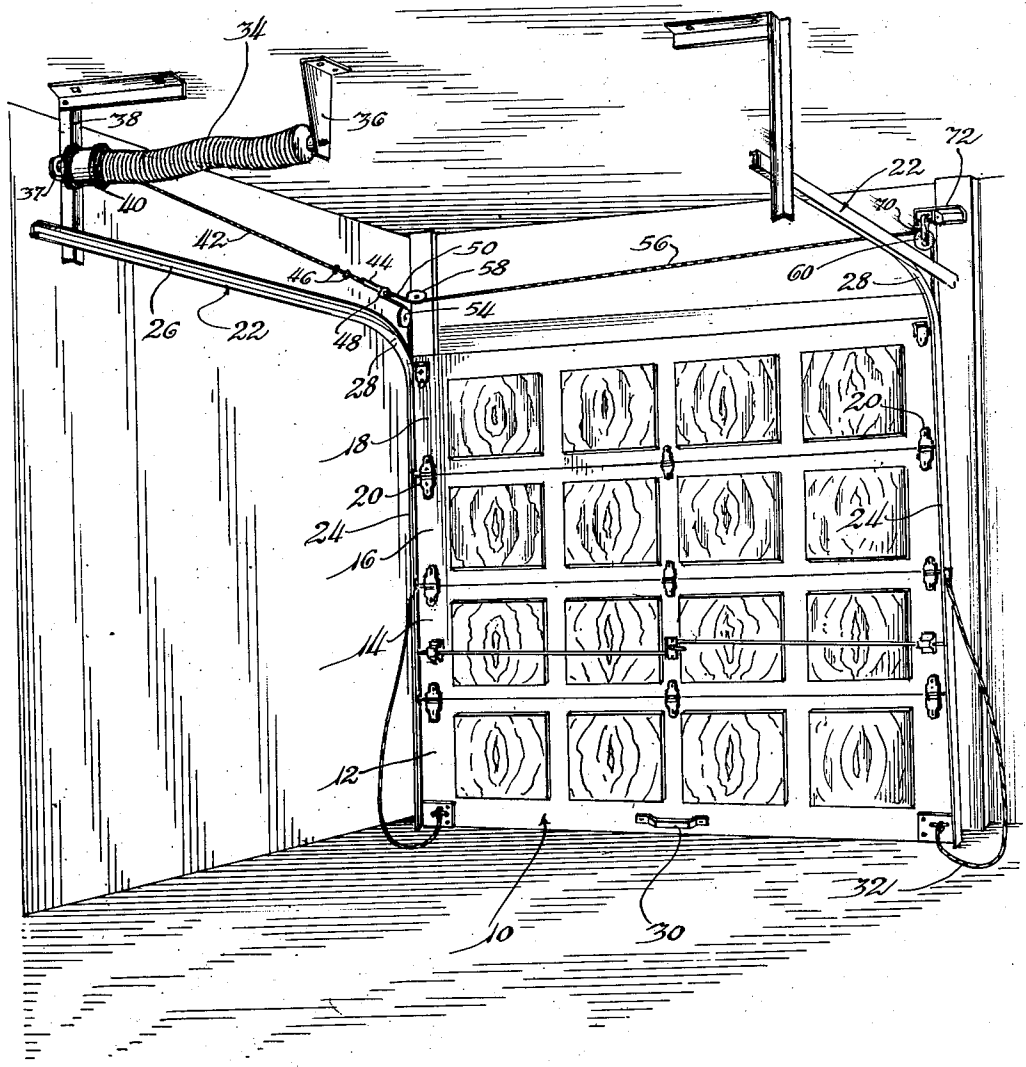
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COUNTERBALANCING MEANS

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Fig. 1.



