Dec. 30, 1952 E. M. BORCHERS ET AL 2,623,236

OVER-CENTER HINGE

Filed Feb. 28, 1947 2 SHEETS—SHEET 1

Fig. 1

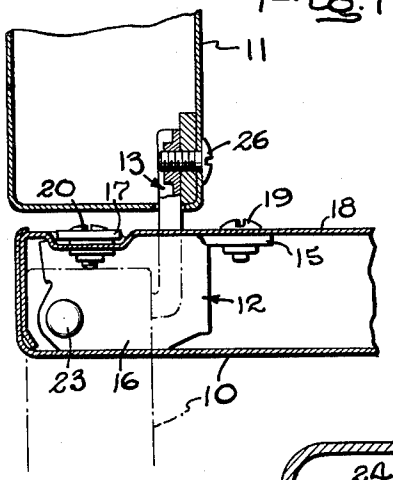


Fig. 2

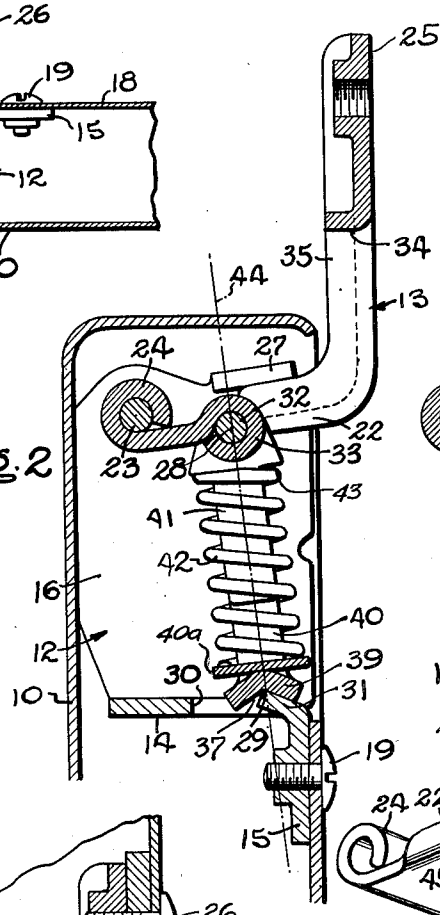


Fig. 4

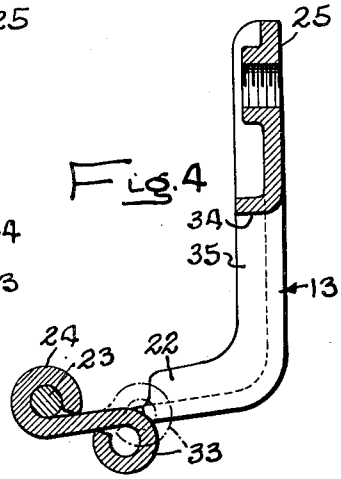


Fig. 5

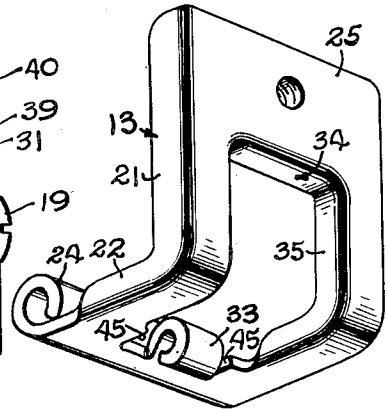
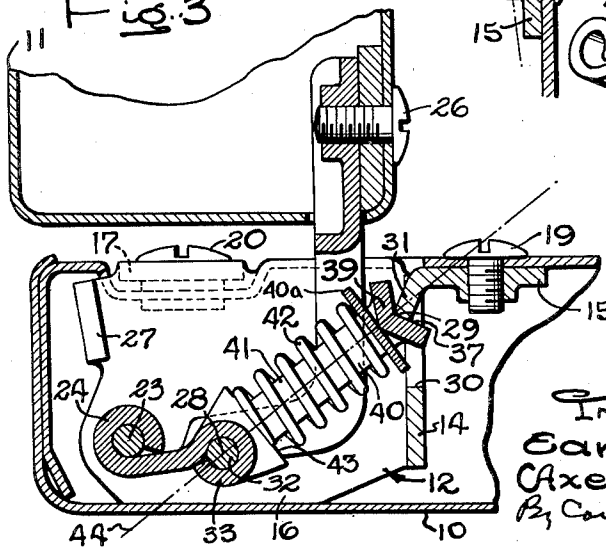


