

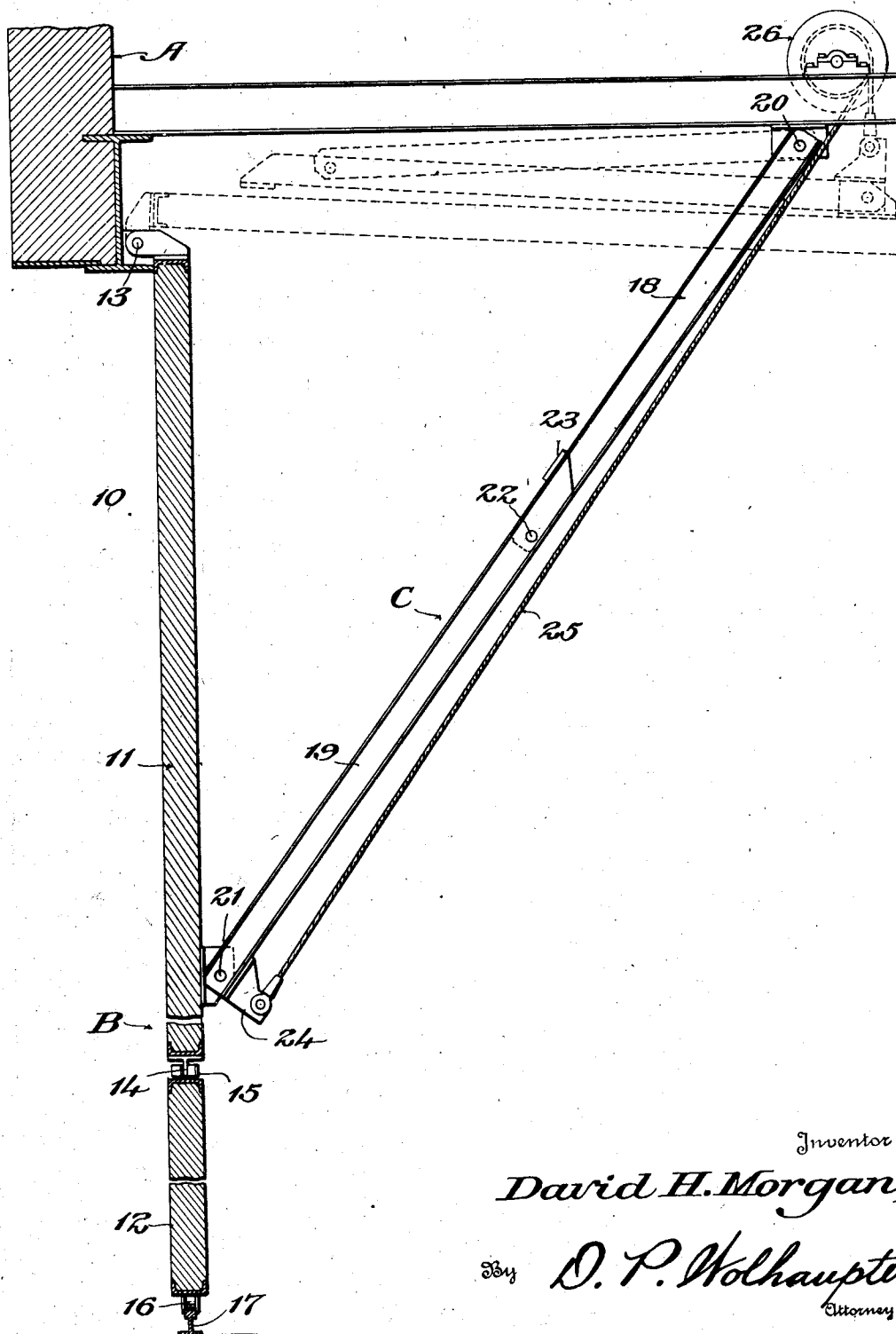
May 23, 1939.

