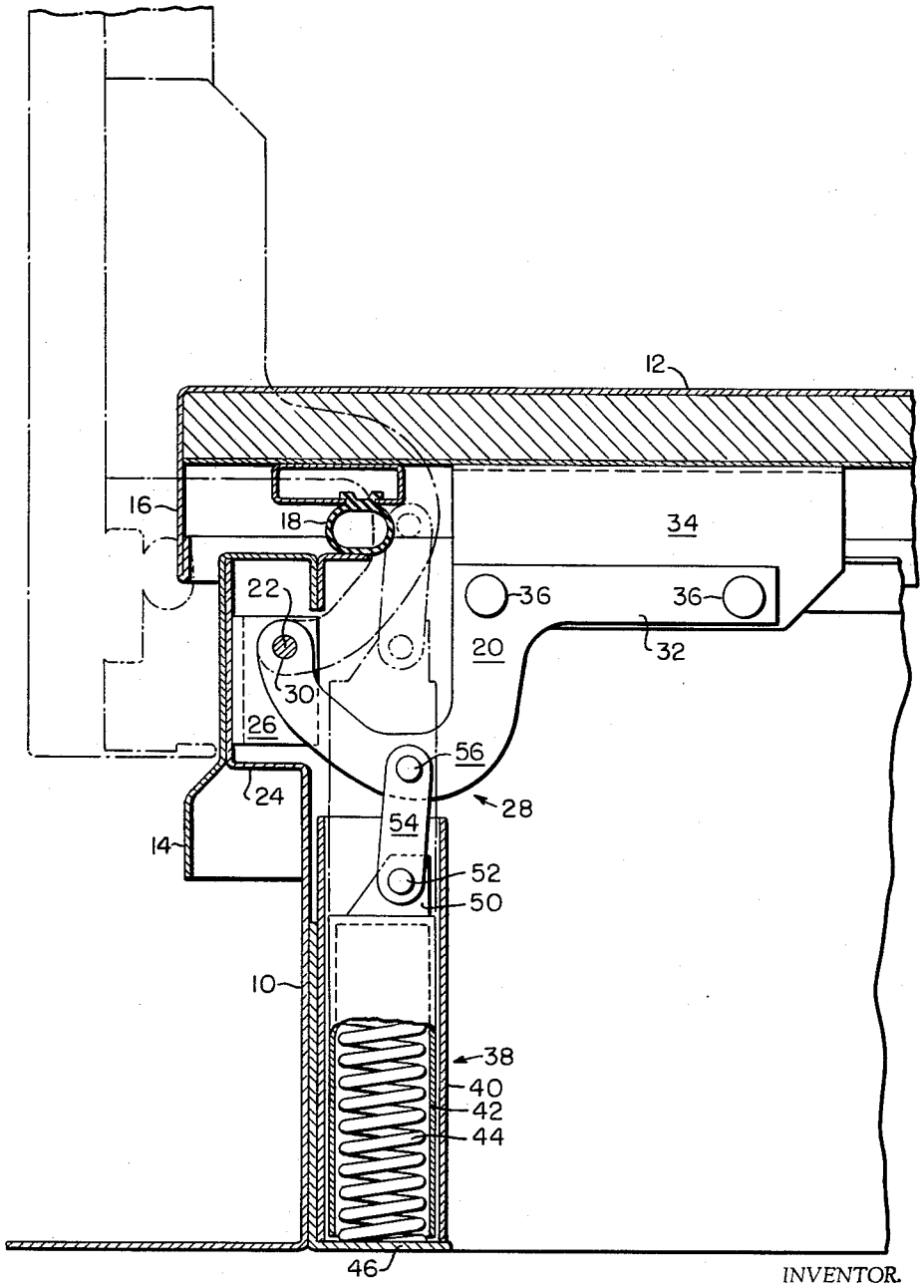
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SPRING HINGE

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INVENTOR.

