United States Patent

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[54] SLIDE RULES INCORPORATING MAGNETIC ELEMENTS

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[52] **U.S. Cl.** .....**235/70 R**, 235/70 B

[51] **Int. Cl.** **G06g 1/02**

[58] **Field of Search** 235/70, 70.2, 70.3, 69

[56] **References Cited**

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[57] **ABSTRACT**

Slide rules constructed predominantly of nonmagnetic materials such as synthetic resins or light alloys, preferably having sliding surfaces of or faced with a synthetic resin or other material of low frictional coefficient, and provided with inserts of magnetizable material in both the slide and body near their contacting faces, at least one of the inserts being magnetized.

8 Claims, 5 Drawing Figures

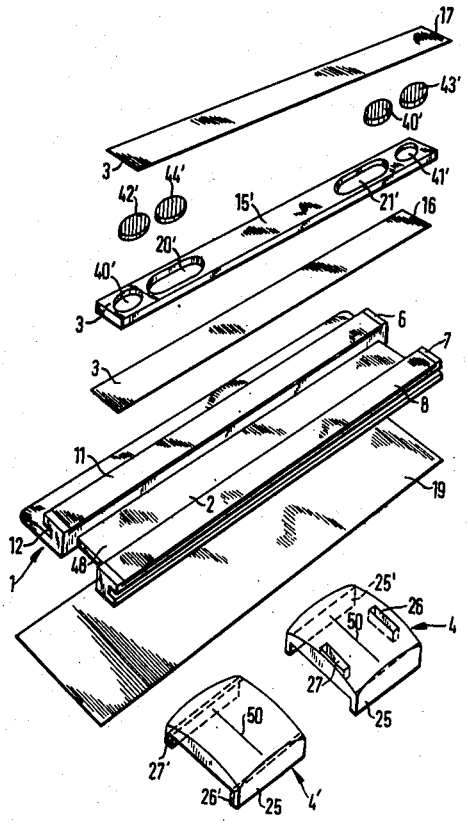

Fig. 1

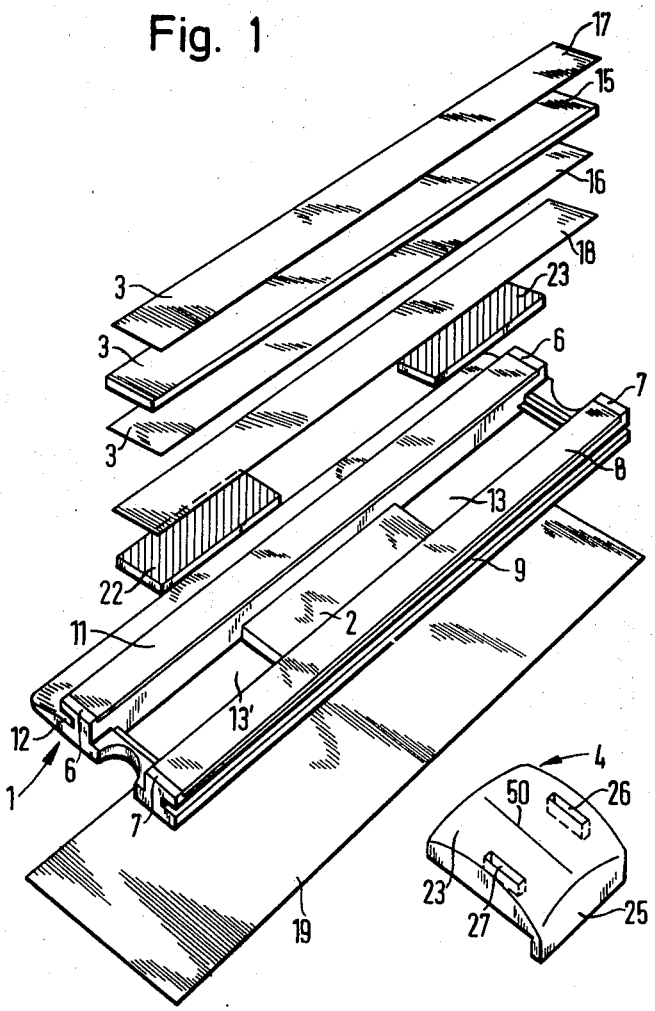

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Fig. 2

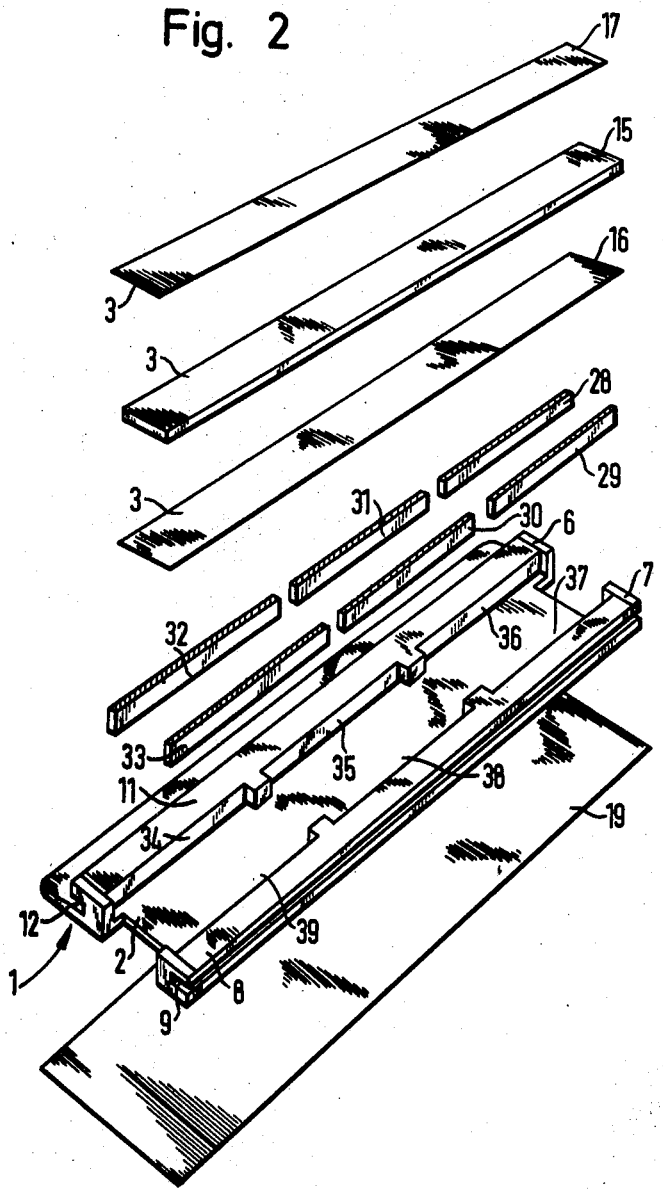

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Fig. 3

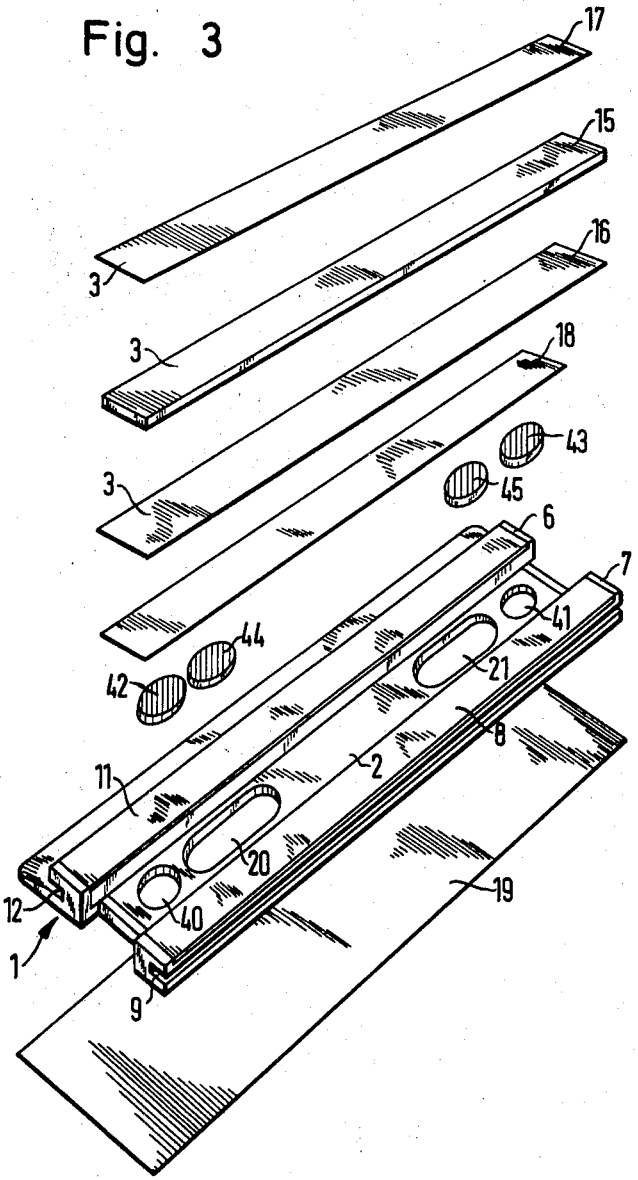

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Fig. 4

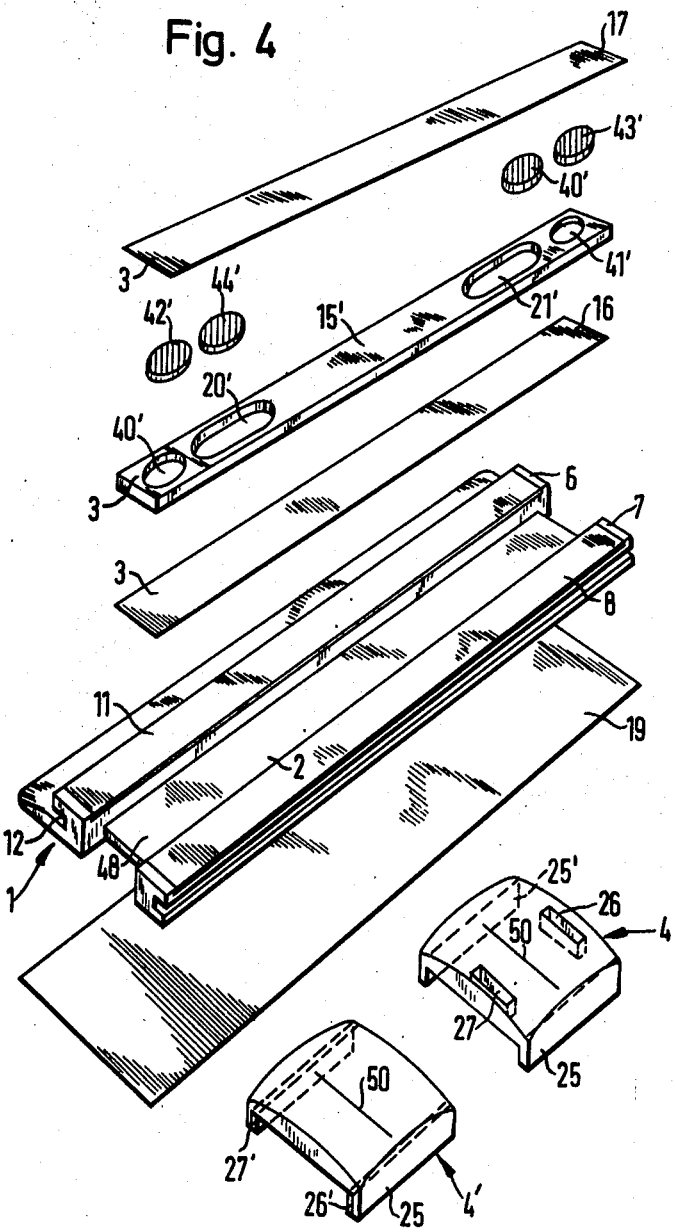

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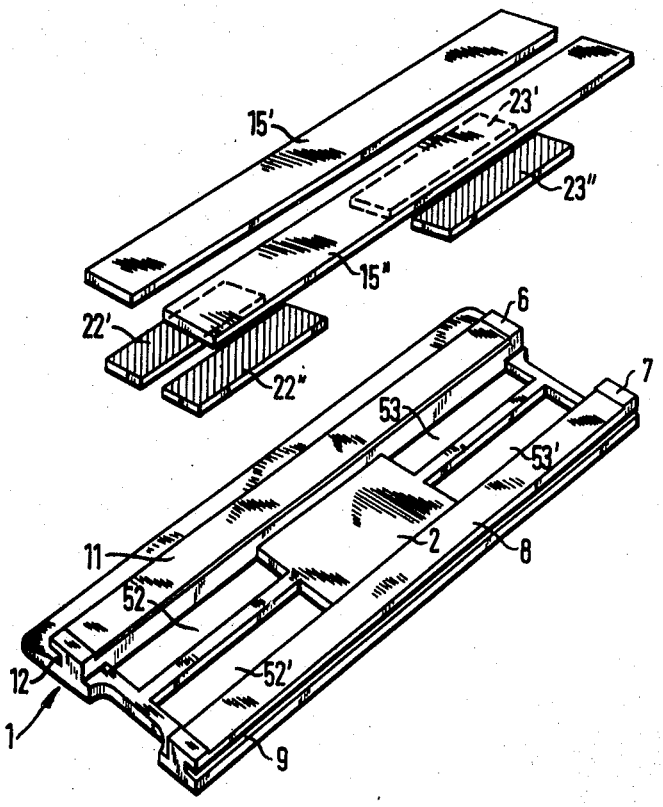
Fig. 5



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SLIDE RULES INCORPORATING MAGNETIC ELEMENTS

