

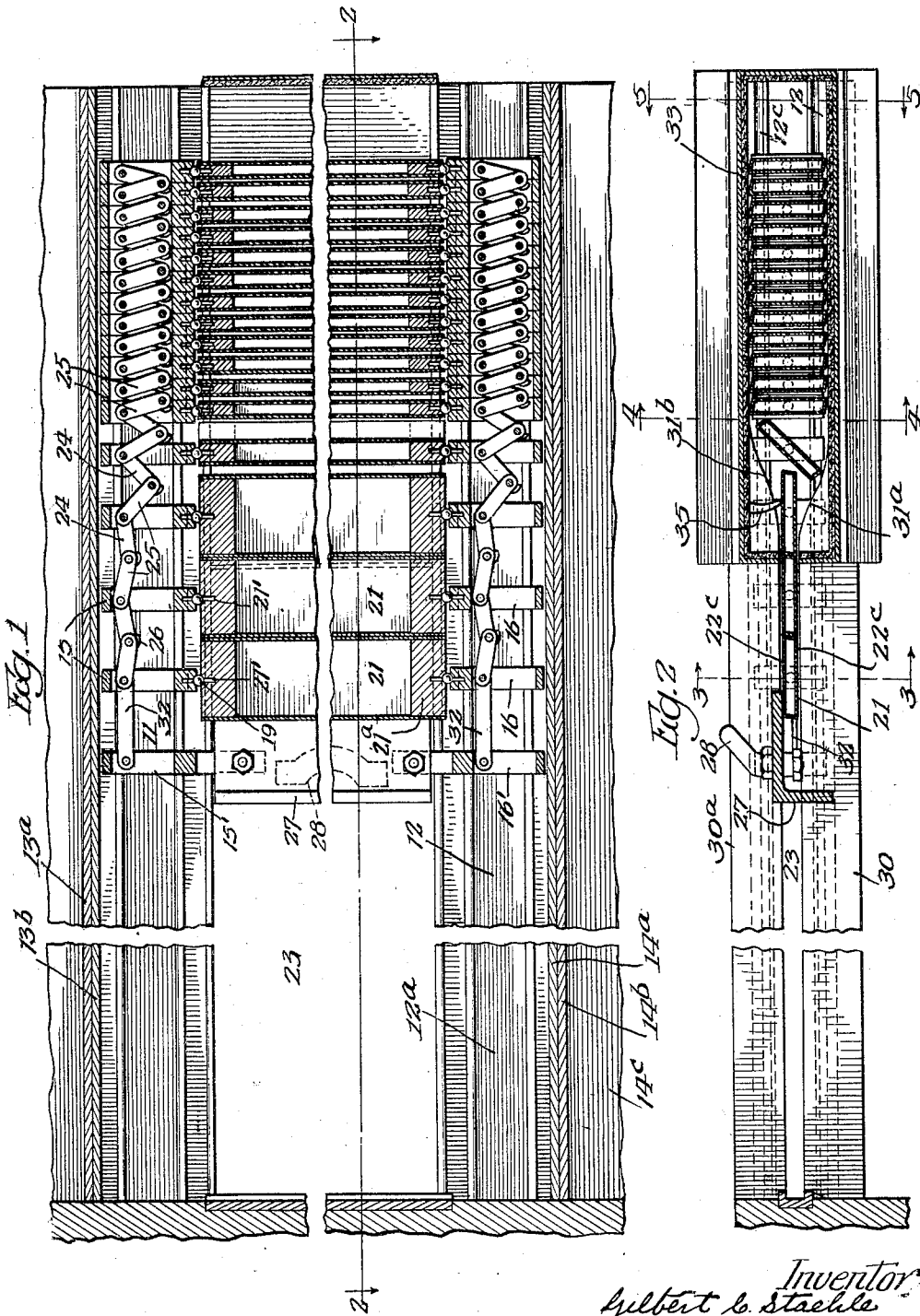
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FOLDING DOOR FOR ELEVATORS AND THE LIKE