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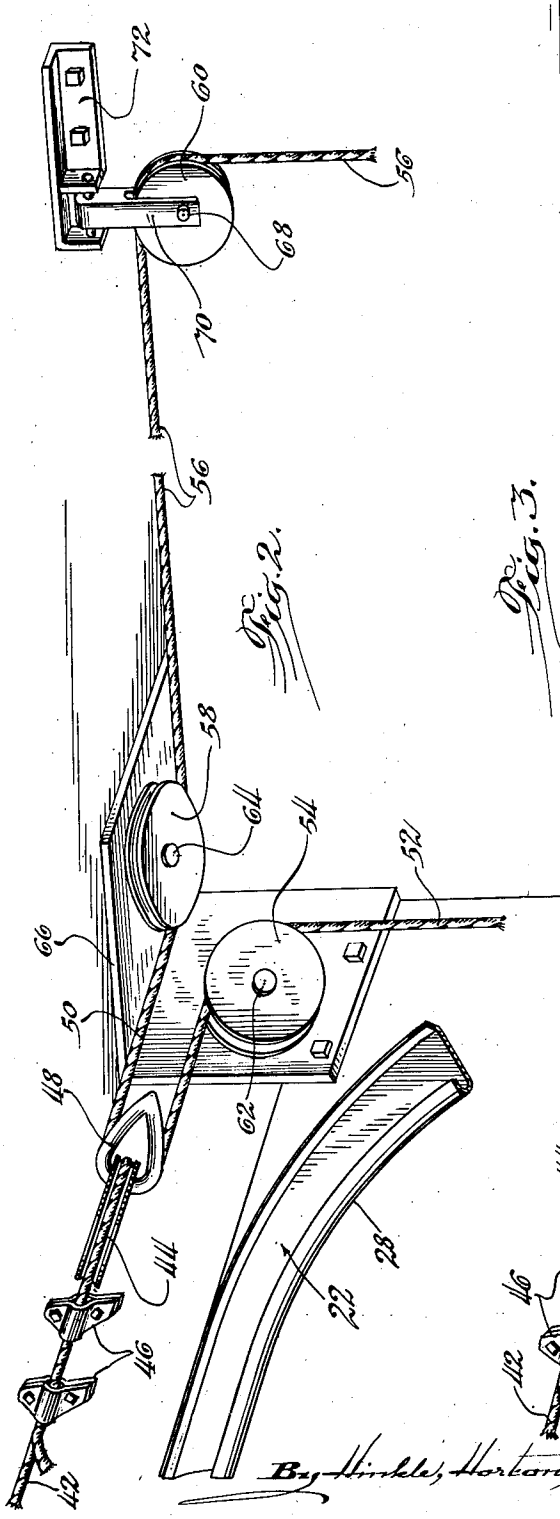


Fig. 2.