BACKGROUND OF THE INVENTION

The manufacture of slide rules requires a high degree of precision with regard to the accuracy of fit of the sliding parts and the ease of alignment of the zero value. The sliding scales must be easily slidable in the body, but, on the other hand, not so easily slidable that unintentional movement can occur. In most slide rules the sliding scales are carried in a channel passing through the body of the rule and supported by a ridge sliding in a groove and a spring is provided to load the slide in one direction in order that all the clearance that allows movement of the slide may be taken up so that the slide always rests in the same lateral position and is accordingly more accurate. However, there are several disadvantages inherent in the use of springs and attempts have been made to produce this loading force in other ways, for instance by the use of magnetism.

In a recent development, slide rules have been made with the body and slide formed of steel for accuracy and ease of manufacture and to permit easy movement of the slide, the tolerances between the slide and the channel holding it have been made large. To maintain the accuracy of the slide in the body and to restrain it from falling out from the end the entire assembly is magnetized.

These fully magnetized steel slide rules suffer the disadvantage that they corrode easily, particularly in warm damp climates, and also they attract small metal objects such as office clips and iron filings. In addition the so-called blue haze develops and hinders the smooth running of the slides in their channel so that this type of slide rule can be used only under the most careful conditions, and they must be continually cleaned or lightly greased; finally they suffer the disadvantage that the metal rubbing on the greased layer produces a black smear which must be removed otherwise the work will be dirtied.

SUMMARY OF THE INVENTION

An object of the present invention is to produce a new type of slide rule in which the slide can be set with the utmost precision and exactitude in the body; which can be easily moved over the scale and yet remains in the selected position; which can be moved easily by light finger pressure and in which all the foregoing disadvantages are avoided and, notwithstanding its simple and workmanlike production, can be advantageously mass-produced.

For the attainment of this object it is proposed to provide a slide rule having one or more slides movable in a rule body and having slidable cursors on the rule body wherein the slides, which are essentially rectangular in cross section or in strip form, are adapted to slide in a channel passing through the rule body which channel has an essentially equivalent rectangular cross section; the slides being freely slidable in and removable from the rule body and held by a magnetic or magnetizable material; and in which the contacting surfaces of the rule body and slide consist of or have a coating of plastic or light alloy metal.

Although in principle the use of magnetism to prevent the slide from falling from the end of a slide rule is know, it is found that the above-proposed slide rule does not have the disadvantage that ensues from full magnetization of the bodies and slides made from steel and that, with the invention, in which the channel is essentially rectangular in cross section, the groove and spring arrangement can be avoided and, furthermore, a simple easily made and easily cleaned slide rule is provided in which the tolerances and exactitude are as good as, or indeed better than, slide rules having a groove and spring arrangement.

In a preferred form of the invention, inlays of magnetic material are placed in the sides or bottom of the channel in which the slide is located and are covered with a layer of plastic while the slide is provided with an intermediate layer of magnetic or magnetizable material.

In a further modification of the invention, inlays of magnetic material are assembled in the slide between two layers of plastic or light metal alloy and a layer of magnetic or magnetizable material is provided in the sides or bottom of the channel of the rule body and, preferably, is overlaid with nonmagnetizable material.

