Aug. 15, 1944. E. J. DAKAN 2,355,956

OVERHEAD SWINGING DOOR

Filed April 15, 1942

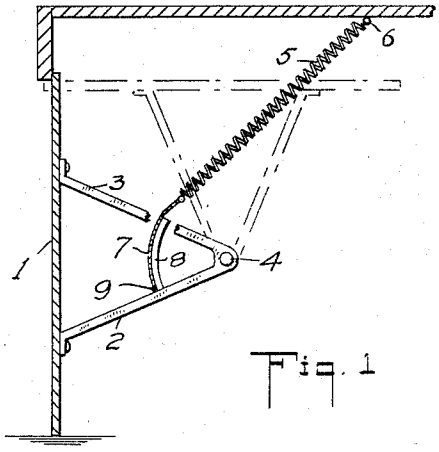


Fig. 1

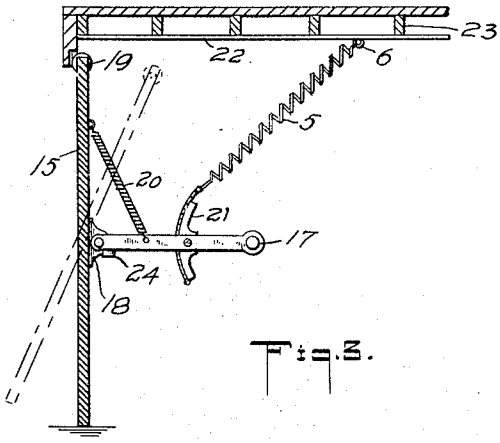


Fig. 3.

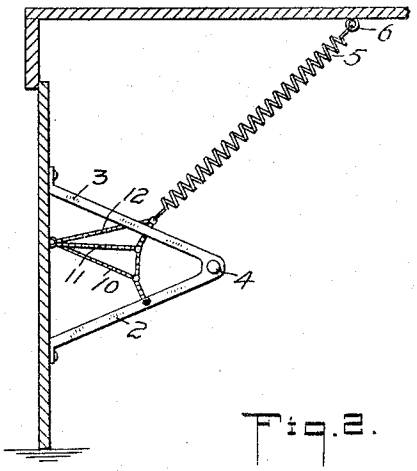
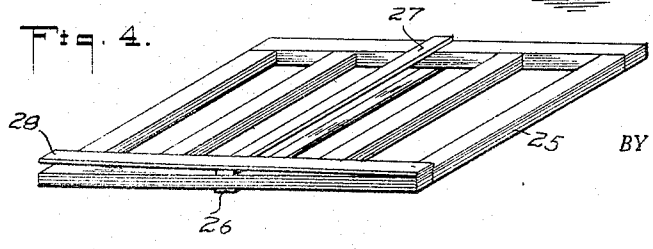


Fig. 2.

Fig. 4.



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OVERHEAD SWINGING DOOR

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2 Claims. (Cl. 20—16)

This invention relates to doors and has particular reference to improvements in the certain novel type of overhead swinging door which now is becoming increasingly popular.

The most economical and perhaps most popular overhead swinging door on the market is of the pivot type, which type of device generally comprises a door panel having arms inwardly extending from the side edges thereof and pivotally hung on the side walls or other suitable stationary supports of the building in which the door is installed. Counter-balancing springs extend from these arms to points near or at the ceiling of the building, although counter-weights are occasionally employed in preference to springs.

The principal difficulty attending the use of such springs is that the angular relation of the springs to the arms of the door gradually changes as the door moves from vertical to overhead open position, with the result that the efficiency of the springs is greatly reduced and complete control of the door is not attainable. It is for this reason an important object of this invention to introduce means for equalizing the pull of the springs in order that a more smoothly and easily operable door mechanism may be obtained, using lighter springs, and which always is under complete control.

Another difficulty attending the use of conventional overhead swinging doors of the pivot type is that considerable space must be present above and behind the top of the closed door, in order to afford clearance for the door as it swings into open position. It is further object of my invention so to fasten the pivot arms to the door that the latter is afforded sufficient freedom of swinging movement on the arms to permit the top of the door to pass under a ceiling set very close to the door top.

