Dec. 22, 1953 J. H. GRENZEBACK 2,663,047

POWER TRANSMITTING DEVICE FOR OVERHEAD GARAGE DOORS

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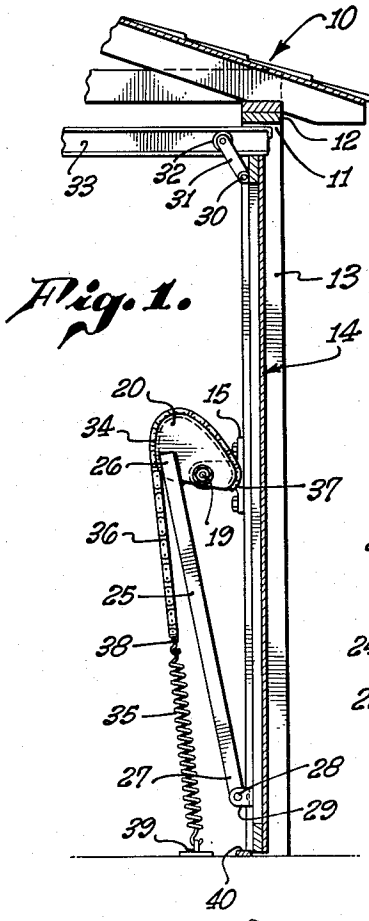


Fig. 1.

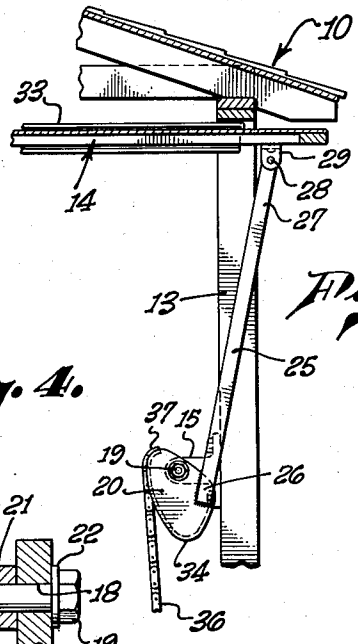


Fig. 2.

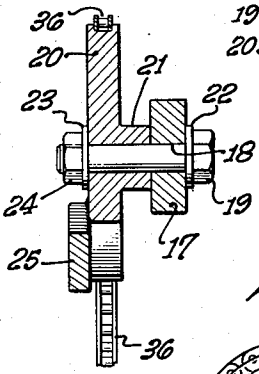


Fig. 4.

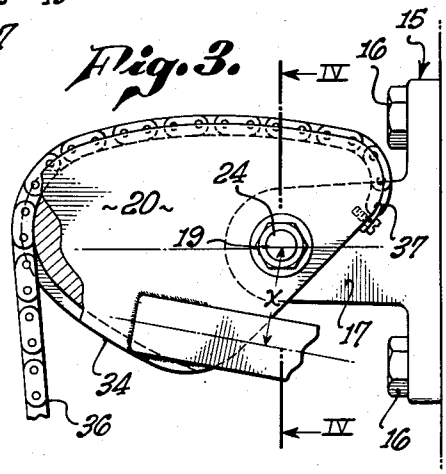


Fig. 3.

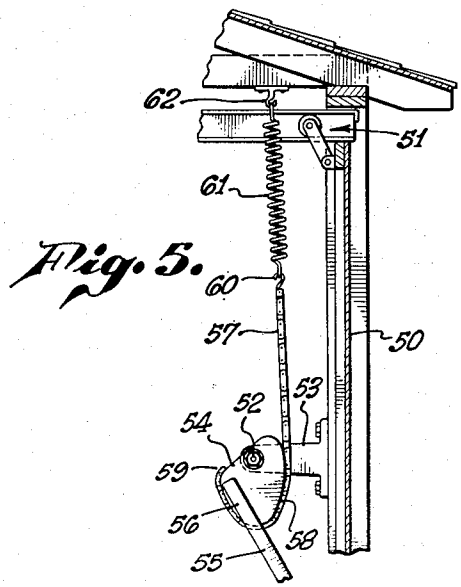


Fig. 5.

