Dec. 12, 1939. L. ANDERSON 2,183,210

HINGE

Filed April 27, 1937 2 Sheets-Sheet 1

Fig. 1.

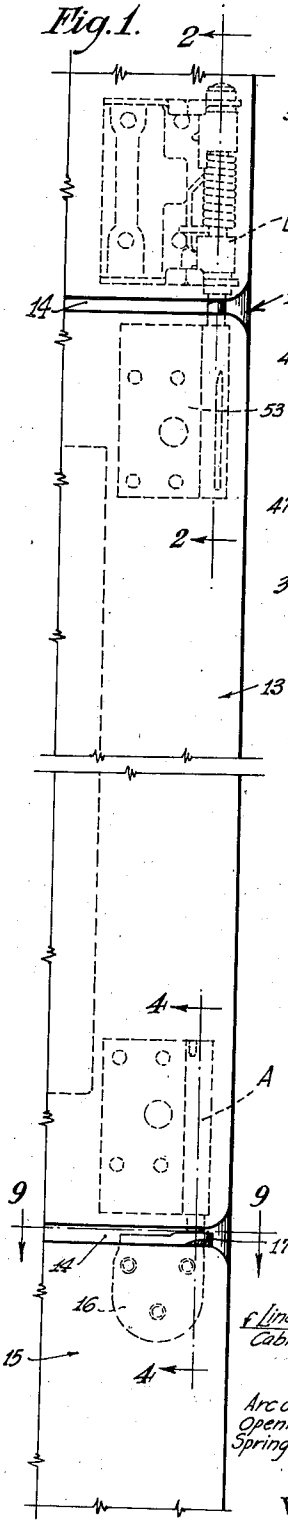


Fig. 2.

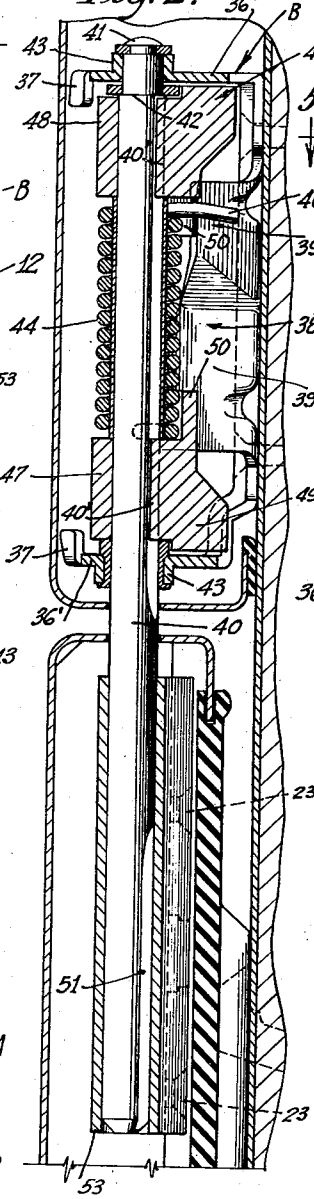


Fig. 3.

