# United States Patent [19]

**Salice et al.**

[11] **3,744,086**

[45] **July 10, 1973**


[54] **DEVICE FOR CONCEALED LINKED HINGES, APT TO AUTOMATICALLY HOLD A DOOR, CABINET DOOR OR FLAP DOOR SHUT**


[75] Inventors: **Luciano Salice**, Cantu; **Silvio Serin**, Padova, both of Italy

[73] Assignee: **S. P. A. Arturo Salice**, Milan, Italy



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[21] Appl. No.: **15,106**

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[52] **U.S. Cl.** ..... **16/164**
[51] **Int. Cl.** ..... **B14c 29/00**
[58] **Field of Search** ..... 16/163, 164, 182, 16/183; 49/350



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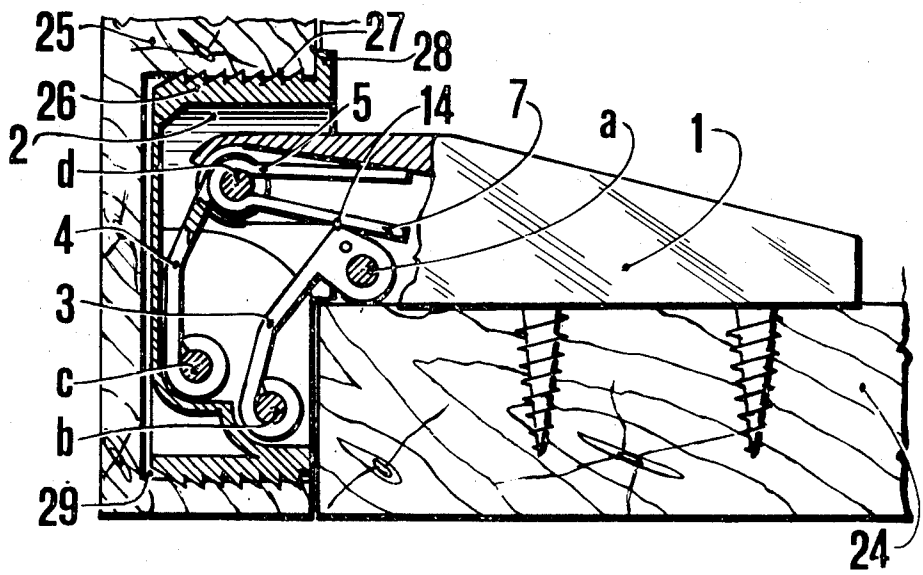
*Primary Examiner*—James T. McCall
*Assistant Examiner*—Garry Morre
*Attorney*—Fidelman, Wolffe & Leitner



[57] **ABSTRACT**

A device for holding a door shut, incorporated in a concealed hinge embodying the kinematic system for an articualted quadrilateral comprising a V-shaped flexure spring having at its apex an eyelet by which said spring is secured to one of the four pivoting pins of the hinge.


**10 Claims, 26 Drawing Figures**



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SHEET 1 OF 5

Fig.1

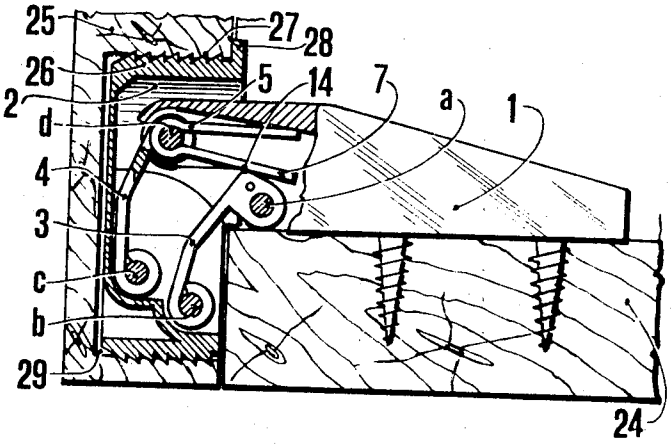



Fig.2

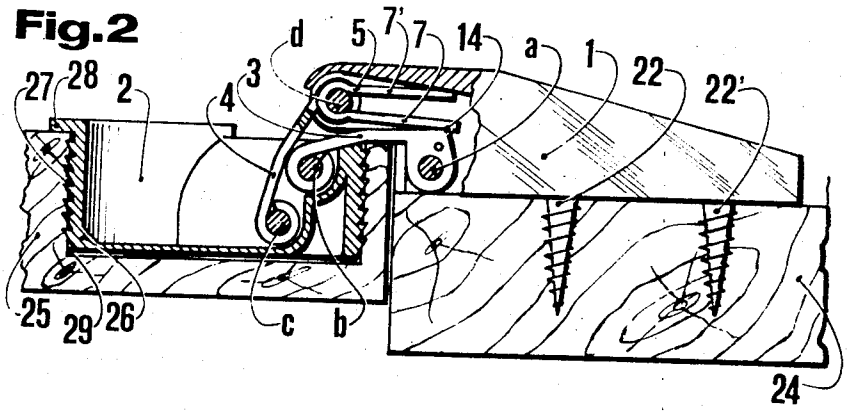
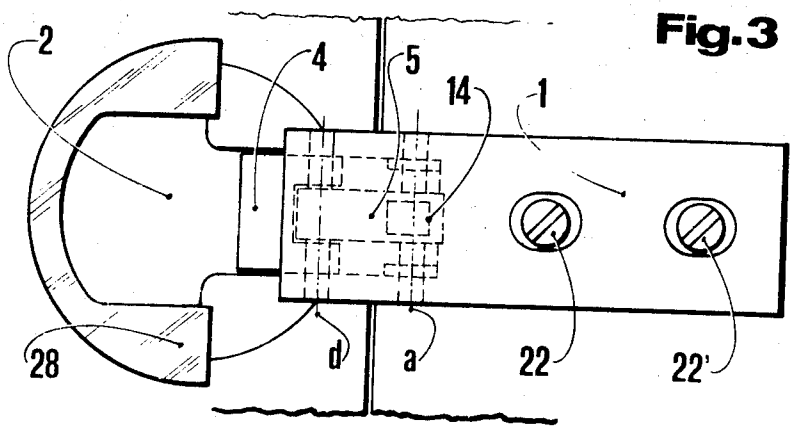