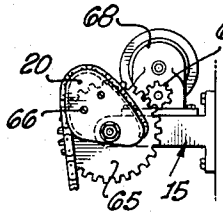


Fig. 6.

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POWER TRANSMITTING DEVICE FOR OVERHEAD GARAGE DOORS

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Fig. 7.

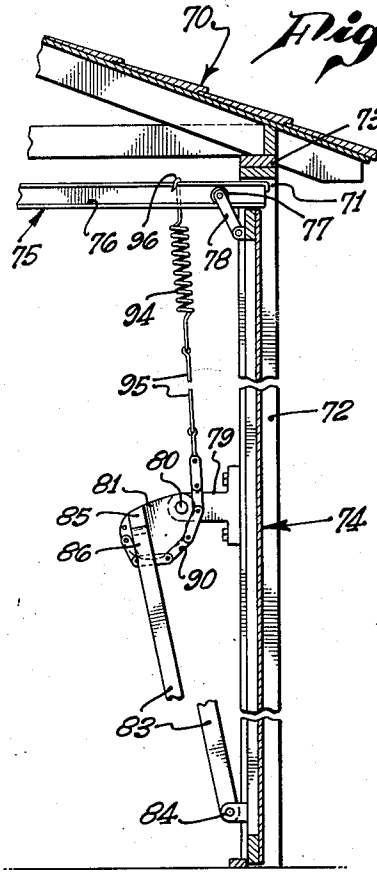
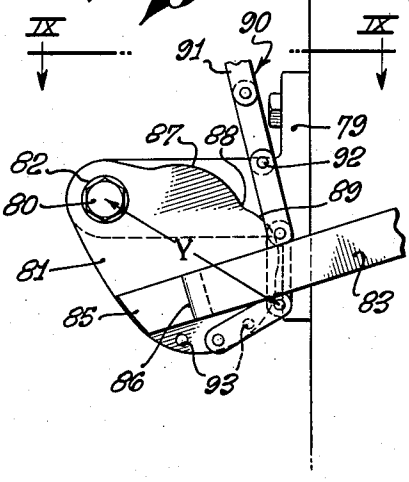


Fig. 8.



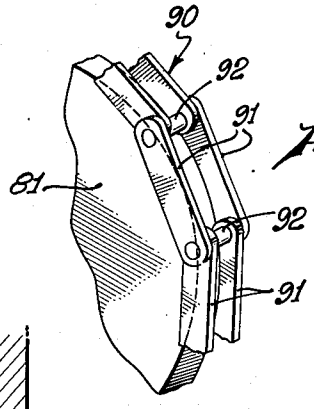


Fig. 10.

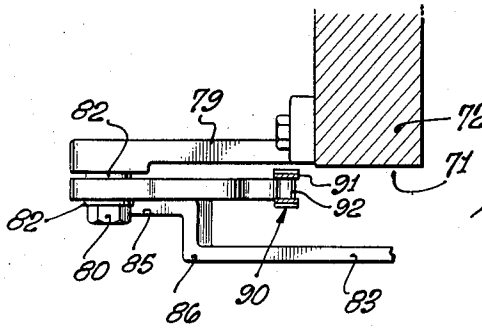


Fig. 9.

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UNITED STATES PATENT OFFICE

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POWER TRANSMITTING DEVICE FOR OVERHEAD GARAGE DOORS

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Application December 20, 1949, Serial No. 134,012

2 Claims. (Cl. 16—1)

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This invention relates to overhead garage door construction and operation and more particularly to a novel power transmission device for use with such doors.

Overhead type garage doors usually include a rigid panel cooperable with a garage door frame and are characterized by a method of operation which includes moving the rigid panel door into an overhead horizontal plane by rotation about a pivotal axis, the door extending within the garage in proximity to the top of the door frame. In some instances, in overhead position, an edge of the door may project beyond the vertical plane of the door frame. While traversing the front portion of the garage, when being raised to an overhead horizontal position, the operation of some overhead garage doors may interfere with vehicles having relatively high bodies, such as station wagons.

