June 15, 1971 L. A. M. TAGNON 3,584,384

OSCILLATING AND SLIDING COUPLING, NOTABLY FOR COMPASSES

Filed April 28, 1969 3 Sheets-Sheet 1

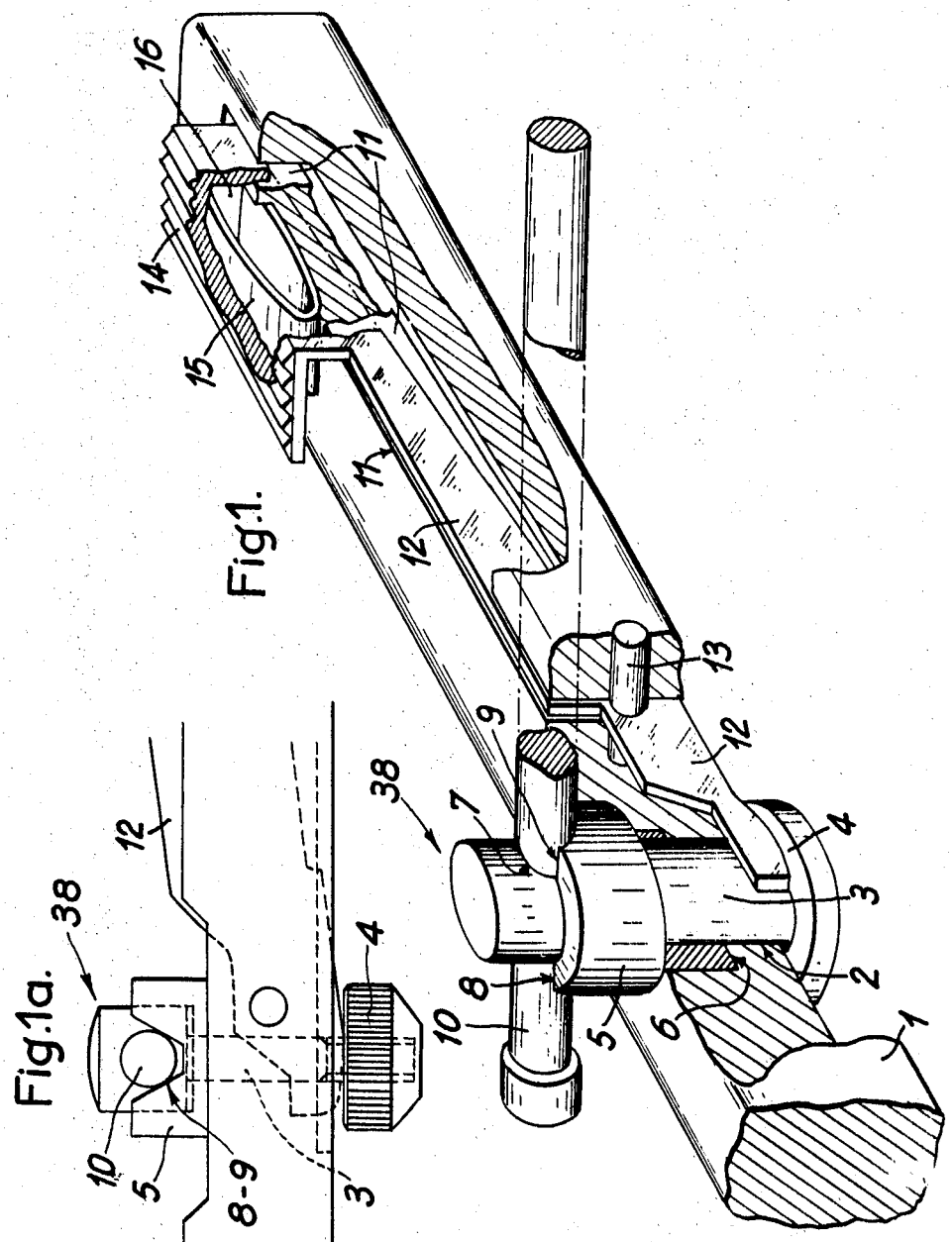

Fig.1.

Fig.1a.

