Dec. 3, 1963 B. VAN CARO ETAL 3,112,875

COMPUTER SLIDE CONSTRUCTION

Filed Nov. 21, 1962 2 Sheets-Sheet 1

Fig. 1.

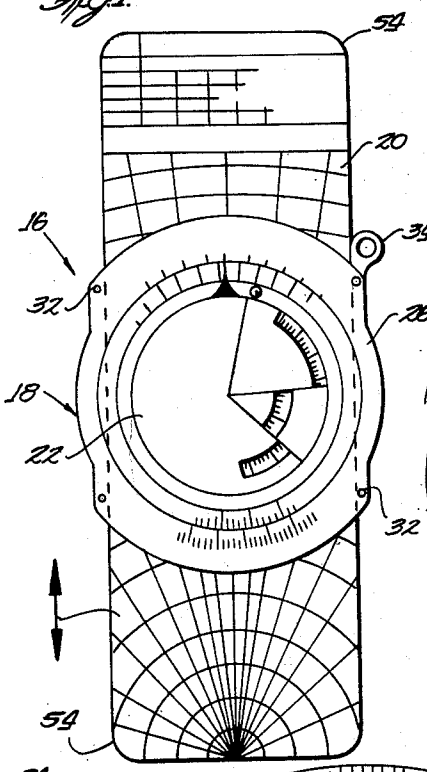


Fig. 2.

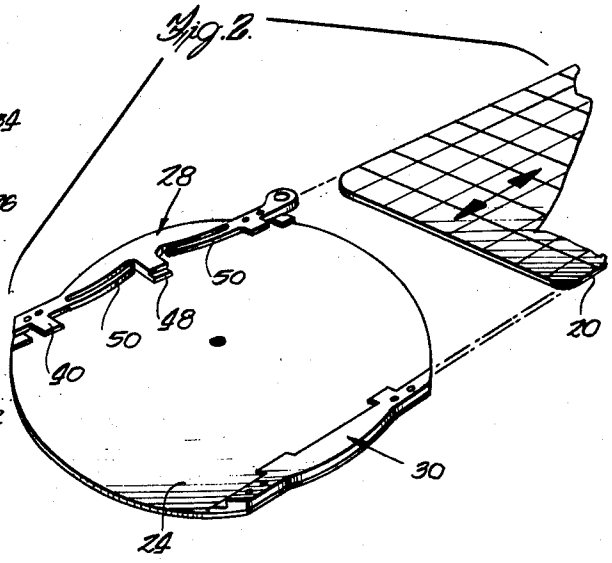


Fig. 3.

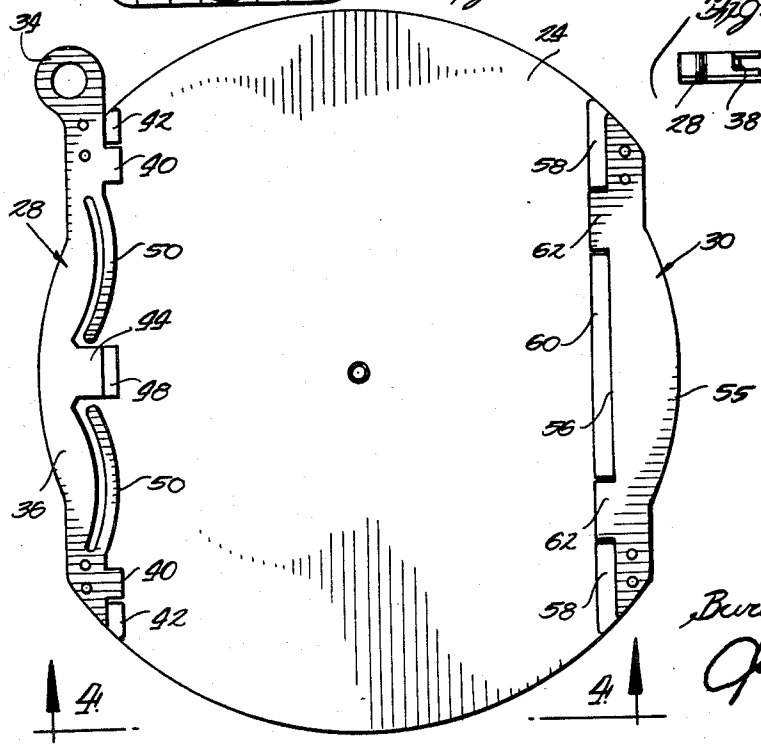


Fig. 4.