Fig.3



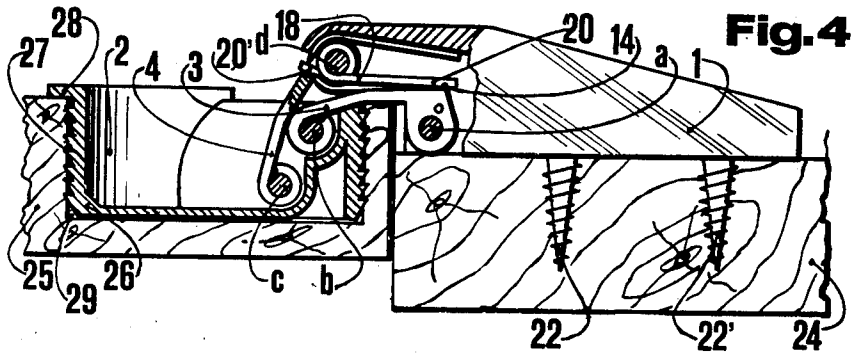



Fig.4

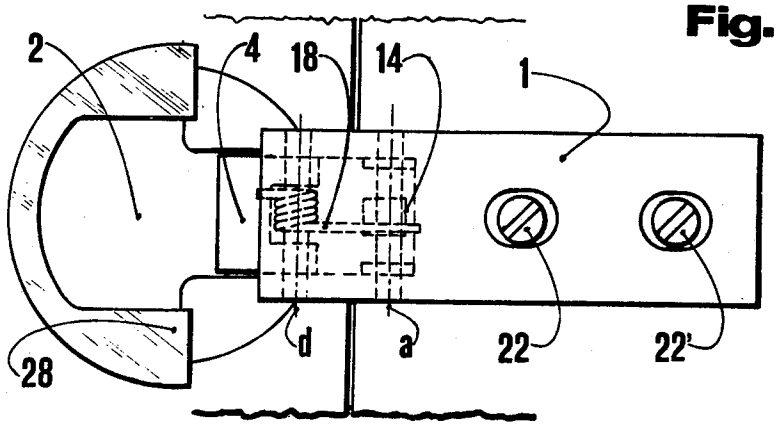



Fig.5

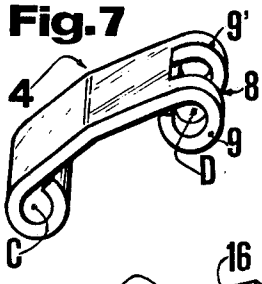



Fig.7

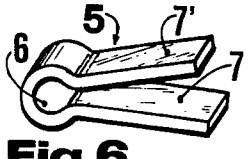



Fig.6

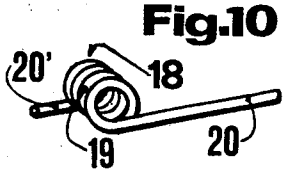
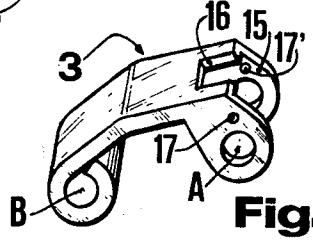



Fig.10

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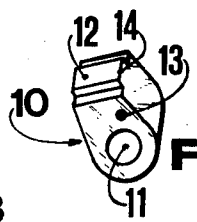



