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TRUSS CONSTRUCTION FOR OVERSWINGING DOORS OR THE LIKE

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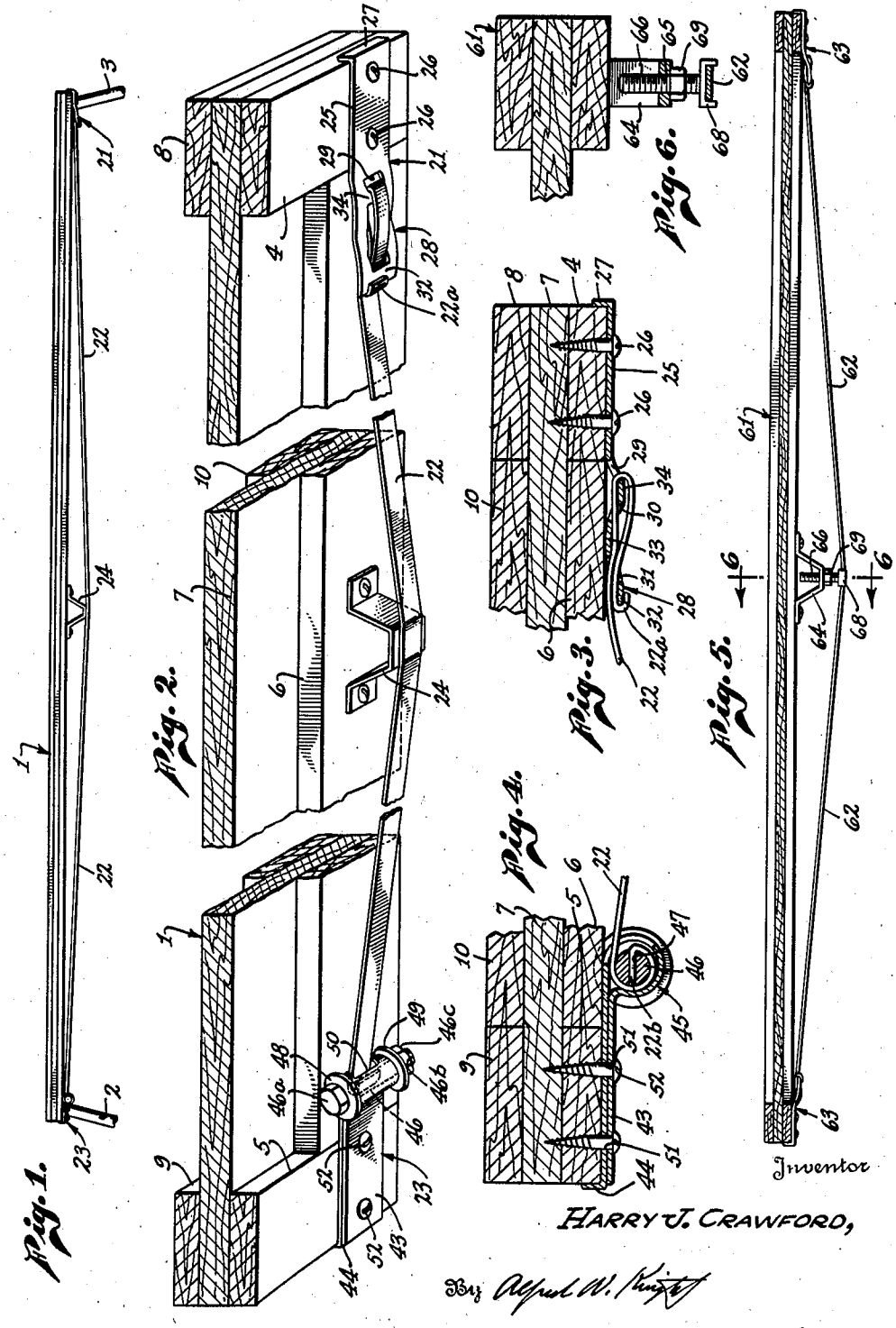


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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TRUSS CONSTRUCTION FOR OVERSWINGING DOORS OR THE LIKE

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6 Claims. (Cl. 20—38)

This invention relates to truss constructions and pertains more particularly to a truss construction for overswinging doors or the like.

