

March 25, 1969

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3,434,751

DOOR LOCK

Filed Nov. 7, 1966

Sheet 1 of 4

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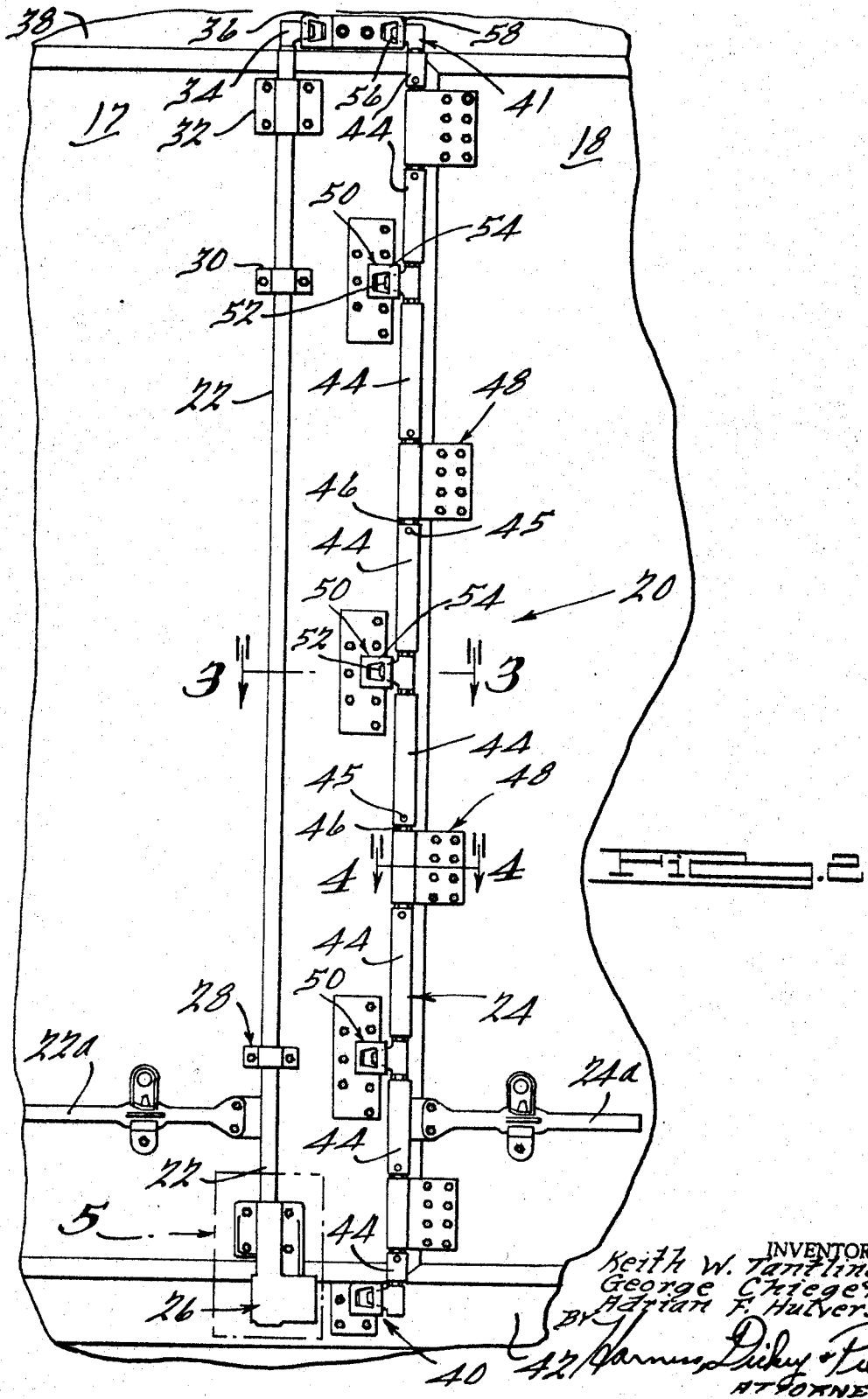
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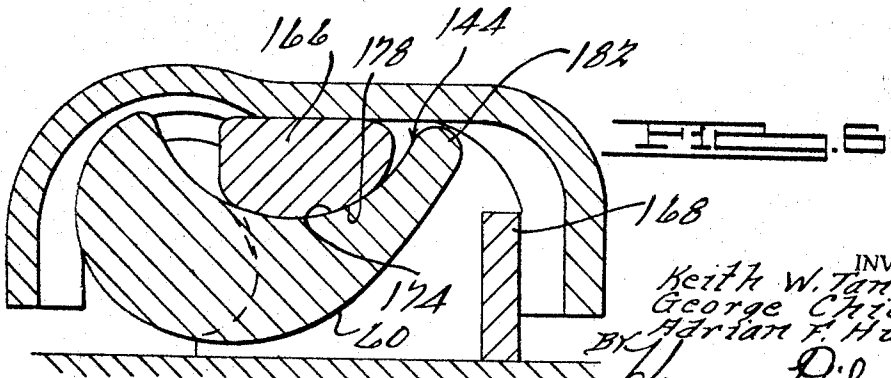