NATHAN LEVINE

BY Fonway, Jenney & Hilbelt

ATTORNEYS

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SPRING HINGE

Nathan Levine, Newton, Mass., assignor to Babcock-Davis Associates, Inc., Boston, Mass., a corporation of New Hampshire

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This invention relates generally to closures and improved hinge means therefor, and more particularly to closures of the general type utilized as hatchway doors and to an improved spring hinge assembly therefor.

In the construction of certain closures it is common to provide spring means to assist in the operation thereof. In the construction of hatchways such spring means are particularly desirable. Hatchways are frequently installed in a generally horizontal position, as for example through floors and through flat roofs. These hatchways are generally constructed of sheet metal and the hatch doors frequently are of substantial size. The metal doors are usually heavy and may be difficult to lift, especially when access to the hatch is up an inclined passage as is common in the case of roof hatches. In order to attempt to counterbalance the hatch door, which is usually hinged to the hatch frame along one edge, coiled springs have been employed in the prior art to exert an opening force on the door. In some installations it is desired to cause the hatch door to open upon the operation of a fusible link in order to provide a safety vent in case of fire. In such installations the spring means selected will be of sufficient size to either partially or fully open the hatch upon release of the fusible hatch lock.

In spring means heretofore employed for counterbalancing or assisting in the opening of hatch doors various spring and lever combinations have been employed. Although these combinations have operated satisfactorily to open the hatch doors with which they are used, the prior constructions have frequently impinged substantially on the passage through the hatch opening making the passage of persons or objects therethrough subject to damage by contact with the spring and lever means. A spring and lever structure which operates satisfactorily to open the hatch door but is illustrative of the problem above described is shown in the patent to Lyons et al. No. 2,603,819 issued July 22, 1952. It will be noted that in the disclosed construction both springs and levers extend substantially into the hatch opening when the door is in "open" condition. It will also be noted that when the door is "closed" the levers and springs extend downwardly in a substantial fashion as shown in FIG. 5 of the patent. This latter condition may be hazardous if the hatch is normally approached from below in "closed" condition.

It is, accordingly, an object of the present invention to provide hatch door spring means which will assist the opening of a hatch door while being of sufficient dimension that they may be located adjacent a side wall of the hatch thereby substantially decreasing interference with the hatchway passage itself during use and consequently minimizing injuries or other accidents.

In the construction of the invention a hatch door of conventional design is utilized in combination with a hatch frame also of usual design. A hinge arm is secured to the hatch door and pivoted to the hatch frame whereby the door may be rotated from a "closed" to an "open" position. A coiled spring positioned within a telescoping spring casing is secured parallel to the hatch frame and flush thereagainst. Linkage means is employed to operatively connect the spring means described to the hinge arm whereby a satisfactory hatch door spring is provided.

It is a feature of this invention that the coiled spring is positioned adjacent the hatch wall and parallel thereto during all portions of its operation.

It is a further feature of this invention that the coiled spring is entirely enclosed by a telescoping casing thereby minimizing any possible injury therefrom.

It is yet another feature of this invention that the linkage employed between the spring means and the hinge arm is so constructed that the linkage connection utilized may not be accidentally caused to move past dead center thereby causing the structure to jam.

These and other objects and features of the invention will become more apparent as the description proceeds with the aid of the accompanying drawing, in which the figure is a side sectional view of a portion of a hatchway showing the spring compensating device of the invention with portions thereof broken away for clarity.

Referring now to the drawing for a more particular description of the invention, a partial view of a horizontal-type hatchway is shown. It will be understood that the structure of the invention is suitable for use in analogous types of closures and is not limited to closures operating in a normally horizontal condition. The particular hatch construction illustrated is typical of the type employed in roof and floor installations where the door or cover is normally in horizontal "closed" condition.