Fig.9

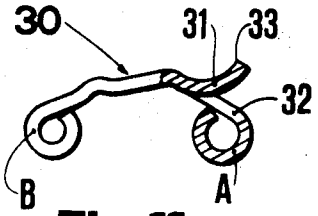



Fig.11

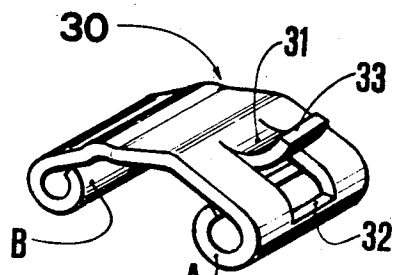



Fig.12

Fig.13

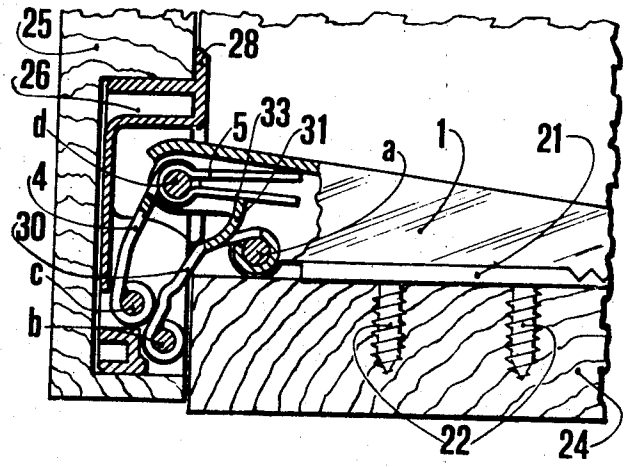
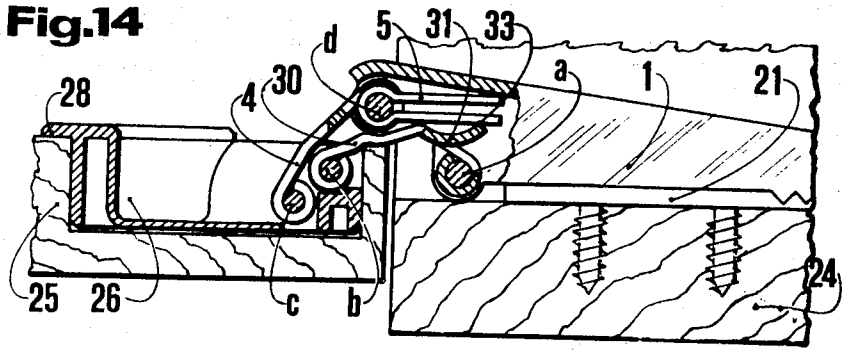



Fig.14



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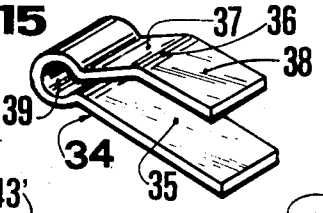


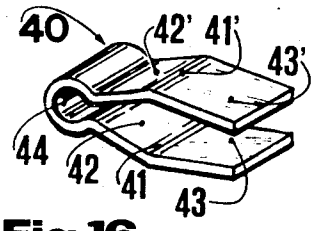
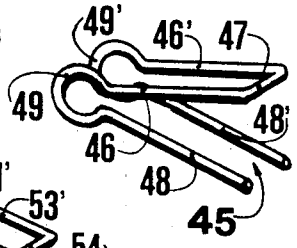




Fig.16

Fig.17



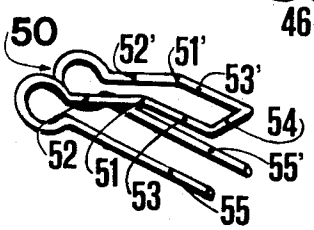




Fig.18

Fig.19

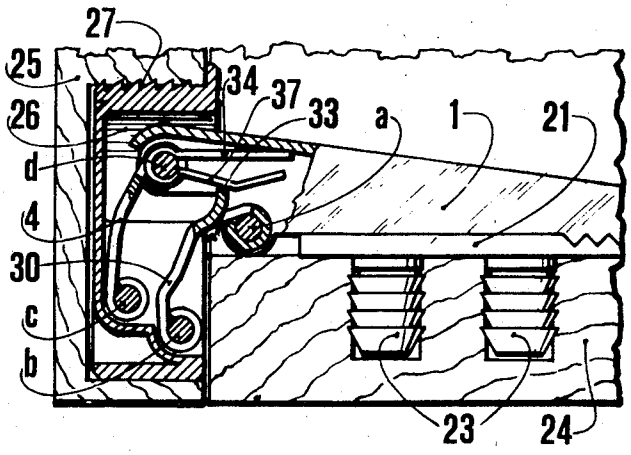
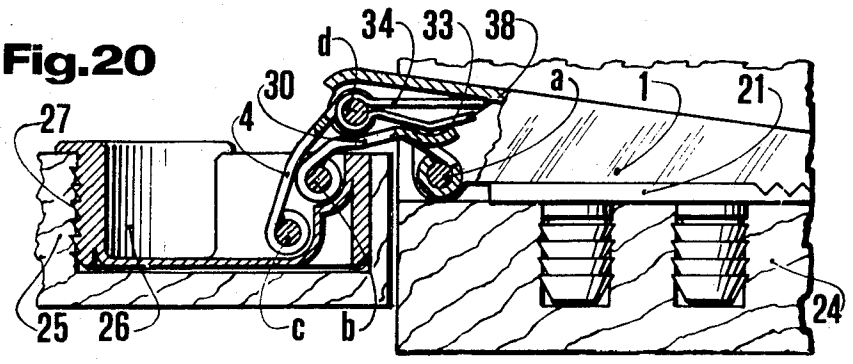