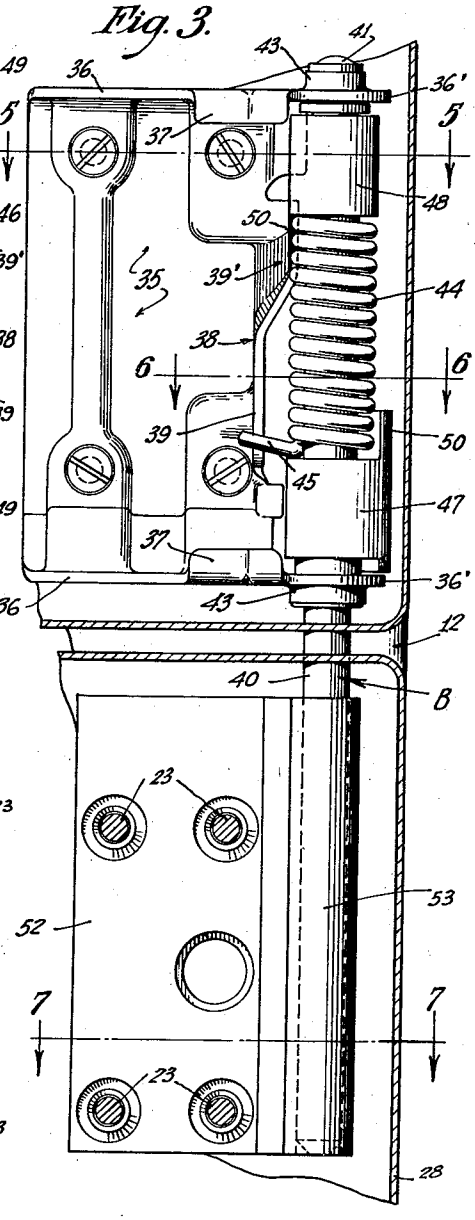
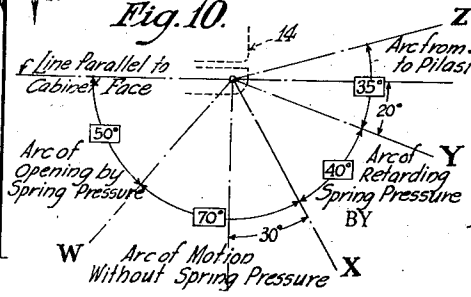


Fig. 10.



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Fig. 4.

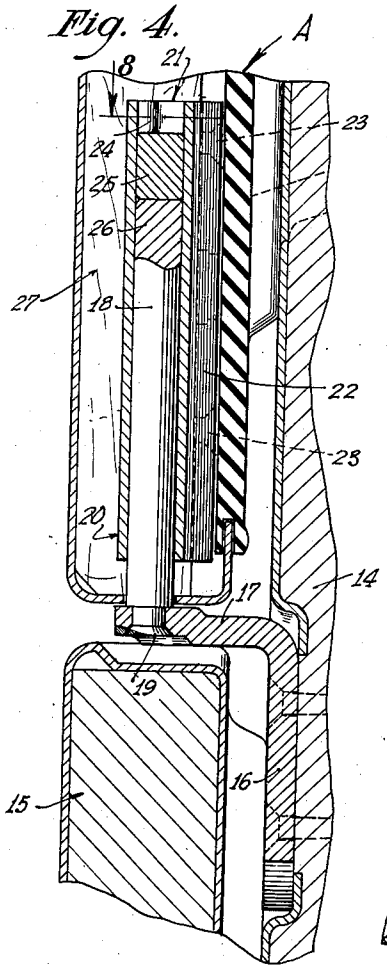


Fig. 5.

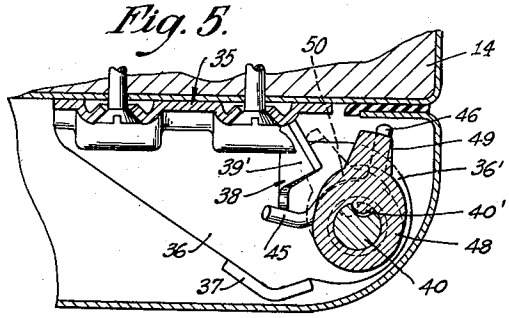


Fig. 6.

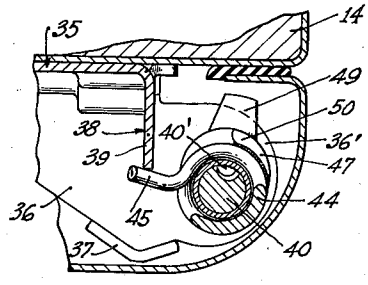


Fig. 7

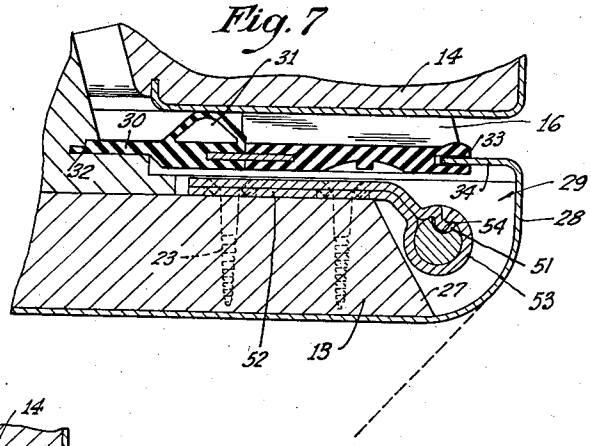


Fig. 9.

