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Description

Bathroom scales often comprise a base, made of plate metal or plastic, on which a load-receiving platform rests which in turn rests on a weighing mechanism supported by the base. The weighing mechanism generally comprises four levers mounted so as to oscillate on the base, at one of their ends, at four points on the base which are located at the corners of a trapezoid. These four levers each receive a force equal to part of the weight resting on the receiving platform and are arranged so as to act on a weighing spring with a force which is in principle equal (or proportional) to the sum of the forces acting on the four levers, i.e. to the load to be weighed; German patent document A-2 949 612, for example, describes a device of this type.

In practice, however, various causes of perturbation interfere and the result is a greater or lesser degree of inaccuracy in the weighing. Thus, for example, the floor on which the base rests is not perfectly even and the base and the platform deform to a certain extent under the action of the load. The levers in turn are subject to torsional deformations with the result that the forces transmitted to the spring are no longer vertical, thereby affecting the accuracy of the measurement.

The object of the present invention is to overcome these defects, at least to the extent that any residual weighing error is negligible. For this purpose, the present invention relates to a weighing machine, such as bathroom scales, corresponding to Claim 1.

The attached drawing shows, by way of example, an embodiment and variants of the weighing machine according to the invention, in the form of bathroom scales.

Figure 1 is a general plan view of this embodiment, showing its base and its weighing mechanism,

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assuming that the load-receiving platform has been removed.

Figure 2 is a partial side view of the weighing mechanism shown in Figure 1.

05 Figure 3 is a partial plan view of a detail of Figure 1.

Figure 4 is a cutaway view along 4-4 of Figure 3.

Figure 5 is a partial cutaway view along 5-5 of Figure 4.

10 Figure 6 is a cutaway view of a detail on a larger scale.

Figure 7 is a similar view to Figure 6, but relating to a first variant.

15 Figure 8 is a similar cutaway view to Figure 6, but along 8-8 of Figure 9 and relating to a second variant.

Figure 9 is a partial plan view corresponding to Figure 8.

20 Figure 10 is a similar view to Figure 8, but relating to a third variant.

Figure 11 is a similar view to Figure 10, but relating to a fourth variant.

25 Figure 12 is a similar cutaway view to Figure 11, but along 12-12 of Figure 3 and relating to a fifth variant.

Figure 13 is a plan view corresponding to Figure 12.

30 The bathroom scales shown have a four-sided base 1, made of plastic or metal, which has, in the region of each corner, a knife-shaped support 2a, 2b, 2c, 2d on which one of the ends of one of the four levers 3a, 3b, 4a, 4b of the weighing mechanism rests.

35 At its left-hand end in Figure 2, the lever 3a has a V-shaped cutout 5a by which the lever rests on the knife 2a. This known arrangement enables the lever 3a to

oscillate practically without friction on the base 1. Likewise, the lever 4a has a V-shaped cutout 6a by which the lever 4a interacts with the knife 2b.

05 The lever 3b is identical to the lever 3a is (sic) has a V-shaped notch identical to 5a, by which it rests on the knife 2d. Similarly, the lever 4b is identical to 4a and has a V-shaped notch identical to 6a, by which it rests on the knife 2c.

10 The levers 4a, 4b are much shorter than the levers 3a, 3b and are attached to the latter by their end which is opposite the one mounted in an oscillating fashion on the base 1. Figure 2 shows how the short lever 4a is attached to the long lever 3a. The arrangement is identical for the levers 3b, 4b and is not illustrated in detail.

15 In Figure 2, the left-hand end of the lever 4a has a notch 7, the bottom of which rests on a first knife 8 of a connecting piece 9. This piece has a second knife 10, which interacts with the bottom of a V-shaped notch 11 made approximately half-way along the lever 3a.

20 It is seen that the short lever 4a is thus suspended from the long lever 3a by its left-hand end in Figure 2. The other short lever, 4b, is suspended in the same way from the other long lever, 3b, by means of a connecting piece 9a (Figure 1) identical to 9.