Fig. 3



INVENTORS
Earl M. Borchers
Axel W. Ahlgren
By Carlson, Pitzner, Hubbard & Wolfe
ATTORNEYS

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OVER-CENTER HINGE

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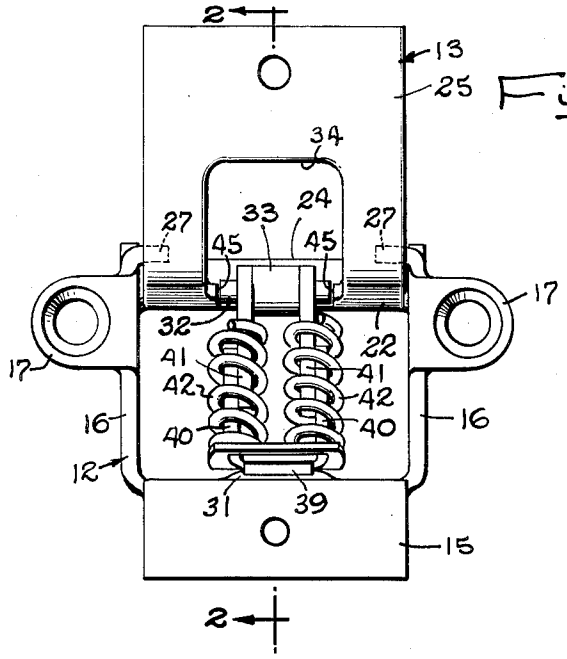


Fig. 6

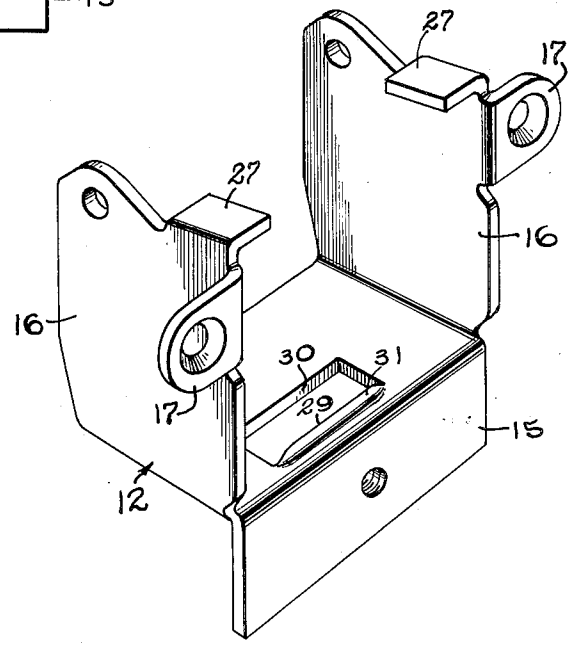


Fig. 7

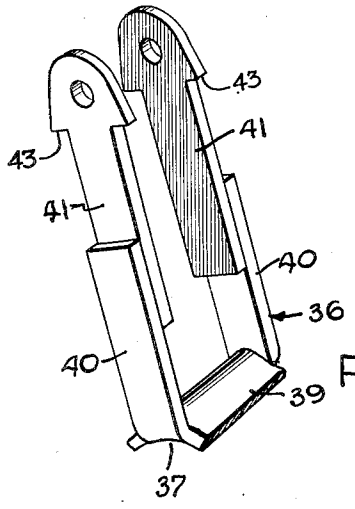


Fig. 8

INVENTORS
Earl M. Borchers
Axel W. Ahlgren
By Carlson, Pitzner, Hubbard & Wolfe
ATTORNEYS

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OVER-CENTER HINGE

Earl M. Borchers and Axel W. Ahlgren, Rockford, Ill., assignors to American Cabinet Hardware Corporation, Rockford, Ill., a corporation of Illinois

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5 Claims. (Cl. 16—135)

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This invention relates to hinges for use on cabinet doors and the like and operable with an over-center action to urge the door into closed and open positions respectively.

