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2,284,588

INDICATING DEVICE

Original Filed June 15, 1938

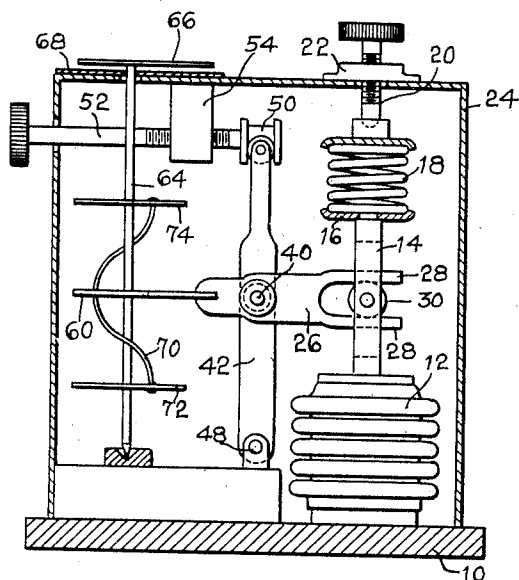


Fig. 1.

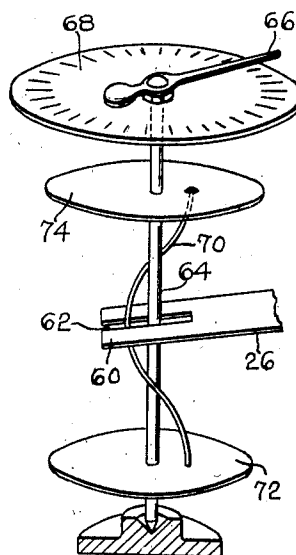


Fig. 3.

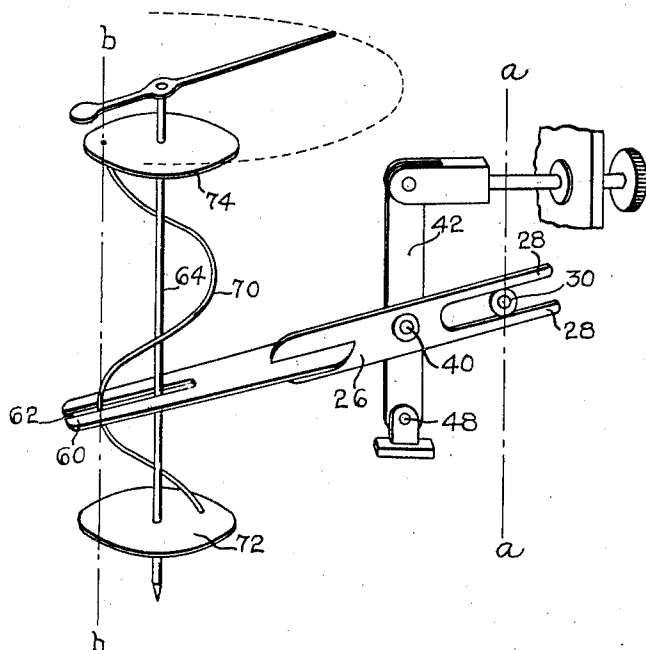


Fig. 2.

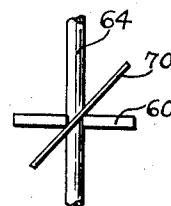


Fig. 4.

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INDICATING DEVICE

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Original application June 15, 1938, Serial No. 213,937. Divided and this application April 30, 1940, Serial No. 332,595

8 Claims. (Cl. 73-110)

This invention relates to an indicating device and more particularly to an indicating device for accurately measuring displacement.

This application is a division of my copending application Serial No. 213,937 filed June 15, 1938, for Indicating device, ripening into United States Letters Patent No. 2,223,640 dated December 3, 1940.

It is characteristic of all springs that the displacement is proportional to the force exerted upon the spring. However, if the spring used as a lever is moved about a pivot, the linear displacement along a straight line will vary, that is, the effective length of the spring measured with respect to a straight line and a pivot changes. Numerous attempts have been made to compensate for the change in the effective length of a spring.

An object of this invention is to provide a pivotally mounted lever having a constant ratio existing between the various lengths for any particular setting.