25 Each lever also has a V-shaped notch for interaction with a knife belonging to the receiving platform, which rests in this way on these four levers. Said notches in the levers 3a, 4a, 3b, 4b are shown at 12, 13, 30 14 and 15 respectively.

The base 1 has four bosses 16, each of which has a cylindrical hole 17 running through it in order to receive one of the four corresponding fingers belonging to the receiving platform, which is not shown.

35 The weighing spring consists of a steel leaf 18

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fixed over part of its length to a supporting block 19 integral with the base 1. The other part of its length extends beyond the block 19, on the right-hand side of Figure 1, is (sic) forms a flexible leaf. One or more stress gauges 20 are placed on this part, their purpose being on the one hand to measure the bending of the free part of the leaf 18 and on the other hand to control a display device (not shown) via an electronic circuit (also not shown).

A metal piece 21, which can be cold-stamped, is fixed to the free end of the steel leaf 18. This piece 21 has two positioning bosses 22 engaged in corresponding holes 23 in the leaf 18. The piece 21 is fixed to the leaf 18 by means of two lugs 24 on the piece 21, which, during assembly, are engaged through a hole 25 in the leaf-spring 18, after which they are separated from one another and pressed against the underside of this leaf 18.

The reason for the existence of this piece 21 is that it has a V-shaped or U-shaped groove 26 which is made in this piece by a cold process much more easily than this groove could be made direct in the steel leaf 18 itself.

In the drawing, the right-hand end of the long levers 3a, 3b is provided with a bearing piece 27a, 27b, for example made of plastic, which has a hemispherical bearing surface 28 of small radius.

As will be seen, a force-transmitting member 29 serves to join the levers 3a, 3b to the leaf-spring 18. For this purpose, this member 29 has a rectangular orifice 30 of which one side, 31, is knife-shaped. During assembly, the orifice 30 is threaded over the end part 32 of the piece 21, which is narrower than the main part of this piece, the width of which is the same as that of the leaf-spring 18. The knife of the edge 31 of the orifice

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is brought into the groove 26, the member 29 consequently being suspended from the leaf-spring. A retaining member 33, made of rubber or plastic, is forced on to the part 32 to prevent the member 29 from leaving its illustrated working position.

The force-transmitting member 29 forms a housing (Figure 4) in which the end of the long levers 3a, 3b is engaged, as seen in Figures 4 and 5, so that these ends rest in this housing via the hemispherical parts 28.

The bearing pieces 27a, 27b are of cylindrical general shape and of small diameter. They are arranged side-by-side in the housing formed by the member 29, as can be seen in Figure 5. Curved parts 34, 35 of this member 29 hold the bearing pieces 27a, 27b in place, side-by-side and symmetrically relative to the longitudinal mid-plane of the leaf-spring 18.

The arrangement described minimizes the perturbing effect of an asymmetrical distribution of the load on the receiving platform, as well as the effect of slight deformations of this platform and the base 1. The distance separating the axes of the pieces 27a, 27b is actually very small and, for practical purposes, it is as though the sum of the forces exerted on the levers 3a, 4a, 3b, 4b were in all cases transmitted vertically to the leaf-spring 18, in the plane of symmetry of this leaf.

It should be pointed out that, in the example described and illustrated, the following arrangement helps to prevent the leaf-spring 18 from being subjected to a torsional force which would act on the stress gauges 20 in such a way as to impair the accuracy of the bathroom scales: The length of the knife formed at 31 is very much less than the width of the leaf-spring 18 and the distance between the axes of the bearing pieces 27a, 27b is less than the length of this knife and is practi-

cally negligible, i.e. their action on the leaf-spring 18 is vertical (the points where 27a, 27b act on the suspended member 29 being in vertical alignment with the groove 26) and in the vertical plane of symmetry of this
05 leaf-spring, owing to the symmetry and the short distance between these action points relative to this plane.

It is seen from the foregoing description that, to obtain a good accuracy, it is important for each of the active ends of the long levers 3a, 3b to act indepen-
10 dently on a force-transmitting member suspended in an oscillating fashion from the weighing leaf-spring, in a practically vertical direction and at a negligible (or zero) distance from the vertical plane of symmetry of the weighing leaf-spring, since it is under these conditions
15 that this leaf-spring will be subjected to a force which is equal or proportional to the load resting on the receiving platform.

