Nov. 24, 1959 L. A. RICE 2,914,713

TENSIONING DEVICE

Filed May 21, 1957

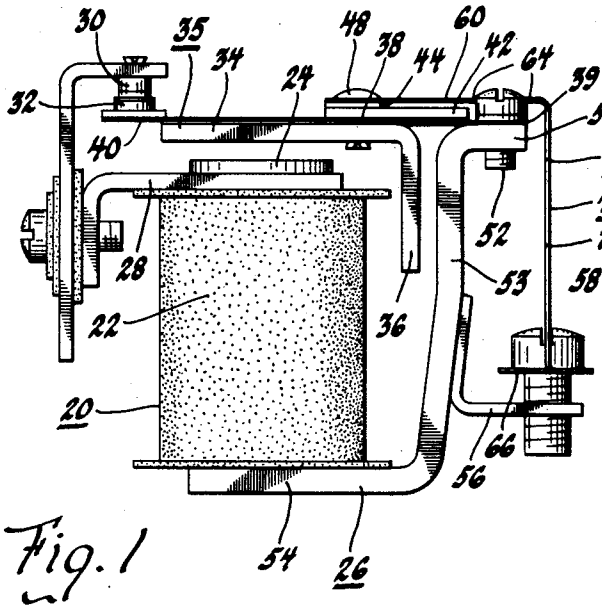



Fig. 1

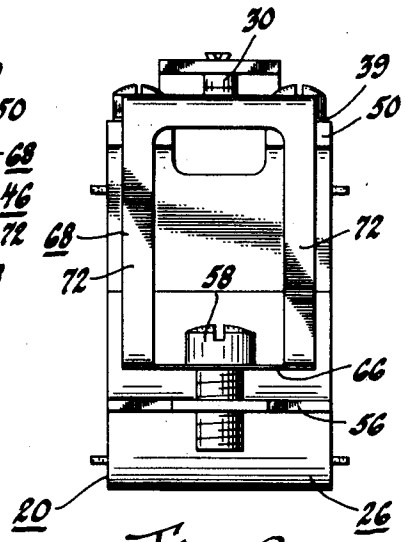



Fig. 2

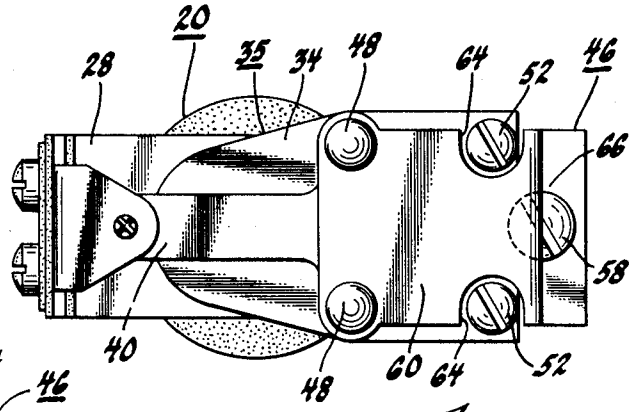



Fig. 3

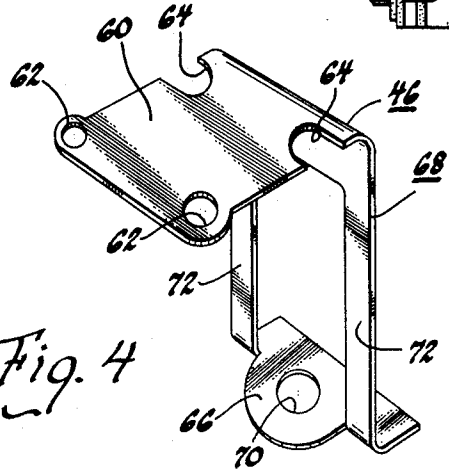



Fig. 4

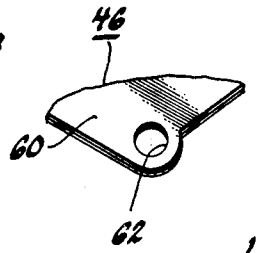



Fig. 5

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# TENSIONING DEVICE

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This invention relates to electromagnetic relays, switches and the like, and is more particularly concerned with an improved spring construction and mounting which will eliminate the effects of mechanical friction in the action of the spring on the armature of the relay.