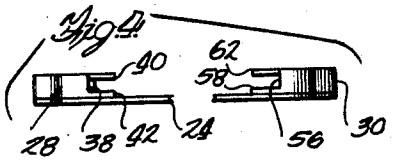


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Fig. 5.

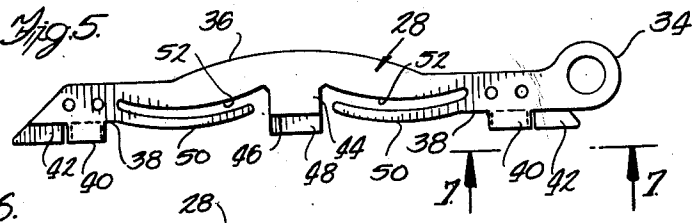



Fig. 6.

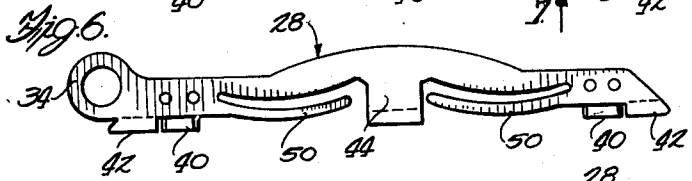



Fig. 7.

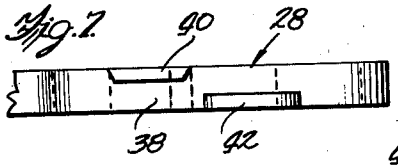



Fig. 8.

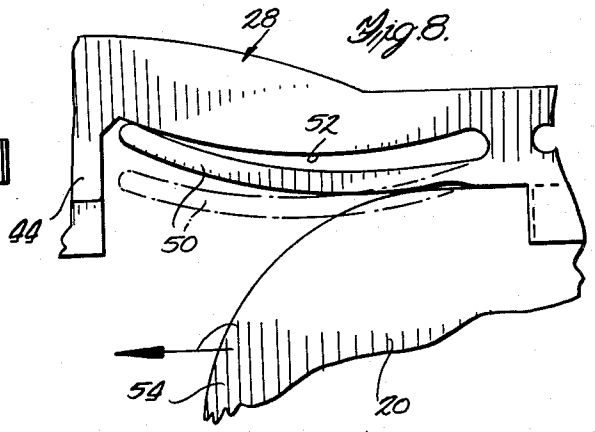



Fig. 9.

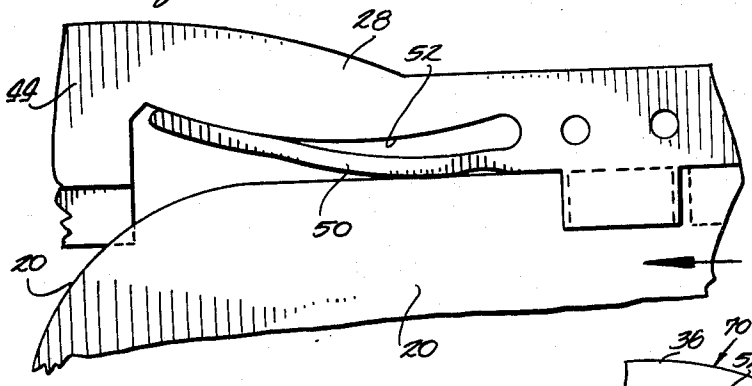



Fig. 10.

