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CLAMPING MEANS FOR FORCE-RESPONSIVE ELEMENT

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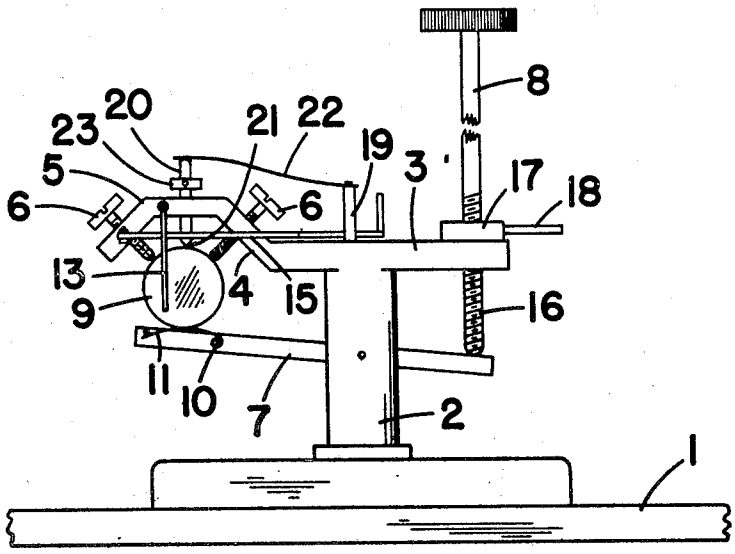

FIG. 1.

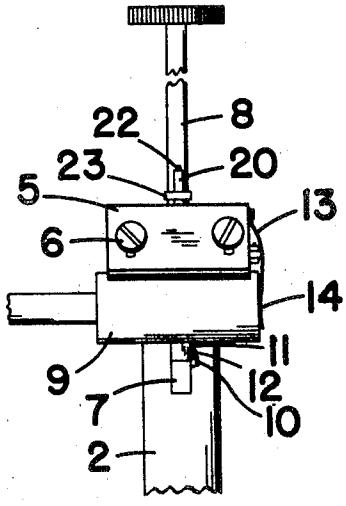

FIG. 2.

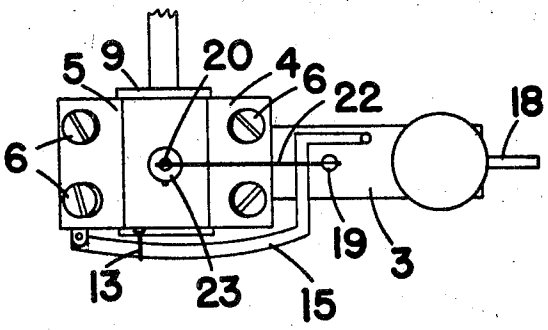

FIG. 3.

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CLAMPING MEANS FOR FORCE-RESPONSIVE ELEMENTS

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8 Claims. (Cl. 265—1.4)

The present invention is directed to gravity meters and similar devices utilizing a mass included in a moving system responsive to a force to be measured, and resides particularly in a clamping mechanism for holding said mass stationary when the system is not in operation, as when it is being transported.

In systems of the general type referred to above, such as gravity meters, seismic pickups, and the like, a mass is suspended as freely as possible in a moving system and means are provided for measuring the movement of the mass in response to a force to be measured. These systems are necessarily of an extremely delicate nature if they are to possess the desired sensitivity. Consequently, said systems cannot be transported safely unless some means is provided for clamping the moving system in a stationary position during transportation.

The principal object of the present invention is the provision of a clamping means for a system of the type described which is simple, positive in action, and easily operated.

An additional object of the present invention is the provision in a clamping system of the type referred to of means for positively preventing any adhesion of the mass to the clamping members when the latter are released. This is an important feature because in such systems the movement of the mass is slight and, accordingly, the space between the mass and the clamping members when the latter are in unclamped position is quite small. In an actual gravity meter this distance is between 0.5 and 0.7 of a millimeter. Under these circumstances, when the clamp is operated to release the mass, there is a tendency for the mass to cling to the clamping members, with the result that subsequent readings may be in error unless the system is jarred to release the mass.

Further objects and advantages of the present invention will appear from the following detailed description of the accompanying drawing in which—

Fig. 1 is a front elevation of a clamping device in accordance with the present invention in clamping position;

Fig. 2 is a side elevation of said device; and

Fig. 3 is a plan view of said device.

Referring to the drawing in detail, numeral 1 designates the bottom of the casing in which the instrument is housed. Numeral 2 designates a standard at the top of which is a cross member 3 having an upwardly inclined portion 4 at the end of which is carried a plate 5 having a vertical section substantially corresponding to three sides of an octagon, with one of these sides in a horizontal position. Through each of the inclined sides of plate 5 is screwed a pair of screws 6 spaced in symmetrical relation to each other. Pivoted on the standard 2 is a bar 7 having one of its ends extending beneath the screws 6 and having its other end extending in the other direction from the pivot and adapted to bear against an adjusting screw 8, screwed into the cross member 3.

The mass which is to be clamped is designated by numeral 9 and is arranged between the screws 6 and the bar 7, in such a way that the bar 7 can contact it symmetrically with respect to the screws 6. The end of the bar which bears against the mass has mounted on it a stud 10, to which is anchored a resilient wire 11, the movement of which is limited by stop 12. This wire normally projects above the edge of the bar 7 and is of extremely small cross sectional area for the reason hereinafter specified.

Anchored to the horizontal portion of the plate 5 is a second resilient wire 13 which has a hump 14 arranged to normally press against the end of mass 9. Pivoted on plate 5 is a lever 15, one portion of which, adjacent the pivot point, is disposed behind the resilient wire 13, and the other end of which projects over the cross member 3.

