the scales on the back of the slide

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1, bracket 5 is provided with a transparent pane 25 having a sight line 26. Said pane 25 is received within a recess formed in the surface of bracket 5 adjacent the rails 2 and 3 and is adhesively secured to said rails so that the sight line 26 is properly correlated with the indicia appearing on the front of the rails.

In the embodiment shown in Figure 5, the relationship of the cooperative side walls of the tongue and groove and the cooperating shoulders of the side rails and slides is shown in the opposite sense from that indicated in the other figures, but nonetheless preserving the deliberate angularity between the cooperating surfaces and confining their contact substantially to a point in any given cross-section. In Figure 5, the groove 27 is dovetailed in cross-section, while the tongue 28 is rectangular, whereas in Figure 3, the groove 7 was rectangular and the tongue 6 a truncated triangle. In the form shown in Figure 5, however, contact between the side rails and the slide is confined substantially to points 29, 30, 31, and 32, as in the previous embodiment, and the reservoir spaces for the reception of lubricant are provided at the same locations as in the previous embodiment, but in slightly different shape.

From the foregoing description, those skilled in the art should readily understand the construction and operation of slide rules embodying the present invention and realize the advantages offered by the invention. While one complete embodiment has been described in detail, and some alternatives suggested, it is not to be understood that the invention is limited to the details of the embodiments disclosed, but, on the contrary, it is to be understood that the embodiments have been shown and described merely to illustrate the invention. Such modifications and variations as do not depart from the spirit of the invention are, although not specifically described herein, contemplated by and within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a slide rule having a pair of spaced rails, a slide member between said rails and having a tongue-and-groove connection therewith, the improvement which comprises, the contiguous surfaces of said tongue-and-groove connections being cross-sectionally non-parallel and making longitudinally line contact with each other.

2. In a slide rule having a pair of spaced rails, a slide member between said rails and having a tongue-and-groove connection therewith, the improvement which comprises, the tongue of said connection having opposite planar side walls and the groove of said connection having opposite planar side walls, said side walls of the tongue being disposed at a substantial angle to the side walls of the groove.

3. The improvement of claim 1 wherein the cross-section of the tongue is a truncated triangle.

4. The improvement of claim 1 wherein the slide and rails have contiguous shoulders above and below the tongue-and-groove connection, and wherein said shoulders are cross-sectionally non-parallel and longitudinally make line contact with each other.

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5. The improvement of claim 1 wherein said spaced rails are connected together at each end by a bracket which is resistant to bending in the longitudinal dimension of the rule and relatively yieldable in the thickness dimension thereof, said rule being free of interconnections between said rails which substantially prevent yielding of said bracket.

6. In a slide rule having a pair of spaced rails, a slide member between said rails and having a tongue-and-groove connection therewith, the improvement which comprises, said slide consisting of a core and a facing strip, said rails being connected together solely by brackets on only one face of the rule, said brackets being relatively more yieldable about the longitudinal axis of said rule than about any other axis thereof and said rails being free of interconnection which substantially prevents yielding of said brackets about the longitudinal axis of said rule, the tongue of said tongue-and-groove connection being formed on the core part of said slide and having its planar side wall on the side opposite said bracket inclined outwardly from said core toward said bracket, the groove of said tongue-and-groove connection having its side wall on the side opposite said bracket disposed substantially parallel with said facing strip so as to make line contact longitudinally with said inclined side wall of said tongue at the mouth of said groove thereby providing a space between said side walls inwardly of said line contact, said slide and rails having contiguous shoulders adjacent said tongue-and-groove connection, said shoulders being non-parallel and engaging only at the outer extremity thereof adjacent said facing strip thereby providing a space between said shoulders adjacent said tongue, and said spaces being packed with lubricant.

7. The improvement of claim 1 wherein said groove is of dovetail cross-section.

8. In a duplex-type slide rule having a slide member and a pair of spaced rails supported on opposite sides of the slide member; the improvement comprising said rails being of substantially similar shape, and the means supporting said rails in proper relationship consisting solely of a pair of brackets secured to the rails adjacent the ends thereof and extending across the slide member on only one face thereof, said brackets being relatively yieldable about the longitudinal axis of the rule in response to manual force and being relatively rigid in any other axis thereof under manual force.

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