Figure 6 shows, on a larger scale, that the hemispherical heads each interact with the member 29 at two
20 points. In the variant according to Figure 7, these hemispherical heads 28 are replaced by simple pointed pieces such as 28a, thereby reducing the frictional forces and increasing the accuracy.

In the variant according to Figures 8 and 9, the
25 ends of the long levers 3a, 3b have been arranged so as to act on one another and on the member 29 or an equivalent member, exactly in this plane of symmetry. In the variant according to Figure 10, this member 29 acts on the leaf-spring 18 via a vertical wire 36 located in the
30 plane of symmetry of the leaf-spring.

In the variant according to Figure 11, the member 29 is dispensed with and the two large intersecting levers 3a, 3b according to Figures 8 and 9 act on the piece 21 of the leaf-spring via a wire 37, instead of the
35 knife 31 interacting with a groove 26 in the manner des-

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cribed above with reference to Figures 3 and 4.

In the variant according to Figures 12 and 13, the leaf-spring 18 is divided into two parallel arms 18a, 18b in its part which is located to the right of the block 19 (Figure 1). In this case, the free end of each of the long arms 3a, 3b (which do not intersect) acts on one of the half leaf-springs 18a, 18b, vertically and in the mid-plane of the half leaf, via a wire 38a, 38b. Each of these two half leaves carries one or more stress gauges 39a, 39b and any spurious torsional effect of the leaf-spring is thus avoided.

Claims

1. A weighing machine, such as bathroom scales, comprising a base (1) supporting a weighing mechanism on which a platform rests which receives the load to be weighed, said platform being vertically mobile relative to the base (1), the weighing mechanism comprising four levers (3a, 3b, 4a, 4b) mounted so as to oscillate on the base (1), at one of their ends, at four points on the base (2a, 2b, 2c, 2d) which are located at the corners of a trapezoid, two of these levers (3a, 3b) being longer and the other two levers (4a, 4b), which are shorter than the first, each bearing, by their other end, on one of the two first levers mentioned (3a, 3b), at a point located between its ends, characterized in that the two longer levers (3a, 3b) interact at their other active end with a weighing spring (18) consisting of a flexible leaf fitted with at least one stress gauge (20) controlling a display device via an electronic circuit, in that the weighing mechanism comprises a force-transmitting member (29) suspended in an oscillating fashion from the weighing leaf-spring (18), and in that the active ends of the two longer levers mentioned (3a, 3b) are mechanically



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- independent of one another and possess bearing means (27a, 27b, 28) which are arranged so that they together exert on this transmission member (29), during a weighing operation, a force which is practically vertical and a negligible distance from the vertical plane of symmetry of the weighing leaf-spring (18) and, consequently, practically equal or proportional to the sum of the four forces exerted on the four levers by the platform when it is loaded.
2. A machine according to Claim 1, characterized in that the end of each of the two levers (3a, 3b) which interacts with the above-mentioned transmission member (29) has a hemispherical bearing head (28) through which it acts on this member (29), the two bearing heads (28) being arranged side-by-side in a housing formed by the transmission member (29), symmetrically relative to the longitudinal mid-plane of the leaf-spring (18) and at a negligible distance from this plane.
3. A machine according to Claim 1 or 2, characterized in that said transmission member (29) has an orifice (30) through which the free end (21, 32) of the weighing leaf-spring (18) passes, one side (31) of this orifice (30) being knife-shaped and interacting with a corresponding notch (26) in the leaf-spring (18, 21).
4. A machine according to Claim 3, characterized in that the body of the weighing leaf-spring (18) is made of steel, a metal end-piece (21), which can be cold-stamped, being joined by a cold process to the free end of the body of the leaf-spring (18) and possessing the notch (26).
5. A machine according to Claim 3, characterized in that the two above-mentioned bearing heads (27a, 27b) act on the transmission member (29) at a point which is in vertical alignment with the point (31, 26) where this member (29) is suspended from the weighing leaf-spring (18, 21).