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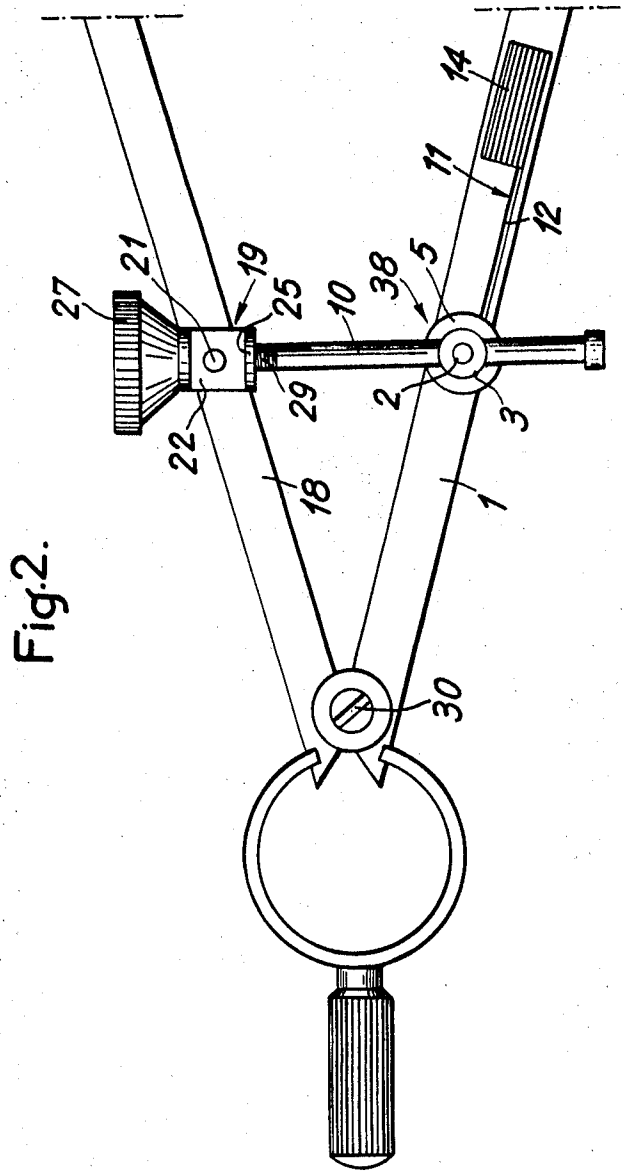

Fig.2.

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Fig.3.

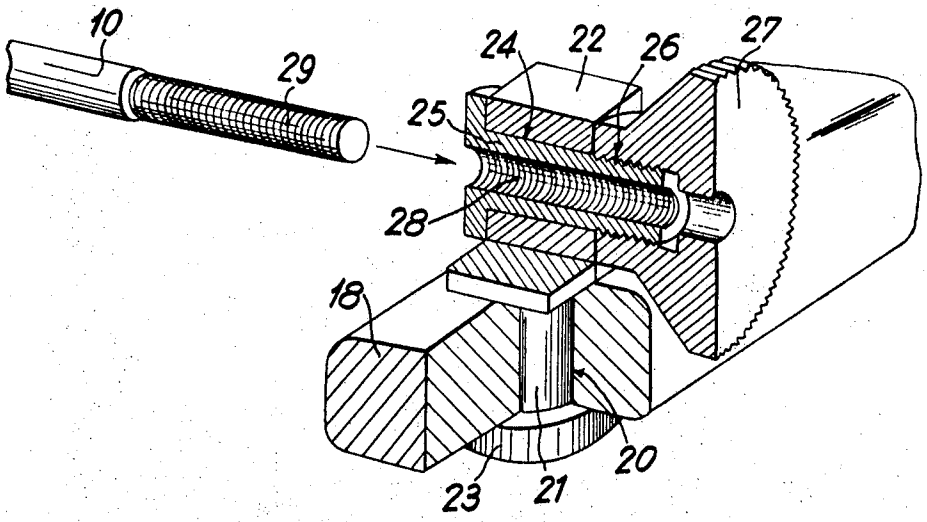
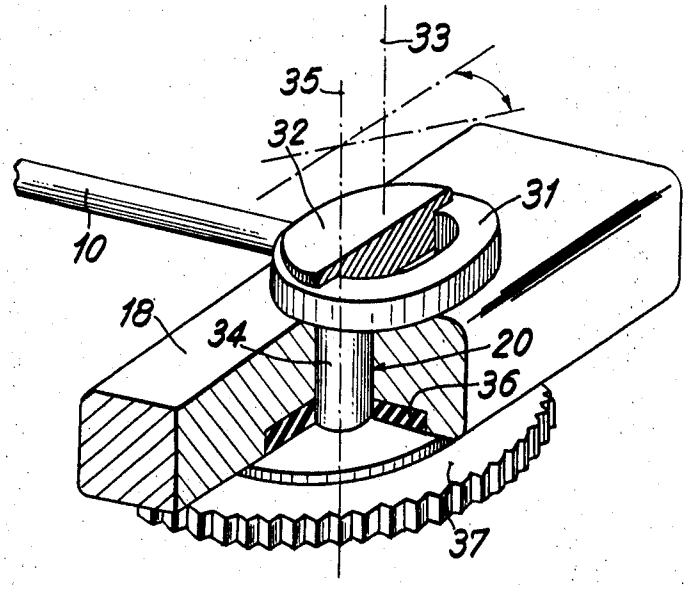


