A mechanically cooperating overhead door movement control and support unit comprising a combination of linkage members and adjustment means, which when installed on the uppermost two panels of a hingedly connected multiple paneled overhead door, and engaged to a conventional channel type track with guide rollers, enables the raising and lowering of the overhead door without the uppermost panel thereof rising substantially above the uppermost horizontal level of the track when the door is set in elevating or descending motion. The unit functionally accomplishes such by the action of a mechanically linked sliding mechanism which translates otherwise vertical motion into horizontal motion as a result of the uppermost panel extendably advancing along the slide mechanism upon raising and retractably withdrawing along same upon lowering of the door. The unit also includes an adjusting assembly which enables the combination to be properly set in order to achieve the previously described translation of motion upon raising or lowering of hingedly connected multiple paneled overhead doors of differing design and configuration.

9 Claims, 18 Drawing Figures
OVERHEAD DOOR MOVEMENT CONTROL AND SUPPORT UNIT

BACKGROUND OF THE INVENTION

Overhead doors, such as the hingedly connected multiple paneled varieties, exemplified, for example, by those such as shown in U.S. Pat. No. 2,007,688 to McCloud, dated July 9, 1935, and U.S. Pat. No. 2,041,221 to Brunst, dated May 19, 1936, have been in widespread use for a number of years. A door of the type described is guided by a set of vertical channel tracks on either side of said door, which tracks are curved at the uppermost extremity thereof to form rearwardly extending horizontal track members on either side of said door. The hingedly connected panels of said door are supported by the channel tracks by means of guide rollers.

When a conventional hingedly connected multiple paneled overhead door is set in motion for opening or closing, the travel of the uppermost panel describes a curve which rises substantially above the uppermost horizontal plane of said tracks, generally a distance of one foot or more. This vertical rise of said uppermost panel on opening or closing of said door is of no consequence as long as the ceiling height above said door is sufficient to accommodate the distance required. However, in situations where a low ceiling height does present a problem as to the extent of vertical rise of said uppermost panel, a conventional overhead door cannot be employed without some modification.

Various methods have been devised to permit the use of a conventional overhead door in the low overhead ceiling situation. Foremost of these methods is a so called “double track” system, wherein the uppermost panel is engaged to an additional overhead set of curved rearwardly extending horizontal track members on either side of said door by means of an additional set of guide wheels, thereby preventing substantial vertical rise of the uppermost panel upon opening or closing of said door. One example of this type is shown in U.S. Pat. No. 2,289,045, to Rowe, issued July 7, 1942. Although the double track system works well, it does involve a considerable additional expense to terms of increased hardward and installation requirements. Other methods in commercial use which have been developed involve the engagement of variously designed camming mechanisms to solve the problem of excess vertical rise of the uppermost panel of an overhead door which is to be installed where there is a low ceiling height. These camming mechanisms operate with varying degrees of effectiveness for the intended purpose.

SUMMARY OF THE INVENTION

It is the principal object of this invention to provide a mechanically cooperating unit, which, when installed on a conventional hingedly connected multiple paneled overhead door will provide a means to enable the raising and lowering of said door without the uppermost panel thereof rising substantially above the uppermost horizontal plane of the channel type track in which the guide rollers of said door are engaged. The unit provides a means to accomplish a modified configuration of the curve of motion followed by said uppermost panel of the overhead door upon opening or closing by translating that which would otherwise be initial vertical displacement of the uppermost panel into horizontal displacement. The described motional translation is brought about by the extending and retracting action of a slide and connecting rod assembly which is engaged to said track by means of a guide roller and set to actuate the motional translation cycle by means of an adjusting bolt. Upon initiating movement of said door the slide is activated to extend upon opening and retract upon closing, through which action there is a modification of the curve that the uppermost panel follows, thereby accomplishing the previously described motional translation.

Another advantage of the invention is that a single unit, when installed on an overhead door of the type described, will enable the raising or lowering of said door without the leading edge of said uppermost panel thereof rising above the uppermost horizontal plane of the door at rest when in the elevated position. The maximum elevation of this curve is substantially less than the one foot or more that would otherwise describe the elevation of the path of the uppermost panel curve if the unit were not installed and the uppermost panel was to follow a conventional configuration upon opening or closing said door. This feature of the unit permits installation of said overhead door types under the lowest possible ceiling conditions.