In the illustrated embodiment a hatch frame or curb **10** is shown for installation in the usual fashion. The frame **10** includes a flanged upstanding wall member which may be of any construction but commonly is formed of sheet metal. A door or cover **12** of conventional construction is also provided and is initially dimensioned to abut the upper most surfaces of the frame **10** to normally close the passage through the hatchway. The frame **10** may be provided with conventional depending flashing flanges **14** and the door **12** may likewise be provided with depending peripheral flanges **16** which serve to prevent the entry of unwanted matter into the hatchway. The door **12** may also be provided with edge seal means, as for example compressible tubular seal members **18** which are initially positioned to abut cooperating surfaces of the frame **10** to provide a seal against the entrance of moisture, dirt, etc.

The door **12** is hinged to the frame **10** by hinge structure including a hinge arm **20** secured to the door **12** and a hinge pivot **22** on which the arm **20** is rotatably engaged, the pivot **22** being secured to the frame **10**.

In the illustrated embodiment the frame **10** is provided at its upper portion with a channel portion **24** which is offset outwardly from the lower portion of the frame **10** and which is closed at its outer extremity while being open to the hatchway along its inner wall. Within the channel **24** a bracket member **26** is provided which is affixed as by welding to the outer wall of the channel member **24**. The bracket **26** carries the pivot pin **22** which may be mounted therein in any suitable fashion. The bracket **26** may be constructed as two parallel walls separately affixed to the channel **24** or may be of alternative construction, as for example U-shaped in configuration.

The arm **20** is provided with a first U-shaped portion indicated generally at **28**. At one extremity of the U portion **28** an aperture **30** is provided to receive the pivot pin **22**. The U-shaped portion **28** is initially oriented with the open portion of the U facing towards the hatch door **12**. At the opposite extremity of the U-shaped portion **28** from the pivot pin receiving aperture **30** an integral extended attaching member **32** is formed. The arm **20** is attached to the door **12** by securing the attaching member **32** to a depending portion **34** of the door **12** by any suitable means as for example bolts **36**. It will be obvious that by the use of at least a pair of arms **20** and associated pivot pins **22** the door **12** may be hingedly secured to the frame **10** of the hatch. By the use of the

U-shaped arm construction described the hatch door may be swing through an arc of approximately 90° to completely free the hatchway for use as is shown in phantom form in the drawing.

In order to provide spring biasing for the hatch door **12** spring means are provided which are affixed to the interior wall of the frame **10**. In the illustrated embodiment, a telescoping spring holder **38** is shown. The spring holder **38** includes an outer tubular member **40** which is open at its upper end and which receives an inner tubular member **42** which is closed at its upper end. A coiled compression spring **44** is contained within the telescoping casing **38** with its upper extremity bearing against the closed upper wall of the inner casing **42** and with its lower extremity bearing against the base of the outer casing **40**. In the illustrated embodiment the tubular outer casing **40** rests upon an angle bracket **46** which forms its base closure and by means of which the telescoping spring assembly is securely affixed to the frame **10** of the hatch. It will be noted that the outer casing **40** may alternatively be provided with a closed bottom portion integral therewith and may be directly affixed to the frame **10** as by welding etc.

It will also be noted that the spring assembly **38** is permanently positioned with the center line of the spring parallel to the frame **10** and in the plane of rotation of the hinge arm **20** about the hinge pivot **22**. In this construction the spring **44** tends to force the inner casing **42** upwardly thus carrying the upper portion of the inner casing **42** outwardly through the open top of the outer casing **40**. It will be noted that the lower portion of the spring assembly **38** does not extend below the base of the frame **10**.

In the illustrated embodiment, the spring assembly **38** is initially positioned in vertical alignment with the arm **20** so that the center line of the spring and the pivot provided thereon, as heretofore described, will lie in the plane of rotation of the arm **20**. A bracket **50** is affixed to the closed upper end of the inner casing **42** and is employed to mount a pivot pin **52**, above referred to, which is engaged in one end of a link **54**.

