July 24, 1951 J. F. O'BRIEN ET AL 2,561,405

RESILIENT MOTIVATING DEVICE

Filed Oct. 3, 1947

FIG. 1

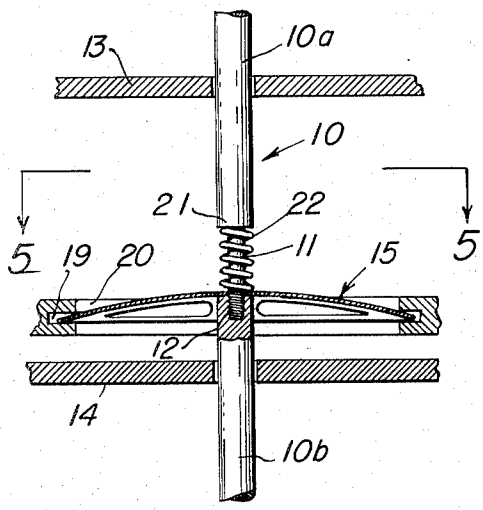


FIG. 2

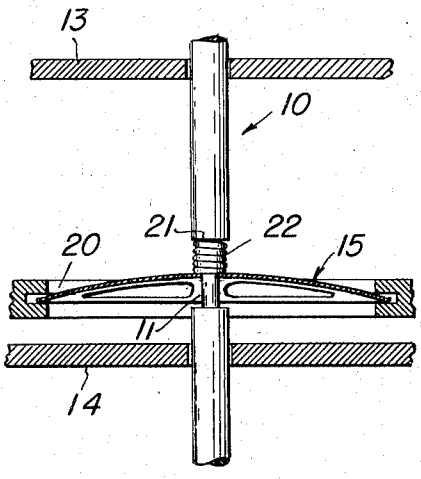


FIG. 3

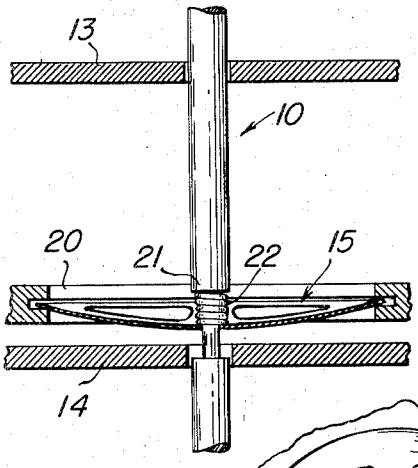


FIG. 4

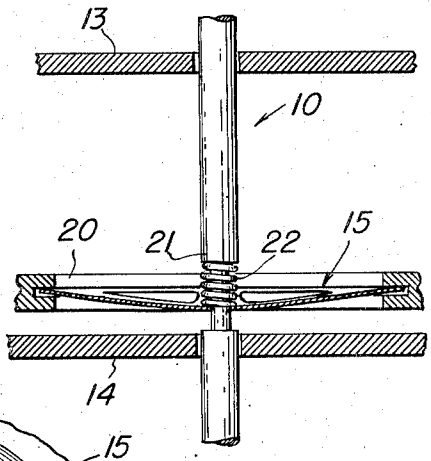
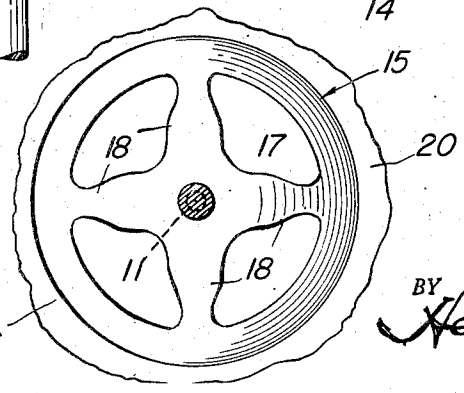


FIG. 5



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RESILIENT MOTIVATING DEVICE

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4 Claims. (Cl. 267—1)

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This invention relates to motivating devices which are spring actuated, and more particularly to those having an instantaneous snap action from an unstable position of energy storage to a spent position of stability.

Devices of this type have a variety of uses, for example, in connection with electric circuit breaker mechanisms for bringing about separation of the circuit make-and-break contacts upon the occurrence of electrical overload in the circuit protected by the mechanism.

Generally they embody a throw member arranged for reciprocation, one stroke thereof being spring-actuated, the other being for the purpose of re-setting the device to its unstable position of energy storage whereby the said member may again be made to execute a throw or power stroke under spring actuation.

It has been found in the past that a particularly effective power stroke, with attendant structural advantages, may be obtained by the use of a snap-disc spring; an accompanying disadvantage being, however, that the length of stroke is necessarily very short in comparison with the diameter of the disc.

One of the objects of the present invention is to effectively lengthen the stroke possible of attainment with a snap-disc spring in a device of the type concerned.

Another is to do so without inhibiting, but rather enhancing, the normal operative results thereof.

The desired improvement is obtained, pursuant to the invention, by combining with the snap-disc spring, preferably adjacent its operative center, a coil spring which resiliently transmits the action of the snap-disc over an extended stroke, determined in extent by the length and compression characteristics of such coil spring.

Further objects and features of the invention will become apparent in the following detailed description of the preferred specific embodiment illustrated in the accompanying drawing.