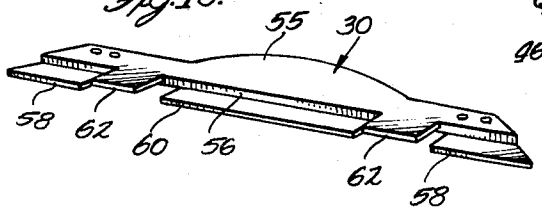
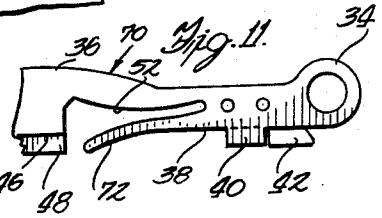



Fig. 11.

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3,112,875

# COMPUTER SLIDE CONSTRUCTION

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5 Claims. (Cl. 235—70)

This invention relates to a slide construction, and more particularly to a slide construction which provides holding effect between relatively slidable elements so that the elements will remain in a given position for use, and yet remain easily adjustable for varying problems.

While the principles of the invention will find useful application in various unrelated types of structures, the invention will be described as used in a type of computer slide rule construction.

An embodiment of the invention which illustrates many of the inventive concepts, includes a holding means having parallel arranged bearing members, secured to a slideable element mounted for sliding movement upon a movable element in the form of an elongate scale. One of the bearing members includes integral yieldable members having the shape of a cantilever beam arranged to provide a steady and yieldable resistance directed normally to the longitudinal axis of the scale element. As will be apparent from the detailed description to follow, the yieldable members may be arranged to provide a compound spring action which allows (1) reduced resistance to mounting of the slidable element upon the scale element and (2) an increased frictional resistance between the slidable element and the scale element after operative assemblage of the elements is effected.

Both of the bearing members operatively cooperate to assure true lineal sliding action, with an automatic alignment feature. In addition, the bearing members incorporate grooves having discontinuous side portions which simultaneously reduce draft and center the slidable element to thus contribute to ease of operation.

Application of the principles of the invention affords other advantages which, by way of example, include smooth operation with positive orientation, effective holding action; i.e., little danger of slippage or wander from set point, and simplicity of structure. These advantages when achieved with the broad manufacturing tolerances possible, contribute to economies in parts production and assembly costs, and long and satisfactory service life.

A general object of the invention is to provide an improvement in slide constructions of the type in which yieldable holding means are relied upon to maintain relatively movable elements in a set position.

More specifically, an object of the invention is to provide a yieldable holding means for relatively movable elements, which holding means are characterized by a compound spring action so that operative assembly of the elements may be effected with great ease and convenience, and further, that after assembly, a steady force of increased resistance is provided for holding the elements in any set position within the operative limits of the assemblage.

A further object of the invention is to provide a yieldable holding means between a slideable element and an elongate scale, which holding means will assure true lineal sliding action. A related object is to provide an automatic alignment feature for such holding means.

Still another object relates to the provision of a holding means for use between relatively slideable elements which holding means is arranged to reduce drag between the elements during sliding movement to thus contribute to ease of operation.

Another object of the invention is to provide a yieldable holding means for relatively slidable elements,



which holding means is characterized by smooth operation and positive orientation, as well as minimization of slippage or wander from a given set point.

The principles of the invention may be embodied in items which lend themselves to mass production techniques, and accordingly, an object of the invention is to achieve low production costs, while maintaining liberal manufacturing tolerances well within a practical range. A further related object is to provide a holding means for use in items, such as slide rules, which have a long and trouble-free service life.