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2,159,040

BRACING AND OPERATING MEANS FOR CLOSURES

Filed April 7, 1938



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UNITED STATES PATENT OFFICE

2,159,040

BRACING AND OPERATING MEANS FOR CLOSURES

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Application April 7, 1938, Serial No. 200,706

2 Claims. (Cl. 268—74)

This invention relates to bracing and operating means for closure elements of the swinging type, and has for its general object to provide, on the one hand, a bracing means which is effective positively to hold a swinging closure against being swung either inwardly or outwardly from a closed position by pressure exerted either inwardly or outwardly thereagainst and, on the other hand, to provide, in association with such bracing means, a closure operating means which is effective, when actuated to open the closure, first to release said bracing means and then to swing the closure to an open position.

While the invention is capable of use in association with closures of various different sizes swingable on either horizontal or vertical pivots and embodying either a single or a plurality of closure elements, it is of special utility where used in association with closures of the type embodying an upper, swingable section and a lower, slidable or swingable section which, when closed, is supported at its top by the bottom of said upper section.

Closures of the type referred to are employed for closing the doorways or other openings of factory and warehouse buildings, aircraft hangars and various other structures, and the purpose in having the closure composed of upper and lower sections is to permit opening of either the entire doorway or other opening when occasion demands, or only the lower portion of the doorway or other opening when there is no necessity for opening the same throughout its height. This is important for various reasons, among which may be mentioned the conservation of heat within a structure by maintaining the upper closure section closed when there is no necessity for opening the same, and the conservation of energy employed for operating the closure, whether it be of the power or manually operated type.

In closures of the type referred to the lower section usually is slidable horizontally to open and closed positions and usually is provided at its top with rollers which cooperate with a track carried by the bottom of the upper section. Alternatively, the lower section may, in some instances, be pivoted or otherwise connected at its top with the bottom of the upper section. In either case, the bottom of the upper section serves as a support for the top of the lower section during opening and closing of the lower section and when the lower section is closed. It is important, therefore, in order to insure against undesirable inward and outward move-

ment of the top of the lower section when said section is closed, to hold the lower portion of the upper section against inward or outward movement. Accordingly, the invention has more particularly in view to provide, in association with the upper section, a bracing means which assumes a locked position holding the lower portion of said section securely and positively against inward or outward movement under the influence of wind or other pressure exerted inwardly or outwardly thereagainst when said section is closed, and to provide, in association with said bracing means, an upper section opening and closing controlling means which is effective, when operated to open said section, first to unlock said bracing means. Thus, there is avoided any necessity of separately locking the bracing means following closing of the upper section, or of separately unlocking said bracing means prior to opening of said upper section, and this, in turn, means that the mechanism is fool-proof and that there is no danger of the bracing means being harmed by opening or closing of the upper section.

Another object of the invention is to provide a bracing and operating means for swingable closures which is of simple construction, cheap and easy to produce and install, and which is thoroughly reliable and efficient in operation.

With the foregoing and other objects in view, the invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claims.

In the accompanying drawing, the figure is a vertical, transverse section through a closure structure embodying the features of the invention, the open position of the upper section being indicated by dotted lines.

Referring to the drawing in detail, A designates a portion of a building structure having a doorway 10, and B designates, generally, an associated door or closure for said doorway comprising an upper section 11 and a lower section 12.

The upper section 11, the specific construction of which is immaterial, is pivoted at or near its upper end, as indicated at 13, to any suitable part of the building structure A preferably at or near the top of the doorway 10, and is swingable between a vertically or substantially vertically disposed, closed position and a horizontally or substantially horizontally disposed,

open position, as illustrated by full and dotted lines, respectively, in the drawing.