Various means have been provided for facilitating and controlling the moving of such an overhead type garage door from a vertical position to an overhead horizontal position. Prior proposed means have included various complicated and intricate arrangements of hardware and hardware accessories mounted on the side of the door frame or in an overhead position adjacent the top of the door frame. Garage doors of the type here considered may vary in width from 7 feet to 16 feet and larger, and are of considerable weight. Although springs have been used for the purpose of counterbalancing the doors, prior arrangements have not been entirely satisfactory in that the weight has not been properly counterbalanced in all positions of a door. When a door is being lowered, it should drop slowly and reach a fully closed position without excessive impact; when it is being opened, very little effort should be exerted to initiate raising of the door but since the door (in its last stages of movement into fully open position) moves in a substantially horizontal plane, excessive counterbalancing is not needed at such stage. Ordinarily overhead garage door arrangements open and close the doors with unnecessary and undesirable impact at the initial and final positions. These prior proposed means required a very careful and accurate installation in order to permit the door to properly operate and to provide adequate control of the door during its movement from vertical to horizontal position.

The primary object of this invention is to design and provide a power transmission device cooperable with overhead type garage doors wherein opening and closing of said doors is facilitated, the hardware accessories used in connection with the power transmitting device are easily installed and adapted to a door frame, and the power transmitting device is simple and compact to afford economy of space within the garage.

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Another object of this invention is to provide an overhead garage door construction and operation wherein relatively small and light springs are used to partially counterbalance the door.

A further object of this invention is to provide an overhead garage door construction and operation wherein the door may be moved into and from open overhead position by applying a minimum of force, and yet so controlled as to obtain a smooth, uniform action throughout movement of the door.

This invention contemplates a power transmitting device for use on overheard garage doors of rigid, panel type wherein counterbalancing means may be adaptable for installation adjacent to either the top or bottom of the door frame to conserve storage space and to minimize interference of the door construction with utilization of the garage.

Generally speaking, this invention contemplates a power transmitting device for overhead garage doors of the rigid panel type wherein a garage door may be pivotally hung at opposite sides from approximately the mid-point of a door frame for movement about a horizontal axis, parallel to and spaced from the plane of the door frame. The power transmitting device includes a member pivoted about the same axis as the door and connected to the door by a rigid lifting arm fixed at one end to the member at a point spaced from the pivotal axis and pivotally connected at the other end to the door. The member is provided with a marginal edge contoured to provide points lying at varying distances from the pivotal axis of the member. Flexible means extending along and in contact with said marginal edge may be secured to the member at one end and at the other end connected to a counterbalancing spring means which may be suitably anchored adjacent either the top or bottom of the door frame. The marginal edge of the power transmitting member is so contoured that the resultant effect of the spring means and the several leverages provided by the member, as measured from the pivotal axis to the several points on the marginal edge of the member, provides a smooth, uniform action when the garage door is moved from a vertical position to an overhead horizontal position.

Other objects and advantages of this inven-

tion will be readily apparent to those skilled in the art from the following description of the drawings.

In the drawings:

Fig. 1 is a fragmentary sectional view of a garage and overhead garage door construction embodying this invention, the section being taken in a vertical plane lying transversely of the garage door.

Fig. 2 is a fragmentary sectional view of the garage door construction shown in Fig. 1, the section being taken in substantially the same plane as in Fig. 1 and showing the garage door in overhead horizontal position.

Fig. 3 is an enlarged view of a power transmitting device embodying this invention, as shown in the garage door construction in Fig. 1.

Fig. 4 is a fragmentary sectional view, taken in a vertical transverse plane passing through the axis of the power transmitting device, as indicated by the line IV—IV of Fig. 3.

Fig. 5 is a fragmentary sectional view of an overhead garage door construction embodying this invention, wherein the counterbalancing means is connected to a member adjacent the top of the door frame.

Fig. 6 is a fragmentary side view of a device embodying this invention and operable by electrically actuated means.

Fig. 7 is a fragmentary, sectional view taken in a vertical plane of an overhead garage door construction illustrating a different embodiment of this invention.

Fig. 8 is an enlarged, fragmentary view of the power transmitting device shown in Fig. 7, the figure illustrating the device when the door is in a position 45° to the vertical.