Because doors of the type referred to are supported along their side edges only, it is found that the center portion of the door, while in overhead open position, has a tendency to sag. Furthermore, this tendency magnifies as the width of the door increases. To overcome this difficulty, it is customary to mount adjustable transverse braces at the top, bottom and along the center of the door. This is objectionable, not only because the door owner or operator fails to adjust these braces from time to time during the period in which the new lumber ordinarily used in such doors sets and tends to warp, but also for the reason that the braces project downward from the opened door, often to form obstructions detrimental to the free and unhindered passage under the door. It is a still further object of my invention so to construct the door panel as to eliminate the tendency to sag and at the same time to do away with such obstructive braces.

These and further objects of the invention, as well as the many advantageous features of construction embodied therein are hereinafter fully described, and a drawing is hereto annexed in which preferred forms of the invention are illustrated. In the drawing:

Figure 1 is a diagrammatic, side elevational view of an overhead swinging door in which features of the present invention are embodied;

Figure 2 shows a slight modification of the device of Fig. 1;

Figure 3 is a side elevational view of a pivotally hung door in which further modifications are embodied; and

Figure 4 illustrates an improved method of constructing a door panel so as to eliminate the tendency to sag.

Reference is in the first instance invited to Fig. 1, in which the conventional type of overhead swinging door of the pivot type is illustrated. This door comprises a panel 1, from which arms 2, 3 are shown extending to a pivotal point 4, all as common in present day practice. It is to be understood, of course, that a set of arms is provided at each side of the door, and that pivots 4 are present to support each set of arms. In the conventional overhead swinging door, counterbalancing springs 5 extend from the arms 3 to a position 6, near the ceiling of the building.

The most difficult part of the door installation is the placing and adjusting the tension of the springs because, if the point 6 is carried far enough forward to obtain a fairly direct and efficient pull on the arms 3, in closed door position, it is seen that the springs attain greatest contraction at the time or even before the door reaches its horizontal, open position. The result is that the slight remaining tension of the springs is insufficient securely to maintain the door in open position and even may urge the door to return to closed position. It is therefore not held securely in open position and even slight wind pressure, from the right direction, may suffice to start the door toward closing position, thereby to endanger human life and property.

In the structure of Fig. 1, however, the spring 5 is not attached to the arm 3, but to a chain or cable 7, which rides over a curved guide 8 to a point 9 in the arm 2, where it is suitably fastened. If the guide 9 is circular and concentric with the pivot point 4, it is seen that it travels on a circular arc during the closing movement of the door, and the parts may be so designed that the angular position of the spring changes little, if at all. At least, the point 6 can be placed to get an efficient pull on the arms, and the direction of the pull remains substantially constant.

Because of necessary economy of construction, it may not be commercially practical correctly to shape the guides 8, but it is found that minor

irregularities in the shape thereof has no material effect on the efficiency thereof. The introduction of the simple guide 8 not only results in improved door operation and a safer door, but also makes the use of lighter and cheaper springs possible.

Another way of obtaining this advantageous result is illustrated in Fig. 2. The door arms 2, 3, pivot 4 and spring 5 may remain unchanged, but the guide 8 is removed and chains or cables 10, 11, 12 extend from the chain 7 at the end of the springs to chosen positions along the door 1. The positions and the length of the connections 10, 11, 12 are calculated to retain the same angular position of the springs at both extremes of door movement. During the door movement, it is found that this angular relation changes slightly, but this is immaterial because it does not noticeably affect the ease of operation of the door. In other words, this link suspension substantially corresponds to guide arrangement of Fig. 1.