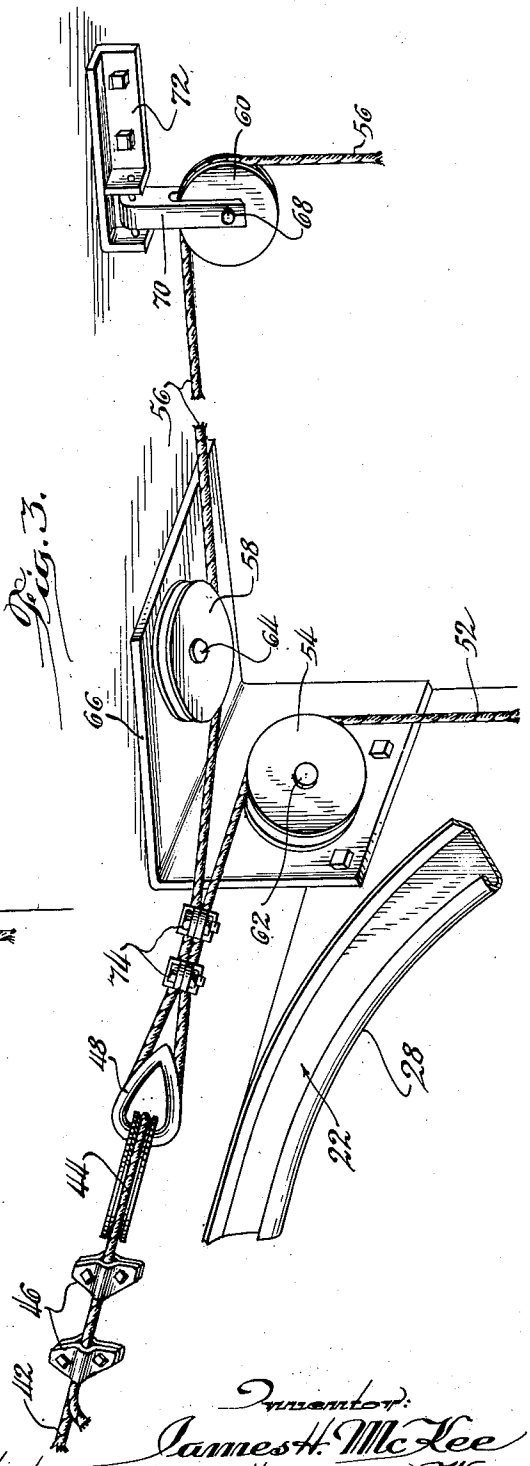


Fig. 3.

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COUNTERBALANCING MEANS

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Fig. 4.

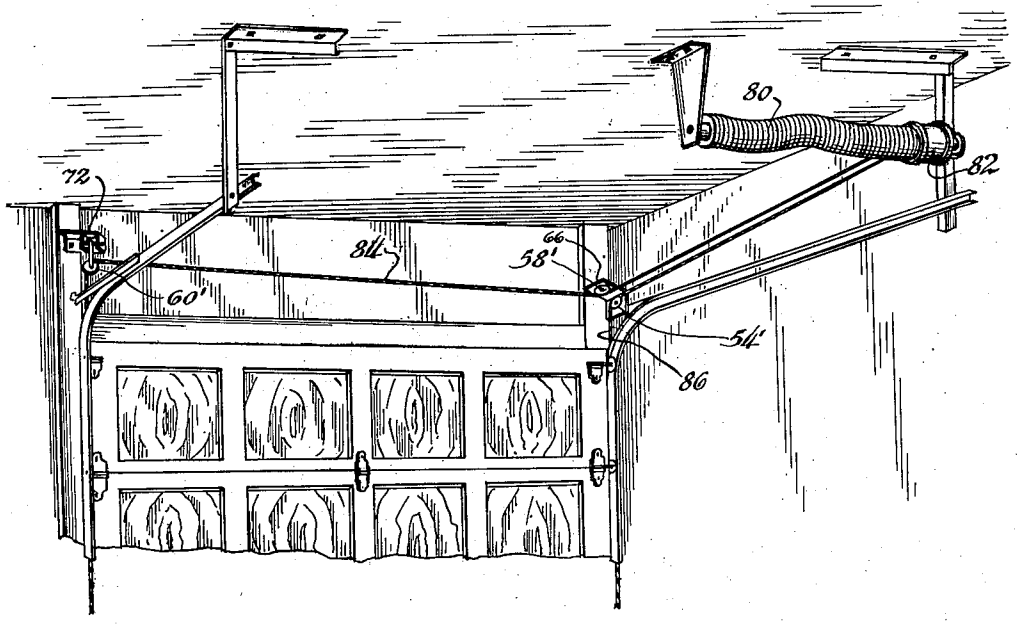
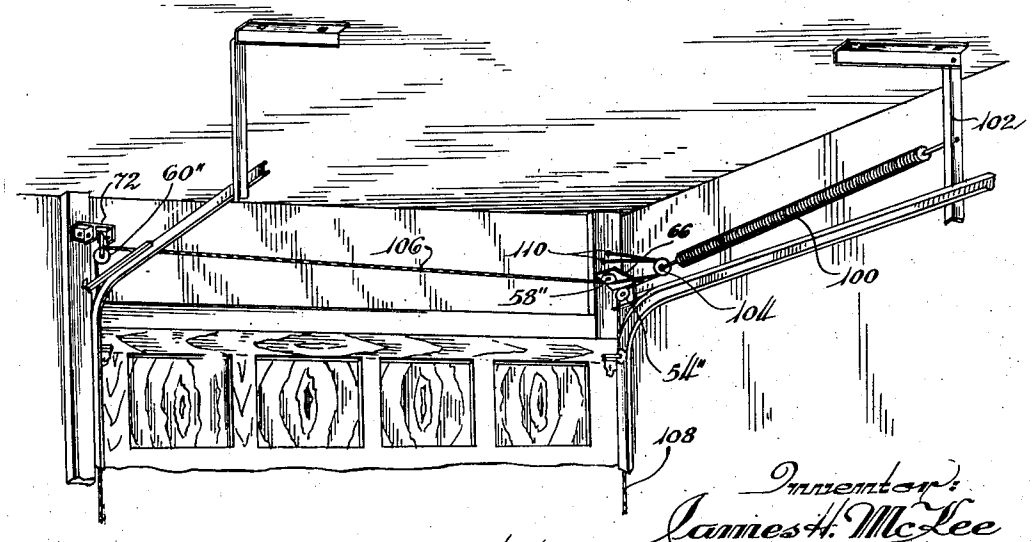