Fig. 9 is a fragmentary, enlarged view taken from the plane indicated by line IX—IX of Fig. 8.

Fig. 10 is a fragmentary, perspective, enlarged view of the contoured member and flexible element used in Fig. 7.

Referring particularly to the modification of this invention illustrated in Fig. 1 to Fig. 4, a garage generally indicated at 10 comprises a garage door opening 11, defined by a door frame including a lintel 12 and spaced, upstanding door jambs 13, only one jamb being shown since the other is identical and spaced therefrom for forming the opening 11. Cooperable with the door frame is an overhead type garage door 14 suitably constructed so as to provide a rigid, flat panel capable of being enclosed by the door frame with a suitable tolerance therebetween. The door 14 may be made of suitable wood material, or may be a light weight metal alloy door, such as aluminum.

The door 14 may be pivotally mounted from the spaced door jambs 13 by means including a bracket member 15 positioned at approximately the vertical mid-point of the door jamb and on the interior surface thereof. The bracket member 15 may be secured to the door jamb in well known manner as by spaced bolt and nut assemblies 16. The bracket member 15 includes a central, inwardly extending projection 17 lying in a vertical plane provided with an opening 18 adjacent its inner end.

A cam type member 20 is provided with a hub 21 extending from one face of the member for eccentrically and pivotally mounting said member on a bolt 19 extending horizontally through opening 18. The bolt 19 is provided with spaced washers 22 and 23 and a nut 24 for suitably securing the cam member. Bushings and sleeve bearings can be used if desired. The member 20 is connected to door 14 by means of a rigid lifting arm 25 fixed to member 20 at one end 26 as by welding at a point radially spaced from the axis of hub 21. The other end 27 of the lifting arm may be pivotally connected as at 28 to a suitable lug 29 secured to the door adjacent the lower marginal edge of said door. The door 14 is thus pivotally mounted about a horizontal axis parallel to and spaced inwardly from the plane of the door when in vertical position by the cooperative relationship of the lifting arm, member 20, and bracket 15.

The door 14 may be further supported adjacent its upper margin by means of roller and track assemblies provided at opposite sides of the door. Each upper corner of the door may be provided with a bracket 30 having a horizontal bore therein for accommodating a pivot pin to which may be pivotally connected one end of a link 31. At its opposite end the link 31 is pivotally connected to a roller 32 which rides in a virtually horizontal, inwardly extending track 33 of any well known configuration and lying virtually normal to the plane of the door frame for guiding the upper portion of the door inwardly when the door is moved into overhead horizontal position.

Smooth, uniform operation of the door is provided by the particular configuration of the periphery or marginal edge 34 of the cam type member. The marginal edge comprises a plurality of points spaced at predetermined varying distances from the pivotal axis of the member for providing a plurality of effective lever arms of varying length. The leverages thus provided sequentially cooperate during movement of the door with a counterbalancing spring means 35, as described in detail hereinafter. Member 20 may be provided with a circumferential groove to receive the flexible element 36 (or member 20 may be made of two external thin plates and an inner thicker element, all suitably contoured and connected together to provide a recessed edge) or the edge of member 20 may be provided with lugs or sprocket teeth to engage chain 36.

The spring means 35 is connected with member 20 by means of a flexible element 36 illustrated here as being a link chain. The element 36 is fixed by any suitable means at one end 37 to the marginal edge of member 20 at a point which is ineffective in providing a lever arm, and the other end 38 is connected to one end of the spring means 35 in well known manner. From the fixed connection, the flexible element 36 extends along and is in contact with the plurality of points provided on the contoured marginal edge 34 until it separates from the edge at a point of tangency and connects with the spring means 35. The spring means 35 may be suitably anchored to the bottom portion of the door jamb 13 or garage floor as at 39 in well known manner. End 37 of the flexible element 36 may be adjustably secured to member 20 for varying the initial tensioning of spring 35.