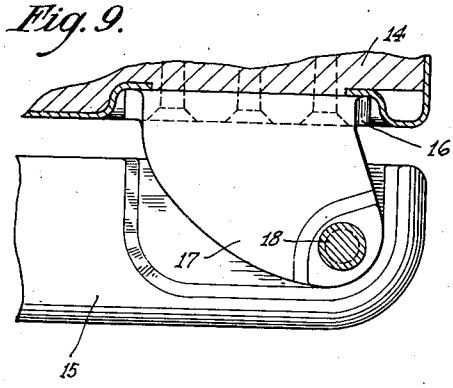
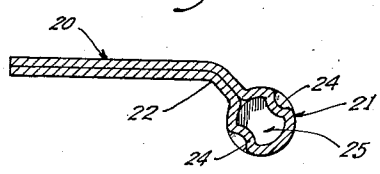


Fig. 8.



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Patented Dec. 12, 1939 2,183,210

UNITED STATES PATENT OFFICE

2,183,210

HINGE

Lloyd Anderson, Grand Rapids, Mich., assignor to National Lock Co., Rockford, Ill., a corporation of Delaware

Application April 27, 1937, Serial No. 139,130

12 Claims. (Cl. 16—189)

This invention pertains to hinge mechanism and especially to an automatic hinge structure for use with utility cabinets and closures having self-opening or automatically opening doors.

Among its important objects the invention provides a hinge assembly adapted for concealed mounting.

A further object is the provision of a hinge having spring means effective to pivot a door in opposite directions from a predetermined intermediate position of the door, and ineffective during movement of the door between said positions.

It is further an object to provide an automatic hinge having spring means energized by closing movement of a door and effective to swing said door open when the same is unlatched, the hinge being thereafter operable to permit continued and free opening movement of the door a predetermined distance, whereupon the spring means becomes effective to resist further opening movement of the door beyond a determined point.

Still another object is a hinge especially suited for concealed installation in utility cabinets, refrigerators and the like, and operable to open the door part way when the same is released, and thereafter operable to permit free and continued opening movement of the door and to cushion and restrain such continued movement when the door approaches fully open position.

Yet another object is the provision of a novel end-thrust hinge as a cooperating element of the hinge structure characterized above.

In addition to the foregoing objects, the invention provides an improved hinge structure which is simple, rugged, and suited to quantity production methods, and with these and other objects in view, the invention consists in the arrangement and form of elements hereinafter described in conjunction with the drawings, in which:

Fig. 1 is a front elevational fragment of a refrigerator door mounted on the improved hinge means;

Fig. 2 is an enlarged vertical side section through the door and hinge assembly along lines 2—2 of Fig. 1;

Fig. 3 is an enlarged plan view of the automatic hinge unit;

Fig. 4 is an enlarged vertical side section through the door and lower or thrust hinge unit, and is taken along lines 4—4 of Fig. 1;

Fig. 5 is a horizontal section through the upper part of the automatic hinge, as seen along lines 5—5 of Fig. 3;

Fig. 6 is another horizontal section through the automatic hinge viewed along lines 6—6 of Fig. 3;

Fig. 7 is a horizontal section through the thrust hinge, and is taken along lines 7—7 of Fig. 3;

Fig. 8 is a horizontal sectional detail through the thrust hinge alone, taken on line 8 in Fig. 4 and is similar to Fig. 7;

Fig. 9 is a top plan view, partly in section, showing the thrust-hinge pintle mounting along lines 9—9 of Fig. 1; while

Fig. 10 is a diagram plotting the action of the automatic hinge in its cycle of operation.

The improved hinge structure of the present invention is intended for general application, but is otherwise especially suited for use with refrigerators, and in Fig. 1 I have shown a refrigerator cabinet 12 having a door 13 swung on a lower or thrust hinge unit A and an upper automatic hinge unit B.