A general object is to provide a hinge of the above character which may be formed from sheet metal parts, which has a relatively small dead center range, and which is durable in construction.

Another object is to provide a hinge of the above character having an over-center device constructed and mounted on the hinge parts in a novel manner.

The invention also resides in the novel mounting for the ends of a compression spring type of over-center device.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary view of a cabinet door supported on its frame by means of a hinge embodying the present invention.

Figs. 2 and 3 are cross-sectional views of the hinge in the door open and closed positions thereof, the sections being on the line 2—2 of Fig. 6.

Fig. 4 is a longitudinal sectional view along the line 2—2 of Fig. 6 of one of the hinge parts.

Fig. 5 is a perspective view of one of the hinge parts.

Fig. 6 is an elevational view of the hinge looking from the right of Fig. 2.

Fig. 7 is a perspective view of the other hinge part.

Fig. 8 is a perspective view of the over-center device.

In the form shown in the drawings for purposes of illustration, the improved hinge is especially adapted for use on a hollow metal cabinet door 10 which may be mounted on a frame 11 to swing through substantially a right angle from the closed position shown in full outline in Fig. 1 to an open position shown in phantom. The hinge proper includes a box-like frame member 12 formed by bending a piece of sheet metal into a rectangular U-shape to form a flat closed end 14 with a right angular mounting flange 15 on one edge and two spaced parallel legs 16 with projecting mounting lugs 17 at their ends lying in the plane of the flange 15. This part is disposed within the door 10 and secured to the back panel 18 thereof by screws 19 and 20 respectively entered through holes in the flange 15 and the lugs 17.

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The other hinge part indicated generally at 13 is a substantially right angular L-shaped piece of sheet metal strengthened by an edge flange 21. The shorter leg 22 of the L projects in between the legs 16 of the hinge frame 12 and the end is curled as indicated at 24 around a pintle 23 rigidly connecting the free ends of the frame legs 16 on the side of the U opposite the mounting flange 15. The other end portion 25 of the L is adapted to project through an opening in the edge of the door frame 11 and is secured to a side panel of the latter by a screw 26 (see Fig. 1). The length of the leg 22 is somewhat shorter than the depth of the U-shaped frame 12 so that the L-shaped part 13 may be disposed within the frame when the door is closed (Figs. 1 and 3) and will lie adjacent and substantially in the plane of the U-shaped frame when the door is open (Figs. 2 and 6). Swinging of the part 13 to the latter position is limited by engagement of the leg 22 with lugs 27 bent inwardly at the ends of the frame legs 16 on the side of the U opposite the pintle 23.

In accordance with the present invention, a novel over-center device is mounted within the hinge frame 12 and is arranged to act in compression between an axis 28 on the part 13 adjacent the pivot 23 thereof and an abutment 29 formed on the closed end 14 of the frame 12 adjacent the flange 15. In order to locate the line of action of the over-center device accurately, it is preferred to make the abutment 29 in the form of an edge. To this end an aperture 30 is punched in the end 14 adjacent the flange 15 and the outer defining margin of the aperture is bent inwardly to form a lip 31 with the edge 29 thereof extending parallel to the pintle 23 and located accurately relative to the frame 12.