Overswinging doors such as are used in garages or the like are commonly made in widths of from sixteen to eighteen feet or more. These doors are usually supported only at their sides, so that when they are swung to their open or upward positions and lie in a horizontal plane there is a considerable tendency for a door to sag downwardly at its center section. This causes the doors to warp and also subjects the supports to undue stresses. It is, therefore, a practical necessity to provide these doors with one or more truss or tie rods which extend laterally across the underside of a door when in its horizontal position.

These truss rods are bridged away from the plane of the door at one or more positions removed from the edges of the door so that an upward thrust is produced at the bridged portions by tension in the truss-rod. Heretofore the tension members have consisted of tie-rods having threaded ends which were passed through holes in brackets attached adjacent the door edges. The threaded ends were provided with nuts which were run down on the rod to establish the desired tension. Due to the fact that relatively soft iron rods are used because of their low cost and also because they may be easily threaded, rather than steel rods which are more expensive and harder to work, it is necessary to use rods of fairly large diameter. When it is remembered that the threads are usually cut on the ends of the rod and that the rod is only as strong as the root diameter of the threads, it will be seen that considerable unnecessary material is required. This increases the cost of materials and the weight of the finished door and also increases shipping costs.

The various fittings required to construct an overswinging door can usually be made to occupy a rather small package, the only exception being the tie rods. These rods are usually sixteen to eighteen feet long and cannot be placed in a small enough package for parcel post shipment. If they are rolled into a compact circle they take a permanent set so that after they are straightened and positioned as tie rods they must frequently be retightened to maintain the desired tension. If they are rolled in a single circle, say six feet in diameter, less permanent distortion is produced and they are more satisfactory as tie rods after uncoiling than in the above example, but they still cannot be shipped parcel post and usually have to be crated and shipped by freight.

It is, therefore, a particular and important object of this invention to overcome the above-mentioned common deficiency in truss constructions by providing a simple and less expensive truss structure which provides improved performance and may be shipped in a small package.

Another object of the invention is to provide a truss construction of the class described which is inexpensive to manufacture and install.

A further object of the invention is to provide a truss construction for overswinging doors or the like which provides the necessary thrust against the plane of the door without subjecting the edges of the door to an undue turning moment which tends to twist the door framework.

Another object of the invention is to provide a truss construction for overswinging doors or the like which, for the same amount of bridging from the plane of the truss supports as is used in conventional constructions, projects a smaller distance from the plane of the door than conventional constructions.

A further object of the invention is to provide a truss construction of the class described which is secured to the door edges in such manner as to use the compressional strength of the door frame (instead of relying on the rigidity of the door panel in its own plane) to provide the necessary reaction to the forces set up in the tension member of the truss.

Another object of the invention is to provide novel clamping members for securing my improved form of tension member of the truss construction to a door panel.

Further objects and advantages of the invention will either be brought out specifically in the ensuing description or will be apparent therefrom.

The construction of this invention comprises, in one contemplation, a trussed door construction in which an overswinging door or the like is caused to be braced against mid-section sag when disposed with its plane in a generally horizontal relation, characterized by the provision of a thin tape tension member extending along the downwardly directed face of such a panel in such relation and secured to such panel at its respective ends through the agency of attachment means causing the tension stresses in said tape to be applied to the door panel as near as possible to the plane of the panel. In another contemplation, the invention comprises a bracing means for a door panel of the character described, in

which a cooperative assembly of a flat tape tension member, attachment means of the character above set forth, and a suitable bridge or compression post, is provided for attachment to such a door panel. In another contemplation, the invention resides in the provision of a trussing structure for door panels, comprising a flat tape tension member and cooperatively associated attachment members adapted for attachment to such a door panel in such manner as to dispose the attached ends of the tape tension member as near as possible to the panel of such door at the position of such attachment means, and to provide for establishment of the desired degree of tension stress in such tape member in use.