Referring to Figs. 1, 4 and 9, particularly the latter two, the thrust hinge assembly A comprises a stationary bracket 16 screwed into position in a recessed lower front part of the cabinet pilaster 14 behind the usual lower drawer structure 15, which may also be an ordinary face plate in some styles of cabinet structure.

The hinge bracket 16 has a horizontally extended arm or flange 17 from which extends upwardly a pintle or bolt 18 having the extremity of its shouldered end 19 peened or flared to hold the pintle immovably in place.

Mounted in a suitably recessed lower part of the door 13 above the stationary bracket 16 is a movable bracket 20 (Figs. 1, 4, 7, and 8) secured to the door body by screws or the like. This movable hinge is formed by bending a metal plate back upon itself so as to leave a cylindrical sleeve or channel 21 at the bight of the bend, and this bight portion is offset relative to the plane of the body 20, as at 22, and the overlying body portions 20 are provided with registered holes for mounting screws 23.

Near its upper end the bight or sleeve part of the movable hinge is pinched-in to form a pair of oppositely disposed bosses 24 against which abuts a cylindrical plug or stud 25 fitted closely into the sleeve and serving as an end-thrust bearing for the free end 26 of the pintle in the assembled relation shown in Fig. 4. Thus the downward thrust or component of the door weight is carried largely by the firmly seated stud or plug 25 as it bears down on the free end of the pintle 18.

The manner in which the hinge units are mounted, so as to conceal the same, is illustrated

in Fig. 7, which in fact shows the structure of the upper unit B, but is also typical of unit A except that the latter does not have the key and keyway arrangement, 51—54. Referring now to Fig. 4 in view of Fig. 7, it will be seen that the movable hinge element, generally indicated at 20, is attached near the rear lower edge of the door 13 in the recessed or hollow part 27 thereof this edge being spaced from the metal facing 28 to provide a space 29 into which the offset sleeve portion 21 extends. Closing off the space 29 is a rubber or like apron 30 having a tube-like sealing bead 31 and fitted at its inner edge 32 into a suitable grooving in the door, while the outer edge of the apron is grooved at 33 to fit over the inturned edge 34 of the facing sheet 28.

The automatic hinge structure B shown in Fig. 3 comprises a stationary and somewhat elongated mounting plate 35 having a pair of opposite laterally extending flanges or wings 36 with portions 36' projected beyond the long edge of the plate at opposite ends thereof.

Each of the wings 36 has an inwardly turned stopping ear 37 (Figs. 2 and 3), and between the projecting parts of the wings of flanges 36 and extending upwardly substantially between the same, the rear edge part of the plate is struck up at right angles to the plane of the plate to provide an intermediate flange 38 having one lower portion or ear 39 (see also Fig. 6) also disposed in a plane substantially normal to the plate 35, while the opposite and upper part or ear 39' of the intermediate flange extends in a plane disposed at about 45° to the plane of the plate 35. Thus the intermediate flange appears to be twisted so as to have an upper ear portion disposed in advance of a lower ear portion relative to the adjoining edge of the plate, the purpose of these intermediate ears being explained hereinafter, but it may be observed here that in addition to its other utilitarian features, this peculiar intermediate flange formation greatly reinforces the mounting or base plate 35.

Extended through aligned openings in the projecting portions 36' of the flanges 36 is an upper pintle 40 having its upper end headed as at 41, and there being a shoulder 42 (Fig. 2) bearing against the wing, thus securing the rod or pintle against removal from the plate 35. It may be observed that each of the wing portions 36' has the material around the pintle-receiving openings drawn out to form collars 43 and provide a bearing surface for the pintle.

Embracing the pintle between the wings is a strong coil spring 44 having its two ends 45 and 46 projecting more or less radially or laterally in the general direction of the intermediate flange ears or wings for stopping engagement with the same, each end being displaced in a circumferential sense relative to the other around the pintle.