The axis 28 is defined by an abutment in the form of a pin 32 which extends through a curl bent out of a lug 33 which is left after punching out the central portion of the part 13 to form an aperture 34 extending around the right angular bend in the part. For strengthening purposes, a flange 35 is formed around most of the aperture 34. The curled lug 33 is narrower than the aperture 34 and is initially formed with the axis of the curl spaced outwardly from the plane of the leg 22 as shown in full in Fig. 4. Then, after insertion of the pin 32 and assembly of the over-center device thereon, the curl 33 is bent into the position shown in phantom in Fig. 4 and in full in Figs. 2 and 3 so as to bring the ends of the pin 32 into alinement with edges 45 on the leg 22 thereby preventing endwise shifting of the pin relative to the curl. By this method of as-

sembly, the axis 28 defined by the pin 32 may be located accurately with respect to the pintle 23.

In general, the over-center device proper comprises one or more coiled compression springs within the hinge structure extending through the aperture 34 in the part 13 diagonally of the bend in the L when the door is in closed position (Fig. 3) and acting at opposite ends against the two abutments 29 and 32 above referred to so as to tend at all times to separate these abutments and urge the part 13 about the fulcrum 23 in one direction or the other depending on the location of the line 44 of action of the spring relative to this fulcrum. The springs are supported by a link which extends between the abutments and, in the present instance, comprises a U-shaped sheet metal member 36 (Fig. 8) whose closed end 39 is formed with a V-shaped seat 37 abutting at its apex with the fulcrum edge 29. The spaced parallel legs 40 of this member project short of the pin 32 and lie against flat bars 41 respectively pivoted on the projecting ends of the pin 32 and slidable along the legs 40 so that the over-center device as a whole is extensible and contractible longitudinally. Such contraction is resisted by relatively stiff compression springs 42 which are colied about the overlapping end portion of the bars 41 and the legs 40 of the member 36 with each spring abutting at one end against shoulders 43 formed on the bar adjacent its pivot. The other spring end acts against an apertured plate 40a fitting over the legs of the member 36 and against the closed end 39 thereof.

When the door is in closed position the line 44 of action of the springs 42 through the axis 28 and the edge 29 will be spaced outwardly from the pivot 23 (see Fig. 3) and the spring force will act with a substantial moment arm to urge the door counterclockwise against the stop (not shown) which determines the closed position of the door. Now, as the door is swung clockwise in the opening direction about the pivot 23, the line 44 moves toward this pivot and reaches the latter after the door has swung approximately 35 degress. As the line passes over-center a few degrees past the pivot center 23, the action of the spring force on the door is reversed and the door is urged to the open position (Fig. 2) determined by the stop lugs 21. Thus, the springs act with substantial moment arms to hold the door either closed or open. The dead center position of the over-center device may, by proper design, be located at any desired angular position of the door.

It will be observed that when the parts are in the door open position as shown in Fig. 2, the pivoted leg 22 of the L 13 is parallel to the closed or apertured end of the U, while the other leg of the L parallels the plane of the U. At this time, the line 44 through the spring abutments lies substantially in the plane of the U. As the L is swung about the pivot 23, the line 44 of action of the spring is carried laterally across the pivot, and in the limit door closed position shown in Fig. 3 extends at a substantial angle relative to the plane of the U and diagonally of the space within the U, the spring then being disposed within the corner aperture 34 of the L and extending across the corner of the latter so as to form a triangle with the bend of the L. By virtue of this arrangement, the L becomes nested compactly within the U with the outer leg 25 disposed parallel to and closely adjacent the closed end of the U, the pivoted leg of the L paralleling the plane of the U. The parts of the longitudinally extensible over-center device are always disposed wholly within the U-shaped member in all positions of the door, and the over-all dimensions of the hinge structure are reduced to a minimum.

We claim as our invention:

1. An over-center hinge comprising a U-shaped sheet metal member with a flat closed end, a lip punched out of said closed end and forming a fulcrum edge paralleling the closed end, a pintle rigidly connecting the legs of said member, an L-shaped plate having an aperture therein and one end portion received between said legs and curled around said pintle, a curl narrower than said aperture bent from the defining end edge thereof adjacent said pintle with the axis of the curl lying substantially in the plane of said end portion, a pin longer than and extending through said curl and held against movement by abutment of its ends with the side edges of said aperture, a U-shaped element providing a seat at its closed end abutting against said fulcrum edge, bars lying against the respective legs of said element and respectively pivoted on the projecting ends of said pin, and springs each coiled about one of said bars and acting in compression between its bar and the closed end of said element.