My invention will be better understood when described in conjunction with the accompanying drawing, in which:

Fig. 1 is a somewhat diagrammatic representation of a front elevation of an overswinging door in its upper or open position, showing a preferred form of my truss construction;

Fig. 2 is a perspective view of a portion of the door illustrated in Fig. 1, showing my truss construction in greater detail, the door being broken into sections in order to show the relative positions of the parts of my truss construction without unduly reducing their scale;

Fig. 3 is a longitudinal section through the fixed truss clamping member illustrated in Fig. 2;

Fig. 4 is a longitudinal section through the adjustable truss clamping member illustrated in Fig. 2;

Fig. 5 is a sectional view of a door showing a modified form of truss construction in elevation; and

Fig. 6 is a sectional detail taken along line 6—6 in Fig. 5.

Referring to the drawing, a typical overswinging door is shown at 1 and is provided with suitable supporting arms 2 and 3 which are journaled for rotation in a vertical plane about a common horizontal axis lying below the plane of the door (as viewed in Fig. 1). The journals are not shown, since they are conventional in this form of construction, may be of various constructions, and do not form part of this invention. As an example, the door may be supported by a construction such as shown in my copending application Serial No. 201,117, filed April 9, 1938. As another example, the door may be of the type shown in Ferris Patent No. 1,926,671 and may be supported as shown therein.

The door is shown as comprising side frame members 4 and 5 which extend adjacent the vertical or lateral edges of the door, and a lateral frame member 6 which extends laterally of the door between the side members. These members provide a structure upon which the door panels are secured and provide the necessary strength to the door. Sometimes a second set of side and lateral frame members such as the members 8, 9, and 10 respectively are placed opposite the members 4, 5, and 6 over the door panels to provide for greater stiffness. In any event, the actual construction of the door is of little consequence, since it is usual to provide side and lateral frame members, either of the type shown or of other conventional types, on the inside of the door and to fasten any trusses to the side frame members or adjacent thereto.

My preferred truss construction is shown as comprising a fixed clamping member 21 attached to the edge of the door 1 as to the edge of the vertically extending frame member 4. A tension member comprising a thin metal tape 22 is shown secured to the clamping member 21 and extending laterally across the door, with its major surface facing the door, to adjacent the opposite side of the door where it is secured to an adjustable clamping member 23. The clamping member 23 is secured to the edge of the door and in this case to the edge of the vertically extending frame member 5. Intermediate the ends of the span of the tension tape 22 a U-shaped bridge 24 or compression post, is provided which is in engagement with the tape and the door; in this case it is secured for convenience to the lateral frame member 6, and is adapted to hold the tension tape away from the door and provide a thrust toward the plane of the door when the tape 22 is held in tension. The actual construction of the bridge 24 is of no consequence, and any suitable means may be substituted therefor which will perform an equivalent function.

The fixed clamping member 21, forming part of the attachment means, is shown as comprising a plate, a substantially rectangular plate in this instance, with its longest axis extending in the direction of extent of the tape 22, the clamp being adapted to be attached and lie flat against a door member and to extend substantially in the plane of the door member. The particular clamping member illustrated may be said to comprise three portions: a central portion 25 which is provided with holes through which mounting screws 26 extend; an outer end portion 27 which is bent vertically away from the plane of the central portion 25 and provides a lip which projects over the edge of the frame member 4; and an inner end portion 28 provided with slots 29, 30, and 31 for the self-clamping reception of the end of the tape 22. The outer end 28 of the clamping member 21 thus comprises bars 32, 33, and 34, which are separated by slots 31, 30, and 29, respectively. To facilitate the feeding of the tape 22 through the slots, the end bars 32 and 34 are raised upwardly from the plane of the central portion 25, and the center bar 33 is depressed from this plane when the slots are punched in the plate.

In practice, the clamp 21 is first attached to the edge of the door with the central portion 25 in close engagement with the door and with the lip member 27 engaging the edge of the door. The tape 22 is then fed beneath the bar 28 and through the slot 31, thence over the bar 33, through the slot 30, under the bar 34, and through the slot 29. The tape is then bent back over the bar 34 and is fed back through the slot 31 and beneath the bar 32. The end of the tape is then usually bent back as at 22*a* to reduce any tendency for slippage. This self-clamping arrangement is found satisfactory for holding the tension tape securely against the relatively high tensions which are encountered in use.

