Dec. 14, 1943. J. MAURER 2,336,695

COMPARATOR

Filed Oct. 23, 1942

Fig. 1.

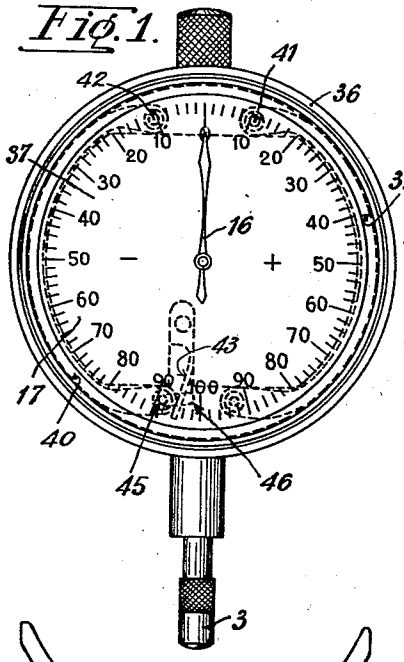


Fig. 2.

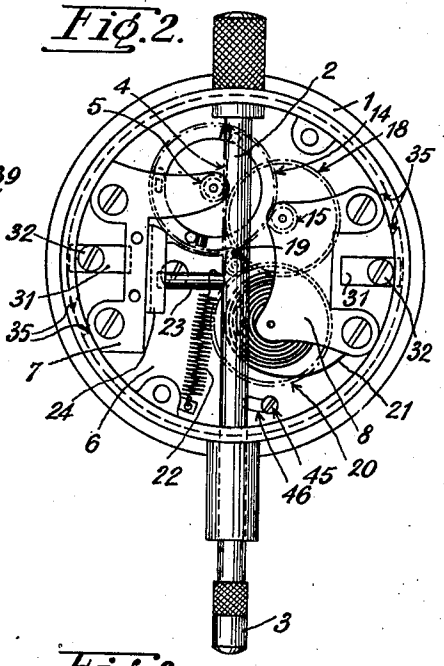


Fig. 3.

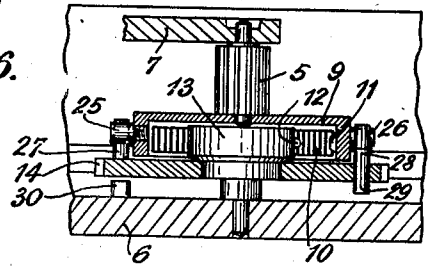


Fig. 6.

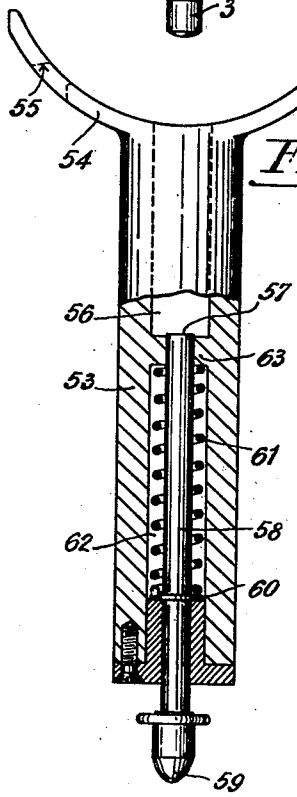


Fig. 4.

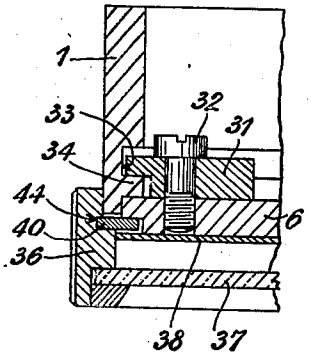
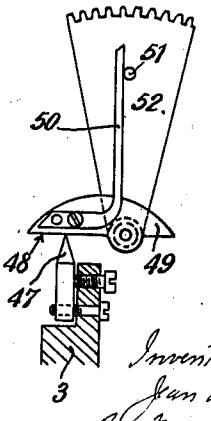


Fig. 5.