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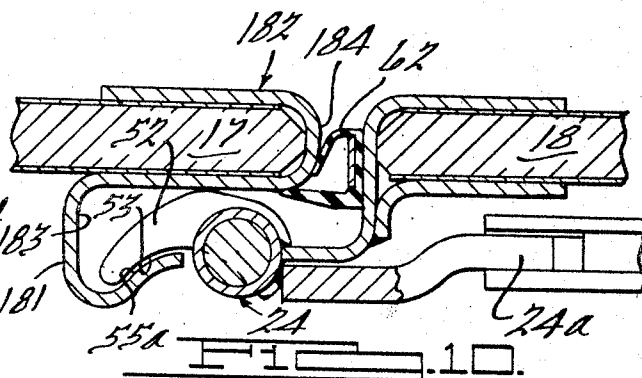
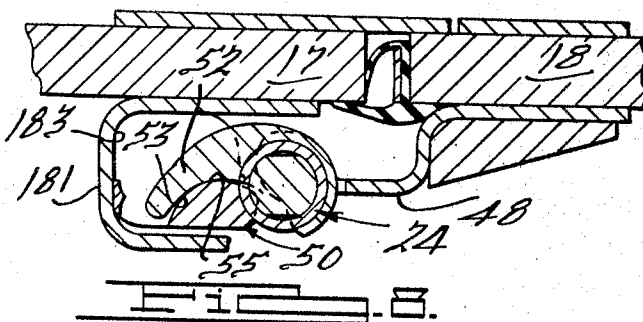
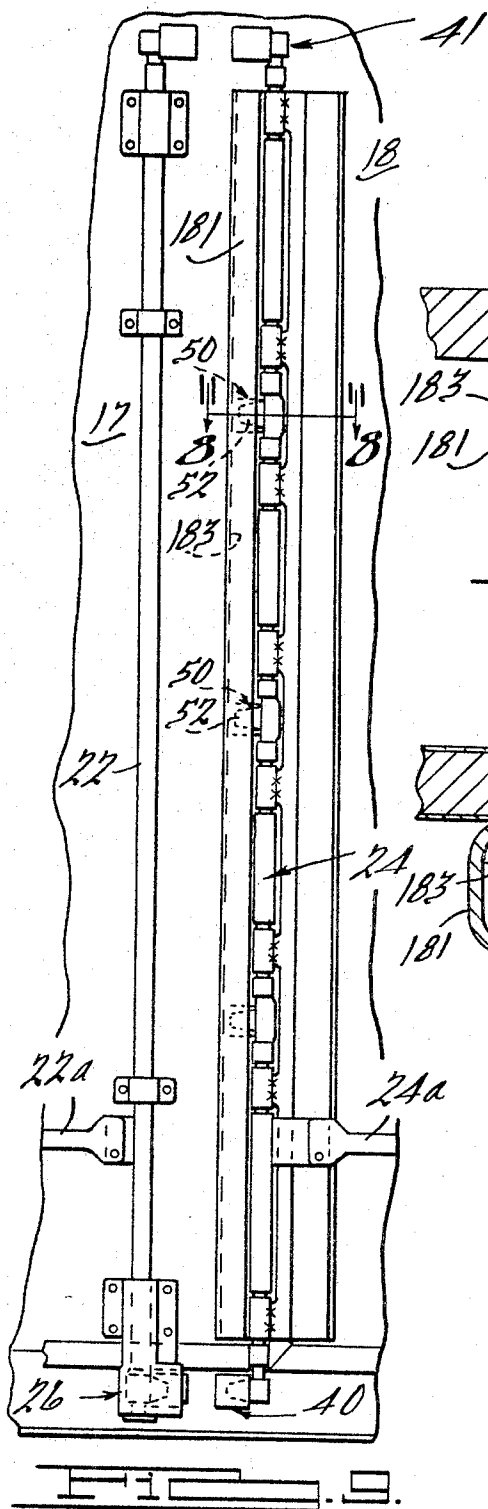
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3,434,751 DOOR LOCK