Still another advantage afforded by the present invention is exemplified by the embodiment of adjustment means which enables installation and use of the unit on conventional hingedly connected multiple paneled overhead doors of different size, shape, or style.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side elevation of an installed overhead door movement control and support unit, embodying the principles of the present invention, as shown in a functionally operating configuration with a conventional hingedly connected multiple paneled overhead door in partially elevated position.

FIG. 2 is a fragmentary simplified side elevation of a conventionally installed overhead door in the closed position, showing the relative position of the uppermost extremity of the uppermost panel to a low overhead ceiling level.

FIG. 3 is a fragmentary simplified side elevation similar to FIG. 2 but showing instead the unit comprising the invention installed on a conventional overhead door in the closed position, and the relative position of the uppermost extremity of the uppermost panel to a low overhead ceiling level.

FIG. 4 is a view similar to FIG. 2, but showing the conventionally installed overhead door in a partially elevated position with the uppermost panel graphically extended to the uppermost elevation required for opening or closing.

FIG. 5 is a view similar to FIG. 3, but showing the overhead door of the invention in a partially elevated position and the relative position of the uppermost extremity of the uppermost panel with said unit configuration being shown on opening or closing as distinguished from a conventional installation as shown in FIG. 4.

FIG. 6 is a fragmentary simplified side elevation showing the maximum relative height to which a conventional overhead door installation as shown in FIGS. 2 and 4 can be elevated when there is a low overhead ceiling level.
FIG. 7 is a simplified fragmentary side elevation showing the overhead door of the invention in a substantially elevated position and the configuration of said unit at the completion of the functional operating cycle.

FIG. 8 is a curve showing the approximate path of movement of the uppermost extremity of the uppermost panel of a conventionally installed overhead door upon opening or closing.

FIG. 9 shows a curve comparative to FIG. 8, showing the relative opening and closing path of movement of the uppermost extremity of the uppermost panel of a conventional overhead door upon which the invention has been installed.

FIG. 10 is an enlarged sectional view of the assembled slide and guide as shown in FIG. 1 and seen on the line 10—10 thereof.

FIG. 11 is an enlarged sectional view of a modified form of the assembled slide and guide as shown in FIG. 1 and on the line 10—10 thereof, wherein friction reducing mechanism is included between the slide and internal surface of the guide during extension and retraction of said slide within said guide.

FIG. 12 is a fragmentary enlarged side view of the assembled slide and guide as shown in FIG. 1 and additionally showing details of the adjusting bolt assembly also shown in FIG. 1, as seen on the line 12—12 thereof.

FIG. 13 is a fragmentary enlarged top sectional view revealing details of the socket shown in FIG. 1, as seen along the line 13—13 thereof.

FIG. 14 is a fragmentary enlarged side sectional view revealing additional details of the socket shown in FIG. 13, as seen on the line 14—14 thereof.

FIG. 15 is a fragmentary side elevation of an installed overhead door movement control and support unit, embodying the principles of the present invention but, however, showing a different embodiment from that shown in the preceding figures and illustrated in a functionally operating configuration with a conventional hingedly connected multiple paneled overhead door in partially elevated position.

FIG. 16 is an enlarged sectional view of the assembled slide and guide of the mechanism shown in FIG. 15, as seen on the line 16—16 thereof.

FIG. 17 is a fragmentary side elevation similar to FIG. 15 but, in phantom, showing the relationship of certain parts when the door is closed.

FIG. 18 is a fragmentary enlarged sectional view of the assembled slide and guide shown in phantom in closed position in FIG. 17, as seen on the line 18—18 thereof.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, the typical principal elements of a conventional hingedly connected multiple paneled overhead door are shown in combination with the structure 8 of the present invention. The uppermost panel 10 and the second uppermost panel 12 of said door are shown engaged to a channel type track 14 which is comprised of a vertical section 16, a curved section 18, and a horizontal section 20, by means of a guide roller 22 and track roller 24. The aforementioned basic elements mechanically cooperate when said door is raised or lowered to provide the means whereby said door is moved from the closed vertical position to the open horizontal position upon opening, and from the open horizontal position to the closed vertical position upon closing.

Also referring to FIG. 1, to illustrate and explain the details of adjustment and operation of this invention, which contemplates installation of an overhead door movement control and support unit 8 by attachment of said unit to the uppermost panel 10 and second uppermost panel 12 of a conventional hingedly connected multiple paneled overhead door, and by the engagement of guide rollers 22 with channel type tracks 14 of said conventional overhead door assembly. Attachment of unit 8 to said uppermost panel 10 is accomplished by means of a mounting bracket 26 and a mounting bracket screw 28, and to said second uppermost most panel 12 by means of a bracket mounting flange 30 and bracket mounting flange screws 32. The unit when thus installed is in condition for operational adjustment.