Inventor:
Jean Maurer
By Maurer & Leitner
Attorneys

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UNITED STATES PATENT OFFICE

2,336,695

COMPARATOR

Jean Maurer, Geneva, Switzerland

Application October 23, 1942, Serial No. 463,137
In Switzerland October 17, 1941

7 Claims. (Cl. 33—172)

When using the known comparators, care has to be taken that the feeler is not subjected to shocks for, owing to the direct connection between the feeler and the step-up gear mechanism, a shock on this feeler usually results in damaging the teeth of that delicate mechanism.

The present invention aims at obviating this disadvantage and has for its object a comparator the distinctive feature of which is an elastic device that transmits the movement of the feeler to the geared mechanism.

The annexed drawing exemplifies one embodiment of the comparator according to the invention:

Fig. 1 is a face view.

Fig. 2 is a reverse view, supposing the back of the case to be removed.

Fig. 3 is a partial cross section, on a larger scale, of the comparator as shown in Figs. 1 and 2.

Fig. 4 is a partial cross section, also on a larger scale.

Fig. 5 is a partial view of a variant.

Fig. 6 shows an extension that can be fitted at will to the apparatus shown in Fig. 1.

The comparator shown in Figs. 1 to 4 comprises a case 1 transversed diametrically by a rod 2, the end 3 of which constitutes the feeler. This rod bears a rack 4 acting on a pinion 5 so as to transmit the movements of the feeler to a step-up gear mechanism contained in a frame comprising a plate 6 and bridges 7, 8, fixed to the plate by means of screws.

The pinion 5 is angularly integral with a drum 9 within which is a spiral spring 10 the outside end of which is fixed at 11 against the inner wall of this drum 9. The inside end of the spring 10 is fixed at 12 on the periphery of a cylindrical part 13 angularly integral with a toothed wheel 14 in mesh with the first pinion 15 of the step-up gear intended to transmit ultimately to the pointer 16 the amplified movements of the feeler 3. The pointer 16 consists, as usual of a watch-hand rotating on a dial 17.

The step-up gear mechanism comprises a toothed wheel 18 with a vertical pinion 15 and is in mesh with a central pinion 19 fixed on an axis bearing the hand 16. An auxiliary toothed wheel 20 is also in mesh with the pinion 19. This wheel is subjected to the action of a spiral spring 21 fixed by one of its ends to the frame bearing the geared mechanism. This spring 21 tends constantly to bring the hand 16 back to the zero position (Fig. 1).

Another retention spring 22 acts directly on the rod 2 bearing the rack 4, tending to pull it into the position shown in Fig. 2, which corresponds to the zero of the hand.

To immobilize it angularly, the rod 2 has a radial bolt 23 (to which also one of the ends of the retention spring 22 is fixed) which slides in a groove 24 on the surface of the bridge 7.

It can be easily seen that the spiral spring 10, being stretched to a certain degree when the different parts are in the positions shown in Figs. 1 to 3, transmits practically completely the movements of the feeler to the geared mechanism and to the hand 16, provided that these movements do not exceed a certain speed and that the strain to be transmitted does not exceed a certain magnitude. When, however, these limits, determined beforehand by the initial tension of this spiral spring, are exceeded, this spring yields elastically and thus obviates dangerous strain on the teeth. It can be said that the elastic connection between the pinion 5 and the wheel 14 absorbs any shock to the feeler 3, and this does away with the disadvantages of known comparators referred to at the outset.

The drum 9 has two radial pins 25 and 26 projecting outwards from its periphery. Each of these pins presses against one of two bolts 27, 28 fixed on the wheel 14 parallel to its axis. The pins 25, 26 are normally pressed against the bolts 27, 28 by the tension of the spiral spring 10. The pins thus relinquish contact with these bolts when the pressure exceeds the limits indicated above.