2. An over-center hinge comprising a U-shaped sheet metal member, an L-shaped sheet metal member, a pin spanning the free ends of the U and pivotally supporting the end of one leg of the L for swinging of the latter between a first position in which the pivoted leg of the L substantially parallels the closed end of the U and a second position in which the L is nested within the U with the other leg lying adjacent said closed U end, both legs of said L being cut away to form an aperture which extends around the corner of the L, means on said L adjacent said pivot pin and on the closed end of the U providing opposed spaced abutments, a coiled compression spring acting at opposite ends against said abutments and disposed substantially normal to the plane of the closed end of said U when said L is in said first position, said spring extending diagonally of said plane when the L is in said second position, and a substantially straight link pivoted on the pivoted leg of said L and extending through said spring between said abutments.

3. An over-center hinge comprising a U-shaped sheet metal member, an L-shaped sheet metal member having first and second legs, a pivot spanning the free ends of the U and pivotally supporting the free end of said first leg of said L for swinging of the latter into and out of a nested position in which said L-shaped member is disposed within the U and said second leg of the L is disposed adjacent the closed end of the U, both legs of said L being cut away to form a corner aperture, a curl spaced from said pivot and bent out of said first leg adjacent the pivot, a cross pin in said curl paralleling said pivot, means on the closed end of said U providing a first abutment spaced from and facing toward said pivot, a substantially straight link fulcrumed at one end on said cross pin and extending between the pin and said abutment, a second abutment on said link adjacent said cross pin facing toward said first abutment, said cross pin, when said members are in said nested position, being offset laterally to one side of a line connecting

said pivot and said first abutment and movable toward and across said line as said L-shaped member is swung out of said nested position, and a compression spring coiled around said link and urging said abutments away from each other longitudinally of said link, said link and spring constituting a longitudinally extensible over-center device which in said nested position of the L is disposed in and extends across said aperture to form a triangle with the corner of the L.

4. An over-center hinge comprising a U-shaped sheet metal member, an L-shaped sheet metal member having first and second legs, a pivot spanning the free ends of the U and pivotally supporting the free end of said first leg of said L for swinging of the latter into and out of a nested position in which said L-shaped member is disposed within the U and said second leg of the L is disposed adjacent the closed end of the U, a curl spaced from said pivot and bent out of said first leg adjacent the pivot, a cross pin in said curl paralleling said pivot, means on the closed end of said U providing a first abutment spaced from and facing toward said pivot, a substantially straight link fulcrumed on said cross pin and extending between said cross pin and said abutment, a second abutment on said link adjacent said cross pin facing toward said first abutment, said cross pin, when said members are in said nested position, being offset laterally to one side of a line connecting said pivot and said first abutment and movable toward and across said line as said L-shaped member is swung out of said nested position, and a compression spring coiled around said link and urging said abutments away from each other.

5. An over-center hinge comprising a U-shaped member, an L-shaped member having first and second legs, a first pivot at the free ends of the U pivotally supporting the free end of said first leg of said L for swinging of the latter into and out of a nested position in which said L-shaped member is disposed within the U and said second leg of the L is disposed adjacent the closed end of the U, a second pivot on said first leg of the L paralleling said first pivot spaced from and disposed adjacent said first pivot, means on the closed end of said U providing an abutment spaced from and facing toward said two pivots, a substantially straight link fulcrumed at one end on said second pivot and extending between the latter and said abutment, said second pivot, when said members are in said nested position, being offset laterally to one side of a line connecting said first pivot and said abutment and movable toward and across said line as said L-shaped member is swung out of said nested position, and a compression spring coiled around said link and urging said abutment and said second pivot apart whereby to bias the longitudinal axis of said link laterally and away from said first pivot.

EARL M. BORCHERS.
AXEL W. AHLGREN.

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