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Filed Nov. 7, 1966, Ser. No. 592,350

Int. Cl. E05c 3/04, 3/14

U.S. Cl. 292—218

3 Claims

ABSTRACT OF THE DISCLOSURE

An anti-rack door locking construction suitable for use on a truck, trailer, or large container having two doors pivotally supported within a complementary door frame, said anti-rack construction comprising: (a) an anti-rack lock rod mounted in upright position on the edge of one of said doors adjacent to the edge of the second door when in the closed position, (b) locking tongues on the upper and lower ends of the lock rod, (c) tongue keepers mounted on the door frame to provide for locking connection with the tongues at the end of the lock rod, (d) at least two or more intermediate locking tongues mounted on the lock rod, (e) at least two or more corresponding intermediate tongue keepers mounted on the second door generally adjacent the intermediate locking tongues for connection therewith when the doors are in closed position, (f) an upright lock connecting bar mounted on the second door in approximately parallel relationship to the lock rod of the first door but spaced therefrom, (g) locking means at each end of the lock connecting bar for holding the second door in fixed securement to the door frame, and (h) at least one of said locking means being comprised of an anti-rack lock means for holding the second door in fixed vertical position relative to the door frame.

This invention generally relates to an improved "anti-rack" door lock for van-type trucks, highway semi-trailers, and the like.

In the past, the forces to which the doors and door frames of highway semi-trailers and van-type vehicles have been subjected have been known in the art as "racking" forces. These forces tend to move the doors vertically relative to one another and to the door frame. Because the doors and door frames of such trailers are generally utilized to insure the structural integrity of the trailers, the locks for the doors of such vehicles must be of relatively strong construction in order to withstand the racking forces and positively retain the doors properly closed within their door frames. To a certain extent the problems resultant from these racking forces on vans, highway trailers and the like, have been solved by the anti-rack door locks shown in U.S. Patents 3,134,618 and 3,160,433. However, even the door locks shown in these patents have not been completely accepted as overcoming the problems resultant from racking forces, such as racking forces caused by the high humping loads due to railroad piggyback operation which is a conventional, often used, and very important technique in modern times. For example, although the invention disclosed in Chieger et al. Patent 3,160,433 has been quite successful, the door lock there shown has certain drawbacks. In this regard, it will be noted that in Chieger et al. there is no actual locking connection between the two trailer doors themselves when same are in side-by-side relationship in closed position and, due to the tolerance and operating clearance requirements inherently necessary between the doors and the door frame, it has been found that when racking forces are exerted on the doors and the door frame that the doors can shift relative to one another, and of course

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this is very detrimental to the maintenance of a proper, structurally aligned, door frame which is free from the damages of racking forces. In addition, it will be noted that in Chieger et al. the only actual locking members provide engagement with the door frame and since there are no locking members disposed on the trailer doors themselves to hold said doors in fixed position relative to one another, the racking forces can in effect shift one trailer door relative to the other and hence eventually cause relatively severe damage to the trailer door and door frame.