In the drawing:

Fig. 1 is a view in fragmentary vertical section of structure embodying a preferred form of the invention; the resilient motivating device being illustrated in its stable, spent position;

Fig. 2 is a similar view but illustrating the device at an intermediate stage between the stable position of Fig. 1 and the unstable, energy-storage position;

Fig. 3 is a similar view illustrating the device at its unstable energy-storage position ready for the return power stroke;

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Fig. 4 is a similar view illustrating the device at an intermediate stage of the spring-actuated power stroke; and

Fig. 5 is a horizontal section taken on the line 5—5, Fig. 1.

Referring now to the drawing: The particular form of the device here illustrated comprises a throw-rod 10 made up of separable lengths 10*a* and 10*b*, the length 10*a* being provided with a shank 11 of reduced diameter which terminates in a threaded end portion 12, and the length 10*b* having an internally threaded recess provided in one end thereof for screw connection with the said threaded end of shank 11. See Fig. 1.

The device is mounted in frame structure possessing the spaced guide plates 13 and 14, through which the throw-rod 10 extends for reciprocative sliding movement. The throw-rod may accomplish any particular purpose for which the device is designed; for example, the part 10*b* thereof may carry an electrical shorting bar (not shown) for bridging a gap in an electric power circuit, and the part 10*a* may carry a keeper (not shown) for suitable latch mechanism, whereby the device is adapted to serve as a component part of an electric circuit breaker.

The shank 11 of the throw-rod provides a coupling zone defined by spaced stop shoulders, for loosely coupling snap-disc spring 15 to the throw-rod. Such snap-disc spring is a single-equilibrium type, having a rim 16, a hub 17, and spokes 18 radiating from hub to rim, all as is well known in the art. The snap disk spring is a uni-metal disk integrally formed of a single homogeneous metal. An aperture for the reception of shank 11 of the throw-rod is provided through the hub 17, and the rim 16 is adapted to fit into a circumferential recess 19 provided in a support 20 which is fixed in position in any suitable manner.

Positioned between the snap-disc spring 15 and that stop shoulder 21 of the throw-rod which is disposed adjacent the stable position of such snap-disc spring, and closely encircling the throw-rod shank 11, is a coil compression spring 22, advantageously designed to be somewhat weaker than the snap-disc spring, and effective to extend the normal range of throw of the latter. As illustrated in Figs. 1, 2 and 4, the coil spring 22 is directly interposed between the shoulder 21 on the throw rod and the snap disk spring.

In Fig. 1 the device is shown in its stable position, the snap-disc spring 15 being in its position of equilibrium and the coil spring 22 being

freely extended. Assuming the device to be embodied in an electric circuit breaker, as above set forth, this would be the position of the component parts following release of the latching mechanism and consequent throwing of the throw-rod 10 to raised, circuit-breaking position.

For re-setting the device, throw-rod 10 is forced through its return stroke, here downwardly, either manually or by other suitable means. In the course of this forced return stroke of the throw-rod, coil spring 22 is first compressed. It is preferred that the relative strengths of the two springs be such that the compression of the coil spring is complete before the snap-disc spring is forced into its unstable position of energy storage, see Fig. 2, though this is not necessarily the case.

In the unstable condition of the device, see Fig. 3, the coil spring 22 is fully compressed and the snap-disc spring 15 is held in its unstable, energy-storage position. This condition of the device may be maintained in any way suited to the use to which the device is put. As a component part of a circuit breaker, the condition will be maintained by the aforementioned latching mechanism operable on a keeper associated with the part 10*a* of the throw-rod.

Upon release of the latching mechanism, or other means employed to maintain the device in its unstable condition, both of the springs will simultaneously act to throw the throw-rod through its power stroke, the coil spring 22, however, being operative to resiliently transmit the action of snap-disc spring 15 to the throw-rod. See Fig. 4. In this manner the force of snap-disc spring 15 is extended beyond its normally effective range, the additional distance depending upon the length and compression characteristics of coil spring 22.

While the rod 10 has, above, been considered to be the movable member thrown by the springs 15 and 22, and the support 20 the fixed member serving to anchor the snap-disc spring 15 for action within a fixed operative zone, the situation may be reversed in certain instances, the support 20 becoming the throw member of the device and the rod 10 the fixed anchorage.

Whereas this invention is here illustrated and described with respect to a particular preferred embodiment thereof it should be understood that various changes may be made therein and other specific embodiments may be constructed, on the basis of the teachings hereof, by those skilled in the art without departing from the generic purview of the invention as defined by the following claims.

We claim:

1. In combination, a reciprocative throw element; a single equilibrium snap-disc spring with which said throw element is loosely coupled; means anchoring said snap-disc spring integrally formed of a single homogeneous metal for operation within a fixed zone; and a compression coil spring directly interposed between said snap-disc spring and said throw element for increasing the effective length of throw of said snap-disc spring.

2. The combination recited in claim 1 wherein the throw element is a rod passing through the center of the snap-disc spring and loosely coupled thereat to afford limited lost motion of said rod relative to said snap-disc spring; and wherein the coil spring closely encircles the said rod within the zone of coupling, for resiliently transmitting the force of said snap-disc spring to said throw rod over an extended distance.

3. In combination, a single equilibrium snap-disc spring integrally formed of a single homogeneous metal; a rod passing through the center of said snap-disc spring; spaced stop means loosely coupling said spring to said rod; a rigid circumferential support for said spring; and a compression coil spring closely encircling said rod directly between said snap-disc spring and that one of said stop means which is disposed adjacent the stable position of said snap-disc spring.

4. The combination set forth in claim 3 wherein the rod is movable, and the support is fixed.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,958,594	Spencer	May 15, 1934
1,983,823	Spencer	Dec. 11, 1934
2,217,419	Saul	Oct. 8, 1940