Fig.20



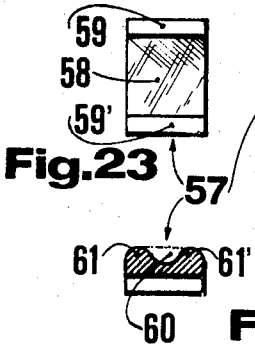



Fig.23

Fig.22

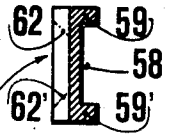



Fig.21

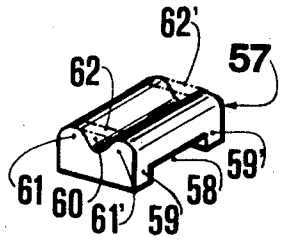



Fig.24

Fig.25

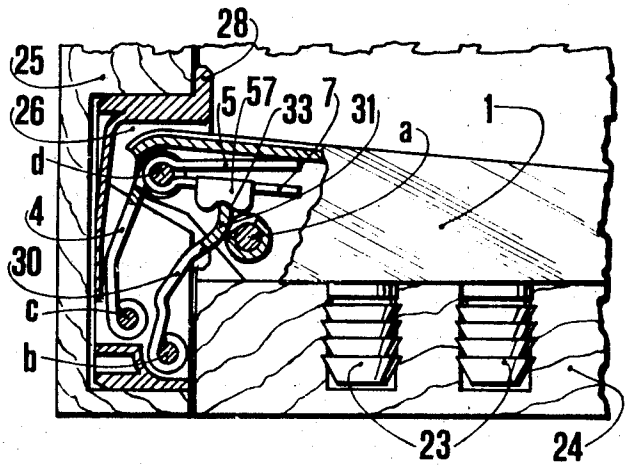
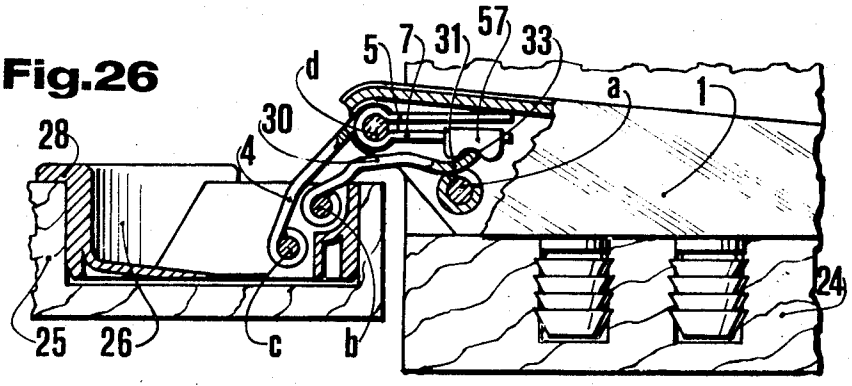



Fig.26



# DEVICE FOR CONCEALED LINKED HINGES, APT TO AUTOMATICALLY HOLD A DOOR, CABINET DOOR OR FLAP DOOR SHUT

Concealed linked hinges are known as providing the kinematic scheme for an articulated quadrilateral and suitable to hinge a rotable wing, such as a door, a cabinet door or a flap door, relative to a fixed carrier structure, such as a jamb or a cross frame for a door or a cabinet.

These hinges may be free, or provided with a generally spring device urging them to either or both of the extreme closed and open positions.

Several of these devices have been known and can be classified as follows: (a) "bistable" devices, except for an intermediate dead point, always urging the door on which they are applied to the nearest of its extreme closed and open positions; and (b) "monostable" devices, urging the door to only one of said two extreme positions, generally to the closed position, while at least for some length leaving the door free to the opposite position.

The devices, both of the bistable and monostable character, operating with a high advance with respect to the extreme position to which the door is urged thereby, while ensuring in many cases an effective closure or opening, have the common defect of imparting an increasing acceleration to the door, so that, on stopping, the attained speed and still more the knenetic energy will cause a violent shock with the dual drawback of producing a troublesome banging noise and subjecting the hinges and structures connected thereto to an unnecessary fatigue capable in the time of damaging the components.

Devices are also known capable of appreciably reducing, but not completely avoiding this defect, in that the device operates at a location relatively closer to the position to which the door is to be urged thereby.

A further adverse aspect in all of prior devices is in the large number of the members comprising the same and additional to the proper hinge, these members, in addition to one or more springs and tongues, consisting of cams or other lugs projecting from at least one of the elements comprising the linkage, also of spring guide stems, or capsules for containing the springs, arms transmitting the involved forces, staples connecting the stems or capsules, rollers or balls interposed between the moving elements, cross walls or pins for securing the devices to the hinge elements, auxiliary swinging staples with associated pivotings and so on. The plurality of the device components will involve conjunctively a high cost for the device, due both to the manufacture of many pieces and subsequent assembling thereof, a higher casual variability in the achievable results and a higher likelihood in failures or breakages.

A further adverse aspect relating to the large number and variety in the components of these devices is that the latter would be bulky, would require substantially sized and often confined shapes of members for accomodating hinge elements, in addition to economy this being also at the expense of the aesthetical requirements of the hinges.

According to the invention, the device for concealed linked hinges, apt to hold a door, cabinet door or flap door shut, is directed to:

avoiding that, when closed, the door might spontaneously re-open or remain ajar, even when the door carrying structure is uncorrectly positioned, such as where a jamb is not completely vertical or a cabinet bearing on a not fully flat floor, and the like;

ensuring that the door is free to turn about its hinges or to stay at any intermediate position without being urged to preferential positions, except when it is very close to the closed position;

not producing any door slamming, so that the operation is smooth, noiseless and progressive;

being always suitably active at any door position, except at a position very close to the closed position, so as to favourably provide for automatically restoring such clearances which, although minimal, are unavoidable in hinge links, to ensure an operation which is smooth and perfectly guided to all of the possible positions;

comprising the least amount as possible of additional members to the actual hinge members, as a limit, only one member: a spring;

providing a minimal overall size and being also accomodable within a portion of the hinge which would exist as such even when the hinge would be devoid of the device, so as to be applicable also on hinges having a maximum availability to aesthetical requirements, in addition to functional requirements.