In principle, with reference to slidability, it is sufficient if one sliding surface is coated with a plastic layer and the other sliding surface is of magnetizable material. However, it is preferable, to prevent corrosion, to case the magnetizable material as well as the magnetic material with plastic.

Usual magnetic and magnetizable iron alloy materials may be employed; also magnetic materials such as those of the ferrite type such as manganese-zinc-ferrite, nickel-zinc-ferrite, or manganese-magnesium-ferrite; also oxidic permanent magnets, such as barium-ferrite, cobalt-ferrite, or ferrites based on iron oxide can be used and finally moldable synthetic resin materials containing magnetic powder or magnetizable pigments can be used. The last named have the advantage that they have a surface similar to plastic yet, in spite of this, they display magnetic properties so that no special plastic layer or coating is required and plastic markings can be impressed directly on them to form the required scale.

The inlays of magnetic material are preferably arranged in recesses in the channel of the rule body or in the slides which are then preferably covered over with a layer of nonmagnetic material to protect and retain the magnetic inserts. In this way it is possible to arrange the inlays separately so that they are slidable lengthways, by means of elongating the recesses in the lengthwise direction so that a to-and-fro movement of the magnetic inlay can be obtained. The advantage of this is that the slide, in the channel of the rule body, is freely movable to a corresponding extent. It is particularly advantageous if part of the recesses in the channel of the rule body, or the slide is completely filled with an inlay of magnetic material while the remainder of the recesses are elongated so that inlays of magnetic material arranged in these recesses have a limited lengthwise sliding movement. In the result the slide must be moved against a greater force over large movements, but against a smaller magnetic force for smaller movements so that freer setting of the slide can be achieved.

The plastic coating which is required to be placed over the magnetic or magnetizable inlays in the slide can be impressed with markings and scales on the lower surface. An advantage of this is that the impressed or stamped scale markings cannot be washed off or scored from the outside. Furthermore it is preferred that the scale-bearing faces of the slide should exhibit small cross markings at both ends to register the scale points at zero. This simplifies manufacture and permits a more exact agreement with the zero point to be obtained.

In a further modification of the invention the cursor has one or two parallel smooth running faces depending at right angles from its lower surface and there is provided in these running faces, or crosswise to them, in the cursor's lower surface strips of magnetic or magnetizable material. It is then possible to make the cursor simply of injection-molded plastic and, without using metal springs, to place them slidably on the rule body.

BRIEF DESCRIPTION OF DRAWINGS

In order that the invention may be well understood it will now be described in more detail with reference to the accompanying drawings, in which:

FIG. 1 is an exploded view of a slide rule in which the magnetic inlays are located beneath the channel in the body of the rule.

FIG. 2 shows a slide rule similar to that shown in FIG. 1 wherein the magnetic inlays are located in the side of the channel.

FIG. 3 shows a slide rule similar to that shown in FIG. 1 in which some of the magnetic inlays are rigidly located in recesses and the rest are slidable lengthwise in elongated recesses.

FIG. 4 shows a slide rule in which the magnetic inlays are in the side, and two cursors usable therewith.

FIG. 5 shows a slide rule in which, in a wider channel two independently movable slides are mounted.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The slide rules shown in the drawings consist essentially of a rule body 1, having a channel 2 running longitudinally throughout its length, in which a slide 3 is arranged to move to-and-fro longitudinally. A cursor 4 slides over the lengthwise scale surfaces 8 and 11 of the rule body, retained either with ridges and grooves 9 and 12 or with magnetic inlays.

In the slide rule shown in FIG. 1 there are provided two recesses 13 and 13' beneath the channel 2 in the body of the rule in which inlays 22 and 23 of magnetic material are set. The recesses are overlaid with a nonmagnetic cover or layer 18.

The slide 3 consists of an interlayer 15 of magnetizable material, for example sheet steel, between two nonmagnetic layers 16 and 17.

In addition the rule body has, on both ends of the scale surfaces 8 and 11, crosspieces 6 and 7 which ease the exact alignment of the scale surfaces.

The cursor shown in FIG. 1, in the foregoing ease, has a guiding surface 25 at one side depending at right angles from the cursor's lower surface 23, a marking line 50, and two inlays 26 and 27 of magnetic or magnetizable material set in its lower surface.