The adjustable clamping member 23, forming part of the attachment means, is shown as comprising a central plate portion 43 which is attached to and lies flat against the door member 5; an outer end portion 44 which is bent away from the plane of the central portion 43 and provides a lip which engages the edge of the door member 5; and an inner end member 45 providing a bearing or anchor within which a spool 46 is rotatably mounted. The spool 46 is slotted as at 47 so that the end 22*b* of the tape 22 may be inserted therein and secured thereby. Rotation of the spool causes the tape to be wound therearound and pulled toward one of the points at which it is

secured. This allows the correct amount of tension to be put on the tape.

To facilitate winding the spool and tensioning the tape, one end of the spool is provided with an enlarged head **46***a* which is engageable by a wrench or other tool, and the other end of the spool is threaded as at **46***b* and provided with a suitable threaded member such as a nut **46***c*. A washer is provided at **48** between the head **46***a* and the edge of the bearing member **45**, and another washer is provided at **49** between the nut **46***c* and the bearing edge **45**. Thus the spool may be rotated to produce the required tension in the truss **22** by engaging the head **46***a* with a suitable wrench. When the required tension is obtained, the nut **46***c* may then be tightened so that the frictional engagement of the washers **48** and **49** with the bearing member **45** and the engagement of the washers with the head **46***a* and nut **46***b* maintain the required tension in the truss. Obviously, other forms of adjusting and clamping means may be used in place of the one above described. The spool bearing member **45** is slotted as at **50** to permit access of the tape **22** to the slot **47** in the spool **46**.

The adjustable clamping member illustrated in Figs. 2 and 4 is also of interest because of its simple and inexpensive construction. Thus it may be fabricated from a single elongated piece of strap iron, which is bent back upon itself to form the cylindrical spool bearing **45**, and the overlapping portions are provided with alined openings **51** for reception of mounting screws **52** which then serve not only to hold the clamping member in position on the door member but also serve to hold the overlapping portions together.

The lips **27** and **44** provided on the mounting members are of extreme importance in that they compressively engage the edges of the door over a relatively wide area and use the compressive strength of the door members to their greatest advantage. Because of these lips, each of the clamping members may be secured to the door edge by ordinary wood screws, since there is little tendency for the screws to pull out, because they are primarily loaded in shear.

My construction also greatly reduces the tendency of the door to warp as a result of the stresses produced by the truss. This advantage is obtained because the trussed construction is such that the tension member is fastened or secured to the door substantially in the plane of the door, and as a consequence no lever arms are provided which would cause the tension in the tension tape to produce a turning moment which would tend to twist the member **4** in a clockwise direction and the member **5** in a counterclockwise direction. With existing constructions, the tie rods or tension members are usually secured to angle irons which extend along the length of the members **4** and **5**, and these angle irons are bolted to the members **4** and **5** at different places throughout their length, which requires a considerable amount of labor and additional expense. The tie rods are then secured to the angle irons at positions removed from the plane of the members **4** and **5** so that the tension in the tie rods tends to rotate the angle irons and also to rotate the members **4** and **5**. As a consequence, there is considerable axial stress on the bolts required to hold the angle irons against the frame members and a tendency for these bolts to pull through. It is necessary for the tie rods on existing constructions to be raised above the plane of the frame members at their ends, since they are usually rods and are provided with nuts which must be tightened. This raising provides the necessary clearance to turn the nuts. To get the required angular departure of the tie rods from the plane of the door it is necessary to additionally raise the bridge or bridges by an amount which is equal to the amount which the tie rods are raised from the door at the edge thereof. Thus my construction not only is less expensive, but it reduces the tendency for the door frame to warp, and for a given amount of bridging projects a smaller distance from the plane of the door and saves head-room, which is a matter of importance.

With my construction the tension member may comprise a steel tape, for example, a tape about 0.04" by about one-half inch wide. The cost of such a steel tape compares very favorably with the cost of a $\frac{5}{16}$" threaded soft-iron rod, usually being less expensive. This is about the minimum diameter rod that can be used. At the same time, the steel tape has all the advantages of a steel rod, which is generally too expensive for this purpose. In other words, the steel tape can be elastically deformed so that even though the supports give somewhat, tension can be maintained in the truss after it is tightened. With the soft iron rods this advantage is not present.