Fig.4.



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OSCILLATING AND SLIDING COUPLING, NOTABLY FOR COMPASSES

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Int. Cl. B43l 9/02
U.S. Cl. 33—27 4 Claims

ABSTRACT OF THE DISCLOSURE

This coupling mechanism permitting the relative oscillating and sliding movements between a rod and a given point of a support is applicable more particularly to the construction of a bow compass wherein a spacer rod is connected to a given point of one of the compass legs by said coupling mechanism and to a corresponding point of the other leg by means of another coupling mechanism providing simply the oscillation and also the fine adjustment. The compass normally locked with precision in the desired angular position can be subjected either to considerable radius changes by moving its legs towards and away from each other by simply depressing with one finger a release key, or to small radius changes by rotating a fine-adjustment knob.

BACKGROUND OF THE INVENTION

The present invention relates in general to coupling mechanisms of the type permitting the relative oscillating and sliding movements between a rod and a given point of a support, with releasable means for locking said rod in the selected position relative to said support, and more particularly to coupling mechanisms of this type applicable notably to precision compasses and the like.

To draw with precision circular arcs and circles, a great number of precision instruments are available to the draftsman. Thus, to describe a circle having a radius ranging from 0 to .2", the draftsman uses pump, spring-bow or rotational compasses. These are expensive instruments requiring a certain skill to effect precision work. If the radius ranges from about .2" to about 1½", a pair of bow compasses are used. Although very useful and accurate, this instrument is expensive and on the other hand its adjustment to the desired dimension requires a considerable time. Moreover, when the adjustment screw begins to wear out misadjustments are frequent occurrence. If the radius ranges from about 1½" to about 6", the draftsman uses the conventional pair of large compasses, or long-legged compasses. Although many technical improvements have constantly been brought to this instrument in order to increase its efficiency, notably in connection with the guiding and rigidity of the pivotal connection between the legs, it is still highly objectionable in that it will easily lose its initial setting, notably when a plurality of arcs and circles are to be described with the pencil point. When used with the pen point, these compasses become difficult to handle notably if the pen-supporting leg is loaded with an ink reservoir. Furthermore, if the draftsman is confronted with arcs and circles having a radius within the range of about 6" to about 12", he uses the same large compasses with a lengthening-bar, but in this case the error amplification due either to insufficient rigidity or misadjustment makes the use of this assembly very unreliable. Thus, describing a circle by using a hard pencil under a certain pressure is almost impossible. Finally, in the case of radii longer than 12" the draftsman utilizes the so-called beam-compasses or trammel which, when properly operated, give satisfactory results.

Under these conditions, for describing circles and arcs having a radius of 0 to 6", the draftsman must dispose of a plurality of instruments completed by a great number of accessories, which constitute a cumbersome, costly and time-robbing set.

Various attempts have therefore been made with a view to increase the number of cases in which the conventional, long-legged compasses can be used, notably by providing means for setting and locking the legs in a predetermined relative angular position while improving the rigidity of the articulation.