It should be noted that the rigid connection of end 26 of lifting arm 25 is provided between the pivotal axis of the member 20 and the point of tangential contact of the flexible element 36 with the marginal edge 34 when the door is in vertical position. In this modification it should also be noted that in all positions of the door the pivotal axis of the member lies between the plane of the door and the rigid connection of end 26 of arm 25 to the member 20. The longitudinal

axis of lifting arm 25 does not cross the axis of pivot 19, but instead is spaced therefrom a distance X (Fig. 3).

The manner of operation of the power transmitting device embodied in the arangement of the cam member 20, lifting arm 25 and spring means 35 will be evident from the operation of the door. In normal closed position, as shown in Fig. 1, wherein the door 14 lies in a vertical plane and is supported by the roller means 32 and from the bracket 15 through the pivotal axis of the member 20 and lifting arm 25, the spring means 35 is in its maximum extended position for partially counterbalancing the weight of the door 14 and is exerting its maximum counterbalancing force. It should be noted, in this closed position, that the flexible element departs the marginal edge of cam member 20 and is extended downwardly to spring 35 in a plane slightly converging with respect to the vertical plane of the door. The length of the lever or moment arm of the spring forces about the pivotal axis of the cam member, is measured as the length of a perpendicular line to the converging plane, and extending to the pivotal horizontal axis of the cam member for assisting in the beginning of the lifting of the arm. The initial moment arm available through which the maximum spring forces act, is taken along a line passing in proximity to the fixed connection of the lifting arm to the member 20 and extending on one side of the pivotal axis of the cam member. The moment of force exerted by the weight of the door about the pivotal axis in this closed position has a short moment arm, virtually the distance between the pivotal axis and the vertical plane of the door. A stop 40 may be provided for positioning the door and limiting its movement to a vertical closed position.

As a slight force is applied to the bottom of the door to move the door to an overhead horizontal position, movement of the door will cause turning of member 20 about its pivotal axis. Since the spring means 35 exerts a force which is proportional to the amount of its deflection, the decrease in spring counterbalancing forces upon contraction of the spring, is compensated for by the change in point of contact of the flexible element 36 with the marginal edge 34, due to turning of the member about the pivotal axis for increasing the effective leverage.

From the closed vertical position of the door and to a position of the door in a plane lying at 45° to the vertical, the moment force of the door increases to a maximum. During movement of the door to a 45° position, the counterbalancing effect of the spring is decreased by contraction thereof while the points of contact provided on the marginal edge for the flexible member are spaced an increasing distance from the pivotal axis, thus providing increasing leverages which not only compensate for the decreased counterbalancing effect of the spring means but also for the increasing moment of force of the door.

When the door is lying in a plane of approximately 45° to the vertical wherein the moment of force of the door about the pivotal axis is the greatest, the member 20 is tangentially contacted by the flexible element at a point on the marginal edge of member 20 spaced a maximum distance from the pivotal axis of the member. This point, affording maximum leverage, lies in a zone between a plane passing through the pivotal axis of the member and substantially parallel to the axis of the lifting arm and a parallel plane passing through the longitudinal axis of the lifting arm.

As the door is raised above the halfway position at 45°, the moment of force of the door about the pivotal axis decreases. The distance of points of contact on the marginal edge 34 to the pivotal axis of the member is also selectively decreased in accordance with the change in length of the moment arm of the door and with the proportional contraction of the spring means 35 so as to provide easy, smooth operation of the door in its final movement to horizontal position.

Thus it will be readily apparent that the contour of the marginal edge 34 of member 20 provides a plurality of points so spaced from the fixed pivotal axis of the member and door so as to afford various leverages related to the moment arm of the door and force exerted by the spring means to uniformly counterbalance movement of the door in all positions of the door as it is moved from a vertical to an overhead horizontal position.

It will be noted that when the door is in overhead open position the moment force of the weight of the door is acting to the left of the horizontal axis as viewed in Fig. 3. The spring 35 is under some tension and is not completely collapsed and a final or ultimate moment arm is made available by the member 20 whereby the spring forces act to positively urge and maintain the door in open overhead position. In other words, a small force is acting upon the bottom portion of the door through the lifting arm 25 in order to prevent the door in overhead position from closing unexpectedly.