It will be understood that, with the slide rule shown in FIG. 1, a cursor can be used which has a projection from the guiding surface 25 that mates with the groove 9.

In the further arrangement shown in FIG. 2 there are provided recesses 34, 35, 36 and also 37, 38, 39 at the sides of the channel 2 in which several inlays 28, 29, 30, 31, 32 and 33 of magnetic material can be inserted. With this arrangement the retaining layer 18, becomes unnecessary.

As shown in FIG. 1, the slide consists of two outer layers 16, 17 and an inlay 15 of magnetizable material. The underside of the slide rule 1 is also preferably overlaid with a nonmagnetic layer 19.

In the form of the invention shown in FIG. 3 pieces 42 and 43 of magnetic material are inserted in the recesses 40, 41 in the channel 2. Further elongated recesses 20 and 21, are provided into which are inserted pieces of magnetic material 44 and 45, which are movable in these recesses. After the pieces of magnetic material are inserted the bottom of the channel 2 is covered with a layer 18. This construction, as already stated, has the advantage that a larger to-and-fro movement will act against the force of the pieces 44 and 45 as well as of the pieces 42 and 43, while the final setting is made only against the force of the pieces 42 and 43.

In the arrangement shown in FIG. 4 the slide 3 consists, as before, of upper and lower covering layers 17 and 16 but, in place of the magnetizable strip 15 there is now provided a strip 15' of nonmagnetic material in which recesses 40' and 41' are provided to receive inlays 42' and 43' of magnetic material. Furthermore, in the same way as in FIG. 3, elongated recesses 20' and 21' are provided to receive movable inlays 44' and 45' of magnetic material. Similarly, the bottom of the channel 2, is now formed of a strip 48 of magnetizable material which can be covered with a plastic layer (not shown). Two cursors 4 and 4', are provided for the slide rule, both with two guiding surfaces. 4 is similar to the cursor as shown in FIG. 1 in that it is fitted to the rule and retained magnetically by means of strips 26 and 27 of magnetic or magnetizable material inlaid in the cursor's lower surface. Cursor 4' is retained by means of magnetic or magnetizable strips 26' and 27' inserted in the guiding faces.

In the slide rule shown in FIG. 5 there is provided, in place a single slide, two slide pieces 15' and 15'' of magnetizable material which are preferably covered with a nonmagnetic layer (not shown). In place of the recesses 13 and 13' of the construction of FIG. 1, there are two recesses 52 and 52' and correspondingly 53 and 53' in which inlays 22' and 22'' and 23' and 23'' can be inserted. The bottom of the channel is preferably covered with a corresponding nonmagnetic sheet.

I claim:

1. A slide rule having a body, at least one bed formed on said body, a slide mounted in sliding contact with said bed, surfaces defining at least one cavity in at least one of said contacting surfaces, a magnetic element accommodated within each said cavity capable of limited longitudinal movement therein along the axis of relative movement between said slide and said slide rule body, at least one magnetic element also inlaid into the other said contacting surface, said magnetic elements being selected from the group consisting of magnetized and magnetizable elements, the magnetic element(s) in at least one of said contacting surfaces being magnetized, and the contacting surfaces of said slide and bed being each formed at least predominantly of a nonmagnetic material.

2. A slide rule according to claim 1, wherein a cursor is mounted on the slide rule body so as to coact with the body and the slide.

3. A slide rule according to claim 2, wherein magnetic means are provided for retaining the cursor on the slide rule body.

4. A slide rule according to claim 1, wherein the slide rule body incorporates a plurality of inlaid magnetized elements.

5. A slide rule according to claim 4, wherein the slide incorporates said magnetizable element in the form of a continuous inlaid strip of magnetizable material.

6. A slide rule according to claim 1, wherein the slide incorporates at least one magnetized element sandwiched between layers of nonmagnetic material, and wherein the slide rule body incorporates a magnetic element in the form of a continuous strip of magnetic material inlaid into the bed surface contacting the slide.

7. A slide rule according to claim 1, wherein both said slide rule body and said slide have surfaces defining a plurality of recesses in the contacting surfaces of said body and said slide, a magnetic element being received within each said recess.

8. A slide rule according to claim 1, wherein the adjacent outer surfaces of said slide rule body and said slide are each provided with scales marked with synthetic resin strips indented into said outer surfaces.

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