Dec. 26, 1950 R. A. NOWELL 2,535,448

COUNTERBALANCED HINGE STRUCTURE

Filed April 2, 1948 2 Sheets-Sheet 1

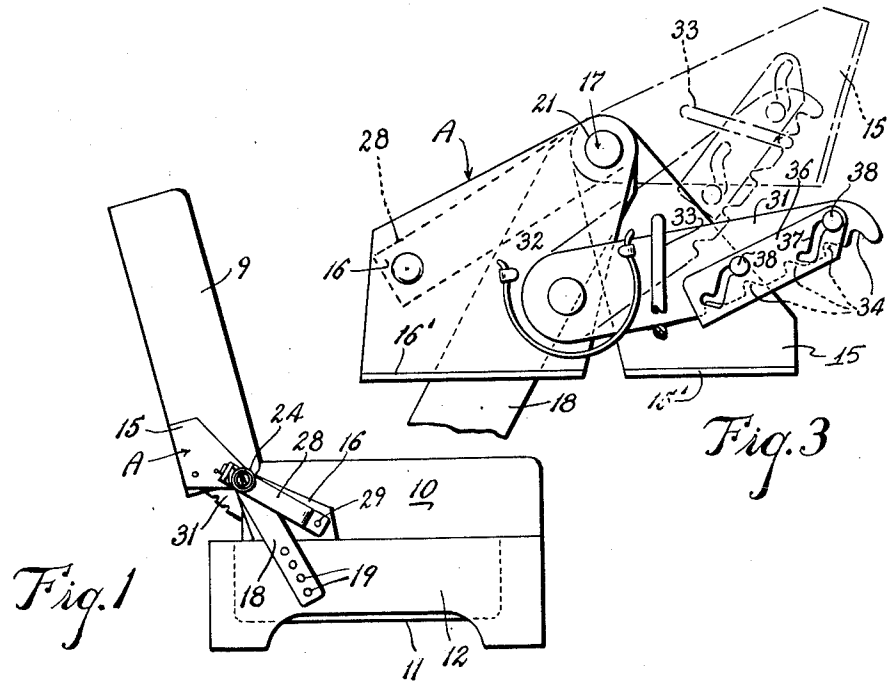


Fig. 1

Fig. 3

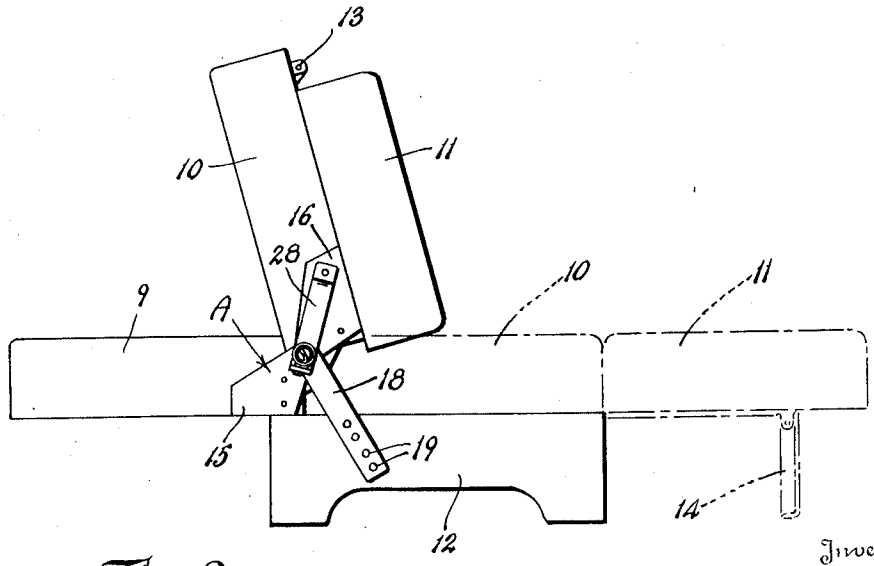


Fig. 2

Inventor,
Richard A. Nowell

By R. S. Berry

Attorney

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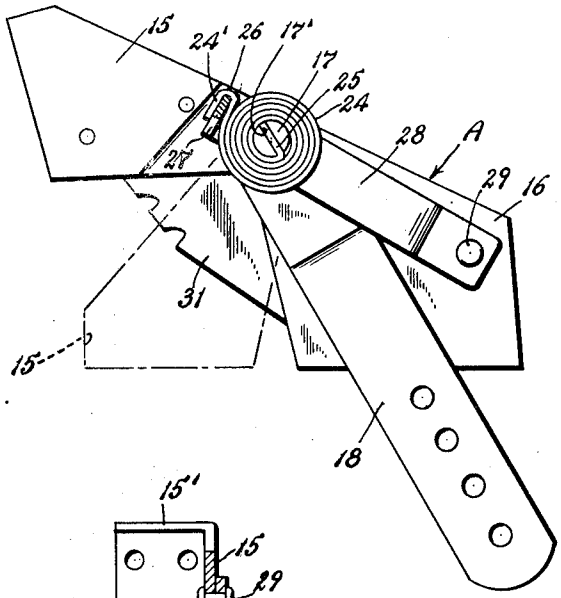


Fig. 4

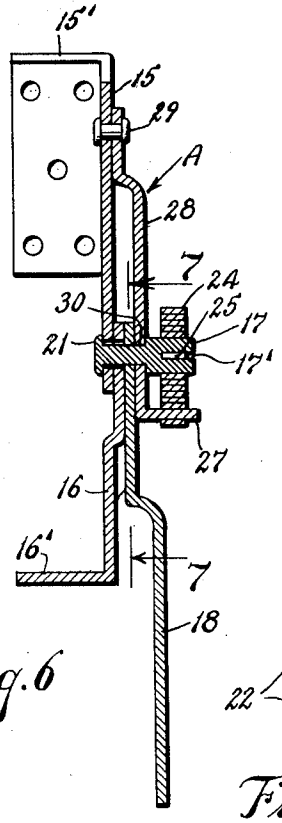


Fig. 6

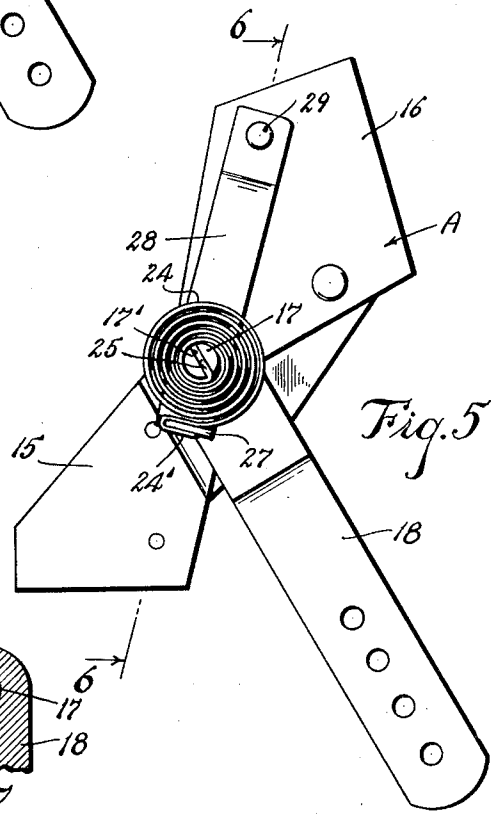


Fig. 5

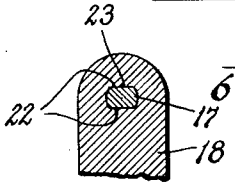


Fig. 7

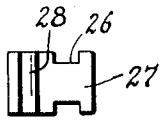


Fig. 8

Inventor,
Richard A. Nowell
By R. L. Barry
Attorney

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COUNTERBALANCED HINGE STRUCTURE

Richard A. Nowell, Los Angeles, Calif., assignor to Metal Products, Inc., Los Angeles, Calif., a corporation of California

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This invention relates to an improved hinge unit for joining the foldable and extensible sections of convertible furniture such as sofa beds, chair beds and the like.

One of the objects of this invention is to provide a hinge of the character described having embodied therein a novel counterbalancing means which is an improvement over counterbalancing means heretofore used in this art in point of being more compact, smaller and more reliable as to performance and in making it possible to extend, adjust and fold the sections of a sofa bed or similar piece of convertible furniture with greater ease than heretofore.