Filed Feb. 25, 1929 2 Sheets-Sheet 1



Inventor
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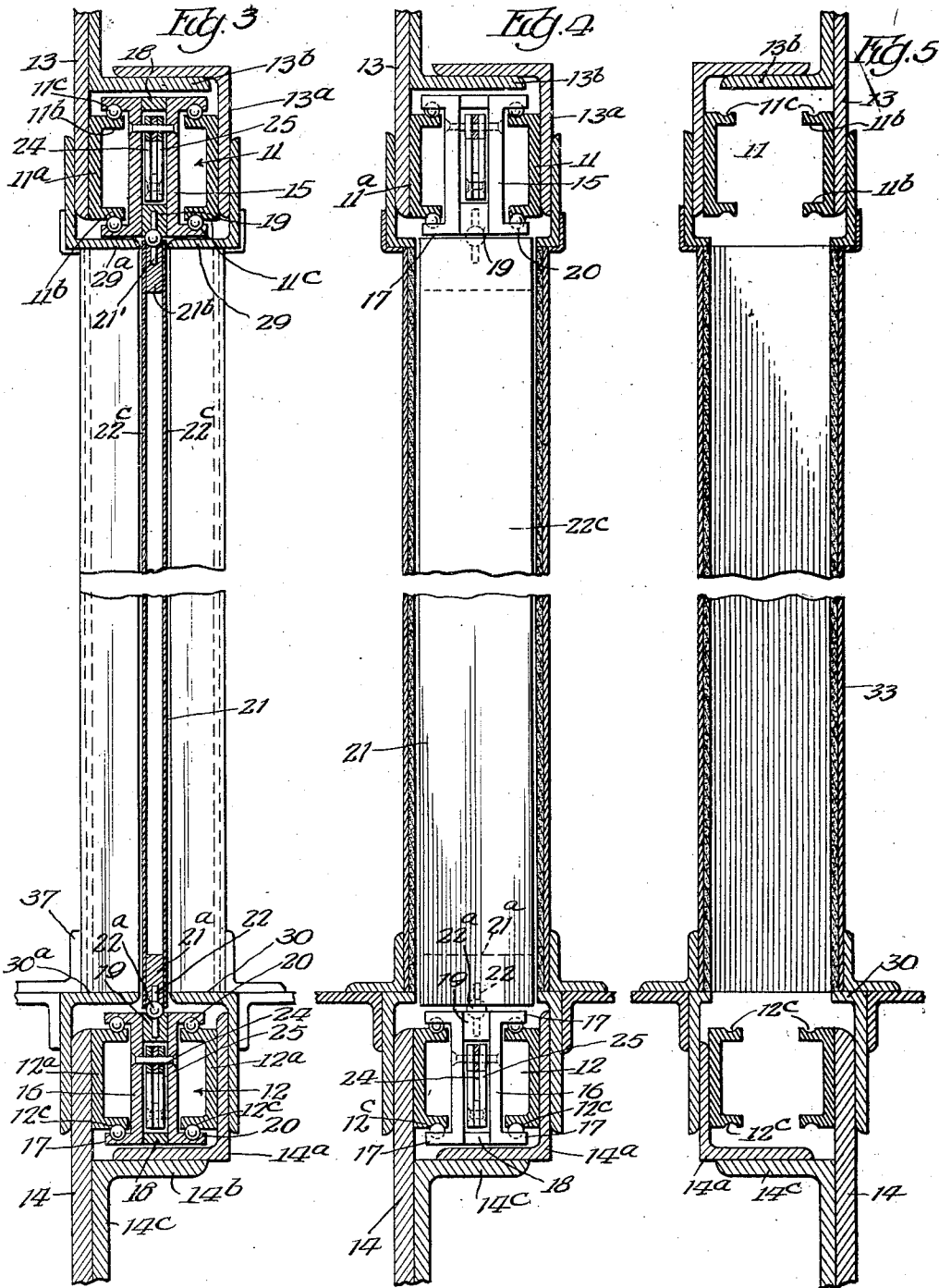
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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FOLDING DOOR FOR ELEVATORS AND THE LIKE

Application filed February 25, 1929. Serial No. 342,414.