Fig. 5.



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UNITED STATES PATENT OFFICE

2,607,410

COUNTERBALANCING MEANS

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Application January 12, 1949, Serial No. 70,543

3 Claims. (Cl. 160—191)

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My invention relates to counterbalancing means and is more particularly concerned with counterbalancing means for overhead types of doors commonly used in garages, service stations and other buildings.

The conventional overhead type of door consists of a multisection door provided with rollers at its edges for engaging guiding and supporting tracks located on opposite sides of the door opening and having horizontal and vertical portions connected by curved portions whereby the door may be moved from a vertical closed position to a horizontal open position, and vice versa. Such a door is ordinarily counterbalanced by providing a tension spring or torsion spring and drum above the door opening and at either side thereof, each tension spring or drum being connected by the cable to a fitting at the bottom of the door adjacent one edge thereof.

In some instances a single torsion spring is attached to a shaft extending transversely of the door opening and having a drum at either end thereof for receiving one of the cables attached to the lower edge of the door. It is also known to provide counterbalancing weights in lieu of the springs located at either side of the door. All of these prior art constructions are objectionable from the standpoint of cost and some at least are objectionable on the ground that they occupy space which could be otherwise used or which is not available in certain types of buildings.

An object of my invention is to provide a new and improved counterbalancing means which overcomes these objections of the prior art.

Another object of my invention is to provide a new and improved counterbalancing means which utilizes only a single spring but which does not require the shaft and double drum construction of the prior art.

Another object of my invention is to provide new and improved counterbalancing means which is cheaper and easier to manufacture and install than the prior art constructions.

Another object of my invention is to provide a counterbalancing means having a unique arrangement of guiding sheaves and cables.

Another object of my invention is to provide a new and improved guiding sheave.

Other objects and advantages will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a perspective rear view of an overhead type of door embodying one form of my invention;

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Fig. 2 is an enlarged view showing the unique arrangement of cables and sheaves utilized in the construction of Fig. 1;

Fig. 3 is a view similar to Fig. 2 but showing a variation in the cable arrangement;

Fig. 4 is a perspective rear view of the upper part of a door construction embodying a third form of my invention; and

Fig. 5 is a view similar to Fig. 4 but showing a construction embodying a fourth form of my invention.

Referring particularly to Fig. 1, it will be noted that I have therein illustrated an overhead type of door construction including a door indicated generally by reference character **10** and composed of sections **12**, **14**, **16**, and **18** connected by suitable hinges **20**. Opposite sides of the door are provided with the usual rollers engaging the tracks **22** located on opposite sides of the door opening and affixed in the usual manner to the doorjambs and ceiling or roof of the building.

The tracks have vertical portions **24** and horizontal portions **26** connected by curved portions **28**. The door **10** is provided with the usual handle **30** and pull-down rope **32** for moving the door between the closed position shown and an open position in which the door rests in the horizontal portions of the tracks **22** and for moving the door back to closed position.