Operational adjustment is accomplished by positioning said guide roller 22 by means of inserting the guide roller supporting axle 34 through one of a plurality of adjustment holes 36 adjacent one end of connecting rod 38. Adjustment of said guide roller 22 is accomplished in conjunction with adjustment of the movement control link 40 which is longitudinally adjustable by being comprised of an upper adjustment bar 42 and a lower adjustment bar 44, and is pivotally connected to the upper adjustment bar bracket 46 by means of inserting the upper adjustment bar connecting pin 48 through a selected hole 50 in upper adjustment bar bracket 46. The lower end of said movement control link 40 is thereupon pivotally connected to the bracket 52 by means of inserting the lower adjustment bar connecting pin 54 through a selected bracket adjustment hole 56. Lengthening or shortening of said movement control link 40, as required, is accomplished by aligning certain adjustment holes 58 in the upper adjustment bar 42 with suitable adjustment holes 60 in the lower adjustment bar 44, thereupon securing the adjusted longitudinal dimension of said movement control link 40 by means of locking said upper and lower adjustment bars by locking bolts 62 and 64. The unit is thus operationally adjusted and is in a condition for functional adjustment, which causes said unit to perform in the manner for which it was designed.

Functional adjustment is for the purpose of permitting the slide 66 to come into longitudinal alignment with the connecting rod 38 which in reality is an extension on one end of said slide 66, thereby enabling the axial extension of the aligned connecting rod 38 and slide 66 to slide through the guide 68 at that point which will prevent said uppermost panel 10 from rising substantially above the horizontal section 20 of the channel type track 14 upon raising said overhead door assembly from a vertically closed position by enabling said guide 68, in effect, to slidably advance along said connected slide 66 and its extension rod 38 which extends rearwardly from said guide 68 upon the initiation of such slidable advancement, considered in relation to the door movement. Functional adjustment, therefore, is for the purpose of initiating a translation of the movement of said uppermost panel 10 from a vertical to a horizontal direction upon raising said overhead door assembly. When functional adjustment is accomplished said unit will operationally function with precision during both raising or lowering movement of said overhead door assembly.
Referring to FIG. 12, functional adjustment is accomplished by means of elevating or depressing the adjusting stop bolt 70 through the adjusting bracket hole 72 by means of the adjusting nut 74 so that contact of the adjusting stop bolt head 76 with the limit bracket 78 will be of such elongation as to cause said unit to initiate the motional translation hereinbefore described. Referring again to FIG. 1, upon effecting the adjustment as hereinbefore explained the connecting rod 38 will be pivotally urged upon pin 82 to come into longitudinal alignment with said slide 66 within the socket 80 and the desired motional translation will thereupon be maintained throughout the operational cycle. With said functional adjustment properly made, the adjusting stop bolt 70 is then locked into position against the adjusting bracket 84 by means of the locking nut 86 and final functional operational adjustment then is complete, at which point the uppermost panel 10 will not be elevated above the low ceiling level 88 when raising or lowering said overhead door assembly.

Attention also is directed to the fact that the cooperative functionally operating mechanical harmony of said unit is accomplished through the expedient of proper adjustment, which will vary for installation of said unit upon conventional hingedly connected multiple paneled doors of differing design, style, or configuration.

The unit as disclosed in FIG. 1 may be constructed of metal, or plastic, or a combination thereof, or any other suitable material.

In FIGS. 2 to 7 inclusive, a series of fragmentary simplified side elevational views illustrate a comparison between the vertical rise of the uppermost panel 10 of a conventionally installed hingedly connected multiple paneled overhead door and a similar type door upon which has been installed a functionally operating overhead door movement control and support unit comprising the present invention. In FIG. 2 a conventional overhead door installation is shown in the closed vertical position in which the relative location of the uppermost panel 10 thereof to the low ceiling level 88 is illustrated. In FIG. 3 there is shown a similar view as seen in FIG. 2, except that said view illustrates the installation of the unit comprising the invention 8 upon the door and the configuration thereof is shown when said door is in the closed vertical position, in addition to the relative location of the uppermost panel 10 of said door to the low ceiling level 88.