The invention relates to folding doors for elevators and the like.

One object of the invention is to provide a door which is composed of a series of hinged leaves which, when turned into aligned relation, usually form a continuous or complete closure, and which are adapted, when shifted to an open position, to be collapsed into a small space. The invention contemplates the use of hinged leaves to form the closure, as contra-distinguished from diagonally crossed bars, such as are now in general use on elevators.

Another object is to provide an improved door structure which comprises a series of horizontally turned leaves which, when separated, will be successively guided into alignment to form a closure for an opening and which, when turned into a transverse position and moved out of the opening, will be serially collapsed and shifted into contact relation.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Fig. 1 is a vertical longitudinal section of a structure embodying the invention. Fig. 2 is a horizontal section on line 2—2 of Fig. 1. Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is a section on line 4—4 of Fig. 2, and Fig. 5 is a section on line 5—5 of Fig. 2.

The invention is exemplified in an elevator cab which is provided with an upper track or runway 11 which comprises a pair of channel-beams 11^a which are spaced apart and have horizontal flanges 11^b formed with longitudinal grooves or recesses 11^c on the top and bottom faces of the flanges. The cab is also provided with a lower track or runway 12 which comprises a pair of channel beams 12^a which are spaced apart and have horizontal flanges formed with longitudinal grooves or races 12^c on the top and bottom faces of the flanges. The outer faces of beams 11^a are fixedly secured to a plate 13 and an angle bar 13^a respectively of the cab structure. Angle bar 13^a is secured to an angle bar 13^b which

is fixed to plate 13. The outer faces of beams 12^a of the lower track are fixed to a plate 14 and to an angle bar 14^a of the floor frame of the cab respectively. Bar 14^a is fixed to an angle bar 14^c which is secured to plate 14. A series of guide brackets or runners 15 are mounted to travel on and between beams 11^a of the upper track, and a corresponding series of guide-beams or runners 16 are mounted to travel on and between the beams 12^a of the lower track. Each of said brackets is composed of a pair of members which are secured together in spaced relation by spacing blocks 18 and 19 between them, and each member has outwardly extending flanges 17 at the top and bottom thereof to lap the flanges of the track beams. Each flange 17 has a recess in which is confined an anti-friction ball 20 which is adapted to roll in the contiguous groove in one of the track beams. These balls are provided between the top and bottom faces of the upper and lower flanges of the track beams so the brackets will be horizontally and rectilinearly on the tracks. These brackets extend vertically through the spaces between the track beams.

A door leaf 21 extends between and connects each vertical pair of brackets 15 and 16 so the said brackets will travel uniformly on the upper and lower tracks and pivotally support the door leaf between them. Each leaf 21 is connected at its bottom to a bracket 16 by a pivot pin 22 which extends into the socket in the block 19 of said bracket and into a socket in the bottom bar 21^a of the door leaf and has a ball 22^a to space said bar from said bracket. Each bracket 15 is similarly connected to the top bar 21^b of a door leaf 21 by a pivot pin 21^c which is coaxial with the pin 22 at the bottom of said leaf. Each door leaf is preferably formed of said bars 21^a and 21^b and a sheet metal covering 22^c, so that when the leaves are extended into edge-to-edge relation, they will form a substantially continuous or imperforate closure. The end walls of the leaves are preferably inclined transversely so that when the leaves are aligned, the contiguous ends will lap or abut against each other. The pivots between the upper and the lower brackets and the