In the modification illustrated in Fig. 5, the power transmitting device embodying this invention is so arranged as to permit anchoring the counterbalancing spring means adjacent the top of the door in order to position the spring means out of possible interference with use of the garage. In this modification a door 50 is supported by roller and track assemblies generally indicated at 51 adjacent the top of the door and from a fixed pivotal axis 52 provided by a bracket 53 and a cam-shaped member 54 as in the previous modification. The member 54 is connected to the door by means of a lifting arm 55 pivotally connected to the lower portion of the door and having an end 56 fixed to the member 54 as by welding at a point radially spaced from the pivotal axis 52 and between the point of initial tangential contact of a flexible element 57 with a contoured marginal edge 58 of member 54 when the door is in vertical position.

It should be noted that the contoured marginal edge 58 is substantially identical in configuration as that described in the previous modification and that the member 54 has been in effect reversed in position, as by turning it over about both its vertical and horizontal axes and then fixing end 56 of the lifting arm to the member at point lying between the pivotal axis and the tangential point of contact with the element 57. The element 57 is suitably secured at one end 59 to the member 54 and is suitably connected at 60 to an end of spring means 61 which may be conveniently anchored to a structural member of the garage adjacent the top of the door, as indicated at 62. The flexible element 57 extends along and in contact with the marginal edge 58 from its point of connection to the member to its point of separation for connection to the spring means 61 as in the previous modification.

It will be readily apparent that the method of operation of the modification shown in Fig. 4, is virtually the same as that described in the previous modification, whereby as the door is moved from its vertical position the spring 61 and the leverages afforded by the variable distances between the fixed pivotal axis of the member and the point of contact of the flexible element virtually counterbalances the moment of the door about the pivotal axis. As in the previous modification, the maximum moment of the door occurs at virtually a halfway point when the door is lying in a plane of 45° and wherein the point of contact of the flexible element 57 is at a point on the marginal edge 58 which is spaced a maximum distance from the pivotal axis of the member to thereby afford a maximum counterbalancing leverage.

It will be readily apparent from the above description of the two modifications illustrated that the power transmitting device, including the cam-shaped members 20 and 54, may be suitably designed so that the various leverages afforded by the marginal edge of the cam-shaped members will provide any desired control of the door in its movement from a vertical position to an overhead horizontal position. For example, it may be desired, in operation of the door, to provide several points in its upward movement wherein the door and the counterbalancing spring means 20 may be substantially in balance so that a garage door may be left in partially opened position. Such operation may be accomplished by providing a point on the marginal edge 34 in which the leverage afforded by the distance between said point and pivotal axis of such member together with the counterbalancing action of the spring will provide a counterbalancing force equivalent to the movement of force of the door about the pivotal axis when the door is in the selected position.

When the door is in open, overhead horizontal position, the spring means 35 and the member 20 are so arranged as to exert a slight counterbalancing force upon the door. It will be readily seen in Fig. 2, that the effect of this counterbalancing force when the door is in open position is to maintain the door in open position without auxiliary limiting or holding means. If desired, relatively shallow recesses may be provided adjacent the inner ends of the track 33 for accommodating the roller 32 to define the proper open position of the door.

In closing the garage door by movement of the door from its open horizontal position to a vertical position within the door frame, downward movement of the door is resisted by the effect of the counterbalancing forces exerted by the spring 35 and the cam member 20. The movement of the door about its pivotal axis is thus retarded and controlled so that the door will not rapidly fall or slam into its closed position.

While the door is normally raised to overhead position by the manual application of force to the bottom of the door, it is understood that electrically actuated means may be employed to raise and to close the door as indicated in Fig. 6. The door actuating means includes a circular toothed sprocket 65 fixed to the inner surface of the member 20 for rotation about the pivotal axis by any suitable means such as welding or bolt and nut assemblies 66. Since the rotation of the member 20 is approximately 180°, a segment of a circular sprocket may be used instead of the circular sprocket illustrated. The teeth of the sprocket 65 mesh with the teeth of a pinion gear 67 driven by a reversible electric motor 68, the motor 68 being supported from the bracket 15. Operation of the motor 68 by means of a suitable reversing switch (not shown) will cause the pinion gear 67 to drive the sprocket wheel 65 and the member 20 about the pivotal axis of the member and thus cause opening or closing of the garage door.