Briefly stated, the invention comprises an anti-rack door locking construction for a vehicle, trailer, large container and the like including two doors pivotally supported within a complementary door frame, said construction comprising: an anti-rack lock rod assembly mounted in upright position generally on the end of one of said doors, which end is adjacent the other of said doors when both doors are in closed position, said assembly having locking tongue means on upper and lower ends of said lock rod assembly for securing said assembly to said door frame by engagement with corresponding tongue keeper means for mounting on said door frame thereby enabling said engagement to take place by rotation of said lock rod assembly to secure the tongue means within the keeper means, said assembly also having intermediate locking tongue means for securing an intermediate portion of the lock rod assembly by rotational engagement to corresponding intermediate keeper means disposed on the other door, and said other door also having disposed thereon a lock connecting bar in generally upright position and approximately parallel to said lock rod assembly with said lock connecting bar when said other door is in closed position having generally disposed at each end thereof locking means for holding said other door in fixed securement to said door frame, said locking means being operated by rotation of said lock connecting bar, at least one of said locking means being an anti-rack lock means for holding said other door in fixed vertical position relative to said door frame, said anti-rack lock means including a lock frame rigidly attached to said other door having a box-like shroud overlaying the door frame, the shroud on said frame having an aperture facing the door frame and an outwardly divergent truncated conical internal recess therein, a keeper fixture rigidly attached to the door frame having a truncated conical portion complementary to the shroud on said lock frame and acceptable therein to absorb racking forces and a tongue keeper element spaced from said door frame, and a locking tongue element rotatably supported by said lock frame at two axially spaced points and movable between a locked condition and an unlocked condition by rotation of said connecting bar, said locking tongue element having a tongue portion engageable with the tongue keeper element on said keeper fixture to retain the door in the locked condition, said construction further including a flexible sealing member disposed on said other door adjacent said lock rod assembly and generally parallel thereto, said sealing member acting to provide a substantially air-tight seal between the doors when in closed position due to a bendable flange on the sealing member held in compressed condition when said doors are closed, and an elongated protective flange means disposed on and extending substantially the length of the door on which it is mounted, said flange means forming said intermediate keeper means.

Accordingly in view of the above it is an object of this invention to provide an improved anti-rack door locking construction.

Another object of the invention is to provide an improved anti-rack door lock which has locking members to fixedly position two doors relative to one another in addition to locking members which fixedly position the

doors relative to the door frame of a highway semi-trailer, van-type vehicle, a large container for freight, or the like.

Another object of the invention is to provide an improved anti-rack door lock for a trailer, truck, or van-type highway vehicle, any of which have two doors at one end thereof mounted within a door frame construction and wherein the lock connecting bar for at least one of said doors is positioned generally on that end of said door which comes into approximate closing contact with the second door.

Other objects, features and advantages of the present invention will become apparent from the subsequent description and the appended claims taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a rear view of a van-type vehicle having the improved anti-rack door lock of the present invention;

FIGURE 2 is an enlarged detailed view which more completely illustrates the door lock as indicated within the oblong area shown by dotted lines and indicated at numeral 2 in FIG. 1;

FIGURE 3 is a cross sectional view taken along line 3—3 of FIG. 2;

FIGURE 4 is a cross sectional view along line 4—4 of FIG. 2;

FIGURE 5 is an enlarged detailed view taken within the area 5 indicated by dotted lines in FIG. 2;

FIGURE 6 is a cross sectional view taken along the line 6—6 in FIG. 5,

FIGURE 7 is a cross sectional view taken along the line 7—7 of FIG. 5,

FIGURE 8 is a cross sectional view taken along the line 8—8 of FIG. 9;

FIGURE 9 is a partial elevational view of another embodiment of the door locking construction disclosed herein, and

FIGURE 10 is a cross sectional view similar to that of FIG. 8 and showing how an elongated protective flange is used to provide a complementary shaped surface for engagement with the tongue elements on the lock rod assembly of the door locking construction herein.