leaves permit the leaves to swing horizontally into edge-to-edge relation to close the entire door opening 23 and to swing transversely crosswise of the tracks when the leaves are to be collapsed to clear said opening. The upper brackets 15 are serially connected by a pair of vertically swinging toggle links 24 and 25. The upper brackets are connected to permit the brackets to move together into close relation when the leaves are swung into transverse position, and so that they will successively draw the succeeding bracket outwardly when the door is to be closed. Each of these connections consists of a pair of vertically swinging toggle links. The lower brackets 16 are similarly connected by toggle links. The outer end of each pair of links is pivoted to a bracket and their inner ends are pivoted to each other so they can fold together when the brackets are pushed together, and so that when the brackets are pulled outwardly they will cause the next bracket to be moved outwardly. One link of each pair is provided with a stop 23 to prevent the links from passing into dead-center or locking relation. A pair of brackets 15', 16', similar in construction to brackets 15 and 16, is provided in advance of the first leaf 21, and these brackets 15', 16' are rigidly secured to a vertical angle bar 27 which is provided with a handle for operating the door structure. Brackets 15', 16' are respectively connected to the first brackets 15, 16 of the series by single links 32. The upper margins of the leaves 21 are confined between and guided by the horizontal flanges of a pair of angle bars 29 and 29^a, and their lower margins are confined between a similar pair of bars 30 and 30^a when the leaves are positioned in the door opening. The horizontal flanges of these bars are cut away or inclined, as at 31^a and 31^b, so that as the leaves are pulled into the door opening 23, they will swing and be guided into edge-to-edge relation, and will be free to swing reversely when they are pushed out of the opening 23. A housing 33 is provided to enclose the leaves when they are collapsed to clear the door opening.

The operation will be as follows: When the door is collapsed, the leaves 21 will be disposed in the housing 33, and extend transversely with their faces close together, as shown at the right hand of Fig. 2. The upper and lower guide brackets will be in substantial abutting relation. To close the door, the operator will pull handle 28 and bar 27 across opening 23. This will cause brackets 15', 16', through links 32, to draw the first pair of brackets 15 and 16 and the first door leaf which is pivoted thereto outwardly, and as the toggle links, connected to said brackets 15 and 16, are extended, the first leaf will be separated from the succeeding leaf, so the former can swing horizontally from its transverse

position. Each succeeding pair of brackets, with the leaf connected thereto, will be similarly separated from the next succeeding pair of brackets and leaf as the toggle links are extended, and when extended, the links will commence to pull out the following pair of brackets and the leaf carried thereby. This successive separation of the brackets separates the leaf pivots so each leaf may, in succession, swing horizontally into the plane of the door opening. Each vertical pair of brackets will draw the succeeding pair with its leaf outwardly and away from the collapsed leaves until all of the leaves have been pulled out. As the leaves are thus pulled, they successively pass between the inclined surfaces 31^a, 31^b of guide bars 30 and 30^a which will swing them into the plane of opening 23 and guide them into the space between said guide-bars so their edges will abut and so the leaves will form a continuous closure for the opening 23. Said guide-bars will also prevent the turning of the leaves while they are in the door opening. A spring 35 is secured to housing 33 to engage the trailing sides of the leaves and insure their turning into alignment with one another as they pass into the constricted space between guide bars 30, 30^a and thus insure the turning of the leaves into alignment with one another. When the door is to be opened, the operator will push the bar 27 toward the housing 33 and, as the leaves pass between guide surfaces 31^a and 31^b, they will be successively released and turned to extend crosswise of the track, whereupon the toggle links between the brackets to which they are connected will fold together so that the brackets will successively pass into abutting relation until all of the leaves have passed into the housing and opening 23 has been cleared. As each leaf passes to its transverse position, the succeeding leaf will strike it and be deflected out of its longitudinal position and into its transverse position.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

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

1. In a door structure, the combination of upper and lower tracks, a series of leaves mounted to travel longitudinally of the tracks, coaxial pivots at the top and bottom of the leaves respectively which permit them to swing horizontally into alignment with one another, longitudinally of the track and permit them to swing transversely of the track, serial connections for shifting the leaf-pivots which permit them to be spread apart and moved into close relation, and means to control the pivotal movement of

the leaves so they will pass into alignment when the leaf pivots are separated and into transverse position when the leaf-pivots are moved toward one another.