The device according to the invention, apt to hold a concealed hinge shut and providing the kinematic scheme for an articulated quadrilateral, two opposite sides of which are the fixed and movable members of the hinge, and the other two sides of which are two equalizers connecting the same, is characterized by comprising a V-shaped spring having at its apex an eyelet, by which it is secured to one of the four pins of the hinge link and interacts with that of the two equalizers, the pins of which do not carry the spring.

The accompanying drawings show by way of not limiting example some embodiments for the details of the present invention, and more particularly:

FIG. **1** is a partial sectional view showing a closed hinge provided with the closing device according to the invention and comprising a V-shaped spring made of a metal strap, cooperating with a lug projecting from a block fast with the equalizer on which the spring operates;

FIG. **2** is a view similar to that of FIG. **1**, but at an open position;

FIG. **3** is a plan view for the hinge shown in FIGS. **1** and **2**, at an open position and the device shown in phantom;

FIG. **4** is a partial sectional view showing an open hinge having a modified closing device according to the invention; wherein the V-shaped spring is a wire spring;

FIG. **5** is a plan view for the hinge shown in FIG. **4**, at an open position and the device shown in phantom;

FIG. **6** is an axonometrical view of the V-shaped spring made of a metal strap;

FIGS. **7** and **8** are axonometrical views showing two equalizers wherein one of the knots is bifurcated for accomodating the V-shaped spring;

FIG. **9** is an axonometrical view showing a block suitable to be fitted within a proper housing in an equalizer;

FIG. **10** is an axonometrical view showing a wire spring having an intermediate helical coil;

FIG. **11** is a side, partly sectional view showing an equalizer provided with a tongue integrally made from

its body and forming a lever arm with respect to the equalizer;

FIG. 12 is an axonometrical view of the equalizer in FIG. 11;

FIG. 13 is a partly sectional view showing a closed hinge provided with a device suitable to hold it closed and comprising an equalizer such as that shown in FIGS. 1 and 12;

FIG. 14 is a view similar to that in FIG. 13, the hinge being at an open position;

FIGS. 15 and 16 are axonometrical views showing two embodiments for V-shaped metal strap flexure springs having an eyelet at the apex;

FIGS. 17 and 18 are axonometrical views showing two embodiments for V-shaped wire flexure springs having an eyelet at the apex;

FIG. 19 is a partly sectional view showing the closed hinge in FIG. 13, having a closing device comprising a spring with a curved side, such as those in FIGS. 15 and 18;

FIG. 20 is a side view showing the same hinge as in FIG. 19 at an open position;

FIGS. 21, 22 and 23 are three orthogonally projected views, the first two of which are sectional views according to a plane of symmetry of the member, for a slide to be interposed between the spring and equalizer for the closing hinge device;

FIG. 24 is an axonometrical view showing the slide in FIGS. 21–23;

FIG. 25 is a partly sectional view showing a closed hinge similar to that in FIG. 13, but having the closing device comprising a slide as that shown in FIGS. 21–24; and

FIG. 26 is a view showing the hinge in FIG. 25, provided with the same device, but shown at its open position.

Such a hinge comprises a fixed element 1 (FIGS. 1,2,3, 4,5; 13,14; 19,20;25,26) directly secured through a base plate 21 to a fixed carrier structure 21, such as the side wall of a cabinet, by screws 22 or finned bushings 23. This fixed element 1 is fast with two pivoting pins *a* and *d*, about which two equalizers 30 and 4 can swing, each of which by one of the curlings thereof "A" and "D" comprising one of the knots. Each of said equalizers, 30 and 4 respectively, have another knot "B" and "C" pivoting about its corresponding knot of the two pins *b* and *c* fast with a movable element 26 of the hinge. Generally, this movable element 26 is of a substantially cylindrical shape, suitable to be accomodated within a cavity of a similar shape and formed in turn in a movable structure 25, such as a door, cabinet door or flap door, which in the examples shown in said figures is generally of the external rabbet type with respect to the fixed structure 24.

The movable element 26 of the hinge can be secured by simple pressure to the rabbet, as it is peripherally provided with a thread 27 (FIGS. 1,2,4,19 and 20), generally of the "saw tooth" and double-thread type, or screws passing through the flange 28, generally provided in such a body.

It should also be understood that a reverse assembling of the hinge is always possible, whereby the element 1, herein described as a stationary element, will become a movable element, the structure 24 being therefore an internal rabbet cabinet door, whereas the element 26, herein described as a movable element, will become a stationary element, the structure 25 being a fixed structure, such as for example the side wall of a cabinet.

For sake of clearness, hereinafter the element 1 and structure 24 will be related to as stationary, and the element 26 and structure 25 as movable, while it being understood that the function-s thereof can be interchanged, without any alterations in the structure and functions of the closing devices to be described.

All of the embodiments of the present invention to be described, shown and claimed in the following have the following common characterizing points:

The device a V-shaped flexure spring having at its apex an eyelet for securing it to one of the hinge pivoting pins.

The equalizer, pivoting on the pin on which said spring is carried, has a bifurcation at that extreme knot swinging about said pin, so as to accomodate the eyelet of said spring between the two coaxial portions said bifurcation is divided in.

The other equalizer, interacting with the spring, has at one of its two extreme knots a lug or projection terminating with a very sharp corner for interacting with the spring and forming an arm for a lever, the other arm of which is said equalizer.