Keyed to the pintle 40 at each end of the spring 44 (as at 40', Fig. 5) are a pair of stopping collars or spring-engaging lug means 47 and 48 each having a radially or laterally projecting ear or boss 49 near its outer end, which is positioned so as to strike against one of the stopping ears 37 on the plate flanges when the pintle is turned, and each of the collars also having an axially extending lug, projection or ear 50 at an end of the collar opposite to its boss 49 and arranged to bear against the corresponding end 45 or 46 of the coil spring when the pintle is turned in opposite directions, it being pointed out that each of the radial bosses is aligned with the other, while each of the axial ends 45, 46, is displaced circumferentially with respect to the other on the pintle, so it will be understood that when the pintle is turned in opposite directions, these axial ears will engage their respective spring ends at different times, thus permitting a limited freedom of movement of the pintle independently of the spring between determined limits.

The pintle 40 projects beyond the hinge mounting plate 35 and has an axially extending keyway 51 formed by an axial groove in the pintle extended to the lower end thereof (Fig. 2). A movable hinge member 52 formed by bending a plate back upon itself with a cylindrical bight 53, offset from the plane of the plate folds, as in the case of the hinge element 20 of Fig. 8, is attached to the door 13 near the upper right corner thereof similarly to the lower hinge element 20 of the unit A, and attached to the upper right pilaster 14 above the door is the stationary automatic hinge section with the projecting portion of the pintle 40 extended into the sleeve or bight 53 of the movable hinge section therebelow. This bight part 53 has a longitudinally extending inward extension or pinch forming an inside boss or key 54 which is receivable in the keyway 51 of the pintle, so that the movable hinge 52 turns with the pintle 40.

Operation

The description of the lower or thrust hinge assembly adequately explains the simple operation of this element of the hinge structure and emphasizes the function of the bearing engagement between the lower pintle 18 and the thrust stud 25.

In the case of the self-opening or automatic hinge, it may be assumed with reference to Figs. 1, 2, 3, that the door 13 is closed, in which case the coil spring 44 has been tensioned in a clockwise sense by the previous closing movement of the door, which served to rotate the pintle 40 (keyed to the hinge section 52 mounted on the door) in a clockwise direction, thus turning the upper stopping collar with the pintle and causing its axially extending lug 50 to bear against the upper end 46 of the spring (Fig. 2) and tension the latter.

When the door is thus closed, it is intended to be latched by a suitable latch mechanism (not shown), such, for example, as the easy-release latch and handle device shown in my co-pending application, Serial No. 139,131, filed April 27, 1937 and which has matured into Patent No. 2,123,899, July 19, 1938. As soon as the latch is released, the tensioned coil spring 44 will rotate the pintle 40 in an anticlockwise direction and open the door 13 a predetermined amount equal to about 50 degrees of arc as shown graphically in Fig. 10, position W. When this latter condition is reached, the upper axial lug 50 on the collar 48 will be disengaged from the upper spring end 46, and the latter will then bear against the upper intermediate ear 39'.

Thereafter, the door may be manually opened a further distance equal to about 70 degrees of arc, without any spring pressure whatever, to the position X, Fig. 10, and at this juncture the axial lug 50 of the lower stopping collar 47 will have been rotated with the pintle 40 in an anticlockwise sense so as to bear against the lower spring end 45 and tension spring 44 in the opposite direction. If the door is swung vigorously into this position, this latter tensioning of the spring will simply cushion such movement and prevent injury to the hinge, as might occur in

the case of the ordinary hinge if there were nothing to prevent movement of the door clear back against the pilaster. However, if it is desired for any reason to continue the opening movement of the door beyond the position indicated graphically at X, the door may be moved against the tension of the spring another 40 degrees to the position Y, whereupon both radial bosses 49 will strike against the flange ears 37, and the door will be prevented from opening far enough to strike the pilaster.

It will be apparent that the specific recitations set forth herein for purposes of illustration and explanation are not to be construed as limitations, but are to be understood as describing one form of the invention and to include the entire range of equivalent elements and structure coming within the call of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a reverse operating spring hinge, a spring arranged on a pintle for tensioning in opposite directions by application of opposite turning forces to one or the other of its ends, means arranged to prevent movement of either end of the spring when a turning force is applied to the opposite end, and spring-engaging means arranged in circumferentially offset relation around said pintle for engagement with corresponding opposite ends of the spring when the pintle is turned in opposite directions, said ends of the spring being offset with respect to each other in a circumferential sense around the pintle and with respect to the offsetting of said spring-engaging means in such manner that said pintle may be turned predetermined amounts in opposite directions before said spring will be tensioned in either direction.