The arm **20** also mounts a pivot pin **56** substantially at the base of the U-shaped portion thereof. The link **54**, above referred to, is provided with apertures at each end whereby it may be engaged between the pivot pin **52** affixed to the spring assembly **38** and the pivot pin **56** provided in the arm **20**. In practice it has been found most satisfactory to employ a pair of links **54**, one link being mounted between the bracket **50** and arm **20** at each of the cooperating side faces thereof respectively. In this fashion the forces exerted by the spring assembly **38** are transmitted to both sides of the longitudinal center line of the arm **20** thereby eliminating any possible turning moment about the longitudinal center line of the arm which might in time tend to wear the pivots **22**, **52** and **56** unevenly.

It will also be noted that the pivot pin **52** affixed to the spring assembly **38** is initially positioned slightly displaced toward the interior of the hatchway from the center line of the spring **44**. Likewise, the pivot pin **56** is initially positioned even further displaced toward the interior of the hatchway. This construction prevents any possibility of the link initially travelling counterclockwise when the door is closed from "open" position thereby causing the pivot pin **56** to ride over dead center with respect to the pivot pin **52** and the center line of the spring **44** whereupon further closing of the hatch cover would result in jamming of the assembly.

The operation of the invention is as follows:

The hatch frame is installed in the desired location and the door is hingedly mounted thereon by engaging the U-shaped arms on the door with the pivot pins affixed to the frame. It will be noted that two or more hinge units may be employed depending upon the length of the hatch door.

The coiled spring in its telescoping case is rigidly secured flush with the interior edge of the hatch frame directly below the U-shaped arm. The links **54** are engaged between the pivot **52** on the telescoping spring case and the pivot **56** on the arm. The invention is then installed in operating condition.

The coiled spring **44** is initially selected of sufficient strength such that general counterbalancing of the hatch door will be effected. Where it is desired to initially open the hatch door a predetermined amount without manual assistance, the spring may be selected with sufficient additional strength to accomplish this result when the hatch door is unlocked.

FIG. 1 shows the invention as it appears in the "hatch closed" condition. In phantom lines the position of the structure of the invention is shown in the "hatch open" condition. It will be noted that during the opening and closing of the hatch door the telescoping spring assembly moves only in a straight line and does not pivot. In the illustrated embodiment the telescoping spring assembly moves only vertically. By the use of the link **54** the vertical opening force of the spring may be transmitted to the arm **20** at the pivot **56**. It will be noted that during opening and closing of the door the pivot **56** describes an arcuate path the radius of which is the distance between the pivot **22** and the pivot **56**.

It will further be noted that upon closing of the door the links **54** is required to rotate clockwise about the pivot **52** due to the particular positioning of the pivot **52** and **56** with respect to the center line of the spring **44** as above described.

It is a further important feature of this invention that the hinge structure is entirely contained within the interior portion of the hatch frame and therefore is inaccessible to tampering by anyone from the exterior of the hatch.

It is an additional feature of the invention that the hinge and spring structure employed is of a sufficiently small width that hinge and spring assemblies may be positioned adjacent each other in larger hatch door installations to provide a multiple type construction.

Having thus described and illustrated a preferred embodiment of the invention, it is intended to claim all changes and modifications thereof which fall within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A spring hinge structure for use in a hatchway, said hatchway including a side wall and a hatch door designed for movement from a closed position generally normal to said side wall to an open position generally parallel to said side wall comprising, a hinge arm affixed at a first end thereof to said hatch door, said hinge arm having a second end provided with an aperture therethrough; a pivot pin; means mounting said pivot pin on said hatch wall for operative engagement in said aperture in said second end of said hinge arm; spring means including a coiled spring; means rigidly affixing said spring means to said side wall for reciprocating movement parallel to said side wall; at least one link having a first end and a second end for connecting said hinge arm to said spring means; a first pivot pin on said hinge arm for receiving said first end of said at least one link; a second pivot pin on said spring means for receiving said second end of said at least one link, and first means at said first end of said link for engaging said first pivot pin on said hinge arm and second means at said second end of said link for engaging said second pivot pin on said spring means, the center line between the said first and the said second pivot pins on said hinge arm and said spring means being positioned at an angle to the longitudinal center line of said spring means, said angle varying in magnitude but maintaining a constant sign as said hatch door is rotated from the fully closed position to the fully open position, whereby movement of said spring parallel to

said side wall will assist movement of said hinge arm about said pivot on said hatch wall.