The bolt 28 pierces the wheel 14, projecting at 29 on the plane of that wheel facing the plate 6. A stop 30 is fixed to the plate 6 in such a position that the end 29 of the bolt 28 impinges on it when the feeler leaves the normal position shown to an extent determined beforehand corresponding to the maximum movement permitted of the hand 16. When part 29 comes against the stop 30, this obviously arrests the geared mechanism and the hand 16, even if the pressure on the feeler is continued. The feeler 3 can even continue its movement to a certain extent beyond the position it occupies when part 29 strikes the stop 30. This extra movement of the feeler 3 makes the spiral spring 10 yield without any movement being transmitted to the geared mechanism and the hand. In this case also, the pins 25, 26 relinquish contact with the bolts 27, 28. When pressure on the feeler 3 ceases, all parts of the mechanism return automatically to the position shown in the drawing. It is thus seen that the presence of the elastic member 10 not

only allows the absorption of shocks, but also gives to the feeler an extra stroke which has no further action on the geared mechanism: this is very useful for the release of the feeler when the hand 16 is at the end of its stroke. The extent of the extra stroke in question can be controlled at will by giving appropriate dimensions to the spring 10.

The plate 6 is so mounted in the case 1 that it can turn in the latter to a certain extent. It is normally retained in the position shown by means of two flanges 31 fixed on to the plate by means of screws 32. These flanges run in an inner circular groove 33 of the casing 1 in such a way that, when the screws are home, a rib 34 on the casing is seized between the flanges 31 and the plate 6. The rib 34 shows at 35 a notch making it possible to release the plate 6 from the case when the flanges 31 are brought opposite these notches. The flanges and notches are brought together in the manner of a bayonet joint by loosening slightly the screws 32 and turning the plate to a certain extent anti-clockwise to Fig. 2, taking hold of the bridges 7, 8 with the fingers of one hand while grasping the case with the other. It can easily be seen that by thus turning the plate in the case, pinion 5 is freed from the rack 4, and this allows, on the one hand, of regulating the apparatus and, on the other, of extracting the frame from the case without taking out the rack. As a matter of fact, in thus freeing the pinion 5 from the rack 4, the radial bolt 23 is released from the groove 24 at the same time, so that nothing prevents the extraction of the plate 6 with the mechanism that it bears.

The rim 36 holding the glass 37, behind which is the dial 38, is mounted to rotate on the case 1 and is held rigidly in place by two "jaws" 39, 40 fixed to the plate by one of their ends at 41 and 42 respectively. The other end of the jaw 40 is subject to the action of a spring 43 which tends to draw it away from the other jaw. The end of jaw 39 opposed to that at 41 is simply fixed to the plate 6 in such a position that, when the parts occupy the positions shown in the drawing (Figs. 1 and 4), the jaws 39 and 40 are caught in an inner groove 44 in the rim and press laterally against the bottom of this groove in the fashion of a drum brake. At the same time, by reason of their being engaged in this groove, the jaws 39, 40 absolutely resist any rotational movement of the rim on the case. In other words, these jaws prevent the rotational shifting of the rim while serving as a brake against its vertical displacement from the body of the apparatus.

The end of the jaw 40 opposed to that at 42 is provided with a bolt 45 that can slide in a notch 46 in the plate. By acting on this bolt with a tool, contrariwise to the action of the spring 43, the jaws can be brought nearer together and thus released from the groove 44, allowing the rim to be detached from the case.

It is clear that, instead of a spiral spring, a leaf-spring producing the same effect could be used to transmit the movement of the pinion 5 to the wheel 14. Fig. 5 shows a variant in which the feeler 3 has an adjustable tip 47, by which it acts on the surface 48 of a swivel 49. The part 47 and the surface 48 are, then, equivalent to the rack 4 and the pinion 5 in the examples shown in Figs. 1 and 3. A leaf-spring 50 is fixed on to the part 49 and acts normally on a pin 51 of a toothed arc 52 in mesh with the first pinion of the step-up gear not shown. It is easily seen that, as in the first form of operation, when too violent a force is transmitted by the part 3 to the part 49, the spring 50 yields instead of transmitting the whole force of the thrust to the geared mechanism, thus preventing any damage to it.