An example of the type of relay herein contemplated is more fully disclosed in application S.N. 368,561, filed July 17, 1953, now Patent No. 2,788,412, which has been assigned by the inventor to the assignee of the present invention. In the relay shown in this application of this type the movement of the relay armature toward the electromagnet of the relay is opposed by a spring which has an adjustment means on one end arranged so the force exerted by the electromagnet on the armature may be varied. Heretofore, when springs of the type shown are used to oppose the armature movements, it has been necessary to resort to complicated spring seats or to solder the connections between the springs and the spring anchors to eliminate the effects of mechanical friction on the action of the spring. In the present invention, the effect of mechanical friction on the spring is eliminated without resorting to complicated structures. This is accomplished by spacing the mid-portion of the spring from the relay and bending the ends of the spring at right angles to the mid-portion. Thus when one of the ends of the spring is secured to the armature and the other end of the spring is secured by a threaded member that is substantially axially aligned with the mid-portion of the spring, the effects of mechanical friction on the spring action are completely eliminated.

It is an object, therefore, of the present invention to provide a spring means for the armature of a relay which spring means will function without the effects of mechanical friction.

A further object of the present invention is to provide a relay armature with a spring means, the tension of which can be varied and which spring means will function without being effected by mechanical friction.

It is another object of the present invention to use a leaf spring to oppose the movement of an armature for a relay which spring means has one of its ends secured to the armature and the portion of the spring adjacent the other end axially aligned with a threaded adjustment member, so the tension of the spring on the armature can be varied.

It is a still further object of the present invention to use a spring strip to oppose the movement of a relay armature which spring has one of its ends secured to the armature and has its other end arranged so that the leg of the spring adjacent the other end is aligned with a threaded adjustment means and wherein the remaining portions of the spring member are spaced from all components of the relay so that the effects of mechanical friction on the spring action are eliminated.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.



In the drawings:

Figure 1 illustrates an electromagnetic relay wherein a spring according to the present invention is used to oppose the force of the electromagnet on the relay armature.

Figure 2 is a side view of the relay in Figure 1.

Figure 3 is a top view of the relay shown in Fig. 1.

Figure 4 shows a perspective view of the spring according to the present invention as used in the relay shown in Figure 1.

Figure 5 shows the spring as in Figure 4 as formed of bimetal material.

Referring now to the drawings, the numeral **20** indicates an electromagnetic assembly which is carried by a base, not shown, and which includes a magnetic core **22** having a pole piece **24**. The core **22** is carried by a support **26** and supports a connector **28**. The connector **28**, in turn, supports a fixed contact **30** which cooperates with a movable contact **32** which is carried by an armature plate **34**. The plate **34** is part of an armature assembly **35** and has a dependent portion **36** extending at right angles from the anchorage portion **38**. The armature assembly **35** also includes a metal spring hinge **39**, a spring **40** which carries the movable contact **32** and a pair of spacers **42** and **44**. The armature assembly is constantly biased against the force of the electromagnet core **22** by a spring means **46** which will be hereinafter described.

The spring means **46** has one of its ends secured to the armature assembly **35** by means of a pair of rivets **48** which also secures the parts **34**, **39**, **40**, **42** and **44** together, as shown in Figure 1. The metal spring hinge **39**, in turn, is secured to the bent portion **50** of support **26** by means of screws **52**, the location of which is most clearly shown on Figure 3. The portions **50** and the portion **54** of the support **26** are substantially parallel with each other. Connecting these parallel portions **50** and **54** is a portion **53** which is disposed substantially at right angles to portion **54**. A spring support **56** which preferably consists of a metal bracket is welded to portion **53**. The spring support **56** has a threaded opening to receive the adjustment screw **58** for the spring means **46**. The spring means **46** is most clearly shown in Fig. 4 of the drawings. The spring means **46**, preferably formed of a suitable spring strip metal, is arranged to oppose the relative movement between the armature assembly and the support **26** when the armature is attracted by the magnet core **22**. The spring means **46** has openings **62** in a portion **60** which are located to receive the rivets **48** when the spring means **46** is secured by rivets **48** with the parts of the armature assembly **35**. The portion **60** is also notched as at **64** to reduce the stiffness of the spring and to provide clearance to prevent mechanical contact with the screws **52**. Positioned on the other end of the spring means **46** is a bearing portion **66** which is substantially parallel to the portion **60**. The bearing portion **66** is preferably formed as a struck-out portion of the intermediate portion **68**, and is bent substantially at right angles thereto. The portion **66** has an opening **70** therein which loosely receives the shank of the screw **58** while providing a seat for the head portion thereof. The portion **68** of the spring means preferably is formed to have two parallel spaced arms **72** which have a breadth selected to provide the spring with the proper characteristics to bias the armature within a range of predetermined tension.