A single torsion spring **34** is mounted above the door opening adjacent the rear end of the horizontal portion of one track. This spring is mounted on a rod supported at one end in a bracket **36** attached to the ceiling or roof of the building, the other end of the rod being mounted in an auxiliary bracket **37** attached to a main bracket **38** also serving as a support for the rear end of the left-hand track, as viewed in Fig. 1. The torsion spring **34** is connected to a single drum **40**. One end of a rope or form of cable or pull line **42** is attached to the drum **40**, the other end of this cable being bent around a metal eyelet **44** and secured by clamps **46**, as best shown in Fig. 2. The eyelet **44** passes loosely through a second metal eyelet or sheave device **48**. The eyelet **48** is located in a reverse bend of a second cable **50**.

One leg **52** of the cable **50** passes over a sheave **54** and extends downwardly along the left side of the door and is fastened by any suitable means adjacent the lower left-hand corner thereof. A second leg **56** of the cable **50** passes around a sheave **58** and then transversely above the door opening to a second sheave **60** located above the right-hand edge of the door. This part of the

cable then passes downwardly along the right-hand edge of the door and is attached thereto adjacent the lower right-hand corner.

The sheaves 54 and 58 are rotatably mounted on studs 62 and 64, respectively, provided by a bracket 66 which is L-shaped and attached in any suitable manner to the building structure above the left-hand edge of the door opening. The sheave 60 is rotatably mounted on a pin 68 carried by a yoke 70. The yoke 70 is pivotally mounted in a bracket 72 for movement in a plane perpendicular to the plane of the sheave 60.

In the embodiment shown in Figs. 1 and 2, the door may be raised by pulling upwardly on the handle 30 or rope 32 or by pulling upwardly on any suitable handle means (not shown) provided on the outside of the door. As the door moves upwardly and rearwardly in its tracks, the cable 42 is wound on the drum 40 and the torsion spring exerts a counterbalancing force which is applied to the lower corners of the door through this cable 42 and cable 50. This latter cable can slip with respect to its eyelet 48 automatically to adjust any inequalities in the pull exerted on the legs 52 and 56 of this cable. The construction and arrangement of the parts is such that the door reaches its uppermost position before the clamps 46 have moved far enough to engage the drum 40, so that this drum need only be of such size as to accommodate the single cable 42.

As the door approaches its uppermost position, the rollers attached to the opposite sides of the lower edge of the door enter the curved portions of the tracks, thereby moving this lower edge rearwardly or away from the door opening. The pivotal mounting of the sheave 60 is designed to accommodate this rearward movement of the lower edge of the door to which the end of leg 56 of the cable 50 is attached. As the lower edge of the door moves rearwardly, the sheave 60 swings about its pivot to assume a rearwardly and downwardly inclined position so that there is no tendency to pull the cable off of the sheave 60. When the door is lowered, the sheave 60 returns to a substantially vertical position.

While the slipping of the cable 50 about its eyelet 48 is desirable where the door is perfectly balanced, such slippage is to be avoided where the door is of such construction that it is inherently unbalanced; that is, where one side of the door is heavier than the other. With such an unbalanced door, the cable arrangement of Fig. 3 is preferable. This cable arrangement is identical with that of Fig. 2 except that clamps 74 are attached to the cable 50 immediately adjacent its eyelet 48 to prevent any shortening or lengthening of the cable leg 52 with respect to the cable leg 56.

The construction shown in Fig. 4 is generally similar to the constructions of Figs. 1, 2, and 3 except that in Fig. 4 the torsion spring 80 is attached to a single drum 82 of a size designed to accommodate two cables. One cable 84 is attached to the lower left-hand corner of the door and passes upwardly around a sheave 60', across the top of the door opening, around a second sheave 58', and thence to the drum 82 to which its end is attached. A second cable 86 has its lower end attached to the lower right-hand corner of the door and passes upwardly over a sheave 54' and thence to drum 82 to which its other end is attached. This construction most nearly resembles the construction of Fig. 3 in that both cables are rigidly attached to the drum 82 and no slippage is permitted for the purpose of automatically adjusting the relative lengths of the two cables to give equality of pull, and such equality of pull must be secured by manual adjustment if one cable should stretch more than the other.