As will be seen, the adjusting screw 8 is arranged for release of bar 7 by rotation counterclockwise, and is provided with a thread 16 of steep pitch so that a small rotative movement results in a relatively large longitudinal movement. Carried by the screw is a collar 17 having a laterally extending arm 18 which is adapted in the path of its movement to press against the end of lever 15. The cross piece 3 carries a stop 19 to limit the movement of the lever 15.

Slidingly mounted in the horizontal portion of plate 5 is a pin 20, the lower end of which has a knife edge or sharp point 21, and the upper end of which bears against a resilient wire 22 anchored on stop 19. The downward movement of the pin 20 is limited by a collar 23.

When the mass is freely suspended and it is desired to clamp it, this is accomplished by turning adjusting screw 8 clockwise, which results in one end of the bar 7 being thrust upwardly against the mass 9 to force it into contact with the screws 6, thus holding it firmly in place. When a station is reached and it is desired to free the mass, the adjusting screw 8 is turned counterclockwise. When this is done, the bar 7

normally tends to fall away from the mass 9. The resilient wire 11 exerts a positive force which breaks the contact between bar 7 and the mass 9, and this spring wire is made with extremely small cross sectional area so that it will have no tendency, by capillary attraction or otherwise, to stick to the mass 9. It may be mentioned that this sticking is ordinarily caused by the presence of a layer or film of moisture or grease or dirt or any other foreign matter on the surface of the mass 9 or the surface of the other elements, and the tendency to stick is more or less directly proportional to the areas of the surfaces in contact.

With the bar 7 positively withdrawn from the mass 9, the latter has a natural tendency to fall away from the screws 6. Lest there be any tendency to stick in contact with these screws, the pin 20 is provided. The force exerted by the spring wire 22 presses the pin 9 downwardly against the mass, and positively thrusts it away from the screws 6. Since the lower end of pin 20 has a surface area which is practically infinitesimal, there is no tendency for it to stick to the mass 9.

The weight then is freely suspended except for the friction exerted by the spring wire 13, the hump 14 of which is engaged with the end of the mass. The releasing of the clamping members thus far has been accomplished by a partial turn of the adjustment screw 8. When the operator desires to make a reading he further turns screw 8 counterclockwise and brings the arm 18 into contact with the end of lever 15, and moves this lever to the stop 19. When in this position the lever 15 holds the spring wire 13 in such a position that the hump 14 is out of engagement with the mass, which is then freely suspended. The system to which the mass is connected is not shown here since the moving system itself constitutes no part of the present invention. The mass 9, as previously indicated, can be the moving mass of any type of gravity meter, seismic pickup, or the like. A system to which the present clamping means is admirably suited is that described in U. S. Patent 2,183,115.

It will be apparent that changes in design and arrangement of parts can be made in the above described embodiment without departing from the principles upon which the present invention is based. For example, the number of clamping screws 6 can be varied from two to any desired number. Likewise, if desired, screws similar to 6 can be arranged in the bar 7, and any number of such screws can be used. In the embodiment shown, there are four screws 6 on the upper side of the mass, and there is one contact point between the mass and the bar 7.

The nature and objects of the present invention having been thus described and illustrated, what is claimed as new and useful and is desired to be secured by Letters Patent is:

1. A clamping device for a force measurement instrument of the type including a force-responsive element capable of suspension for response to said force which comprises a first clamping member carrying a plurality of clamping points, and a second clamping member carrying at least one clamping point arranged symmetrically with respect to said plurality of clamping points, said plurality of clamping points and said single point being arranged on opposite sides of a portion of said force-responsive element, and means for adjusting the relative positions of said clamping points so as to place them in clamping or non-clamping position as desired.

2. A clamping device for a force measurement instrument of the type including a force-responsive element adapted to be suspended for response to said force, which comprises a first clamping member carrying a plurality of clamping points, and a second clamping member carrying a single clamping point arranged symmetrically with respect to said plurality of clamping points, said plurality of clamping points and said single clamping point being arranged on opposite sides of a portion of said force responsive element and means for varying the relative positions of said clamping members so as to place them in clamping or non-clamping position as desired.

3. A clamping device according to claim 1 including means for positively breaking contact between said force responsive element and said clamping points when the relative positions of the latter are adjusted to non-clamping relationship.

4. A clamping device for a force measurement instrument of the type including a force-responsive element capable of suspension for response to said force which comprises a bracket arm overhanging said element, adjustable screws arranged on said bracket arm symmetrically with respect to said element and adapted to abut against said element, a bar pivoted intermediate its ends and having one of its ends arranged under the said force-responsive element, and means for applying force to the other end of said bar in order to force said force-responsive element against said screws.

5. A device according to claim 4 in which the bar is provided at the point at which it contacts said force-responsive element with a leaf spring in the form of a wire of minute cross sectional area adapted to exert a pressure against said force-responsive element whereby when said bar is moved away from said element said spring will overcome the tendency of said element to adhere to said bar.

6. A device according to claim 4 in which the bracket carries a slidable pin normally spring pressed against the top of said force-responsive element whereby when said bar is removed from underneath said element said pin will overcome any adhesion between said force-responsive element and said screws.

7. A device according to claim 4 in which said clamping device includes a member adapted to frictionally engage said force-responsive element whereby when the bar is moved from clamping position the force-responsive element is still held in position against said screws until said friction element is taken out of contact therewith.

8. A clamping device for a gravimeter having a gravity-responsive mass, said clamping device comprising two clamp carriers disposed on opposite sides of the mass to be clamped, one of said clamp carriers carrying at least three clamping points, the other of said clamp carriers carrying a single clamping point, and means for relatively moving said two clamping members into clamping and non-clamping positions with respect to said gravity-responsive mass.

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