These and further objects and features of the invention will become more apparent from the following description and accompanying drawings of an illustrative embodiment of the invention wherein:

FIG. 1 is a plan view of a computer slide rule in assembled, or operative condition, and including a yieldable holding means illustrative of an embodiment of the invention;

FIG. 2 is a perspective-like view of the slide rule of FIG. 1 in disassembled condition, and showing an elongate scale means thereof in fragmentary illustration;

FIG. 3 is an enlarged plan view of a subassembly of a slideable elements as used in the slide rule of FIG. 1;

FIG. 4 is an end view, in broken section generally as seen from line 4—4 of FIG. 3;

FIG. 5 is a plan view of a first bearing member used in the slide rule of FIG. 1;

FIG. 6 is the same, but showing the reverse side thereof;

FIG. 7 is an enlarged fragmentary view generally as seen from line 7—7 in FIG. 5;

FIG. 8 is an enlarged fragmentary view illustrating the position of an integral spring means during an early stage in the assemblage of the slideable element and the scale means;

FIG. 9 is the same but showing the condition of the spring means when the slideable element and the scale means are in operative assemblage;

FIG. 10 is a perspective-like view of a second bearing member used in the slide rule of FIG. 1; and

FIG. 11 is a fragmentary plan view of a bearing member of the first type, and illustrating a modification in structural detail.

Referring now to the drawings, and more particularly to FIGS. 1 to 4, the computer slide rule **16** is shown which is illustrative of an embodiment of the invention, including a slideable element **18** mounted for relative sliding movement upon an elongate movable element, such as a scale element **20**. The slideable element **18**, which may be a compound construction including a rotatable disc means **22**, as well as the scale element **20**, each include indicia in the form of numerals, lines, charts, etc., whereby certain problems may be conveniently solved by the cooperative action and relative positioning of the movable parts of the slide rule.

Slide rules and computers embodying similar construction to that above described and designed for solution of diverse problems including variable parameters, are of course well known, and no claim on the problem solving features is being made. It is to be further understood that element **18** has been designated as the "slideable element" primarily for the sake of convenience; in use of the slide rule, the element **18** may either be moved upon the scale element **20** while the latter is held stationary, or the element **18** may be held stationary while the scale element is moved. In either case, relative motion between the elements **18** and **20**, is generally required for utilization of the slide rule.

The slideable element **18** consists of a bottom plate **24** of generally circular configuration, a top plate **26** of

matching peripheral shape to that of plate 24, and holding means in the form of elongate bearing members 28 and 30, positioned between the top and bottom plates. Fastening means, such as screws, or rivets 32, may be used to maintain the parts of the slideable element in assembled condition. Since the overall thickness of the bearing members 28 and 30 is made equal, the plates 24 and 26 will be maintained in parallel spaced relation, and at a distance which provides ample clearance between the inner surface of the plates and the flat surfaces of the scale element 30 to assure that the scale element will not be scratched or marred by movement of the slideable element. The bearing members 28 and 30, each of which have a scale supporting groove to be described in greater detail hereinafter, are positioned so that the scale supporting groove of the bearing member 28 is generally parallel to the scale supporting groove of the bearing member 30, and at a distance which is slightly greater than the width of the scale element 20.

The bearing members 28 and 30 are adapted, among other things, to provide cooperative action whereby true lineal motion of the scale element 20 relative to the slideable element 18 is effected. The manner in which the bearing members are adapted to achieve such an objective, will now be described in detail.

With reference to FIGS. 5 to 10, it will be seen that the bearing member 28, which is of elongate form, and may be characterized as a yieldable bearing member, is symmetrical about a vertical center line, with the exception of an integral eyelet portion 34 formed at one end, which may serve as a means for suspending the slide rule 16 from a hook, when it is not being used. An outer edge 36 of the bearing member is shaped to conform to a complementary edge portion of the plates 24 and 26.