Another object of this invention is to provide a ratio-selector for changing the ratio of the lengths.

Another object of this invention is to provide means for shifting a lever to change the relative effectiveness thereof.

Another object of this invention is to provide an indicating device that is cheap, easily manufactured, accurate, easily adjusted and flexible to accommodate changed conditions.

Other objects and advantages reside in the construction of parts, the combination thereof and the mode of operation, as will become more apparent from the following description.

In the drawing, Figure 1 is a cross sectional view showing the organization of the mechanism used to translate linear movements into rotary movements.

Figure 2 is a perspective view showing schematically the driving elements.

Figure 3 is a fragmentary perspective view of the indicant and its driving mechanism.

Figure 4 is another fragmentary view showing the bifurcated driving end of the lever and its associated parts.

In certain types of instruments it is very desirable to translate reciprocatory movements into rotary movements, to accurately indicate changed conditions. In other instances it may be desirable to indicate impulses which may be caused by changes in pressure translated into reciprocatory movements and these in turn indicated by a rotary indicant. A very good illustration of this

is the operation of a sphygmomanometer, whereby the blood pressure is to be measured. In the past, sphygmomanometers have usually indicated the pulsations by use of a mercury column, responding to pulsations throughout the determined pressure ranges. In the mercury column rectilinear displacements are indicated. However, there is a demand for a sphygmomanometer wherein the impulses may be read by a rotary indicant, registering with indicia on a suitable dial. No satisfactory instrument has appeared on the market which satisfies this demand. In order to obtain accurate observations, it is essential to have a very delicate instrument to measure the impulses. In addition to being sensitive, the instrument must be quick acting, without a lag and without an overthrow or overshooting. That being the case, the effective inertia must be eliminated as far as possible. The parts must be light in weight and respond quickly to small changes in pressure.

Referring to the drawing, the reference character 10 indicates a base which supports a pressure responsive bellows 12. Instead of a bellows or Sylphon, any other suitable device for indicating differentials in pressures or changed conditions may be used, as for example, a thermostatic control. These bellows 12 support a standard 14 provided with a spring supporting capping member 16, having mounted thereon a resilient spring 18 biased downwardly, as viewed in Figure 1, by an adjustable set screw 20. This set screw 20 threadedly engages a nut 22, suitably attached to the housing 24. By adjusting the set screw 20, the tension of the spring 18 is changed, so as to change the force opposing the pressure exerted by the upper end of the bellows 12.

It is very desirable to indicate any change in displacement of the bellows 12 caused by a change in the pressures influencing the bellows. This change is transmitted to the standard 14, which moves in unison with the end of the bellows. The device disclosed herein is primarily adapted to indicate changes in the displacement of the end of the bellows. This has been accomplished by the use of a lever 26 provided with a bifurcated end having the bifurcations 28 straddling a suitable roller 30, pivotally mounted in the standard 14, so that any movement of the standard 14 is translated through the roller 30 to the end of the lever 26.

This lever 26 is pivotally mounted upon a pivot 40 supported upon an adjustable standard 42, pivotally mounted at 48 to the base. As viewed in Figure 1, the upper end of the standard 42 is

provided with a collar or swivel 50, having journaled therein a ratio-selecting screw 52, threadedly engaging internal threads in a bracket 54 fixedly attached to the housing 24. The end of the ratio-selecting screw 52 projects through the wall of the housing, as clearly seen in Figure 1, so that by merely rotating the knurled head of the screw 52 the pivot 40 may be advanced towards or away from the standard 14.

The opposite end 60, as shown in Figure 3, is provided with a slot 62 straddling a vertically disposed spindle or shaft 64. This shaft 64 provides a guide for the end of the lever, so as to cause it to move in a path parallel to the longitudinal axis of the standard 14.

The end 60 of the lever is used to translate the linear movement transmitted by the bellows 12 into circular movement or rotary movement. This has been accomplished by a spiral member 70 having its ends attached to a pair of discs 72 and 74 fixedly attached to the shaft or spindle 64. The end of the shaft 64 carries an indicant 66 mounted for rotation with the shaft outside of the casing 24, so as to register with indicia on an externally located dial 68, so that the readings may be observed from the exterior of the casing. The dial 68 is provided with an aperture much larger than the diameter of the shaft 64, so that as the dial 68 rests upon the casing 24, the dial 68 may be rotated from one position to the other. In order to calibrate the device, the dial 68 is rotated relative to the indicant into the proper position. The relative magnitude of movement of the indicant 66 with respect to predetermined movements of the bellows 12 is controlled by the ratio-selector 52.