A first proposition to solve this problem consisted in providing a large-size bow-compass. A symmetric screw ensures at the same time the angular setting of the compass legs, the maintaining of this setting due to its irreversibility, and the complementary triangulation necessary for improving the rigidity. The necessary compromise between the adjustment speed and the degree of precision is attended by a slow adjustment and frequent misadjustments due to frictional contacts, notably on a table. Moreover, when as a consequence of normal wear the nuts take some play on the screw due to the combined action of return springs and usual handling, notably stresses produced when describing arcs and circles with the pencil point, the compasses open gradually. Finally, said adjustment screw, considering the dimensions of conventional compasses, provides but a poor triangulation of which the efficiency, especially with respect to torsional rigidity, is impaired at a relatively fast rate under normal service conditions.

Another proposition consisted of a pair of compasses provided with a circular quadrant rigidly secured to one leg and in tight frictional engagement with the inner faces of a slot formed in the other leg. Teeth formed on the outer contour of this quadrant constitute, in conjunction with a screw having a knurled head rotatably mounted on the slotted leg, a worm-and-gear mechanism for making fine adjustments of the relative angular positions of the compass legs, the selected position being maintained by the irreversibility of the mechanism. A quick change from one position to another is obtained by simply causing the knurled head to slip along the relevant or slotted leg so as to disconnect the worm mechanism and thus free the toothed quadrant. When the desired position is attained, the knurled head is released and then retained in the selected position by adequate spring means. However, the advantage resulting from the rigid fastening of the quadrant to one leg of the compass is lost by the combined functions devolved to the other leg, which are attended by added plays. As a result, the rigidity of this instrument is inferior to that of the compass described in the preceding paragraph, and detrimental play or lost motion develops rather rapidly. Finally, the driving screw urged against the relatively thin quadrant teeth by a relatively weak spring tends to be easily rotated during normal handling, so that the initial adjustment is rapidly lost.

SUMMARY OF THE INVENTION

It is therefore the essential object of the present invention to provide a coupling or like mechanism permitting both oscillating and sliding movements, with locking and unlocking action, of a rod with respect to a selected point on a support, and also the application of this mounting to the construction of draftsman's compasses which are both easy to operate and characterized by a particularly accurate and stable adjustment.

To this end, a shaft considered in a vertical position with respect to a horizontal support (the terms "vertical" and "horizontal," "upper" and "lower" being merely intended to facilitate the understanding of the relative position of the component elements of the mechanism) has a lower end formed with a shoulder engaging the lower face of said support, an intermediate cylindrical portion

extending through a corresponding vertical bore formed in said support and an upper end projecting above the upper face of said support, a socket slidably surrounding the upper projecting end of said shaft and kept in contact with said upper face of said support by a rod slidably engaging a transverse passage formed in said upper end of said shaft and also at least partial extensions of said transverse passage which are formed in said socket, locking means normally urging said shoulder downwards in order to lock said rod against sliding movement between said transverse passage of said shaft and the extensions thereof in said socket, as long as the user does not depress release means controlling said locking means.

In the specific application of this coupling mechanism to the construction of compasses (to be referred to as "compass" in order to simplify the disclosure), the compass is a bow compass comprising two legs and a positioning rod or spacer rod connected by this coupling mechanism to one point of a first leg and to the corresponding point of the other leg by another simply pivoting coupling providing the fine adjustment of the angular distance between the legs.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of this invention will appear more clearly as the following description proceeds with reference to the accompanying drawings illustrating diagrammatically by way of example a typical form of embodiment of the invention. In the drawings:

FIG. 1 is a perspective view with parts broken away showing the oscillating and sliding coupling, with its releasable locking means(for the sliding movement), of a rod with respect to a point of a support;

FIG. 1*a* is a diagrammatic elevational view showing a modified construction utilizing an advantageous form of embodiment of the passage extensions formed in the socket;

FIG. 2 is a plan view from above showing a bow compass constructed with an adjustment rod connected to one point of one of the compass legs by means of the coupling mechanism of this invention;

FIGS. 3 and 4 illustrate in perspective and sectional views two typical forms of embodiment of the pivoting and adjustment means connecting the positioning rod to the corresponding point of the other leg of the compass.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the coupling mechanism **38** illustrated in FIG. 1 the support **1** has a vertical cylindrical bore **2** formed therein for slidably receiving a shaft **3** having a shoulder-shaped lower end **4**. Rotatably and slidably mounted on the opposite or upper end of this shaft **3** is a socket **5** bearing either on the upper face of support **1** or on a shoulder **6** milled or countersunk in this support **1**, coaxially to the cylindrical bore **2**, as shown. A transverse diametral passage **7** is formed through the shaft **3** and the upper face of socket **5** is preferably formed with circular grooves **8** and **9** constituting radial extensions of said passage **7** which are adapted to receive in free sliding fit a plain rod **10** retaining the shaft **3** and its socket **5** on the support **1**. The shaft **3**, socket **5** and spacer rod **10** can thus rotate freely and jointly about the axis of the cylindrical bore **2**, the shoulder **4** preventing this assembly from being released from said support **1**.