A scale supporting groove is formed on the edge opposite edge 36, which groove is defined by a generally flat portion 38, alternately disposed side projections or walls 40 and 42, and a central projection 44 including a flat portion 46, and a side projection 48. The flat portions 38 and 46 are positioned in linear alignment, that is, the surfaces thereof would coincide with a flat plane. It will be noted, as best seen in FIGS. 2, 4 and 7 that side projections 42 and 48 extend from the same edge, or side of the bearing member 28, while side projections 40 extend from the opposite edge thereof. In such manner, a scale holding and guiding groove is provided, having discontinuous side portions which tend to reduce drag on the scale element 20, during use of the slide rule, thus effecting smoother operation thereof. It will be further noted, that the unique arrangement of the groove side walls, allows molding operation techniques to be utilized for production of the bearing member in a finished molded form, if so desired. Extending inwardly toward the central projection 44, are a pair of integrally formed yieldable elements, in the form of fingers 50, which are curved and, when in nonstressed condition, are generally parallel with an adjacent curved surface 52. The outer extremity of the curved fingers 50 will be seen to project beyond the line extending between the flat portions 38 and 46.

When in an initialed stage of mounting the slideable member 18 upon the scale 20, as best seen in FIG. 8, the fingers 50 first engaged by the scale 20, will operate as a cantilever beam to resist flexing movement of the finger. As soon as a substantial portion of the free end of the finger 50 is wedged, or cammed into engagement with the surface 52 by action of the curved end surface 54 of the scale, due to longitudinal movement of the scale as seen in FIG. 9, the finger will operate as a beam fixed at one end and in movable contact with a fixed surface at the other end. Accordingly, in the full engagement position of the finger with the scale 20, the frictional resistance of the finger 50 against the runner side of the scale, will be increased over that initially



imposed by the finger upon the scale. It will be noted that frictional engagement between the finger 50 and the runner side of the scale 20 will take place at a point or region somewhere between the free end and the engagement with the second finger 50, the same type of yieldable resistance action of the finger against the scale will take place, as described in connection with the first finger.

In the case of each finger 50, it will be seen that initially the finger reacts to the load imposed thereupon similar to the bending reaction of a diving board, while in the final stage of loading, as when the free end of the finger engages the surface 52, it reacts in a manner similar to the reaction of a gangplank, having a fixed end, as caused by a load thereupon.

The combined bending resistance of both fingers 50 will urge the scale element 20 into snug contact with the bearing member 30, to thus assure minimization of slippage, or wandering of the slideable element 16 relative to the scale 20. The bearing member 30 as best seen in FIGS. 3 and 10 has an outer edge 55 shaped to conform to a complementary edge portion of the plates 24 and 26. A scale supporting groove is formed on the edge opposite edge 55, which groove is defined by a generally flat surface 56 extending substantially the full length of the bearing member, and alternately arranged side portions, including portions 58 and 60, which extend from the same edge or side of the bearing member, and portions 62 which extend from the opposite edge or side of the bearing member. In such manner, a scale holding and guiding groove is provided, having discontinuous side portions which tend to reduce drag on the scale element 20 during use of the slide rule, as in the case of the bearing member 28. In addition, the unique arrangement of the groove side walls, allows production of the bearing member in a finished mold form, thus affording great economy in manufacture.

The bearing members 28 and 30 may be formed of a variety of materials having the desirable, or necessary structural characteristics, such as metals, i.e., aluminum, manganese, or plastics, including laminated and/or impregnated plastics, hard rubber, etc., by way of example. A very satisfactory type of plastic material for use in the formation of the bearing members is one of a group of virgin nylons, made by the Du Pont Company, and designated as 101, 105 and 109. One advantage of use of nylon in formation of the bearing members, is that the fingers 50 will not flake, or gall, as a result of friction engagement with the scale 20. As a result, smoother operation and longer life expectancy are realized. The scale element 20 likewise may be made of plastic, or a metal, preferably aluminum, or any material which will work well with the material of the bearing member finger. In the selection of materials for use in the slide rule elements, factors such as material cost, machineability or moldability, contemplated use environment (under certain conditions of use, protection against corrosion and fungi may be primary considerations), service life desired, inherent strength required to resist damage which may result from falling, or rough handling, and other factors, all of which are well within the knowledge of competent design engineers, or people skilled in the art.

A modified type of bearing member 70, which may be used in lieu of bearing member 28, is shown in FIG. 11. The modified bearing member 70 differs from bearing member 28, primarily in the structural arrangement of the finger elements incorporated therein. For the sake of brevity and simplicity, all detail portions of the bearing member 70, which are identical to the equivalent portions of the bearing member 28, will be identified by like numerals.