The actuating device disclosed herein is preferably balanced in all respects, that is, the lever 26 is so designed that it balances about the pivot 40. The weight and location of the spiral 70, the discs 72 and 74 and the indicant 66 are preferably so selected that the weight of these parts balance with respect to the longitudinal axis of the shaft 64, so as to eliminate any torque or binding movement.

As may best be seen by referring to Figure 2, the roller 30 moves along the vertical axis *a-a*. The point of contact between the edges of the slot 62 and the spiral 70 is always along the axis *b-b*, which also is vertically disposed, as viewed in Figure 2, and parallel to the axis *a-a*. When lever 26 swings about the pivot 40, the ratio of the distance from the center of the roller 30 to the pivot 40, with respect to the distance from the contact of the spiral 70 with the end 60 of the lever 26 to the pivot 40, is constant. This ratio may be altered by shifting the ratio-selector; but for a particular setting of the ratio-selector, the ratio of the distance or length of one end of the lever with respect to the other is always the same, irrespective of the angular position of the lever.

As may best be seen by referring to Figure 4, the diameter of the shaft or spindle 64 is greater than the diameter of the spiral 70. However, due to the angular path which the spiral 70 travels when it passes through the slot 62, the edges of the spiral always contact the edges of the slot, so that there is no lost motion.

If, for example, the device is used in a sphygmomanometer for indicating the blood pressure, the pressure is supplied to the bellows 12. These bellows may be made from any suitable material so that they will respond to the desired changes in pressure. The impulse caused by the pulsa-

tions of the circulatory system of the body is transmitted to the bellows, so as to displace the end thereof. This, in turn, is transmitted to the standard 14. The spring 18 resists an overthrow in one direction and the resiliency of the bellows resists an overthrow in the opposite direction. The linear movement of the standard 14 is transmitted to the lever 26 which is pivoted at 40, so as to actuate the spiral 70, either in one direction or the other.

Due to the fact that the rotary parts are balanced, it can readily be seen that there will be a tendency for the rotary parts to rotate after the impulse supplied to the bellows has ceased, that is, the inertia of the parts will tend to rotate these parts. However, due to the bifurcated end of the lever straddling the spiral 70, the rotary movement of the rotating parts is transmitted laterally to the end of the lever; but the end of the lever cannot move laterally, for the reason that the slot therein straddles the spindle 64, so that any rotary movement of the spiral is arrested by the shaft or spindle 64. Thus, the device is so constructed that irrespective of the amount that the rotary parts may tend to overthrow, these parts cannot do so, due to the peculiar arrangement of the driving mechanism. The balanced condition of the lever 26 and its intimate contact with the roller 30 prevents the lever from swinging too far. Hence, it is seen that all parts are so arranged that all tendency to overthrow caused by inertia of the parts has been eliminated. By this arrangement, increments of movement of the end of the bellows are translated into increments of movement of the end of the indicant 66, so that the end of the indicant 66 moves through an arcuate path directly proportional to the movement of the end of the bellows.

Although the preferred modification of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. An indicating device including an indicant, means for rotating said indicant including a shaft rotatably mounted for supporting the indicant, a pair of discs fixedly mounted upon the shaft for rotation therewith, a helical member having its ends attached to the discs and concentrically disposed but in spaced relation with respect to the shaft, and actuating means, including a member engaging said helical member and movable along said shaft and guided thereby, said actuating means responding to changed conditions for rotating the discs through said helical member to thereby rotate the shaft and the indicant mounted thereon.

2. An indicating device including an indicant, a device for rotating said indicant including a pair of discs mounted for rotation with the indicant, means for supporting the discs in fixed spaced relation relative to each other, a single helical member having its ends attached to the discs and concentrically disposed with respect to the axis of rotation of said discs, said means forming a guide member parallel to the axis of rotation of said discs, and movably mounted actuating means engaging the helical member, said guide member guiding said actuating means,

said actuating means responding to changed conditions for rotating the discs through said helical member to thereby rotate the indicant.