Another object is to provide a hinge such as described in which the counterbalancing means is constructed and arranged so as to lend desired strength and rigidity thereto while preventing slamming or banging and resultant damage of the hinge and at the same time making for a smoother hinge action.

Another object is to provide a counterbalanced and self locking hinge which will permit of setting and locking the sections of the sofa bed or like piece of furniture in different positions for example, to provide a variously inclined back rest when the piece is used as a sofa or a chaise longue or bed.

A further object is to provide a counterbalanced hinge such as described wherein the counterbalancing means includes a flat spiral spring of clock spring form and a lever arm both of which are mounted on the hinge pin or pivot of the hinge and arranged in such manner as to take up comparatively little room, being in fact arranged within the confines of hinge sections so as not to project appreciably beyond the margins thereof nor to add appreciable bulk thereto.

With the foregoing objects together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed, and illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is an end elevation of a sofa bed showing in side elevation a hinge unit embodying the present invention and as it would appear when the piece of furniture is used as a sofa,

Fig. 2 is an end view of the sofa bed shown in Fig. 1 showing in full lines how the sections are adjusted preliminary to converting the sofa to a bed, the dotted lines showing how two of the sections are extended to complete the bed formation,

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Fig. 3 is an enlarged side elevation of the hinge unit locking toward the inner side of the hinge unit and showing in full lines the position of the hinge leaves when the sections are made up as a bed,

Fig. 4 is an enlarged side elevation of the hinge, the full lines indicating the position shown in Fig. 1, the dotted lines indicating how one of the leaves appears when the sofa is converted to a bed,

Fig. 5 is an enlarged side elevation of the hinge when ajusted as shown in full lines in Fig. 2,

Fig. 6 is a sectional view of the hinge taken on the line 6—6 of Fig. 5 with the locking means omitted for clarity of illustration,

Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 6, and

Fig. 8 is an end elevation of the counterbalancing lever to which one end of the counterbalancing spring is attached.

In the accompanying drawing I have shown my improved hinge structure as used in a sofa bed but it is to be understood that the hinge structure is applicable to various types of convertible furniture.

Referring to Figs. 1 and 2, 9 designates a head or back rest section, 10 a seat or middle section and 11 a foot section making up a sofa bed in the usual association with a box frame 12.

Hinges A embodying my invention (only one such hinge being here shown) are fastened to opposite ends of the box frame 12 and form a hinge joint between the sections 9 and 10 whereas suitable hinge means 13 shown in Fig. 2 joins the sections 10 and 11 whereby the sections are foldable and extensible to form a sofa, a chaise longue, or a full length bed. The usual foldable legs 14 are provided for section 11.

As shown in Fig. 1 when the sections are assembled to form a sofa the foot section 11 lies within the frame 12 beneath the seat section 10.

Fig. 2 shows in full lines the position into which the sections are swung on the hinges A in preparation for final movement of said sections to form a bed or a chaise longue. The dotted line showing of the sections 10 and 11 and the full showing of the section 9 indicate how a full length bed is formed. No showing of the chaise longue formation is made as it is obvious that in this case the back rest section 9 is raised to desired inclined positions while the sections 10 and 11 remain horizontal, it being noted that the hinges A are self-locking as will be hereinafter explained to support the back section 9 in differently inclined positions.

I have shown but one of the two hinges A which are anchored to the ends of the box frame 12 and have their hinge leaves fastened to the sections 9 and 10 respectively in a manner well known in this art. The hinge not shown is mounted in the same manner as the one here shown, on the end of the sofa opposite that appearing in Figs. 1 and 2.

Each of the hinges A is made up of a pair of hinge leaves 15 and 16 of substantially triangular form and connected by means of a hinge pin 17 fixed on the upper end of an anchoring bar 18 secured by means of fastening 19 to the box frame 12. The bar 18 extends upwardly from the top of the frame 12 and is somewhat rearwardly inclined so that the hinge leaves may be connected to the upper end thereof. These leaves have apertured and inwardly extended flanges 15' and 16' along the lower edges which are secured by means of suitable fastenings (not shown) to the undersides of the sections 9 and 10.