Besides, this support **1** has formed therein a longitudinal slot **11** in which a lever **12** fulcrumed on a pivot pin **13** rigid with said support **1** is adapted to oscillate freely. This lever **12** may be bent at its end remote from the coupling mechanism **38** to constitute a key **14** having preferably the same plane of symmetry as said support **1**. This key **14** is normally urged away from the support **1** by a spring **15** reacting for example in a cavity **16** formed in said support **1**. The action of spring **15** is transmitted and amplified by the lever **12** of which the operative end engages the shoulder **4** and urges the shaft **3** forward to

clamp the rod **10** on the socket **5** bearing on the support **1**. As the rod **10** is locked by the double shearing stress thus produced, it cannot slide in the transverse passage **7** and therefore the rod **10**, shaft **3** and socket **5** are rigidly assembled and can rotate about the axis of the cylindrical bore **2** against the moderate frictional resistance provided by the engagement of socket **5** on support **1**.

The circular grooves **8** and **9** formed in socket **5** may advantageously be replaced by V-shaped grooves having a vertex angle approximating 60° as shown in FIG. 1*a*, in order to combine a shearing stress with a wedging-effort and thus improve considerably the locking action while reducing undesired plays due to wear and tear.

In actual use, the operator holds the support **1** with the tip of his fingers and simultaneously depresses the key **14** to compress the spring **15** of which the force, not amplified by the lever **12**, may be relatively low; thus, this movement will suppress the axial traction exerted on shaft **3** so that the rod **10** can slide freely through the passages **7**, **8** and **9**. When the key **14** is released, the locking action is restored immediately on the rod **10** without any undesired slip.

It would not constitute a departure from this invention to replace the lever **12** amplifying the force of spring **15** with a spring, for instance a coil compression spring urging the shoulder **4** directly away from support **1**. Under these conditions, it is only necessary for the draftsman, while he holds the compress by its legs, to depress with the thumb the lower face of shoulder **4**, and this movement will release the rod **10** to permit its sliding movement in the axial direction. To facilitate the depression of shaft **3** the spring force must be limited, at the expenses of the locking efficiency. This solution, although less satisfactory than the first one, is very convenient for the manufacture of an economical compass of relatively limited dimensions and/or precision, for which a less elaborate mode of operation may be contemplated.

The above-described locking system may be used for performing both the compass adjustment and the keeping of the instrument in the desired dimensional position by a rigid and stable triangulation. FIG. 2 shows by way of example a bow compass having a first leg **1** provided with a releasable coupling and locking mechanism **38** of the type described hereinabove for a rod **10**, the visible component elements of this mechanism being denoted by the same reference numerals as in FIG. 1. The rod **10** is connected to the other leg **18** by a device which may be one of the two exemplary forms of embodiment disclosed hereinafter.

In FIG. 3, the fine adjustment is controlled by a screwing action. A cylindrical bore **20** is formed through the second leg **18**. The shank **21** of a head **22** is trunnioned without play in said bore and the assembly is clamped to the compass leg **18** by a nut shown diagrammatically at **23** and locked on said shank **21** through any suitable and known means. This head **22** has formed therethrough a cylindrical transverse gaged passage **24**; the axis of this passage intersects at right angles the axis of said bore **20**. A shouldered or flanged socket **25** can rotate freely in said passage **24** and is held against axial movement in said head **22**. Tightly screwed on one screw-threaded end **26** of socket **25** is a driving knob **27** having a knurled periphery or rim to facilitate the gripping thereof. The shouldered or flanged socket **25** has an axial cylindrical passage **28** formed with fine, precision internal screw-threads. Thus, the assembly comprising the socket **25** and the knurled driving knob **27** can rotate freely and without play in the head **22**, and the latter can also pivot freely with its shank **21**. The rod **10** has a screw-threaded end **29** corresponding to the tapped passage **28** and adjustably engages this passage under the control of the driving knob **27**. Of course, the screw-threaded portions of rod **10** and flanged socket **25** may have an extremely fine pitch, and it would not constitute a departure from the present invention to provide on the flanged socket **25** one of the