2. In a hinge structure, an oscillable pintle, a coil spring arranged on said pintle and having opposite end portions offset with respect to each other in a direction around the pintle, abutment means arranged in relatively stationary position with respect to said pintle and spring so as to be engaged by either one of said end portions when the opposite end portion is turned to tension said spring, and circumferentially offset spring-engaging means on said pintle and arranged and constructed to be moved thereby when the same is turned predetermined amounts in either direction from an intermediate position for engaging one of said end portions to tension said spring while the opposite end of the spring is restrained by said holding means.

3. In a reverse operating spring hinge, a pintle mounted for turning movement, a spring carried on said pintle and having opposite ends projecting for engagement with stop means which is relatively stationary with respect to the pintle and which stop means is arranged and constructed to prevent movement of either end of the spring when the opposite end is moved to tension the spring, and means arranged to turn with said pintle at opposite ends of said spring for respectively engaging one or the other of said ends of the spring to tension the spring in reverse directions depending upon which direction the pintle is turned, said end-engaging means on the pintle being spaced in a direction around the pintle so as to allow a certain amount of free movement of the pintle in either direction before either of the ends of the spring is engaged, whereby the hinge may be operated free of the spring through a certain portion of its hinge movement in either direction.

4. An automatic hinge comprising a base plate having a pair of oppositely disposed laterally extending flanges with aligned openings therein, a pintle extended through said openings in the flanges, a coil spring disposed on said pintle between said flanges and having its opposite end portions extended in a direction laterally therefrom, a pair of divergently extending intermediate ears on said base plate between said flanges and adjacent said pintle and each positioned to be engaged by one of said end portions of the spring, a pair of stopping collars keyed to said pintle at the ends of said spring, each of said collars having a radially extended boss and an axially extended boss and each of the latter bosses being engageable with the adjacent end portion of said spring when said pintle is turned in opposite directions, stopping ears on said flanges and positioned respectively to be engaged by one of said radially extending bosses on the stopping collars, together with a movable hinge plate for attachment to a door and keyed to said pintle.

5. A hinge structure comprising a mounting plate, a movable pintle supported by said plate, a spring on said pintle and having opposite ends extended in a direction laterally from said pintle toward said plate, flange means on said plate and position to be engaged by said spring ends to limit movement thereof when said spring is turned in opposite directions co-axially of said pintle, means near each end of said spring on said pintle and movable with the latter for engaging an end of said spring and tensioning the same when said pintle is turned in either direction, said last mentioned means being operable further to limit the turning movement of said pintle in one direction by abutment with stop means on said plate, together with a second hinge member for attachment to a closure member and having means engaging said pintle for turning movement therewith.

6. A hinge comprising a mounting plate for attachment to a relatively stationary member, a pintle supported for pivotal movement by said plate, a coil spring on said pintle and having free end portions urged thereby in opposite directions against wing means on said plate, means movable with said pintle at each axial end of the spring thereon and operable to engage the adjacent free end portion of the spring and tension the same in one of two directions, depending upon which direction the pintle is turned, stop means on said plate engageable with said means on the pintle to limit the pivotal movement of the latter, and a second hinge member for attachment to a relatively movable closure member and engaged with said pintle for rotation with the latter.

7. A hinge comprising a mounting member and an attaching member, a pintle rotatably supported by said mounting member, a coil spring on said pintle and having free end portions extended in a lateral sense from the pintle in a direction generally toward said mounting member, tensioning means at the axial ends of said spring and movable with said pintle in opposite directions to engage the adjacent free end portions of said spring, means extended from said mounting member and engaging said free end portions of the spring and effective to hold the spring against rotation when said pintle is turned in either direction to cause said tensioning means to engage one of the free ends of the spring as aforesaid, said

attaching member having a sleeve portion embracing said pintle at one side of said mounting member and keyed with the pintle so as to turn with the same.