To more fully describe the invention, FIGURE 1 illustrates a van-type vehicle 10 of conventional structure with a front cab 12 and a rear two-axle suspension system 14 including eight wheels 16. The van 10 has two rear hing-mounted doors 17 and 18 held in closed position by the anti-rack door locking construction designated 20, in accordance with the invention.

FIGURE 2 more clearly illustrates the lock construction 20 as being comprised of a lock connecting bar 22 and a lock rod assembly 24 which are operated by lock opening handles 22a and 24a, respectively. Further the anti-rack door lock construction is comprised of a shrouded door lock 26 at the lower end of the connecting bar 22. The connecting bar 22 is mounted for rotation on the door 17 through the use of intermediate brackets 28 and 30, and an upper bracket 32. Above the bracket 32 there is positioned a tongue 34 and keeper 36 enabling the upper portion of door 17 to be locked to the door frame 38 of the van.

Lock rod assembly 24 is comprised of a tongue and keeper type lock 40 at its lower end for fixing door 18 to the lower door frame 42. The assembly 24 is comprised of a plurality of lock rods 44 of suitable lengths. The lock rods 44 are rotationally fixed relative to one another through the use of hinge pins 46 mounted within hinge bracket assemblies 48 and interconnected with rods 44 by transverse lock pins 45 or the like. The assembly 24 additionally contains three intermediate locks designated 50 and formed by mating tongue 52 and keeper 54 members. Above the intermediate locks 50 there is disposed a tongue 56 and a keeper 58 enabling the upper part of door 18 to be locked to the door frame 38. The tongue and keeper locks on both the connecting bar 22 and the lock rod assembly 24 enable the doors 17 and 18 to be

locked in closed position by rotation of the manual operating handles 22a and 24a and it should be understood that cooperation between the locking tongue and keeper elements cams the doors into the closed condition and retains the doors in said closed condition.

With respect to the shrouded anti-rack lock 26 shown in FIGURE 2, it should be understood that at least one of these locks 26 is necessary to successful operation of the anti-rack door lock construction 20 of the invention. The purpose of the lock 26, as will be explained in more detail herein below with respect to FIGURES 5—7, is to provide the door 17 with an anti-rack locking action between said door and the door frame of the van. Although it is clear that at least one anti-rack lock 26 should be present in the construction 20, of course it should also be understood that a second such lock could be used in place of the tongue 34 and keeper 36 lock used between the door 17 and the door frame 38.

FIGURE 3 clearly illustrates by cross sectional view one of the intermediate locks 50 as shown in FIGURE 2. As shown, the intermediate lock 50 is comprised of tongue 52 and keeper element 54. The camming surface 53 on the tongue 52 acts in cooperation with a mating surface 55 on the keeper element 54 in order to positively cam the door into locked position when the tongue is rotated in a counterclockwise position. FIGURE 3 also illustrates the intermediate bracket 28 used to hold the connecting bar 22 in pivotal relationship to the door 17. This cross section view also illustrates a flexible sealing member 62 which seals the small void 15 formed between doors 17 and 18 when the same are closed. The seal 62 may be made of any material which is rubber, plastic or elastomeric and the seal has an outwardly extending lip 64 shown in bent-down position in FIGURE 3, which bent-down position is caused by subsequent closing of door 18 after door 17 has been closed.

FIGURE 4 shows the hinge bracket assembly 48 in cross sectional view. Hinge bracket assembly 48 is comprised of rod pipe 70 containing hinge pin 46 pivotally mounted therewithin. Rod pipe 70 is fixedly attached to a hinge plate 72 through use of a weld 74 or like connecting means. Hinge plate 72 is connected to door 18 through the use of bolts 76, or like elements.