The lower section 12, the specific construction of which also is immaterial, is horizontally slidable in the plane thereof between closed and open positions and is provided at its top with any suitable means for interlocking cooperation with any suitable means carried by the upper section 11 at the bottom thereof, so that when both of the sections are closed and the upper section is held at its bottom against inward or outward movement, the top of the lower section likewise is held against inward or outward movement. In the present instance the upper section 11 carries at the bottom thereof a depending flange or track 14 and the lower section carries at the top thereof pairs of rollers 15 which respectively engage opposite sides of said flange or track. Thus, there is a freely slidable connection between the bottom of the upper section and the top of the lower section and, at the same time, said connection serves effectively to hold the adjacent ends of said sections against moving either inwardly or outwardly relative to each other when both sections are closed. As will, of course, be understood, the lower section 12, at its bottom, is guided for sliding movement and is held against inward or outward movement in any suitable manner. For example, it may be provided at its bottom with rollers 16 cooperating with a fixed track 17 at the bottom of the doorway 10. Moreover, and as will also be understood, when the bottom section 12 is slid to its open position, it is disposed beyond one side of the upper section 11 or, in other words, is disengaged at its top from the bottom of the upper section, so that the latter is free to be swung between its closed and open positions. Alternatively, the lower section 12 may be pivoted at its top to the bottom of the upper section and may be swingable to open and closed positions. In any case, however, the lower section, when closed, is supported at its top by the bottom of the upper section. Therefore, in order to hold the top of the lower section, when closed, against inward or outward movement, it is necessary to hold the bottom of the upper section against inward and outward movement. Accordingly, there is provided between the upper section 11 and a suitable fixed support, such as a part of the building structure A, a bracing and holding means for the upper section 11 constructed in accordance with the invention and designated generally as C.

The upper section 11 may be mounted to swing either upwardly and inwardly or upwardly and outwardly from its closed to its open position. If said section is mounted to swing upwardly and outwardly to its open position the bracing means C will be disposed at the outer side thereof. If, on the other hand, said section is mounted to swing upwardly and inwardly to its open position, the bracing means C will be disposed at the inner side thereof. In most cases the upper section 11 is mounted to swing upwardly and inwardly to its open position, that is, with respect to the building structure A, and it is illustrated as being swingable in that manner in the present instance. Therefore, the bracing and holding means C is illustrated in the present instance as being disposed at the inner side of said upper section 11.

The bracing and holding means B comprises upper and lower arms 18 and 19, respectively, the former of which is pivoted at or near its upper end to a suitable fixed support, such as a part

of the building structure A, at a point suitably spaced inwardly from the doorway 10, preferably but not necessarily above the horizontal plane of the top of said doorway, as indicated at 20, and the latter of which is pivoted at or near its lower end to the section 11 at or near the bottom of the latter, as indicated at 21. At or near their other ends the arms 18 and 19 are pivotally connected together, as indicated at 22, and their combined effective length is approximately equal to the distance between the pivots 20 and 21 when the section 11 is closed. Accordingly, when the section 11 is closed, the arms 18 and 19 extend diagonally upwardly and inwardly from a bottom portion of said section 11 and together constitute a brace effectively holding the bottom of said upper section and, consequently, the top of the lower section 12, against inward or outward movement under the influence of pressure exerted either inwardly or outwardly against either of said sections. In this connection suitable means is provided whereby the pivot 22 may move inwardly beyond, but only a short distance inwardly beyond, a straight line connecting the pivots 20 and 21 when the section 11 is closed. For example, the pivot 22 may be located inwardly from the adjacent end of one of the arms 18 or 19 and said arm, at or near its said end, may be provided with a lip 23 for engagement with the outer edge of the other arm. In the present instance the upper end of the lower arm 19 extends beyond the pivot 22 and is provided with the lip 23 to engage the outer edge of the upper arm 18 when the section 11 is closed and said pivot 22 is disposed slightly inwardly of a straight line connecting the pivots 20 and 21. Thus, when the section 11 is closed, the toggle-like brace C is effectively locked against being broken by pressure exerted against either of the sections 11 or 12 and the adjacent ends of said sections are, consequently, held positively and effectively against either inward or outward movement. In other words, when the section 11 is closed, the arms 18 and 19 tend constantly to swing inwardly under the influence of gravity. Therefore, when the section 11 is closed, the pivot 22 tends constantly to assume a position slightly inwardly of a straight line connecting the pivots 20 and 21 beyond which position it cannot move. Inward pressure against either of the sections 11 or 12 tends, of course, to collapse the arms 18 and 19 inwardly, but since they cannot move inwardly the sections 11 and 12 are, consequently, held against inward movement. On the other hand, while outward pressure against either of the sections 11 or 12 tends to produce a straight line relationship of the pivots 20, 21 and 22, the pivot 20 obviously will not move outwardly beyond a straight line connecting the pivots 20 and 21 and will immediately return to its normal position slightly inwardly of said line when outward pressure upon either of the sections 11 or 12 ceases. The foreshortening of the distance between the pivots 20 and 21 due to the pivot 22 being disposed only a short distance inwardly of a straight line connecting said pivots 20 and 21 is so extremely slight as to be imperceptible. Consequently, there cannot occur any perceptible inward or outward movement of the adjacent ends of the sections 11 and 12.