many play take-up means known in the art of mechanics, for example a plastic-washer device. The use of this compass is extremely simple. The draftsman approaches the desired distance between the compass points by holding the instrument by the lower portion of its legs and depresses the key **14** (FIGS. 1 and 3), with an easy, accurate and natural action. By releasing the first leg **1** he also releases the key **14**, thus locking the rod **10** on this first leg; then, he holds the instrument with the other leg **18** alone and rotates the knurled knob **27** to obtain the exact desired distance between the compass points. The legs **1** and **18** will then form with the rod **10** an isosceles triangle having its vertices at the axes of bore **2**, shank **21** and pivot **30**. This triangle is characterized by a great rigidity and is free of any undesired misadjustment, except in case of relatively strong frictional contact with the knurled knob **27**, which however should not be expected under normal working conditions.

In the alternate form of embodiment shown in FIG. 4 the rod **10** has a gaged cylindrical or annular end portion **31** having its axis disposed at right angles to that of the rod **10**. This cylindrical portion **31** has a concentric bore engaged by a flanged cylindrical member **32** of which the axis is denoted **33** in the figure. This flanged cylindrical member **32** is carried by a cylindrical shank **34** of which the axis **35** is parallel but eccentric in relation to the axis **33**. The cylindrical shank **34** is rotatably mounted in a cylindrical bore **20** formed in the leg **18** and comprises an integral knurled driving knob **37** either adapted to compress a braking washer **36** or associated with any other equivalent means. Thus, frictional engagement between washer **36** and the protruding flange of driving knob **37** prevents unwanted "play" and accidental rotation. When the knurled knob **37** is rotated the flanged cylindrical member **32** rotates likewise about the axis **35**, without play, thus shifting the axis **33** of cylinder **32** and causing the relative angular position of the compass leg to be modified. Conversely, a force tending to modify the relative angular position of the compass legs is transmitted to the eccentric. The throw should be selected to have a sufficiently low value, and the braking force should be strong enough, to prevent the efforts normally exerted on the compass legs from causing the rotation of cylinder **34** in leg **18**, but in any case this requirement can be met without any major difficulty. This modified form of embodiment (FIG. 4) is advantageous in that the knurled knob **37** is substantially coplanar with the compass legs, i.e. in the plane of the table upon which the compass will be laid. Under these conditions, the probability of shocks likely to cause an accidental rotation of the knurled knob is extremely reduced. The knurled knob may be replaced if desired by a lever of which the permissible and necessary angular movement amplitude can be contained in a normally protected space, for example between the leg **10** and the vertex **30** of the compass.

The above-described invention is characterized by many advantageous features, mainly in the case of the application thereof to the construction of compasses. These features refer both to the construction and to the actual use of the instruments, and the essential ones are briefly summarized hereinafter:

The locking action is safely protected against accidental misadjustments, so far as the compass is subjected only to the normal efforts usually exerted thereon;

The compass is particularly suited for describing circles and arcs with the pencil point under a certain pressure;

The compass rigidity is practically independent of the wear and tear of parts which result from a shearing stress;

The triangular rod is mounted on both legs by means of free-trunnioned members thus permitting the use, under all circumstances, of the complete amplitude available for fine adjustment purpose without producing any distortion torque;

The screw fine adjustment device, particularly simple and of reduced over-all dimensions, can be manufactured without difficulty and nevertheless with a high degree of precision, and provided with any known and suitable complementary braking and wear and play take-up means;

With the particularly attractive eccentric-type fine adjustment device, the knurled knob is substantially coplanar with the compass legs, thus minimizing the risks of accidental rotation of this knob and therefore of producing a misadjustment;

The compass constructed according to this invention is light in weight, and its manufacture is both easy and economical;

This compass is extremely simple to use and the draftsman holding as usual the compass by the lower portion of its legs when taking distances or measuring dimensions has not to change his attitude and movement for locking or releasing the compass;

Experience teaches that adjusting this compass to the desired dimension requires substantially half the time necessary when using conventional compasses so that the draftsmen efficiency is definitely improved;

The limits of the fine adjustment ranges are positively felt;

The component elements of the compass are easily interchangeable.