As can be clearly seen from the drawings, spring **46** is spaced from the support **26** throughout its length and the only points of contact of the spring with the remain-

ing components of the electromagnetic assembly are at the anchorage portion where the rivets **48** secure the spring to the armature assembly and at the bearing portion **66** where the screw extends through mid-portion of opening **70**. The screw **58** by being axially aligned with the spring **46** can be used to adjust the tension of the spring on the armature without appreciably bending the portion **66**. When the armature is attracted by the electromagnet **20**, the spring **46** will bend at the weakened portion between notches **64** and over the entire length of the spring. Manifestly, if desired, the spring may be formed of bimetal material as shown in Figure 5. If this spring is used, the composition of the bimetal may be chosen so the force resisting the closing of the relay armature will be substantially constant within limits regardless of temperature changes. Further, if desired the composition of the spring may be selected to provide an increase or decrease of the spring tension with temperature changes.

The spring arrangement shown in the drawings is particularly advantageous in that it will not be affected by mechanical friction as it functions in reality without spring seats which provide a rubbing contact as have been generally heretofore used. The adjustment through screw **58**, of course, provides another advantage in that the tension of the spring can be varied to compensate for the manufacturing tolerances.

While the forms of the invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a relay of the character described having a support and an armature hingedly mounted on the support, a spring for opposing movement of the armature relative to said support, said spring consisting of a single part formed of spring strip metal having; a portion on one end secured to said armature, an intermediate portion disposed substantially at right angles to the portion secured to the armature and a portion at the other end disposed substantially at right angles to said intermediate portion and arranged so a threaded member carried by said support and received by the third mentioned portion is axially aligned with said intermediate portion, said portion secured to said armature and said other end portion being located substantially parallel to each other.

2. In a relay of the character described having a support and an armature hinged to the support, a spring for opposing relative movement between said armature and support when the armature is attracted by an energized magnetic core carried by the support, said spring consisting of a part formed of spring strip metal having one end secured to the armature, the other end adjustably secured on the support and the portion intermediate the ends spaced from all the remaining components of said relay including the support, said ends of said spring being positioned substantially parallel to each other and at right angles to the longitudinal axis of the core.

3. In a relay of the character described having a support and an armature hingedly mounted on the support by means of a spring hinge member connecting said armature and support, a spring for opposing relative movement between said support and armature when the armature is magnetically attracted by a magnetic core of the relay, said spring consisting of a part formed of spring strip metal having a portion on one end secured to the armature, a portion on the other end substantially parallel with said first mentioned portion engaging the flat underside of the head of a screw that is fastened to said support and an intermediate portion connecting said end portions, said intermediate portion being disposed substantially at right angles to said end portion and having a struck-out central portion arranged to provide two substantially parallel members located at opposite sides of said screw.

4. In a relay of the character described having a support and an armature hinged to the support by means of a spring hinge member connecting said armature and support, a spring for opposing relative movement between said armature and support when the armature is attracted by an energized magnetic core carried by the support, said spring consisting of a part formed of spring strip material and having a first end portion secured to said armature, a second portion located at substantially right angles to said first portion and a third end portion located substantially parallel to said first portion and having an aperture, and fastener means passing through said aperture having a flat surface in engagement with said third portion of said spring, said fastener means being secured to said support and being adjustable relative thereto.

5. In a relay of the character described having a support and an armature hinged to the support, a spring for opposing relative movement between said armature and support when the armature is attracted by an energized magnetic core carried by the support, said spring consisting of a part formed of spring strip material and having a first end portion secured to said armature, a second end portion located substantially parallel to said first portion and having an aperture, and a third portion connecting said first and second portion, and fastener means passing through said aperture having a flat surface in engagement with said second portion of said spring, said fastener means being secured to said support and being adjustable relative thereto, said first and second portions being located substantially at right angles to the longitudinal axis of said core.

6. In a relay of the character described having a support and an armature hinged to the support, a spring for opposing relative movement between said armature and support when the armature is attracted by an energized magnetic core carried by the support, said spring consisting of a part formed of spring strip material and having a first end portion secured to said armature, a second portion located at substantially right angles to said first portion and a third end portion located substantially parallel to said first portion and having an aperture that is in substantial alignment with said second portion, and fastener means passing through said aperture having a flat surface in engagement with said third portion of said spring, said fastener means being secured to said support and being adjustable relative thereto.

7. A relay comprising, a frame member, an armature supported for pivotal movement by said frame member, a magnetic core member, a spring formed of strip spring material for biasing said armature away from said core member, said spring having a first portion secured to said armature, a second portion located substantially at right angles to said first portion and a third portion formed with an aperture that is in alignment with said second portion, said third portion being located substantially parallel to said first portion, a spring support member secured to said frame having a threaded opening the axis of which is parallel to and in alignment with the said second portion of said spring, and a threaded fastener passing through said aperture and threaded into said threaded opening, the head of said fastener having a flat lower side that is parallel to the third portion of the spring and in engagement therewith.

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