Fixed to and extending inwardly from a lower end portion of the lower arm 19 is a bracket 24 to which is connected the free end of a cable 25 or other suitable element for lifting the section 11. This cable or its equivalent extends diag-

onally upwardly and inwardly to a winding drum 26 mounted adjacent to the pivot 20 of the arm 18 and which may be power driven in any suitable manner or, alternatively, said cable may pass over a sheave mounted at the location of the drum 26 and may extend from said sheave either to a suitable power mechanism for pulling the same or to a suitable point to be pulled manually. In any event, regardless of how the cable 25 or its equivalent is pulled, it operates initially through the bracket 24 to rotate the lower arm 19 on its pivot 21 and to swing its upper end forwardly, thereby moving the pivot 22 forwardly of a straight line connecting the pivots 20 and 21 and destroying the locked status of the brace C. Further pulling of said cable or its equivalent then obviously results in further forward collapse of the arms 18 and 19 and in upward and inward swinging movement of the section 11 to any desired extent as far as its fully open, substantially horizontal position illustrated by dotted lines in the drawing. Upon release of the cable 25 or its equivalent, the section 11 swings by gravity to its closed position and the arms 18 and 19 are swung with said section 11 and also by gravity to their locked position shown by full lines in the drawing.

While it is not necessary that the pivot 22 be disposed more than a very short distance inwardly of a straight line connecting the pivots 20 and 21 in order to lock the brace C when the section 11 is closed, said pivot 22 obviously may be disposed any distance inwardly of such line so long as it is not disposed inwardly of a straight line connecting the pivot 20 and the point of connection of the cable 25 with the bracket 24, and the device still be operable in the manner stated.

Of course, there may be only a single brace C, but preferably there are at least two of said braces located at the ends of the section 11, respectively. Moreover, it is obvious that the entire closure may be comprised of only a single swingable section such as the section 11.

Without further description it is thought that

the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. A brace for a closure of the type which is pivoted at its top for swinging movement between a substantially vertically disposed closed position and a substantially horizontally disposed open position, said brace comprising upper and lower arms pivotally connected together adjacent to their adjacent ends, a pivotal connection between the lower end of the lower arm and a bottom portion of the closure, a fixed support, a pivotal connection between the upper end of the upper arm and said fixed support at a point spaced laterally from the pivot of the closure, means limiting movement of the pivotal connection between said arms away from the closure when the latter is closed to a point only a slight distance beyond a straight line connecting the pivots of said arms with the closure and said fixed support, a member fixed to the lower arm adjacent to the lower end thereof and extending beyond the edge thereof remote from the closure, and an operating element connected with said member and extending diagonally upward therefrom contiguous to said brace and at an angle with respect to said brace, when the door is closed, such that a pull exerted on said member has the effect of first swinging said arms to move the pivotal connection between them in the direction of the closure beyond a straight line connecting the pivots of said arms with the closure and the fixed support and of then swinging the closure toward open position.

2. The combination as set forth in claim 1 including a winding drum, and in which the operating element is flexible and is wound on said drum for actuation by the latter to open the closure.

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