In FIG. 4, said conventionally installed overhead door is shown in a partially elevated position with said uppermost panel 10 thereof illustrated as being graphically extended through the low ceiling level 88 to the uppermost elevation which would normally be required for either opening or closing said door. It can be readily seen in FIG. 4 that the low ceiling level 88 would obstruct the vertical rise of said uppermost panel 10 to such an extent that said conventionally installed overhead door could not be satisfactorily operated.

In comparison with FIG. 4, it will be seen that FIG. 5 in which an equivalent partial elevation of said door is shown but upon which has been installed said functionally operating unit embodying the invention 8, movement of said uppermost panel 10 thereof is prevented from rising to any appreciable extent above the uppermost horizontal plane of the channel type track 14, the functional configuration of said unit is also shown in FIG. 5 which is essentially a simplified view of the same unit shown in FIG. 1, and shows the operational advantage which is obtainable by employing said unit in combination with said conventional overhead door and track when a low ceiling level 88 is present. Also shown in FIG. 5 is the translation of otherwise vertical motion of said uppermost panel 10 into horizontal motion by means of the functionally operational action of said unit of the present invention 8.

In FIG. 6 it is shown that the uppermost panel 10 of said conventional overhead door would be sufficiently obstructed by the low ceiling level 88 as to preclude the employment of said door in a low ceiling level 88 situation. Also shown in FIG. 6 is the approximate maximum elevation to which said conventional overhead door could be raised prior to said uppermost panel 10 thereof contacting said low ceiling level 88, thereby preventing any further elevation of said door. In FIG. 7 there is shown a comparison view with FIG. 6 in which it is shown that said conventional overhead door upon which said functionally operational unit of the present invention 8 has been installed can be utilized in a low ceiling level 88 situation where one would otherwise be precluded from doing so. Also shown in FIG. 7 is the configuration of said unit of the present invention 8 upon completion of the functionally operational cycle, in which extension of said guide 68 upon the aligned connecting rod 38 and slide 66 has occurred and the relative relation of said uppermost panel 10 of said door to said low ceiling level 88 also is shown.

The graphical representation in FIG. 8 presents a curve revealing the approximate path traversed by the uppermost panel 10 of a conventional overhead door when said door starts to move from the closed vertical position 90 to the open horizontal position, and the relation of that path to said low ceiling level 88. The curve shown in FIG. 9 is a graphical comparison to the curve shown in FIG. 8, and shows the approximate path traversed by the uppermost panel 10 of a conventional overhead door upon which has been installed said functionally operational unit of the invention 8. Comparison of the relative elevation of the curves as shown in FIGS. 8 and 9 graphically depicts the modified motion of the uppermost panel 10 obtainable by employing said invention 8.

The slide 66 and guide 68 assembly is shown in an enlarged cross section in FIG. 10 to illustrate details of the axially slidable construction thereof. In FIG. 11 a possible modified slide 66A and guide 68 assembly is shown wherein the shape of slide 66A has a configuration enabling the installation of anti-friction wheels 92 attached thereto for purposes of reducing frictional effects.

The enlarged cross sectional end view depicted in FIG. 13 reveals the socket 80 assembly, wherein is shown said connecting rod 38 pivotally attached to said slide 66 by means of said connecting pin 82, and the slidable encasement of said slide 66 by said guide 68. In FIG. 14 is a fragmentary enlarged cross sectional view illustrating a horizontal elevation of FIG. 13, and clearly showing the socket 80 and elements connected thereto as heretofore described.

Referring to FIG. 15, a fragmentary side elevation of another embodiment of unit design 8a is shown attached to the uppermost panel 10 of a conventional hingedly connected multiple paneled overhead door which is illustrated in partially elevated position. The same basic mechanically cooperating system of unit
structure 8 is present therein but different mechanical details from those of the preceding embodiment directly initiate the desired translation of motion of the uppermost panel from vertical to horizontal upon raising or lowering of said overhead door assembly. In this additional embodiment, the connecting rod 38a is pivotally connected to a flat slide 66b by means of a hinge assembly 94 which is simple and may comprise a substantially conventional strap hinge, thereby minimizing manufacturing expense. Operational and functional adjustment of unit 8a are accomplished by the same basic procedure as heretofore described relative to unit 8, but, in addition, initiation of said motionsal translation of said uppermost panel from vertical to horizontal, is induced by the use of a tension spring assembly 96 comprised of a spring 98, spring guide rod 100, an upper spring retainer 102 and lower spring retainer 104, as well as a cam assembly 106 comprising a cam 108 and a cam guide 110. In comparison with the preceding embodiment unit 8a functions in the following manner: As said overhead door assembly is raised, spring 98 expands to extend the flat slide 66b in an upward and rearward direction relative to the door jamb, whereupon said uppermost panel 10 is pulled horizontally rearward from the door jamb by said cam guide 110, tracing a curved upward path along the face of cam 108 and thereby pivotally deflecting the modified connecting rod 38a at a point of rotation about the pintle of the hinge assembly 94, thereupon translating otherwise vertical motion of the uppermost panel 10 into horizontal motion. The functional sequence of said unit 8a is thereafter as heretofore described relative to the preceding embodiment particularly with respect to adjustment bar 42, 44 and the function thereof. On lowering the overhead door, spring 98 retracts, initiating a reverse mechanical sequence as heretofore described.