The members of the closing device are so arranged to one another and all to the remaining structure of the hinge that:

when the hinge is closed, the force said bent spring transmits to the equalizer on which it operates is shifted relative to the axis of the pin about which said equalizer swings, so as to provide a torque biasing the hinge to remain at a closed position; in order to open the hinge, it is required to exert (by acting on the door pivoting at said hinge) a sufficient external force to overcome such a closing torque, further compressing the spring;

when the hinge is open, the force said spring applies to the equalizer on which it operates substantially passes through the axis of the pin about which said pin swings, so that it is substantially zero the arm of a possible driving torque acting on the driven equalizer, and thus it is substantially zero the torque being applied by the spring to said equalizer (or however below the level of the resisting torques, due to frictions in the movement); as a result, the open hinge is at a neutral stability, whereby a door provided with such hinges having said device is free to rotate or to remain at any intermediate position where it has been left, without being urged to preferential positions;

also when, due to the nullity in the arm of its driving torque, the spring action is counteracted, the forces existing between the several members of the linked system comprising the hinge are not cancelled, so that it is always under some load condition, sufficient to restore the unavoidable, and yet extremely reduced clearances in the system links, with the advantage of assuring a smooth and perfectly quided operation of the hinge to all of its possible positions;

thus, the closing device is so compact that it can be inserted in a given linked hinge without any need of having particularly bulky means for accomodating it.

A first embodiment of the present invention is shown in FIGS. 1, 2, 3, 6, 7, 8 and 9 of the accompanying drawings.

In a known concealed linked hinge of the above described design, a metal strap flexure spring 5 (FIG. 6) is V-shape bent, at its apex having an eyelet 6 from which two free straight spread apart sides 7 and 7' ex-

tend; the eyelet 6 is formed so as to be threaded on one of the pivoting pins for the hinge, such as pin *d*.

The equalizer 4 (FIG. 7) provided with knots or loops C and D has one of said two knots or loops, such as knot or loop D, characterized by a bifurcation 8 dividing it in two coaxial sections 9 and 9', between which a spring, such as spring 5, can be freely accomodated.

The equalizer 3 (FIG. 8) provided with knots or loops A and B is characterized by having at one of said knots or loops thereof, such as knot or loop A, a cavity 15, in which a special block to be discussed about hereinafter can be secured; said cavity 15 is completed by a mortice 16 in which a suitable joint tooth is seated; adjacent said knot or loop A there are also provided two small coaxial holes 17 and 17', in which a small pin can be inserted for securing said block.

A block 10 (FIG. 9) preferably but not necessarily of antifriction material, is suitably to be embedded within the cavity 15 of equalizer 3, so that its through hole 11 will be aligned with the corresponding holes comprising said knot or loop A of equalizer 3, whereas its tooth 12 is inserted in the mortice 16 and its small through hole 13 is aligned with the small holes 17 and 17' of equalizer 3, so that a small pin forcibly introduced into said aligned small holes will clamp such a joint; said block 10 is also characterized by the sharp corner 14 intended to interact with one of the free sides 7 or 7' of spring 5.

When the door 25 is closed (FIG. 1), the spring 5 confined between a wall of the fixed wing or flange 1 of the hinge and the projection having the corner 14 of equalizer 3, will act against said corner 14 as on an end of a lever arm, the other arm of which is formed of said equalizer 3; since at said position the force being transmitted from spring 5 to equalizer 3 is substantially shifted from the (alpha) axis of pin *a* forming the lever fulcrum, said spring will give the equalizer 3 a torque biasing it to maintain the hinge closed and the associated door therewith.

An uncorrect positioning of the carrier structure 24 or the door 25, such as could occur where a door is secured to a not completely vertical rabbet or a cabinet bearing on a not fully flat floor or hanging at an uncorrect attitude on a wall, is not sufficient to re-open the door 25 or only even to leave the latter ajar.

In order to re-open the door 25, it is necessary to apply thereto, by a handle, knob or other means, a sufficient force to swing the movable elements of the articulated quadrilateral, and particularly the equalizer 3 about pin *a* (in a clockwise direction as seen in FIGS. 1 and 2); on this oscillation, the corner 14 provided on equalizer 3 will further compress the spring 5, thus giving rise to the initial strain for opening the door.

When the door 25 starts to open, the corner 14 describing a circular cylindrical surface coaxial with pin *a*, while compressing the spring 5 will slide against the side of this spring contacting therewith to reach a zone (FIG. 2) where the reaction force of spring 5 substantially passes through the pin *a*, which is the fulcrum for the lever comprising the equalizer 3 with the projection of the end corner 14, so that the momentum of the driving torque acting between two elements of the articulated quadrilateral is substantially zero, and namely: the fixed side $a - d$ the wall of the fixed side being fast therewith, and the side $a - b$ given by the equalizer 3; under these conditions the door 25 is free to turn or to stay at any intermediate opening position where it has been left.

The spring 5 transmits loads directly to the equalizer 3 and through the latter indirectly to the other elements of the articulated quadrilateral, whichever is the closing or opening position of the door 25, also when its closing effect is counteracted and even more when it is active; an automatic resumption will result for all of those clearances which, although extremely reduced, are unavoidably present in all the links, with the desired result of ensuring a smooth continuous movement for the mechanism.

A first variant to the device hitherto described is that as shown in FIGS. 4, 5 and 10 of the accompanying drawings and consists of substituting the metal strap spring 5 for a wire spring 18.