In Fig. 5 a single tension spring 100 is provided in lieu of the torsion springs of the previous embodiments. One end of the tension spring 100 is attached to the track supporting bracket 102, and the other end of this spring is attached by a yoke to the axle of a sheave or sheaves 104 designed to receive two cables 106 and 108.

Each of the cables 106 and 108 has an end attached to the doorjamb, as indicated at 110. The cable 106 engages sheave 58'' and thence extends transversely above the door opening to the pivot sheave 60'' and thence downwardly along the left-hand side of the door, and is attached to the lower left-hand corner. The cable 108 passes over a fixed sheave 54'' and downwardly along the right-hand edge of the door, and has its lower end affixed to the lower right-hand corner thereof.

When the door in the embodiment of Fig. 5 is moved upwardly, the spring 100 contracts and pulls the sheave 104 toward the fixed support 102, thereby forming larger loops in the cables 106 and 108 and exerting a decreasing pull on these cables comparable with the decrease in weight of the portion of the door remaining in the vertical portions of the tracks. As the door is subsequently lowered, the spring 100 stretches to the length shown, and the loops in the cables 106 and 108 become progressively smaller. It will be noted that in this embodiment no drum is required.

From the foregoing description taken in connection with the accompanying drawings, it will be apparent that I have provided new, simplified, and less expensive means for counterbalancing a multisection door movable between a closed vertical position and an open horizontal position. While I have shown only a few embodiments of my invention, it is to be understood that my invention may assume numerous forms and includes all variations, modifications, and equivalents coming within the appended claims.

I claim:

1. Counterbalancing mechanism for an overhead door movable upwardly and rearwardly from a vertical closed position across a door opening to an overhead horizontal open position, and having guide rollers carried on the sides of the door and engageable with side guideways for guiding movement of the door, said mechanism comprising a continuous cable having its ends connected to the lower opposite sides of the door, means for exerting a rearward pull on an intermediate looped portion of the cable to raise the door, said means including a pull line extending horizontally and rearwardly adjacent one side of the door when it is in raised position, tension means exerting a continuous rearward pull on said pull line at least until said door is substantially in raised position, a sheave device carried at the forward end of the pull line about which said intermediate portion of the cable is looped for adjusting movement thereon, and cable guiding means for guiding the cable during door movement, said cable guiding means including vertically and horizontally pivoted sheaves located above the door opening in substantial alignment with said pull line, both sheaves having their pivots normal to the direction of movement of the pull line, and a third sheave located above the

door opening at the other side edge of the door, said third sheave having its pivot substantially parallel to the pull line when the door is closed, whereby the sheave is in a vertical plane, and a pivoted bracket mounting said third sheave, the pivot for said bracket being horizontal and parallel to the plane of the door opening, whereby said third sheave may swing into a horizontal plane when the door is in raised position.

2. Counterbalancing mechanism for an overhead door movable upwardly and rearwardly from a vertical closed position across a door opening to an overhead horizontal open position, and having guide rollers carried on the sides of the door and engageable with side guideways for guiding movement of the door, said mechanism comprising a continuous cable having its ends connected to the lower opposite sides of the door, means for exerting a rearward pull on an intermediate looped portion of the cable to raise the door, said means including a pull line extending horizontally and rearwardly adjacent one side of the door when it is in raised position, tension means exerting a continuous rearward pull on said pull line at least until said door is substantially in raised position, a sheave device carried at the forward end of the pull line about which said intermediate portion of the cable is looped, and cable guiding means for guiding the cable during door movement, said cable guiding means including vertically and horizontally pivoted sheaves located above the door opening in

substantial alignment with said pull line, both sheaves having their pivots normal to the direction of movement of the pull line, and a third sheave located above the door opening at the other side edge of the door, said third sheave having its pivot substantially parallel to the pull line when the door is closed, whereby the sheave is in a vertical plane, and a pivoted bracket mounting said third sheave, the pivot for said bracket being horizontal and parallel to the plane of the door opening, whereby said third sheave may swing into a horizontal plane when the door is in raised position.

3. The counterbalancing mechanism as set forth in claim 1 in which the vertically and horizontally pivoted sheaves are mounted on a right-angle bracket for ready attachment over the door opening.

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