The hinge pin 17 is provided with a slot 17' in the enlarged outer end thereof, the inner end of the pin being riveted as at 21 against the inner face of the hinge leaf 16, it being noted that the pivoted portions of the hinge leaves are overlapped. The hinge pin-receiving openings in the hinge leaves are circular as is also that portion of the hinge pin passing therethrough whereby the leaves will turn freely on the pin. The hinge pin, however, does not turn as it has a flattened portion 22 (see Fig. 7) which passes through an opening 23 in the anchoring bar 18, said opening having a shape corresponding to the cross section of the flattened portion of the pin.

In accordance with my invention I embody in the hinge hereof a novel counterbalancing means which includes a flat spiral spring 24 of clock spring shape which is coiled around the hinge pin 17 and has its inner end 25 snugly fitted in the slot 17'. The outer end 24' of spring 24 is formed as a hook which engages in a notch 26 in the right angularly extended free end 27 of a lever arm 28. This lever arm is riveted at its other end as at 29 to hinge leaf 16 at a point adjacent the forward edge of the leaf and extends rearwardly beyond the hinge pin 17 which latter passes through an opening 30 in the arm to thus secure the arm in place with its extended end 27 disposed opposite one side of the spring 24.

The spring 24, lever arm 28 and parts of the hinge unit associated therewith are so arranged that the spring is under maximum compression, fully wound up when the sections 9, 10 and 11 are arranged as a sofa as shown in Fig. 1. Although the operation of the counterbalancing means hereof will hereinafter be fully described, it should be noted at this point that the spring and associated parts are so arranged that the spring tends to raise the sections 10 and 11 when in "sofa" position to that when the operator grasps the section 10 and 11 to lift them into the full line position shown in Fig. 2 for extension thereof into horizontal position, the spring aids in the lifting operation and makes it easier to lift and manipulate the comparatively heavy sections. Moreover in lowering the sections 9 and 10 from the elevated position shown in full lines in Fig. 2 either for assembly as a bed as shown in Fig. 2 or as a sofa as shown in Fig. 1, the spring 24 is wound up and opposes and cushions the lowering of the two sections so that banging or slamming thereof and consequent damage to the sofa and associated parts are prevented.

As here shown a well known type of locking means is provided in the hinge for automatically locking the hinge leaves in different angularly related positions. With this arrangement the back rest section 9 and the seat section 10 may be moved as a unit about the hinge pin 17. When the locking means is released the sections 9 and 10 may be moved independently of one another.

As shown in Fig. 3 the locking means includes a latch plate 31 pivoted at one end as at 32 to the inner side of the hinge leaf 16 and slidably extensible through a U-shaped keeper member 33 fixed on the inner side of the hinge leaf 15.

The lower edge of the latch plate 31 is provided with a plurality of ratchet notches 34 adapted to lockingly engage the end portion 33' of the latch member 33. A spring 35 fastened to the leaf 16 and plate 31 urges the latter into locking position, it being noted that the plate has ample space inside the U-shaped keeper member 33 to swing on its pivot 32 into and out of locking engagement with the portion 33' of member 33.

A trigger plate 36 having S-shaped slots 37 therein is slidably supported on headed pins 38 on the latch plate 31 so that the lower edge of the trigger plate will slidably contact the portion 33' of the fixed keeper member 33. This trigger plate is arranged to gravitate into position to prevent the latch plate 31 from locking the sections against relative movement so that the several sections may be moved into the desired position. This action of the trigger plate 36 takes place on retrograde movement of the section 9 such that the ratchet notches 34 are withdrawn from locking engagement with the portion 33' of keeper 33 and the trigger plate 31 is retracted sufficiently relative to the keeper member 33 to drop down below the plane of the lower edge of the latch plate which position is shown in full lines in Fig. 3. The dotted line showing of the locking means in Fig. 3 indicates how the trigger plate will be forced upwardly out of latch preventing position when moved through the keeper member 33' responsive to raising of the back section 9 to desired inclined position whereby the ratchet notches are exposed and may be engaged with portion 33' to lock the back section in the selected position. No further description of this locking means is deemed necessary as the manner of its operation is well known in this art and it is obvious that the counterbalancing means of this invention may be embodied in various forms or hinge structures for collapsible furniture whether provided with self-locking provision or not. However, due to the locking means preventing relative movement of back section 9 and seat section 10, the weight of the back section aids the counterbalancing spring 24 in the lifting action the latter when the seat and foot sections 10 and 11 are being lifted while the back section is being lowered. Consequently the counterbalancing means hereof is more particularly suited to a multiple position hinge of the type here shown and described.