2. A spring hinge structure for use in a hatchway, said hatchway including a side wall and a hatch door designed for movement from a closed position generally normal to said side wall to an open position generally parallel to said side wall comprising, a U-shaped hinge arm affixed at a first end thereof to said hatch door, said hinge arm having a second end provided with an aperture therethrough; a pivot pin mounting bracket secured to said hatch side wall; a hinge pivot pin mounted in said bracket to engage said aperture in said second end of said hinge arm; spring means including a telescoping spring casing containing a coiled compression spring; means rigidly affixing a portion of said telescoping casing to said side wall of said hatch for telescoping movement thereof parallel to said side wall, said spring means being positioned on said side wall in alignment with said hinge arm; first pivot means mounted on said telescoping casing at the end thereof adjacent said hinge arm; at least one link mounted at a first end on said pivot means on said telescoping casing, and second pivot means attached substantially at the bottom of said U-shaped portion of said hinge arm for engagement by a second end of said at least one link whereby movement of said spring parallel to said hatch wall will assist rotation of said hinge arm about said hinge pivot on said hatch wall.

3. A spring hinge structure as defined in claim 2 wherein said pivot means mounted on said telescoping spring casing is spaced away from said side wall of said hatch and beyond said center line of said spring means, and wherein said pivot means on said hinge arm for receiving said at least one link is spaced a greater distance from said side wall and from said center line of said spring means than said pivot means mounted on said telescoping spring casing whereby said link will not ride over dead center when said arm is rotated from an open position substantially parallel to said center line of said spring to a closed position substantially normal to said center line of said spring.

4. A spring hinge structure for use in a hatchway, said hatchway including a side wall and a hatch door designed for movement from a closed position generally normal to said side wall to an open position generally parallel to said side wall comprising, a hinge arm including a first U-shaped portion and a second elongated portion, said hinge arm being affixed to said hatch door at said elongated portion and having an aperture therethrough at said U-shaped portion opposite said elongated attaching portion thereof; a pivot pin mounting bracket secured to said hatch side wall; a hinge pivot pin mounted in said bracket to engage said aperture in said U-shaped

portion of said hinge arm; spring means including a telescoping spring casing containing a coiled compression spring, said telescoping spring casing comprising an outer tubular portion rigidly affixed to said side wall of said hatch, means closing the lower end of said outer tubular portion, and an inner tubular portion having a closed upper end; a bracket affixed at said upper closed end of said second tubular portion of said telescoping spring casing; first pivot means carried in said bracket for reciprocating movement parallel to said side wall of said hatch and in the plane of rotation of said hinge arm about said hinge pivot pin; at least one link mounted at a first end on said first pivot means on said telescoping casing, and second pivot means substantially at the bottom of said U-shaped portion of said hinge arm for engagement by a second end of said at least one link whereby movement of said spring casing parallel to said hatch wall will assist rotation of said hinge arm about said hinge pivot on said hatch wall.

5. A spring hinge structure for use in a hatchway, said hatchway including a side wall and a hatch door designed for movement from a closed position generally normal to said side wall to an open position generally parallel to said side wall comprising, a hinge arm affixed at a first end thereof to said hatch door, said hinge arm having a second end provided with an aperture therethrough; a pivot pin mounted on said hatch side wall for engagement with said aperture in said second end of said hinge arm; spring means including a coiled spring; means rigidly affixing said spring means to said side wall for reciprocating movement parallel to said side wall and a link attached to the spring means by a first pivot at one end of said link and attached to the hinge arm by a second pivot at the other end thereof, the center line of said link forming an angle with the center line of said spring means, said angle being of varying magnitude but of constant sign as said hatch door is rotated, whereby movement of said spring parallel to said hatch wall will assist movement of said hinge arm about said pivot pin on said hatch wall.

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DONLEY J. STOCKING, *Primary Examiner.*