A different modification of the power transmitting device is illustrated in Figs. 7 to 10 inclusive. This modification differs from the previously described embodiments in that the flexible element is adjustably connected to the contoured member, the spring means is provided with a connection to a roller and track assembly, and the contoured member and flexible element are arranged for cooperation in a different manner.

A garage, generally indicated at 70, is provided with a garage door opening 71 defined by an upstanding door jamb 72 and a horizontal lintel 73. A garage door 74 is movably supported within the door opening 71 by means including roller and track assemblies 75 each comprising a suitable channel-shaped track member 76 secured to the garage in virtually horizontal position and extending rearwardly into the garage from the door opening. A roller 77 cooperable with member 76 may be pivotally connected to a link 78 which is pivotally connected to an upper corner of the door.

The door 74 is pivotally mounted at each side about a horizontal axis spaced rearwardly from the plane of the door by a bracket 79 secured to the door jamb 72. The bracket 79 is provided with an aperture through which extends a pin 80 for pivotally mounting a contoured member 81 about the pivotal axis. Spacer washers 82 may be provided on opposite sides of the contoured member 81.

The contoured member 81 is connected to the door by means of a lifting arm 83 having one end pivotally connected as at 84 to a bottom portion of the door. The other end of the arm is fixed as by welding to the contoured member 81 at a point or area 85 radially spaced from the pivotal axis. It should be noted that the lifting arm 83 is provided with an offset portion 86 adjacent its fixed connection to the contoured member so that the arm may travel in a vertical plane spaced inwardly from and parallel to the door jamb 72 when the door is being opened and closed for permitting mounting of the bracket 79 and the cam member 81 behind the door jamb and spaced away from the door opening. The bracket and cam member are thus mounted in a zone which will afford full utilization of the door opening and that portion of the garage immediately adjacent to the door opening.

The contoured member 81 is provided with a peripheral edge of irregular configuration having spaced convex portions 87 and 89 and intermediate depressions or concave portions 88 for providing spaced points along said edge at varying distances from the pivotal axis of the member.

In this modification the contoured member is preferably made of a single, flat metal plate. Adjustably connected to the contoured member is a flexible element 90 shown here as being a self-tracking link chain formed of relatively long, spaced, parallel links 91 and connecting pivot pins 92. The links 91 are spaced a sufficient distance apart to accommodate therebetween marginal edge portions of the contoured member for permitting contact of pins 92 as spaced points on the edge of the contoured member. The con-

toured member is provided with a plurality of spaced ports 93 adjacent to and along its contoured edge for selective reception of pin 92 of the last link of the flexible element. The flexible element may be thus adjustably connected to the contoured member in a plurality of selected different positions whereby the pins of the adjacent links may be moved along the edge of the contoured member for causing their contact therewith at various spaced points either in the depressions 88 or on the convex portions 87, 89, for decreasing or increasing the effective leverage of the member and thus the magnitude of the counterbalancing forces. Field adjustment of effective counterbalancing forces is thus conveniently provided in order to obtain a desired lifting and closing action of the door.

The other end of the flexible element 90 is connected to a spring means 94 by any convenient means shown here as connecting rods 95. The spring means 94 is provided with a hook 96 which may be hung over track means 76 at a suitable point spaced rearwardly from the plane of the door. The hook is not restrained against movement along track means 76, but when once positioned the tension of the spring means 94 will hold the hook in place. When the door is in upper position, fine adjustment of spring tension may be made by slidably moving the hook along the track means.

It should be particularly noted that the length of spring used in this modification is relatively short and of smaller diameter as compared with springs employed in the prior modifications.