Operation

When sections 9, 10 and 11 are positioned to form a sofa bed, love seat, bed, chair bed or the like, as represented in Fig. 1, the locking means appears as shown in full lines in Fig. 4 and in dotted lines in Fig. 3. At this time the spring 24 is tightly wound ready to exert a force to aid in raising the seat section 10 and the foot section 11.

When it is desired to adjust the sections 9, 10, and 11 from "sofa" position to form a bed, the seat section 10 is lifted with the foot section 11 folded thereunder and swung forwardly into position shown in full lines in Fig. 2. As the sections 9 and 10 are locked at this time by the latch bar 31 of the locking means, the back section 9 will be lowered when the seat and foot sections 10 and 11 are raised and said back section is therefore moved to the horizontal position shown in Fig. 2. The spring 24 exerts a lifting force which is augmented by the weight of the back section while the sections 10 and 11 are being swung upwardly and the back section 9 is being swung downwardly thereby making it possible to properly adjust the comparatively heavy sections 9, 10 and 11 with comparative ease. The location of the spring 24 around the axis of the hinge unit A and the arrangement and action of the lever arm 28 relative to the spring and the leaves of the hinge unit, are such that a comparatively small and compact spring, taking up but little room, will prove effective to aid in making adjustments of the sections of the unit in a most desirable manner not heretofore achieved in this art.

After the sections 9, 10 and 11 are adjusted to the positions shown in full lines in Fig. 2 the seat section 10 and foot section are swung downwardly while the foot section 11 is swung outward on hinges 13 to take with the section 10 the horizontal bed position shown in dotted lines in Fig. 2. This lowering of sections 10 and 11 causes the back section 9, still locked to section 10, to be raised to the backrest position shown in Fig. 1 where it may readily be grasped by the operator and pulled forwardly a short distance to cause the latch plate 31 to move out of locking position and the trigger plate 36 to gravitate into position to prevent the latch plate from locking on the member 33' of keeper 33 while the back section is being lowered to the "bed" position shown in full lines in Fig. 2. Movement of the back section 9 relative to section 10 does not in any manner effect the counterbalancing spring 24 but when the sectons 10 and 11 are swung downwardly, the spring 24 is wound up and resists and cushions the lowering of said sections 10 and 11 so as to avoid slamming or banging and possible injury of the operator or damage to the parts of the unit.

When the sections 9, 10 and 11 are in "bed" position, a chaise longue formation may readily be effected by raising the back section 9 into any of several inclined positions and then pushing the section back slightly to cause the locking means to hold the back rest in selected position.

It will now be apparent that I have provided a novel and highly efficient counterbalancing hinge structure wherein a simple spring of small and compact construction together with a lever arm in a particular association with the hinge parts and said spring, coact to make it exceptionally easy to lift and lower with safety the heavy sections of collapsible furniture of various kinds, particularly in sofa-beds, love-seat beds, chair-beds and the like.

While I have shown and described a specific embodiment of my invention I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

I claim:

1. In a hinge structure, a pair of hinge leaves, a hinge pin pivotally connecting said leaves, a rigid support on which said pin is non-rotatably held, a flat spiral spring coiled around said pin with one end fixed thereto, a lever arm fulcrumed on said pin fixed adjacent one of its ends to one end of one leaf of said pair of leaves with its other end fixed to the other end of said spring whereby said spring will be wound up and unwound responsive to certain movements of said one hinge leaf.

2. In a hinge structure, a pair of hinge leaves, a hinge pin pivotally connecting said leaves, a rigid support on which said pin is non-rotatably held, a flat spiral spring coiled around said pin with one end fixed thereto, a lever arm fixed adjacent one end to one end of one leaf of said pair of leaves with its other end fixed to the other end of said spring whereby said spring will be wound up and unwound responsive to certain movements of said one hinge leaf, said pin passing through said lever arm which latter turns about the pin on movement of the hinge leaf to which said arm is fixed.