FIGURES 5, 6 and 7 show by enlarged detail the shrouded anti-rack lock 26 of FIGS. 1 and 2. Lock 26 comprises a frame 130 made of, for example, cast steel having vertically aligned bores 140 and 141 therein for the acceptance of a lower end 142 of the connecting bar 22 and lower end portion 143 of a tongue element 144, respectively. An upper end 145 of the tongue element 144 is secured within a central bore 146 in the connecting bar 22, as by welding. The frame portion 30 of the lock 26 is secured to the door 17 as by a plurality of bolts 150 which extend through complementary apertures in the door 17. The frame portion is positively located relative to the door 17 by a pair of enlarged bosses 152 and 154 which extend through complementary apertures 156 and 158 on the door 17 to accept shear forces therebetween. The locking tongue element 144 has a radially extending tongue portion 160 with outwardly convergent upper and lower surfaces 162 and 164, respectively for acceptance under a tongue-keeper element 166 on a keeper fixture 168. The keeper fixture 168 is secured to the frame 42 as by welding. The tongue keeper element 166 has tapered surfaces 170 and 172 complementary to the surfaces 162 and 164 on the tongue 160.

FIGURE 6 illustrates that the tongue keeper element 166 on the fixture 168 has an arcuate face 174 to effect a camming action with a complementary curved surface 178 on the tongue portion 160 of the tongue element 144. As the door 17 is swung toward the closed position with respect to the door frame, an outer end portion 182 of the tongue 160 engages behind the arcuate surface 174 on the tongue keeper element 166 of the keeper fixture

168. Subsequent rotation of the connecting bar 22 and locking tongue element 144 cams the door 17 to the closed position with respect to the door frame. It is to be noted that the bearing point between the tongue 160 and the tongue keeper element 166 is relatively closely spaced to the axis of rotation of the tongue element 144 to minimize any opening moment on the element 144 due to rearwardly shifting loads on the doors 17 and 18. The lower end 143 of the tongue element is journaled in the bore 141 of the frame 130 and thus the tongue element 144 is supported at two axially spaced points to preclude bending or canting thereof.

FIGURE 5 illustrates that the lock frame 130 is provided with an integral rearwardly opening shroud 100 that is of box-like exterior configuration and generally V-shaped internal vertical cross section defined by convergent surfaces 102 and 104. As the door and therefore the lock frame 130 and anti-rack shroud 100 rotate toward the closed position with respect to the door frame, the surfaces 102 and 104 of the anti-rack shroud 100 are engaged over a pair of complementary surfaces 106 and 108 on the keeper element 68, positioning the door 17 vertically with respect to the door frame 42 and precluding subsequent relative vertical movement therebetween. Because the anti-rack shroud 100 on the frame 130 and anti-rack keeper element 168 on the door frame 42 absorb vertical shear forces between the door 17 and the door frame 42, the tongue element 144 and connecting bar 22 that extend between the vertically aligned locks at each end of the connecting bar 22 are not subjected to vertical loads upon the tendency of the door to move vertically relative to the frame. Therefore, the locking tongue is used solely for closing and locking the door and not for an anti-rack purpose which would tend to damage the locking capability between tongue and keeper.

FIGURES 8 and 9 show an alternative embodiment of the invention wherein an elongated protective flange means 181 runs along the length of the edge of the door 17 and is provided with keeper elements 50 for engagement with the tongue elements 52. As can be seen from FIGURES 8 and 9, the protective flange generally runs the length of the door on which it is mounted and provides a recessed channel 183 within which the keeper elements 50 are disposed. The protective flange is advantageous from the standpoint that it acts to prevent the keeper elements 50 from being damaged from exterior blows, etc. As shown in FIGURE 8, the structure used for mounting the protective flange, keeper element, and locking tongue element utilizes a plate 48 on which the lock rod assembly 24 is mounted. Similar to the door locking construction described above, the doors 17 and 18 are sealed by a flexible sealing element 62 which engages the door 17. Also as shown in 58, the keeper element 50 disposed within the recess 183 of the protective flange 181 contains a complementary shaped surface 55 which permits engagement with the tongue element 52 by a camming engagement with the surface 53 on the tongue element.