As above stated, the clearance found in garages and other buildings served by overhead doors, above the top of the closed door, at times is so slight that no room is present to swing the above described pivotally hung door into open position. In such cases, I prefer to employ the design illustrated in Fig. 3, in which a door 15 is fitted with a single arm, pivotally hung at 17. This arm is not rigidly mounted on the door, but it is journaled in lugs 18. A guide 21 is mounted on the arm in position to maintain the spring 5 in the position shown in Fig. 1. The operation of the door remains as above described, except that the initial opening pull on the door brings it into the position indicated in dotted outline in order to swing the top of the door inward and downward far enough to clear the ceiling as the door rises into open position. Ordinarily, the pivot is centrally placed relative to the door, but in this case it is slightly raised above the center. The purpose of this is to make certain that the lower portion of the door is slightly heavier than its upper portion. When so proportioned, it is found that the top of the door rides lightly along the ceiling and is thereby steadied in its movement. If more evenly balanced, the door is apt to swing freely back and forth during its movement, to cause its top repeatedly to bump into the ceiling. If no smooth ceiling is present, it is advisable to nail a board 22 along the joist 23 to serve as a guide for the top of the door, and a guide roller 19 may be there added, if preferred.

Because the door pivots in the lugs 18 which are set back from the door panel, a slight tendency is present on the part of the door panel, in closed position, to tilt forward. This tendency may, however, readily be counteracted by extending a light spring 20 from the door panel to the arm 16, substantially as indicated in Fig. 3. Or, if preferred, a stop 24 may be added to the lug 18 to prevent such forward tilting movement.

It was above stated that transverse braces are applied to overhead swinging doors to counteract the tendency on the part of the door to sag in the middle. Also that such braces are objectionable because they project downward from the open door and so reduce the head clearance, which in garages always is slight. A simple way of eliminating such braces and at the same time to make the door sag resistant, is illustrated in Fig. 4.

Garage doors, like the garage framing, are usually built on the job by the contractor erecting the garage. A framework of suitable lumber is first nailed or bolted together, and this frame is covered with a siding of thin boards. I have found that placing of these boards under slight tension, in assembling, suffices to make the dooor sag resistant. This may be done as indicated in Fig. 5, where the numeral 25 designates an assembled frame, and it is noticed that a thin board 26 is laid under the frame along its vertical center line. Also that a thin board 27 is similarly placed on top thereof. The first siding board 28 is thereupon nailed at one end to the frame and additional boards are similarly nailed thereon until the frame is covered. Pressure is now applied to the nailed side, as by a workman standing thereon, and similar pressure is applied to the opposite side slightly to spring the frame 25 over the board 26. The free end of the siding boards are then nailed in position, whereupon the pressure on the frame is relieved and the boards 26 and 27 removed. When thereupon the intermediate portions of the siding boards are nailed to the frame, it is found that the completed door is under sufficient tension to resist all tendency to sag. Because it is the thickness of the boards 26, 27 which determines the degree of tension under which the door should be placed, some experience is requisite to the selection of the proper thickness, and it should be noted that the thickness of these boards increases slightly as the width of the door increases. In a narrow door, the tendency to sag is negligible.

While I have herein shown and described preferred forms of the invention, I do not wish to be limited to ten precise forms presented, but reserve the right to embody such modifications as may come within the scope of the claims hereto appended.

I claim:

1. In an overhead swinging door for a building having a door opening, a door panel vertically positioned to close said door opening, a stationary pivot behind and at each side of said door opening a V-shaped bracket journaled at its apex on each pivot and extending to the door panel, a spring on each side of the door extending from a point in the building above and behind said pivots, a flexible connection from the end of each spring to the arm of each bracket which is farther from the spring suspension point, and flexible members extending from the door panel intermediate the arms of the brackets to each of said flexible connections for equalizing the direction of pull of the spring as the door rises into open position.

2. In an overhead swinging door, a door panel vertically positioned to close the door opening, a stationary pivot behind and at each side of the door opening, a V-shaped bracket journaled at its apex on each pivot and extending to the door panel, a spring on each side of the door extending from a point above and behind said pivots, a flexible connection from the end of each spring to the arm of each bracket which is farther from the spring suspension point, and flexible members extending from points on the door panel intermediate the arms of the brackets to each of said flexible connections, said members comprising a plurality of elements diverging from the juncture points on the panel to uniformly spaced points along said flexible connections for equalizing the direction of pull of the spring as the door rises into open position.

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