2. In a door structure, the combination of upper and lower tracks, a series of leaves mounted to travel longitudinally of the tracks, coaxial pivots at the top and bottom of the leaves respectively which permit them to swing horizontally into alignment with one another longitudinally of the track and permit them to swing transversely of the track, and serial connections for shifting the leaf-pivots which permit them to be spread apart and to be moved into close relation, and guide-bars to control the pivotal movement of the leaves so they will pass into alignment when the leaf pivots are separated and into transverse position when the leaf-pivots are moved toward one another.

3. In a door structure, the combination of upper and lower tracks, a series of leaves mounted to travel longitudinally of the tracks, coaxial pivots at the top and bottom of the leaves respectively which permit them to swing horizontally into alignment with one another longitudinally of the track and permit them to swing transversely of the track, and toggle-link connections for shifting the leaf-pivots and which permit them to be spread apart and to be moved into close relation, and means to control the pivotal movement of the leaves so they will pass into alignment when the leaf pivots are separated and into transverse position when the leaf-pivots are moved toward one another.

4. In a door structure, the combination of upper and lower tracks, a series of leaves mounted to travel longitudinally of the tracks, guides on the tracks, coaxial pivots between the top and bottom of the leaves respectively and the guides which permit them to swing horizontally into alignment with one another longitudinally of the track and permit them to swing transversely of the track, and serial connections for shifting the guides, which permit them to be spread apart and to be moved into close relation, and means to control the pivotal movement of the leaves so they will pass into alignment when the guides are separated and into transverse position when the guides are moved toward one another.

5. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, and serial connections between the guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit

the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions.

6. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, serial connections between the guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions, and means to control the swinging of the leaves.

7. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, and serial connections between the guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions, said tracks comprising bars spaced apart, the guides extending between the bars.

8. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another longitudinally of the track and transversely to the track, and toggle-link connections between the guides which permit their limited separation and are foldable to permit the guides to move toward one another so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and to permit the leaves to be moved into close relation when they are in their transverse positions.

9. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, and serial connections between the

guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions, said tracks each having guide-ways on the top and bottom thereof, and said guides having upper and lower bearings for said ways.

10. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, serial connections between the guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions, and a vertical operating bar, connected to positively shift the guides in which the first leaf is pivoted.

11. In a door structure, the combination of upper and lower tracks, a series of leaves, a series of vertical pairs of guides mounted to travel on the tracks respectively, coaxial pivotal connections between the guides of each vertical pair and the leaves respectively which permit them to swing horizontally into alignment with one another and transversely to the track, serial connections between the guides which permit their limited separation so the pivotal connections for the leaves may be spread apart to permit the leaves to swing into and out of alignment and permit them to be moved into close relation when they are in their transverse positions, a vertical bar, and a pair of guides on the tracks to which said bar is fixed and connected to the guides in which the first leaf is pivoted.

12. In a door structure, the combination of upper and lower tracks, a series of leaves mounted to travel longitudinally of the tracks, coaxial pivots at the top and bottom of the leaves respectively which permit them to swing horizontally into alignment with one another longitudinally of the track, and permit them to swing transversely of the track, connections by which the leaf-pivots will be serially spread apart and which permit them to be moved into close relation, and means to control the pivotal movement of the leaves so they will pass into alignment when the leaf-pivots are separated and into transverse position when the leaf-pivots are moved toward one another, and a housing into which the leaves are movable.

Signed at Chicago, Illinois, this 16th day of February, 1929.

GILBERT C. STAEHLE.