Fig. 6 shows an extension that can be fixed at will to the comparator as shown in Fig. 1. This extension comprises a hollow handle 53 with a part in the form of a rim arc 54 to be fastened on to the periphery of the case by means of screws fitting into holes 55 in part 54. When this extension is fixed to the apparatus shown in Fig. 1, the slide-rod 3 fits into a cavity 56, where its end impinges on the end 57 of a spindle 58, which terminates at its other end with the auxiliary feeler 59. The spindle 58 bears a collar 60 acted on by a spring 61 placed round the spindle 58 in a cavity 62 of the part 53. The other end of this spring presses against the part 63 separating the two cavities 56 and 62 and at the same time serves as guide for the spindle 58. It can easily be seen that, thanks to this extension, the movements of the auxiliary feeler 59 are wholly transmitted to the feeler 3. This auxiliary apparatus permits the use of the comparator in cases where it would be difficult to use it alone.

It is evident that the elastic member, yielding when strain is transmitted to the feeler, could be placed directly between the feeler and a part sliding co-axially with the latter. In that case, it would be a helical compression spring normally stretched to a certain degree and keeping the feeler at the maximum distance from the part in question. It is easily understood that shocks to the feeler would have the effect of compressing the spring still farther and thus making it absorb those shocks.

What I claim is:

1. A comparator having a slidable sensing member spring biased toward its position of maximum extent, an indicator and a gear train for operating the same, said indicator and gear train being spring biased toward a minimum reading; a rack connected with said sensing member and a pinion meshing with said rack, said pinion being coaxial with one of the gears of said gear train and having a yielding connection with said gear whereby to permit limited two-way movement of said sensing member without concomitant movement of said gear train and indicator.

2. A comparator comprising a sensing member spring biased toward a normal position; an indicator, and a gear train connected with said indicator and spring biased toward a normal position; a rack and pinion connected with said sensing member, said pinion being coaxial with one of the gears of said gear train, a member coaxial with said gear and said pinion and having engagement with said gear capable of exerting force thereon in one direction only and a flexible connection also between said member and said gear and exerting force in both directions.

3. A comparator comprising a slidable sensing member having a rack thereon; an indicator, and a gear train for operating the same, including a pinion normally meshing with said rack; a casing having bearings for said slidable sensing member; a frame mounted in said casing, said indicator and said gear train being mounted in said frame, and means comprising a bayonet joint whereby limited rotation of said frame relative to said casing will disengage said rack and pinion

without axial movement of said frame relative to said casing and further rotation to a predetermined angular position will permit removal of said frame and the parts mounted therein from said casing without interference from said sensing member.

4. A comparator comprising a sensing member, a spring biasing said sensing member toward a normal position, an indicator, a gear train connected with said indicator, and a spring biasing said gear train and said indicator toward a normal position; a resilient member connecting said sensing member with said gear train whereby to permit limited two-way movement of said sensing device without concomitant movement of said gear train while transmitting to said gear train movement of said sensing device in either direction, said resilient member being resiliently weaker than the spring biasing said sensing member and stronger than the spring biasing said gear train.

5. A comparator comprising a sensing member, a spring biasing said sensing member toward a normal position, an indicator, a gear train connected with said indicator, and a spring biasing said gear train and said indicator toward a normal position; a resilient member connecting said sensing member with said gear train whereby to permit limited two-way movement of said sensing device without concomitant movement of said gear train while transmitting to said gear train movement of said sensing device in either direction, said resilient member being resiliently weaker than the spring biasing said sensing member and stronger than the spring biasing said gear train and means limiting the amplitude of deflection from said normal position of said indicator and its gear train.

6. A comparator comprising a sensing member, a spring biasing said sensing member toward a normal position, an indicator, a gear train connected with said indicator, and a spring biasing said gear train and said indicator toward a normal position; a spiral spring connecting said sensing member with said gear train whereby to permit limited two-way movement of said sensing device without concomitant movement of said gear train while transmitting to said gear train movement of said sensing device in either direction, said spiral spring being resiliently weaker than the spring biasing said sensing member and stronger than the spring biasing said gear train.

7. A comparator comprising a sensing member, a spring biasing said sensing member toward a normal position, an indicator, a gear train connected with said indicator, and a spring biasing said gear train and said indicator toward a normal position; a leaf spring connecting said sensing member with said gear train whereby to permit limited two-way movement of said sensing device without concomitant movement of said gear train while transmitting to said gear train movement of said sensing device in either direction, said leaf spring being resiliently weaker than the spring biasing said sensing member and stronger than the spring biasing said gear train.

J. MAURER.