Of course, many modifications and variations may be brought to the specific forms of embodiment shown and described herein, without however departing from the spirit and scope of the invention as set forth in the appended claims.

Thus, notably, the shearing stress exerted on the rod for locking purposes may be obtained through any other equivalent spring-urged system, whether by using a lever or not, the function of this lever consisting either in transmitting and/or eliminating this stress, or transmitting it only, or eliminating it separately.

Besides, although in all the examples described and illustrated herein the rod is rectilinear it would not constitute a departure from the basic principles of this invention to utilize the mountings according to this invention in any apparatus requiring some form of indicating means, whether along a straight line, along a curve, or a combination of straight and curved lines.

What is claimed is:

1. A pair of compasses comprising a first leg having a lower face and an upper face, a shaft extending through said first leg at right angles to said faces, said shaft having a lower portion formed with a shoulder adapted to engage said lower face and an upper portion projecting above said upper face, a bearing socket rotatably and sildably mounted on said projecting upper portion of said shaft, a passage formed through said upper portion of said shaft, a spacer rod having one end slidably engaged in said passage, at least partial radial extensions of said passage which are formed in said socket and engageable by said rod, means for constantly urging said shaft shoulder downwards in order to clamp on the one hand said rod against said socket extensions of said passage and on the other hand said socket proper against said upper face of said first leg and thus lock said spacer rod with respect to said first leg, control means actuatable for causing said first means to cease urging said shaft shoulder downward in order to permit the desired adjustment of said spacer rod both in oscillation and in sliding movement with respect to said first leg, another leg pivoted to said first leg about a pivot pin extending at right angles to said lower and upper faces of said first leg, said other leg having a lower face and an upper face substantially coplanar with the relevant lower and upper faces of said first leg, respectively, said spacer rod comprising another end extending towards said other leg, and a mounting carried by said upper face of said other leg for connecting said other end of said spacer rod to said other leg in a manner permitting free oscillation and adjustable axial movement of said spacer rod with respect to said other leg.

2. A pair of compasses as set forth in claim 1, wherein said mounting provided on said other leg comprises a head rotatably mounted on the upper face of said other leg about an axis perpendicular to said upper face, said head having a cylindrical passage formed therein and extending at right angles to the axis of rotation thereof, an internally screw-threaded socket rotatably engaged and axially restrained in said cylindrical passage and a knurled knob rigid with said socket for controlling the rotation thereof, said other end of said spacer rod being threaded and in screw engagement with the internal thread in said socket.

3. A pair of compasses as set forth in claim 1, wherein the other end of said spacer rod has rigid therewith an annular member with a cylindrical bore of which the axis is at right angles to that of said spacer rod and to said other leg, and wherein said mounting provided on said other leg consists of an eccentric means comprising a circular head fitted and rotatably mounted in the cylindrical bore of said annular member, and a shank rigid with said circular head and of which the axis is eccentric with respect to that of said circular head, said shank being rotatably mounted in and extending through a cylindrical bore formed through said other leg at right angles to the upper and lower faces thereof, said shank being further provided at its free end with an integral knurled driving knob, and braking means operative to prevent undesired rotary movement of said eccentric means about the axis of its shank is interposed between said knob and the lower face of said other leg, whereby the relative angular position of the compass leg may be adjusted by rotating said knob against the braking force of said braking means to rotate said eccentric

means and thereby cause said other leg to move transversely substantially in the longitudinal direction of the spacer rod while pivoting about said pivot pin.

4. A pair of compasses as set forth in claim 1 wherein said means for constantly urging comprises a lever extending longitudinally to and pivoted on said first leg about a transversal pivot pin of which the axis is parallel to the upper face of said first leg, with a short operative lever arm downwardly engaging said shaft shoulder and with a long lever arm, and spring means cooperating with said long lever arm to cause said lever to pivot about its associated pivot pin to urge said short lever arm downwardly against the shaft shoulder, and wherein said control means comprises a push-member integral with said long lever arm and operative, when pressed, to move said long lever arm against the force of said spring means to release the downward pressure exerted by said short lever arm on said shaft shoulder and thereby allow sliding movement of the spacer rod in said dimetral passage.

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