8. A hinge comprising a mounting plate having opposite lateral wings, a pintle rod pivotally supported between said wings and having a portion extended beyond said plate, a coil spring on said pintle rod between said wings and having free end portions extended in a direction away from said rod and generally toward said plate, the latter having an intermediate flange positioned between said free end portions of the spring, a stopping collar keyed to said pintle rod at each end of said spring, each one of said collars having an axially extending lug positioned to engage the adjacent free end portion of said spring when said pintle rod is turned in opposite directions, said lugs being positioned at different circumferential points about said pintle rod so as to permit a predetermined degree of turning movement of said pintle rod in one or the other direction before one or the other of said lugs engages its corresponding free end portion as aforesaid, together with a movable hinge member in the form of a plate bent back about itself to provide a sleeve at the bight of the bend, said sleeve being offset from the remainder of the plate, the extending portion of said pintle rod having a keyway, and said sleeve portion of the movable plate having an interior key and being fitted upon the extending portion of the pintle with said key in said keyway so that the pintle and movable plate turn together.

9. A hinge comprising a mounting plate having oppositely disposed laterally extending side flanges, each with a wing portion projected beyond the body of said plate, each of said wing portions having an opening aligned with an opening in the other, a pintle rod extended into said aligned openings for pivotal movement therein and having at one extremity a shoulder portion confronting one side of the adjacent wing, and a headed portion at the opposite side of said adjacent wing preventing removal of the pintle from said plate, said pintle having a portion projecting beyond said mounting plate and provided with an axially extended groove adjacent the opposite end thereof, a coil spring on said pintle between said wings and having free end portions extended in a radial sense in a direction generally toward said mounting plate, and the latter having an intermediate flange extended therefrom toward said spring and between said free end portions thereof, collar members on said pintle rod at each end of said spring and keyed to the rod for movement therewith, each of said collar members having a radially extended boss and an axially extended lug, said lugs being displaced one from the other circumferentially on said pintle rod and being positioned to engage the adjacent free end portion of said spring when said pintle rod is turned a predetermined distance in either direction whereby said spring may be tensioned in opposite directions, said laterally extending side portions of the mounting plate having stopping ears positioned for engagement by said radially extending bosses on the collars to limit the turning movement of said pintle rod, together with a movable hinge member in the form of a plate bent back upon itself to provide a cylindrical sleeve in the bight portion thereof, said sleeve being offset from the body of said plate and having an inwardly extended pinch providing a key, said sleeve being fitted upon the projecting portion of said pintle rod with said pinch received in said groove in the same whereby said movable hinge plate and said pintle rod may turn together.

10. A hinge comprising a mounting plate adapted for attachment to one member of a closure assembly, a pintle pivotally mounted on said mounting plate and having a portion extending beyond said plate for operative engagement with a cooperating hinge member, a spring mounted on said pintle between the pivotal mountings of the latter on said mounting plate, said spring having opposite end portions extending radially of said pintle and generally toward said mounting plate, said mounting plate having an intermediate flange portion struck up and extending between said end portions of the spring to provide an abutment limiting the movement of said end portions in opposite directions, and spring-engaging means on said pintle at the opposite ends of said spring and movable with the pintle for engaging the corresponding extending end portions of said spring to tension the latter in opposite directions when said pintle is turned in opposite directions.

11. A hinge as set forth in claim 10 and further characterized by the arrangement of said spring-engaging means at the opposite ends of the spring for engagement with their corresponding radial extensions of the spring only when said pintle is turned a predetermined amount in either direction, whereby said pintle is free to move a predetermined distance in either direction before tensioning said spring.

12. A hinge including a mounting member, a pintle pivotally supported on said mounting member and having a spring disposed thereon between its ends, said spring having opposite end portions extending in a radial sense away from the pintle, means on said mounting member and extending between said opposite end portions of the spring for engaging and maintaining said end portions in offset relation to each other circumferentially of said pintle and permitting movement of said end portions only in opposite directions, means on said pintle and movable therewith at the opposite ends of said spring and each having portions offset with respect to the other circumferentially of said pintle and respectively engageable with corresponding extending end portions of said spring when said pintle is turned a distance in either direction corresponding to the offset distance between said offset portions of the means at the opposite ends of the spring as aforesaid, whereby the pintle may be turned in opposite directions a predetermined distance to engage and tension said spring.

LLOYD ANDERSON.