June 3, 1941. H. RICHTER 2,244,083

LOCKING DEVICE

Filed April 25, 1940 3 Sheets-Sheet 1

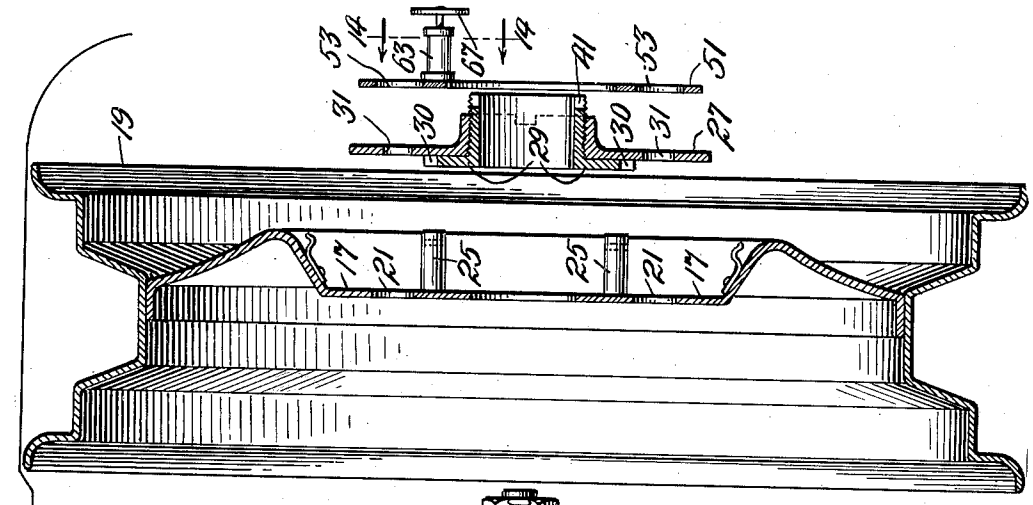


Fig. 2.

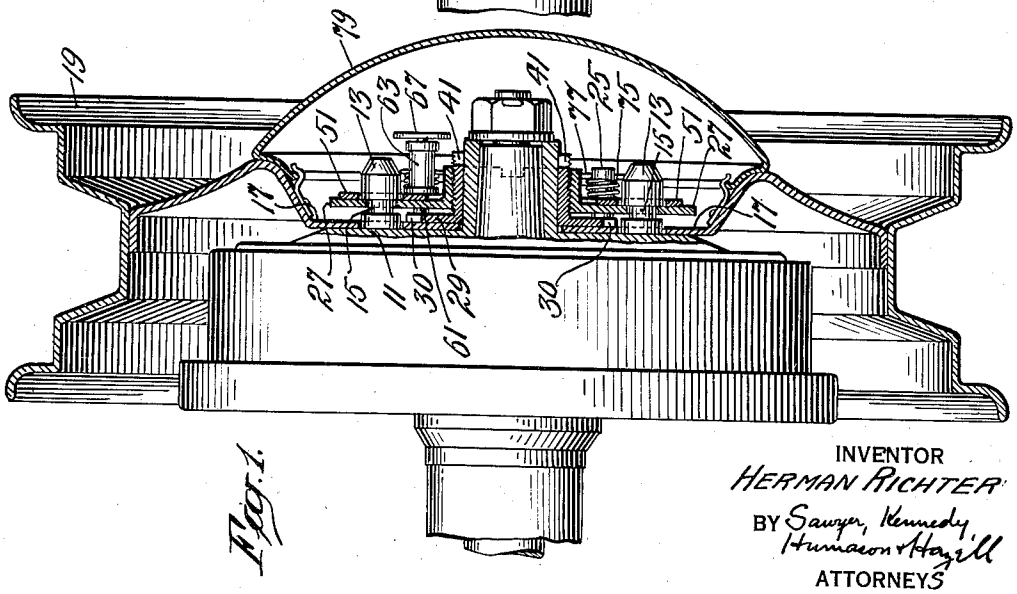


Fig. 1.

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Filed April 25, 1940 3 Sheets-Sheet 2

Fig. 3.