This spring 18 has an intermediate helical coil made of a few turns 19 acting as the eyelet 6 of spring 5, two free branches 20 and 20' extending therefrom, which can be unequal and opposite, as shown in said figures, or equal and spread apart in the form of a "V," as the sides 7 and 7' of spring 5.

The substitution of spring 18 for spring 5 will not involve any change in the closing device, provided that it is provided with resilient characteristics equivalent to those of spring 5; the matter of being more or less preferred will depend on practical reasons.

A first improvement consists of adopting in the device for holding a door provided with concealed linked hinges shut as above described, an equalizer which, rather than comprising two separate parts made of a different materail and interconnected by a small pin, carries a tongue integral with the equalizer and acting as a lever arm relative thereto.

An exemplary construction of this equalizer is shown in FIGS. 11 and 12, wherein the equalizer 30, made of suitably shaped steel strip and carrying at the ends two cylindrical curlings making up the knots or loops "A" and "B," has adjacent knot or loop "A" a tongue 31 provided by cutting the equalizer body according to contour 32 and bending it to bring its corner 33 to the most suitable position to form one end ("power" or "resistance" end) of a lever, the (alpha) axis of the knot or loop "A" of which is the fulcrum, whereas the (beta) axis of the knot or loop "B" is the other end.

Corner 33 is a sharp corner, so as to form a precise contact line with the spring with which it is to interact, but not being a cutting corner or edge, so that it will not tend to cut the spring; this can be economically accomplished by suitably selecting the cut direction for the steel strip and in the case by a next barreling of the finished piece.

As clearly shown in FIGS. 13 and 14, the closing device including the novel equalizer 30 has a configuration and performs as the device shown in FIGS. 1,2 and 3 and including the equalizer 3.

The advantages provided by the combination of a simple equalizer, such as equalizer 30, with a V-shaped spring are many over the combination of a composite equalizer, such as equalizer 3, integrated with the block 10, and the same spring.

Thus, only one piece (equalizer 30 provided with a tongue 31) has to be made instead of three pieces (equalizer 3, block 10, shown in FIGS. 8 and 9, and a small pin for coupling thereof), saving the preassembling costs for the three pieces. The final position of end 33 relative to the two axes "alpha" and "beta" of

equalizer 30, which is very important for the correct operation of the above described device, is affected by only one working tolerance, instead of being a combination of the individual tolerances of equalizer 3, block 10 and coupling thereof. The possibility is avoided of even a minimal shifting of the two elements from each other upon closing trip which is a source of undesired noises. The assembling of the hinge and associated closing device is simplified.

A second improvement consists of giving the free side of the V-shaped spring intended to interact with the end 33 of the tongue 31 of equalizer 30 a convex shape rather than a flat shape, in order to enhance the closing effect and at the same time reducing the stresses being interchanged by the system elements when the hinge is open.

A first exemplary embodiment for this second improvement is shown in FIG. 15, wherein a metal strap V-shaped spring 34 is illustrated and provided with an eyelet 39, one of the free side 35 being straight, as in the above described spring 5, but modified in that the free side opposite the straight side 35 has a bending 36 dividing it in two sections, a section 37 between the bending 36 and eyelet 39 diverging from the opposite side 35, and an end section 38 converging to said flat opposite side 35.

The advantages of this novel form will be evident from FIGS. 19 and 20.

When the hinge is closed (FIG. 19), the contact between spring 34 and corner or edge 33 of equalizer 30 occurs in the section 37 of said spring 34; the greater free spring divergency of section 37 relative to the opposite side over that of a spring having both flat free sides, causes an increase in the force through which said spring will bias the hinge to close.

On the other hand, when the hinge is open (FIG. 20), due to the free spring convergency of its section 38, on which at open hinge the contact occurs between said spring 34 and edge 33 of equalizer 30, the chamber for spring 34 will be less and also there will be a lower amount of the unnecessary fatigue to which all of the device elements and some elements of the hinge are subjected.

FIG. 16 shows another embodiment of spring 40, having both of its free sides bent at 41, 41', so as to be divided in two sections, of which the side 42,42' on the side of eyelet 44 substantially diverges from its opposite side, whereas the outer side 43,43' converges to said opposite side.

The advantages of this further form are the same as for spring 34, with the addition that owing to its symmetry this member provides for a greater simplicity of assembling in the hinge.

A third improvement consists of substituting the wire springs shown in FIGS. 17 and 18 for the metal strap spring shown in FIGS. 15 and 16.

In the wire spring of FIG. 17, one of the straight sides comprises two branches 46 and 46', parallel to each other and connected by a cross section 47, while the opposite straight side comprises two not interconnected branches 48 and 48'; as in the preceding examples, the two eyelets 49 and 49' of each branch can be slipped on a pin *d* of the hinge.

In the wire spring 50 of FIG. 18, corresponding to the metal strap spring 34, this spring 50 has a curved side wherein the bendings 51 and 51' divide each branch respectively in sections 52 and 52', diverging from the opposite straight side 55 and 55', and two sections 53 and 53' converging to said opposite side 55 and 55'. The two branches of the curved side are interconnected by a cross section 54, while those of the straight side 55 and 55' are free to each other.

The wire springs can provide over the corresponding metal strap springs the advantage of a smaller friction surface to the tongue acting there against and above all a larger availability of the material, since a larger variety of grade and sizes for spring wires can be normally found in commerce than those for spring metal straps.