3. An indicating device including a rotatable indicant, said indicating device including a spirally disposed actuating wire offset from the axis of rotation of the indicant, a lever for actuating the indicant, said lever having a fulcrum, a contact position spaced away from the fulcrum receiving the force to be measured, and a slotted portion straddling the spiral so that as the lever is rotated about the fulcrum by the force the rotation of the lever is translated into rotary motion by the spiral actuating the indicant, said indicating device including a shaft spaced from said spiral and positioned in the slotted portion, said shaft extending in a direction parallel to the axis of rotation of the spiral.

4. An indicating device for translating rectilinear movement into rotary movement, said indicating device including an indicant, a device for rotating the indicant including a wire formed into a spiral offset with respect to the axis of rotation thereof, a lever mechanism responding to the rectilinear force to be measured for actuating the indicant, said lever mechanism including an adjustable fulcrum upon which the lever is mounted for pivotal movement, one end of the lever being slotted, and means actuated by the force to be measured traveling in a rectilinear path, said means being seated in the slot for actuating the lever, the opposite end of the lever being slotted and straddling the spiral wire so as to cause the indicant to record the displacement caused by the force exerted upon the lever.

5. An indicating device for translating rectilinear movement into rotary movement, said indicating device including a rotatably mounted indicant, a device for rotating the indicant including a wire formed into a spiral offset with respect to the axis of rotation thereof, a lever mechanism for actuating the indicant responding to the rectilinear force to be measured, said lever mechanism including an adjustable fulcrum upon which the lever is mounted for pivotal movement, one end of the lever being slotted, and means traveling in a rectilinear path actuated by the force to be measured seated in the slot for actuating the lever, the opposite end of the lever being slotted and straddling the spiral wire so as to cause the indicant to record the displacement caused by the force exerted upon the lever, said indicating device including means for guiding the lever extending in a direction parallel to the axis of rotation of the indicant.

6. An indicating device for translating rectilinear movement into rotary movement in direct proportion, said indicating device including

an indicant, a device for rotating the indicant including a wire formed into a spiral offset with respect to the axis of rotation thereof, and a lever mechanism responding to the rectilinear force to be measured for actuating the indicant, said lever mechanism including an adjustable fulcrum upon which the lever is mounted for pivotal movement, one end of the lever being slotted, means seated in the slot for actuating the lever in response to the force to be measured, the opposite end of the lever being slotted and straddling the spiral wire so as to cause the indicant to record the displacement caused by the force exerted upon the lever, said device for rotating the indicant including a shaft for supporting the spiral, said shaft being positioned within the slotted end of the lever so as to guide the lever in a direction parallel to the axis of rotation of the indicant.

7. An indicating device for translating rectilinear movement responsive to a force to be measured into rotary movement for measuring the force, said indicating device including a shaft, a spiral wire concentrically disposed in offset relation with respect to the shaft, a lever pivotally mounted upon a fulcrum, extending in a substantially horizontal direction, said one end having a slot therein, the other end extending in a substantially vertical direction, said other end having a slot therein, means positioned in one of the slots for driving the lever in response to displacement caused by changes in the force to be measured, the bifurcated arm forming the slot in the opposite end of the lever straddling the shaft and the spiral, the shaft guiding the lever and the spiral rotating the indicant to measure the rectilinear movement of the force.

8. An indicating device for translating rectilinear movement responsive to a force to be measured into rotary movement for measuring the force, said indicating device including a shaft, a spiral wire concentrically disposed in offset relation with respect to the shaft, adjustably mounted means constituting an adjustable fulcrum, a lever pivotally mounted upon the fulcrum, one end extending in a substantially horizontal direction, said one end having a slot therein, the other end extending in a substantially vertical direction, said other end having a slot therein, means positioned in one of the slots for driving the lever in response to displacement caused by changes in the force to be measured, the bifurcated arm forming the slot in the opposite end of the lever straddling the shaft and the spiral, the shaft guiding the lever and the spiral rotating the indicant to measure the rectilinear movement of the force.

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