The bearing member 70 has a pair of integrally formed and inwardly directed yieldable elements in the form of fingers 72 (one shown), each of which is bent away from the curved surface 52 in the manner shown. The extremity, or free end of each finger 72, in non-stressed con-

dition, projects beyond the line extending between the flat portions 28 and 46.

In the initial stage of mounting of the slideable element 18 upon the scale element 20, it will be apparent that the finger 72 will operate as a cantilever beam to resist flexing movement of the finger. As the flat runner side of the scale element is brought into engagement with the free end of the finger, a mid-region of the finger 70 will engage the curved surface 52. This will, in effect, shorten the effective length of the finger, and will substantially increase the yieldable resistance relative to the scale element 20. After both the fingers 72 are thus placed into engagement with the side of the scale element, the resulting yieldable force will serve to maintain the opposite runner edge of the scale in snug engagement with the flat slot portion 56 of the bearing member 30. It will be found that the modified embodiment, as exemplified by bearing member 70, will satisfy all of the objectives of the invention.

A further modified embodiment (not shown) may also be employed with satisfactory results. In such an embodiment, the yieldable finger member would be arranged in the form of a bow, with both ends being fixed, i.e. integral, with the body of the bearing member. Such a finger member would not provide as easy initial assembly action as in the case of fingers 50 and 72; however, it would otherwise provide similar type of advantageous action as characterizes the fingers 50 and 72.

From the foregoing, it will be obvious that the improvement described above, and particularly the structural and operational features associated with the bearing members forming part of the slide rule assemblage, will satisfy all of the objectives set forth hereinbefore.

The foregoing description has been given in detail without thought of limitation since the inventive principles involved are capable of assuming other forms without departing from the spirit of the invention and the scope of the accompanying claims.

What is claimed is:

1. A computer slide rule comprising a pair of elements mounted for relative slidable movement, a holding means for maintaining said elements in a given relative position, said holding means including elongate bearing members secured to one of said elements in parallel relation, each of said bearing members being formed as a one-piece plastic molding to provide a groove defined by a flat surface portion and discontinuous side projections, one of said bearing members serving as a yieldable bearing member and having an integrally formed cantilever-like yieldable finger, said finger being curved and having a mid-portion thereof projecting beyond a line coincident with the flat surface portion of the groove formed in the yieldable bearing member, said finger being movable into abutment with an adjacent spaced portion of the bearing member when the movable element is being supported by the bearing members thereby defining tangential contact with the movable element.



2. A computer slide rule according to claim 1, wherein a pair of fingers are directed toward each other and are similar in form and symmetrical with respect to a vertical center-line of the bearing member.

3. A computer slide rule according to claim 1, wherein the discontinuous side projections are alternately disposed along each edge of the flat surface portion.

4. A computer slide rule according to claim 1 in which said finger and abutment are complementarily curved and positioned in essentially parallel relation so that upon compression the free end of the finger first has point engagement with the abutment and then is progressively flexed thereby exerting a progressively augmented reactive holding action.

5. A computer slide rule comprising a pair of elements mounted for relative slideable movement, a holding means for maintaining said elements in a given relative position, said holding means including elongate bearing members secured to one of said elements in parallel relation, each of said bearing members being formed as a one-piece plastic molding to provide a groove defined by a flat surface portion anad discontinuous alternately staggered side projections, one of said bearing members serving as a yieldable bearing member and having a pair of integrally formed cantilever-like yieldable fingers, said fingers being curved and having a portion thereof projecting beyond a line coincident with the flat surface portion of the groove formed in the yieldable bearing member, a pair of finger abutments curved complementarily with the fingers and in close adjacent parallel relation therewith, said fingers being movable into first end and then side contact with the abutment depending upon the dimensional assemblage tolerances of the computer elements to provide a snug frictional relationship between the relatively movable elements.

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