Other forms of wire springs, corresponding to the above described metal strap springs, or to not substantial modifications thereof, can be readily devised on the example of those herein described. For example, it could be thought of increasing the elastic constant of these springs, without resorting to unduly large wire diameters, drawing near one another not only two, but a plurality of similarly shaped branches.

A further improvement of the invention consists of interposing a slide, preferably but not necessarily of anti-friction material, between the end 33 of tongue 31 of equalizer 30 and the free side of the V-shaped spring, on which said end operates.

An exemplary embodiment of this slide is shown in FIGS.21, 22, 23 and 24, while its application is shown in FIGS. 25 and 26.

The slide 57 has a groove 58 defined by two side shoulders 59 and 59' for its guidance when sliding along a side of a spring, such as side 7 of spring 5; on its opposite face the slide having a saddles 60 defined by two suitably rounded shoulders 61 and 61' for accomodating the end 33 of tongue 31 of equalizer 30 and allowing the required swinging thereof. The axes of saddle 60 and groove 58 are oblique and at right angles to each other. The saddle 60 can be a through saddle or confined at its ends by two further shoulders 62 and 62' for better coupling it with the tongue 31 of equalizer 30.

The operation of the closing device comprising a spring, such as spring 5, and an equalizer, such as equalizer 30, integrated by the interposition of a slide, such as slide 57, is identical to that of the previously described devices, but has some further advantages: during the closing device operation, in any case there occurs a relative movement between the end 33 of tongue 31 of equalizer 30 and the side of a spring, such as side 7 of spring 5, which comprises a sliding and an oscillation.

The slide 57 separates the two components of the movement which turns from direct to indirect; more particularly, the sliding or dragging is only between the groove 58 of slide 57 and the side 7 of spring 5, while the rolling is only between the end 33 of tongue 31 and the saddle 60 of said slide 57.

A suitable but not extremely restrictive selection of the material for manufacturing the slide 57, will permit to substantially reduce the sum of friction occurring between the several contacting elements and in any case will provide for a more rational distribution and surely a lower degree in wears of said elements.

Accordingly, a smoother and more noiseless operation of the device will result, which is satisfactory, even if reducing conveniently the spring strength and therefore all the loads being involved, with a lower fatigue in all of the members of said device and hinge on which it is applied.

What is claimed is:

1. A device for holding a door shut, incorporated in a concealed hinge comprising:

a. fixed carrier means secured to a first surface,

b. a first pair of pin means fixedly attached to said carrier,

c. first equalizer means pivotally attached to one of said pin means at one end thereof by bi-furcated attaching means,

d. second equalizer means pivotally attached to the other of said pin means at one end thereof,

e. movable means secured to a second surface and including a recess therein,

f. another pair of pin means attached to said movable means and located in said recess, one of said other pair of pin means projecting further into said recess than the other of said other pair of pin means and having said first equalizer means pivotally attached thereto, the other of said other pair of pin means having said second equalizer means pivotally attached thereto,

g. a V-shaped flexure spring having an eyelet at the apex and mounted by said eyelet to the one of the first pair of pin means associated with said first equalizer means between the bi-furcated ends of said bi-furcated attaching means, a first leg of said spring interacting with a projection of said second equalizer means acting as a lever with a fulcrum at its first pin means and the second leg of said V-shaped spring interacting with said fixed carrier.

2. A device as claimed in claim 1 wherein said second equalizer means includes a block having a sharp edge interacting with said spring and a joint tooth.

3. A device as claimed in claim 2 wherein said block is of anti-friction material and is secured to said second equalizer means in a cavity therein.

4. A device as claimed in claim 1 wherein said projection of said second equalizer means is adjacent the first pin associated therewith, and terminates with a sharp edge which interacts with said first spring.

5. A device, as claimed in claim 1, wherein said V-shaped flexure spring is made of metal strap and both of its free sides are straight.

6. A device as claimed in claim 1, wherein said V-shaped flexure spring is made of wire, has an intermediate helical coil of a few turns and both of its free sides are straight and each comprise a single branch.

7. A device as claimed in claim 1, wherein said equalizer having a sharp edge projection and interacting with said V-shaped spring is integrally made and has a tongue formed on its body by a U-shaped cut; said tongue terminating with a sharp but not cutting edge and forming an arm of a lever, of which the other arm is said equalizer.

8. A device, as claimed in claim 7, wherein said V-shaped spring has an outwardly facing convexity provided by a bending dividing said side in two sections, the V apex facing section of which diverges from the opposite side, while the end section converges to said opposite side.

9. A device as claimed in claim 7, wherein said V-shaped spring having an eyelet at its apex is made of wire and comprises at least two parallel symmetrical branches interconnected by at least one cross section so as to be made of a single curved and bent wire length.

10. A device as claimed in claim 7, wherein a slide, made of antifriction material, is interposed between the V-shaped spring and that lever arm of the equalizer on which said spring operates, said slide having a groove for its guidance when sliding along one side of the V-shaped spring and a saddle for receiving the end of the lever arm of the equalizer and allowing an oscillation thereof, said groove and saddle having oblique axes at right angles to each other.

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# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,744,086 Dated July 10, 1973

Inventor(s) Luciano Salice, and Silvio Serin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

At page 1 (cover sheet), item 73, the address of the assignee quote "Milan, Italy" should read -- Cantu, Como, Italy --.

Signed and sealed this 12th day of March 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents