May 6, 1930. W. E. TRUMPLER 1,757,604

PIVOT STRUCTURE

Filed March 21, 1927

Fig.1.

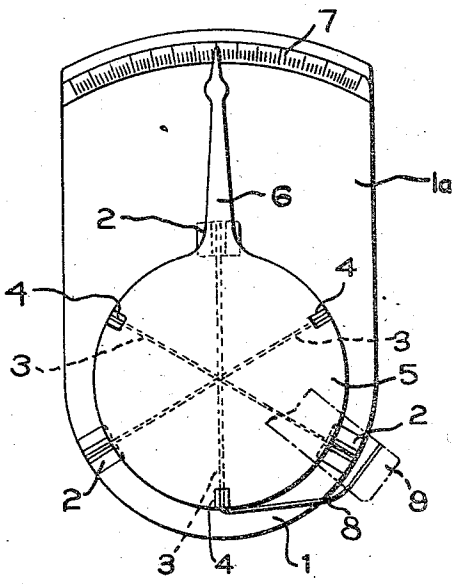


Fig.2.

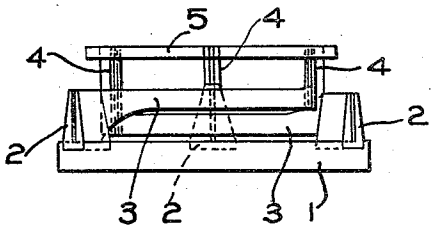


Fig.3.

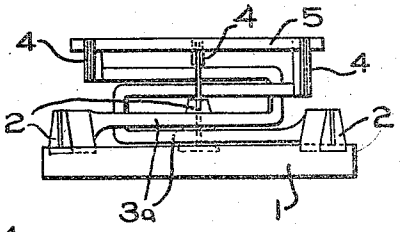
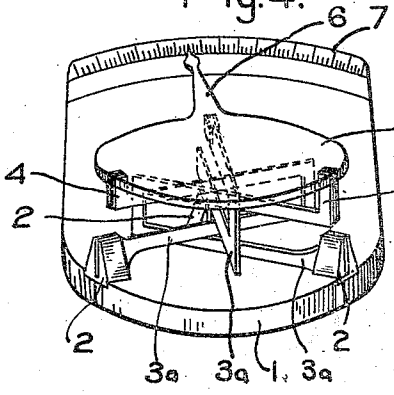


Fig.4.



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UNITED STATES PATENT OFFICE

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PIVOT STRUCTURE

Application filed March 21, 1927. Serial No. 177,024.

My invention relates to pivot structures utilizable for any desired purpose and it has particular relation to stable arrangements by which pivotal or oscillatory movement of great amplitude may be obtained.

In accordance with my invention a mechanical connection, comprising resilient members disposed in intersecting planes and of great flexibility, is interposed between relatively movable parts or elements, whereby frictional resistance is entirely eliminated.

Further, in accordance with my invention, the aforesaid resilient members are so designed that the axis of rotation or oscillation of one of the movable parts or elements substantially coincides with the extension of a line in which the planes of the resilient members intersect.

In accordance with one phase of my invention, the aforesaid spaced resilient members support a deflecting or oscillating pointer co-acting with a suitable scale to indicate the magnitude of an observed quantity, condition, or the like.

My invention relates to a pivot structure of the general character disclosed in my pending application, Serial No. 39,996, filed June 27, 1925, and, in some respects, is an improvement over the disclosure of that application in that the deflecting or bending resilient members are of greater stability and are subjected to less strain, while, at the same time, permitting great amplitude of movement of the relatively movable parts connected thereto.

My invention resides in the structure or apparatus of the character hereinafter described and claimed.

For an illustration of some of the forms my invention may take, reference is to be had to the accompanying drawing in which:

Figures 1 and 2 are plan and side elevational views, respectively, of apparatus constructed in accordance with my invention;

Fig. 3 is a side elevational view of apparatus of a modified form; and

Fig. 4 is a perspective view of the apparatus shown in Fig. 3.

In Figs 1 and 2 is illustrated a supporting structure or base 1 of any suitable construction and of any suitable material, preferably, however, metallic in character. Carried by the base 1, are the legs or standards 2 so arranged as to be detachable therefrom, or, and preferably, formed integrally therewith.

Each standard 2 serves as a support for a resilient member 3 extending across the base 1 in spaced relation thereto. The members 3 may be secured to the standards 2 in any suitable manner, preferably, however, by fitting one end of each of said members 3 in a slot in a standard 2 and then soldering the adjacent surfaces together.

The members 3 should be of highly resilient material and of such character that they may be flexed with relatively little effort. Ordinarily, they should be thin, web-like strips of spring steel, phosphor bronze, or the like.

Each of the aforesaid members 3, at its end removed from its support 2, is preferably received and soldered in a slot formed in a rod or lug 4 projecting from a disk or member 5 utilizable for actuating a pointer 6 formed preferably integral therewith. The pointer 6, at its free end, coacts with, or plays over, a scale 7 formed, in the example illustrated, on an extension 1*a* of the base 1.