3. In a multiple position hinge structure, a pair of hinge leaves, a hinge pin about which said leaves are arranged to turn, a rigid support on which said pin is non-rotatably held, a releasable locking means which when locked holds said leaves against relative movement and when released permits relative movement of said leaves, a flat spiral spring coiled about said pin with its inner end fixed thereto, a lever arm fixed adjacent one end to one leaf of said pair of leaves and having an opening intermediate its ends through which said pin extends, and means fixing the outer end of said spring to said lever arm so that said spring will wind up, and unwind responsive to hinge movement of said hinge leaves.

4. In a multiple position hinge structure, a pair of hinge leaves, a hinge pin pivotally joining said leaves, a pin-supporting arm adapted to be fixed to a support and on which said pin is fixed as a non-rotatable and substantially horizontal axis around which said leaves may be swung upwardly and downwardly, a locking means which holds said leaves against relative hinge movement and which when released allows said leaves to be relatively moved, a flat spiral spring coiled around said pin to one side of said leaves and fixed at its inner end to said pin, a lever arm fixed adjacent one end to one leaf of said pair of leaves and having an opening intermediate its ends through which said pin extends so that said lever arm may turn around said pin, and coacting portions on the outer end of said spring and on the outer end of said lever arm for securing the spring to the lever arm so that when said one leaf is swung upwardly said spring will unwind and assist in such movement of said leaf and on downward swinging of said one leaf will wind up so as to resist such downward movement.

5. In a multiple position hinge structure, a pair of hinge leaves, a hinge pin pivotally joining said leaves, a pin-supporting arm adapted to be fixed to a support and on which said pin is fixed as a non-rotatable and substantially horizontal axis around which said leaves may be swung upwardly and downwardly, a locking means which holds said leaves against relative hinge movement and which when released allows said leaves to be relatively moved, said pin supporting arm being disposed to one side of said hinge leaves, said pin extending outwardly beyond said arm,

a lever arm fixed to one hinge leaf of said pair and having an opening intermediate its ends through which said pin extends so that said arm and said one leaf may swing around said pin, a slotted enlarged head on the outer end of said pin, a flat spiral spring having one end fixed in the slot in said head and being coiled around said head, and outwardly extending portion on the said lever arm with which the outer end of said spring is engaged so that when said one leaf is swung upwardly the spring will unwind and assist in so moving said one leaf and will wind up when said one leaf is swung downwardly.

6. In a multiple position hinge for joining the foldable and extensible sections of collapsible furniture, a pair of hinges leaves each of which is adapted to be fastened to a section of an article of collapsible furniture, a hinge pin pivotally joining said leaves, a hinge-pin supporting arm adapted to be fixed to a support and on which said pin is heid as a non-rotatably and substantially horizontal axis about which said leaves may be swung upwardly and downwardly, locking means associated with said leaves for holding them in predetermined positions against relative movement and which when released permits of relative movement of said leaves, said hinge pin being extended outwardly from said supporting arm, a flat spiral spring coiled around said extended part of said spring and fixed thereto at its inner end and means connecting the outer end of said spring to one hinge leaf of said pair constructed and arranged so that when said leaves are locked together and are swung in one direction the spring will unwind and aid in such movement of said leaves and on opposite movement of said leaves while so locked together will wind up and resist such opposite movement.

7. In a multiple position hinge for joining the foldable and extensible sections of collapsible furniture, a pair of hinge leaves each of which is

adapted to be fastened to a section of an article of collapsible furniture, a hinge pin pivotally joining said leaves, a hinge-pin supporting arm adapted to be fixed to a support and on which said pin is held as a non-rotatable and substantially horizontal axis about which said leaves may be swung upwardly and downwardly, locking means associated with said leaves for holding them in predetermined positions against relative movement and which when released permits of relative movement of said leaves, said hinge pin being extended outwardly from said supporting arm, a flat spiral spring coiled around said extended part of said spring and fixed thereto at its inner end, a lever arm fixed at one end to one leaf of said pair and having an opening therein intermediate its ends through which said pin is extended, the outer end of said lever arm being extended angularly outwardly and disposed to one side of said spring and in such contact therewith that the spring will be wound up and unwound responsive to movements of said one leaf of said pair.

RICHARD A. NOWELL.

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