FIGURE 10 shows another alternative embodiment of the invention wherein the elongated protective flange means 181 is constructed such that it contains a complementary shaped surface 55a on the inside of the flange means. The complementary shaped surface 55a is disposed within the recess generally indicated 183 to again provide for camming engagement with the surface 53 on the tongue element 52 as shown in FIGURE 10. FIGURE 10 also shows that the protective flange means may suitably contain a generally U-shaped portion 182 which wraps around the edge of the door 17 and acts to further strengthen the door construction against racking forces, for example, when the door frame is put under heavy stress, etc., such as when a truck passes through a curve, etc. In this embodiment the flexible seal 62 comes into

contact with the area 184 of the U-shaped portion 182 to make a sealing engagement between the door 18 and the door 17.

In accordance with the invention, it should be apparent that the anti-rack door lock construction herein described is unique in that it provides immovability of door 17 relative to door 18 due to the use of intermediate tongue and keeper type locks 50 which are operable by rotation of the lock rod assembly 24. In addition to doors 17 and 18 being immovable with respect to one another, door 17 is provided with at least one shrouded anti-rack lock 26 which enables that door to be held in fixed position relative to the door frame of the van and also with respect to vertical movement of door 17 relative to the van. Moreover, door 18 is held immovable with respect to the door frame of the van through the use of tongue and keeper type locks 40 and 41, and hence due to all of the above, the van or trailer is provided with a unique ability to resist racking forces which is heretofore unknown in the art.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. An anti-rack door locking construction for a vehicle, trailer, large container and the like including two doors pivotally supported within a complementary door frame, said construction comprising:

an anti-rack lock rod assembly mounted in upright position generally on the end of one of said doors, which end is adjacent the other of said doors when both doors are in closed position, said assembly having locking tongue means on upper and lower ends of said lock rod assembly for securing said assembly to said door frame by engagement with corresponding tongue keeper means for mounting on said door frame thereby enabling said engagement to take place by rotation of said lock rod assembly to secure the tongue means within the keeper means, said assembly also having

intermediate locking tongue means for securing an intermediate portion of the lock rod assembly by rotational engagement to corresponding

intermediate keeper means disposed on the other door, and said other door also having disposed thereon

a lock connecting bar in generally upright position and approximately parallel to said lock rod assembly with said lock connecting bar when said other door is in closed position having generally disposed at each end thereof

locking means for holding said other door in fixed securement to said door frame, said locking means being operated by rotation of said lock connecting bar, at least one of said locking means being

an anti-rack lock means for holding said other door in fixed vertical position relative to said door frame, said anti-rack lock means including

a lock frame rigidly attached to said other door having a box-like shroud overlaying the door frame, the shroud on said frame having an aperture facing the door frame and an outwardly divergent truncated conical internal recess therein,

a keeper fixture rigidly attached to the door frame having a truncated conical portion complementary to the shroud on said lock frame and acceptable therein to absorb racking forces and a tongue keeper element spaced from said door frame, and

a locking tongue element rotatably supported by said lock frame at two axially spaced points and movable between a locked condition and an unlocked condition by rotation of said connecting bar, said locking

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tongue element having a tongue portion engageable with the tongue keeper element on said keeper fixture to retain the door in the locked condition, said construction further including

a flexible sealing member disposed on said other door adjacent said lock rod assembly and generally parallel thereto, said sealing member acting to provide a substantially air-tight seal between the doors when in closed position due to

a bendable flange on the sealing member held in compressed condition when said doors are closed, and

an elongated protective flange means disposed on and extending substantially the length of the door on which it is mounted, said flange means forming said intermediate keeper means.

2. The construction of claim 1 wherein said elongated protective flange means contains

a generally U-shaped portion which wraps around said other door edge to thereby act as a further strengthening against racking forces.

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3. The construction of claim 1 wherein said elongated protective flange means contains

a complementary shaped tongue engaging surface generally extending the length of said door to thereby act as said intermediate keeper means by engaging with the intermediate locking tongue means.

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