For the purpose of oscillating or deflecting the pointer 6, energy may be applied thereto in any suitable manner. To this end, in the example illustrated, a link 8 connects the disk 5 to the member 9 which may be operated in any suitable manner, such for example, as that disclosed in my pending application Ser. No. 177,023, filed Mar. 21, 1927.

When the device is at rest, the planes of the members 3 should intersect in substantially a straight line and it is about this line that the moving system should rotate. When the members 3 are identical, one with the other, and when their dimensions are the same throughout, the length of a member 3 on one side of the aforesaid line should be the same as the length thereof on the other side. However, if it is desirable to have such lengths unequal, the width of the longer

arm of each resilient member 3 may be greater than the width of the shorter arm. This idea is illustrated in Figures 1 and 2 wherein the length of any member 3, between the support 2 and the aforesaid line, in which the planes of the members 3 intersect, is slightly greater than the length of said member 3 between said line and the rod 4. Accordingly, the width of the longer arm of said member 3 is increased somewhat, preferably adjacent the support 2. As a result, the axis of rotation is maintained substantially in coincidence with the aforesaid line.

When a force is applied to the disk 5 to deflect it in either direction, each of the members 3 assumes a form simulating the arc of a circle. The clockwise movement of the disk 5 imparts similar movement to the rods 4. The latter may have torsional flexibility but should be of relatively great stiffness sidewise.

As illustrative of another of the various forms my invention may take, I have illustrated in Figures 3 and 4 a device generally the same as that of Figures 1 and 2 but embodying U-shape resilient member 3*a* in lieu of the straight resilient members 3. The members 3*a* are duplicates of each other and each has both arms of the U lying in substantially the same plane. When assembled, the planes of each of the members 3*a* should intersect in substantially the same straight line, and it is about this line that the pointer 6 should move.

Although herein illustrated as embodied in a deflecting or indicating instrument, it is to be understood that my novel form of pivot structure is susceptible of other uses. For example, in many arts, it is desirable to eliminate, to the maximum extent, the friction developed between relatively movable parts, or to eliminate frictional surfaces entirely. The device herein illustrated satisfies that need. When utilized in lieu of a frictional bearing surface, pointer 6 should be eliminated. Moreover, under such circumstances, it is desirable that the disk 5 and the rods 4, on the one hand, and base 1 and members 2, on the other hand, shall be duplicates of each other.

Ordinarily, it is desirable that three of the resilient members 3, 3*a*, or equivalents, be utilized and that they be equi-distantly spaced on the base or supporting member 1. However, it is to be understood that a greater or less number of such members may be provided and that they may be positioned on the supporting base as desired.

I claim as my invention:

1. The combination with a member, of means for supporting said member for oscillatory movement comprising a plurality of web-like, substantially U-shaped, resilient members disposed in intersecting planes and each freely assuming positions simulating arcs of a circle upon movement of said deflecting member.

2. Deflecting mechanism comprising spaced resilient members of substantially U-shape disposed in intersecting planes so as to cross each other, a deflecting member carried by said resilient members, and means for imparting vibratory movement to said deflecting member.

3. Deflecting mechanism comprising spaced resilient members of substantially U-shape disposed in intersecting planes, a deflecting member carried by said resilient members and having its axis of rotation disposed substantially in the line formed by said intersecting planes and means for imparting vibratory movement to said deflecting member.

4. The combination with a supporting member, of relatively non-flexible legs projecting therefrom and spaced substantially equal distances from a point thereon, individual resilient, web-like members of substantially U-shape carried by individual legs and crossing each other in a line passing substantially through said point, a member carried by said web-like members, and means for imparting oscillatory movement to said last named member.

5. The combination with a supporting member, of relatively non-flexible legs projecting therefrom and spaced substantially equal distances from a point thereon, each of said legs being slotted in a direction extending towards said point, individual resilient, web-like members received by the slotted portion of each leg and disposed in planes intersecting in a line passing substantially through said point, and a member comprising an indicating pointer carried by said web-like members.

6. A pivotal structure comprising the combination with spaced disc-like members disposed in overlying relation, of an odd number of adjacent resilient members disposed in intersecting planes, each of said resilient members being secured at its ends to the respective supporting members.

7. The combination with a supporting member and pivotally-movable deflecting element, of means for mounting said deflecting element on said supporting member comprising, a plurality of resilient members disposed in intersecting planes and crossing each other in non-intersecting parallel planes, each of said resilient members having substantially the shape of a hollow rectangle having one of its sides removed, and each of said resilient members being secured at one end to said supporting member and at the other end to said deflecting element.

8. A pivoted structure comprising the combination with spaced supporting and deflection indicating members disposed in parallel planes, of a plurality of resilient members disposed in intersecting planes, each of said re-

silient members having substantially the shape of a hollow rectangle having one of its sides removed and each of said resilient members being secured at its ends to said supporting and deflection indicating members respectively.

In testimony whereof, I have hereunto subscribed my name this 15th day of March, 1927.

WILLIAM E. TRUMPLER.