The operation of the garage door construction shown in this modification is substantially similar to that described in the previous modifications. It will be noted from a consideration of Fig. 7 that when the door is in closed position the pins of the chain link contact points on the contoured member whereby the effective leverage, together with the action of the extended spring means 94, is virtually sufficient to counterbalance the weight of the door. As the door is moved from its vertical position the pins on the chain link contact spaced points on the contoured member at a greater distance from the pivotal axis of the member to provide a greater effective leverage. The maximum effective leverage indicated by the distance "Y" is available for counterbalancing the weight of the door by the contact of pins 92 immediately adjacent points spaced the maximum distance from the pivotal axis. As the door moves into overhead, horizontal position, the leverage effect of the contoured member is decreased so that the door may come to rest without an abrupt stop.

The contact of the pins of the chain link may be so adjusted as to cause either their spaced contact on convex portions 87 and 89 formed on the countoured member or in the depressions formed therebetween. It will thus be obvious that a large variation in the effective leverage provided by the contoured member is made available by selectively connecting the end link and pin of element 90 to a selected port 93.

It should be particularly noted that operation of a garage door embodying the power transmitting device described above will give a smooth, uniform movement of the door during both opening and closing of the door. Such uniform action is particularly desirable and facilitates control of the door when opened or closed.

In the operation of an overhead type garage door described above, the cam type member may turn through approximately 180° while the door moves through only virtually 90°. The pivotal connection of the end of the lifting arm with the lower portion of the door permits such operation and results in the general vertically positioning of the arm when the door is in virtually overhead horizontal position. The distance to which the bottom margin of the door may project beyond the lintel of the door frame when the door is in overhead position may be determined by selection of the point of pivotal connection of the rigid lever arm with the door.

It will thus be readily apparent that the overhead type garage door construction and operation described is simply constructed, is effective for providing any desired type of door operation, and utilizes hardware accessories which are readily adaptable to a garage door frame.

The construction described above also provides a compact garage door operating mechanism or power transmitting device which occupies a minimum of space within the garage and which will not interfere with high bodied vehicles parked immediately adjacent the garage door opening.

It will be understood by those skilled in the art that various modifications and changes may be made in the embodiments of the invention described and illustrated above and all such changes coming within the scope of the appended claims are embraced thereby.

I claim:

1. In a power transmitting means for an overhead garage door construction guided at its upper end by virtually horizontal track means, the combination of: a flat member provided with means for pivotally mounting a door to be raised upon an axis parallel to the plane of the door and opposite the central portion of the door when in vertical position; a lifting arm having one end adapted to be pivotally connected to the door and having the other end rigidly connected to said member; said member having a contoured edge provided with convex and concave portions spaced at varying distances from the pivotal axis; a flexible element including spaced parallel links and pins connecting said links, said pins contacting the contoured edge at spaced points, the portion of said edge between the spaced points being accommodated between the spaced links; means for adjustably connecting one end of the flexible element along the edge of the member; spring means connected to the other end of the flexible element; means for connecting the spring means to the track means; said member and said spring means being cooperable for counterbalancing the weight of the door by the varying leverages made available by spaced contact of the flexible element with the edge of said member; the adjustable connection of the flexible element to the member being adapted to vary the points of spaced contact of the pins with the contoured edge for modifying the magnitude of counterbalancing forces effective during opening and closing of the door.

2. In a power transmitting means for overhead garage door construction guided at its upper end by virtually horizontal track means, the combination of: a member provided with means for pivotally mounting a door to be raised upon an axis parallel to the plane of the door; a lifting arm having one end adapted to be pivotally connected to a lower portion of the door and the other end rigidly connected to said member for movement with said member in a plane transverse of the pivotal axis, said member being pro-

vided with a contoured edge including points therealong spaced at varying distances from the pivotal axis; a flexible element lying along said edge in contact with spaced points thereon and having one end secured to said member; a spring means under tension connected at one end to the other end of said flexible element, said member and said spring means being cooperable for counterbalancing the weight of the door throughout movement of the door from a vertical to an overhead horizontal position through the varying leverages available by spaced contact of the flexible element with the edge of said member; said spring means being provided at its other end with a connector means for frictionally engaging and for adjustable sliding along said track means for securing said other end of said spring means.

JAMES H. GRENZEBACK.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,214,229	Frasch	Sept. 10, 1940
2,316,510	Ferris et al.	Apr. 13, 1943

FOREIGN PATENTS

Number	Country	Date
51,864	Denmark	July 13, 1936