The modified slide 66b and guide 68a assembly, as well as said spring 98, are shown in an enlarged cross section in FIG. 16, which illustrates details of the axially sliding construction thereof, including a pair of opposed channels in which the flat slide 66b is guided.

The fragmentary side elevation shown in FIG. 17 is similar to FIG. 15, but illustrates the modified unit 8b design, wherein the operational and functional mechanism is basically as above described, but the slide 66 and guide 68 are substantially square in cross-section, as shown in FIG. 18, as disclosed above relative to unit 8 but including spring assembly 96. FIG. 18 shows an enlarged sectional view of the assembled slide 66 and guide 68, as seen on line 18—18 of FIG. 17 and also shows modified connecting rod 38a which is in a position as seen when unit 8b is disposed on the overhead door assembly when in closed position.

While the invention has been described and illustrated in its several preferred embodiments, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as illustrated and described.

1. An overhead door movement control and supporting means adapted to be connected to the uppermost two panels of an articulated multiple panel door for guiding the movement thereof to and from closed vertical position and overhead open horizontal position while being supported and guided by a conventional channel type track having vertical and horizontal portions connected by a curved section, said door supporting means comprising in combination guide means adapted to be fixed to the inner surface of the uppermost panel of such multiple panel door adjacent each side thereof and below the upper edge, a guide member longitudinally slideable in each guide means, an extension flexibly connected to each guide member, a guide roller rotatably connected to each extension, said guide roller being engageable within a conventional channel type track within the upper horizontal and curved portions to guide the upper edge of said uppermost panel of said door from a vertically closed position to a horizontal open position within the plane of said horizontal portions of said conventional track means, said guiding being accomplished by said extensions initially being at an angle to said guide members to dispose said rollers initially in predetermined spaced relation from the inner surface of said uppermost door panel and advanced ahead of the upper edge of said panel as opening of said door is initiated, thereby serving to pull said upper edge abruptly from the initial vertical plane thereof toward the horizontal plane while said guide members slide in said guide means and said extensions thereon move into substantially axial alignment therewith as said uppermost panel is guided into horizontal open position, and an elongated control member connected between each of the next to the uppermost door panels and the outer end portions of said extension of said guide members and operable to effect sliding of said guide members relative to said guide means.

2. The overhead door control and supporting means according to claim 1, in which said extension on each guide member includes means to effect adjustment of said guide roller relative thereto to change the relative position thereof upon said extension and thereby change the longitudinal distance thereof from said uppermost level.

3. The overhead door control and supporting means according to claim 1 further including stop means operable between each guide member and one end of said guide means therefor operable to position said guide member in the initial position thereof in said guide means.

4. The overhead door control and supporting means according to claim 3 in which said stop means comprises a stop member adjustable axially upon said guide member and arranged to engage abutment means adjacent said one end of said guide means.

5. The overhead door control and supporting means according to claim 1, in which said extension of each guide member further includes means to effect adjustment of the upper end of said control member relative to said extension.

6. The overhead door control and supporting means according to claim 1, in which each control member is longitudinally adjustable to vary the slideable movement of said guide members relative to said guide means.

7. The overhead door control and supporting means according to claim 1, which further includes means to adjustably connect one end of said control member relative to said second uppermost panel and thereby change the relative lateral position thereof in relation to said panel.
8. The overhead door control and supporting means according to claim 1, further including a cam surface on said guide means and a cam follower on said extension to effect initiation of motional sequence relative to opening and closing of said door.

9. The overhead door control and supporting means according to claim 1 in which said guide member is a flat slide, and said guide means comprises opposed channels in which the edges of said slide are movable, and said means also including spring means between said slide and guide means operable to exert tension and compression forces to effect extension and retraction of said slide relative to said guide means during opening and closing of said door.