In the above-described embodiment of my invention the tape is adjustably secured to one edge of the door, and the variation in tension is produced by pulling the tape toward one side of the door. In Figs. 5 and 6 another arrangement is illustrated in which a door **61** is shown with a tape **62** secured to the lateral edges thereof as through the agency of self-clamping fixed clamp members **63** which may be the same as the member **21** illustrated in Figs. 1–3. An adjustable means for varying the tension in the tape when the tape is under tension is provided and is shown as comprising a bridge member **64** which is secured to the door and is provided with an opening **65** through which extends a threaded member **66** which is in contact with the tape. The upper end of the member **66** is preferably provided with a channel **68** for the reception of the tape. A nut **69** is provided on the member **66** and bears against the bridge **64**. By rotating the nut relative to the member **66** the tape may be raised from the plane of the door adjacent the bridge and the tension may be varied.

It should be appreciated that although I have only shown a single tension member located near an edge of the door, it is contemplated to provide two or more of such members located at spaced positions between the top and bottom of the door and extending across the door as shown, in accordance with common practices. It should also be appreciated that the tension arrangement of my invention need not extend from side to side of the door, but may be used in other positions on the door according to the particular needs of a given installation. For example, a tension member may extend from the top to the bottom of a door or diagonally across a door.

It should be obvious that my invention is subject to considerable modification, and hence I do not choose to be limited to the examples shown and described herein, but rather to the scope of the appended claims.

I claim:

1. An overswinging door construction in which a door panel is adapted to be swung between positions in which the plane of the door panel is alternatively disposed in a generally vertical and a generally horizontal relation, a trussing assem-

bly adapted to support such panel substantially in its own plane, which comprises: a door panel of the character described; an elongated flat tape tension member extending along the face of said panel which is downwardly directed when said panel is in said generally horizontal relation, the flat face portion of said tape member being directed towards said panel; attachment means at the respective ends of said tape member for securing the same to said face of said panel at the edge portions thereof and in close proximity to said plane; bridge means engaging said tape member and said door panel and spacing said tape member from said plane at a position intermediate the length of said tape member; and means for producing a tension stress in said tape member between said attachment means to provide a thrust upon said panel through said bridge means and substantially prevent said panel from sagging when disposed in said generally horizontal relation.

2. A truss construction for overswinging doors or the like comprising: a thin metal tape tension member adapted to extend laterally across said door with its major surface facing said door; a bridge adapted to receive said tape intermediate the ends of the span of said tape and hold said tape away from the door to provide a thrust toward the plane of said door; means adapted to secure said tape to said door adjacent the plane of the door at the ends of the span of said tape; and tensioning means in engagement with said tape for producing a desired tension in said tape.

3. A truss construction as set forth in claim 2, said tensioning means comprising means adjustable when said tape is under tension for moving said tape away from the plane of said door intermediate the ends of said tape.

4. A truss construction as set forth in claim 2, said tensioning means comprising means for pulling said tape toward one of the points at which said tape is secured.

5. A truss construction for overswinging doors or the like, comprising: a clamp member adapted for attachment adjacent one edge of said door; a truss comprising a thin metal tape secured to said clamp and extending with its major surface facing said door to adjacent the opposite side of said door; a bridge adapted to receive said tape intermediate the ends of the span thereof and hold said tape away from the door to provide a thrust toward the plane of said door; and an adjustable clamping member adapted to be secured to said door adjacent said opposite side, said adjustable clamping member comprising a relatively flat body portion adapted for attachment to said door, spool bearing means carried on said body, and a rotatable spool member extending through said bearing means and adapted to engage said tape and adapted to be clamped in any rotative position to hold said tape in tension, said tape being engaged by said clamping members substantially in the plane in which said clamping members are attached to the door.

6. A fixed clamping member for a tape-type truss construction of the class described, comprising: a plate adapted to be attached to and lie flat against a door member in a plane parallel to the plane thereof, said member having adjacent one end a lip portion projecting from its plane and adapted to engage an edge of said door, said member being slotted in a plurality of places adjacent its other end for the self-clamping reception of said tape.

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