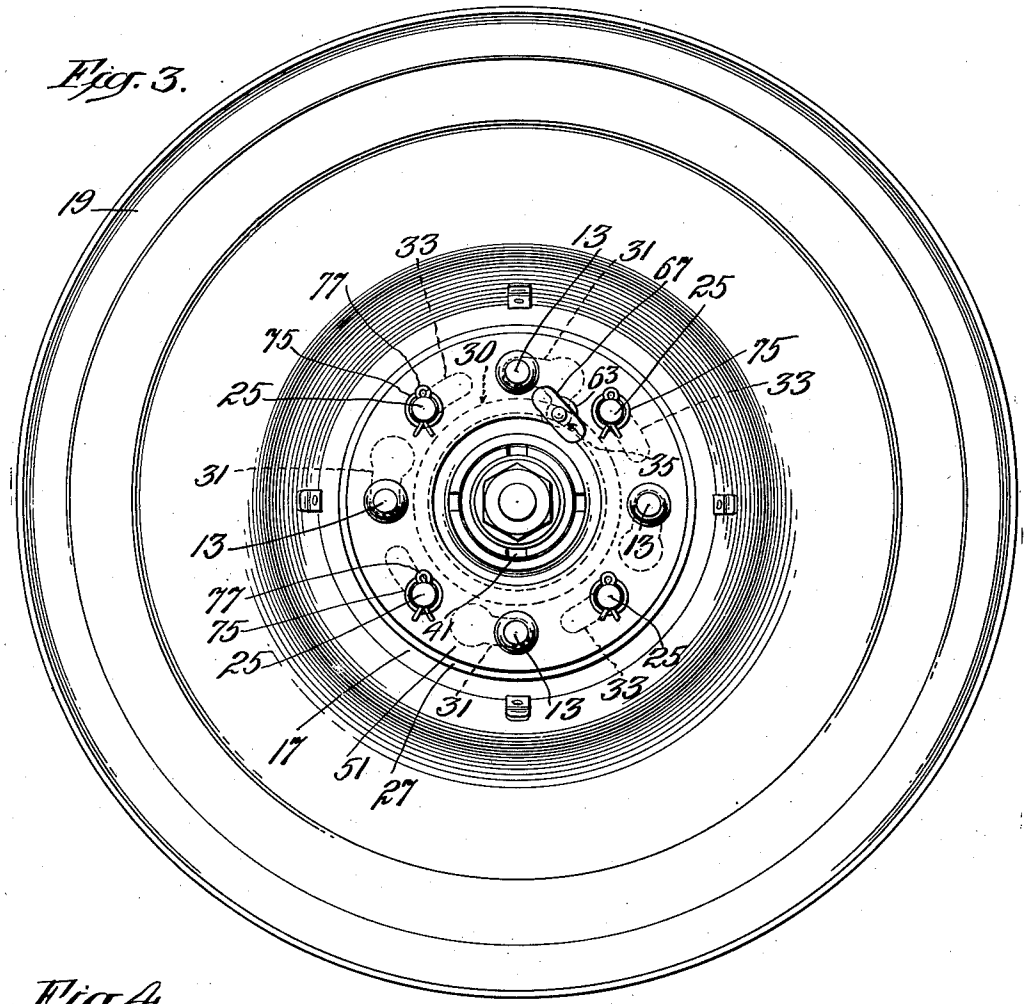


Fig. 4.

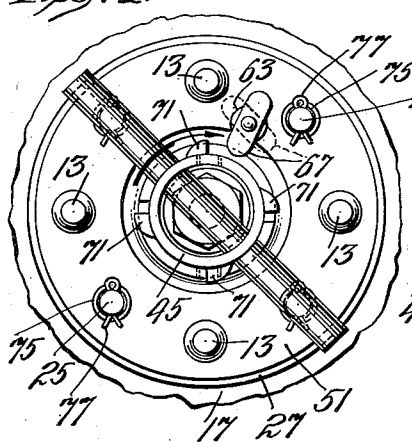
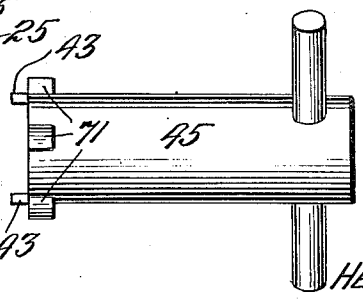


Fig. 5.



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Filed April 25, 1940 3 Sheets-Sheet 3

Fig. 6.

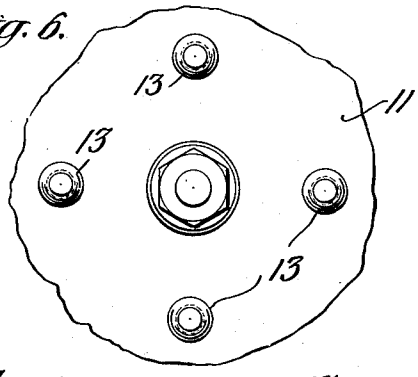


Fig. 10.

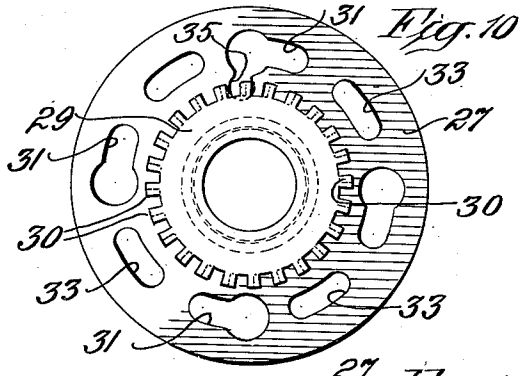


Fig. 7.

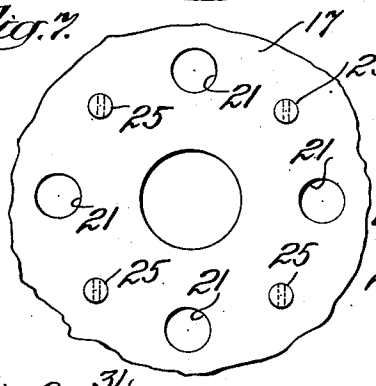


Fig. 11.

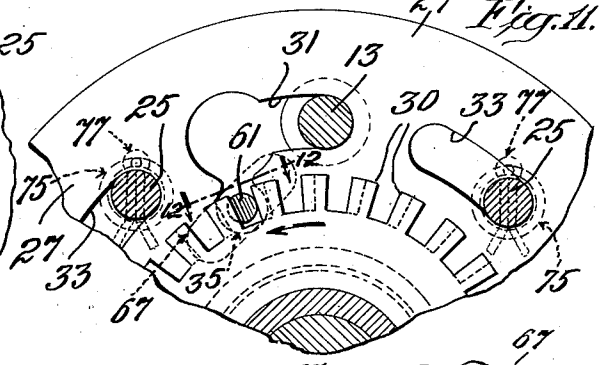


Fig. 8.

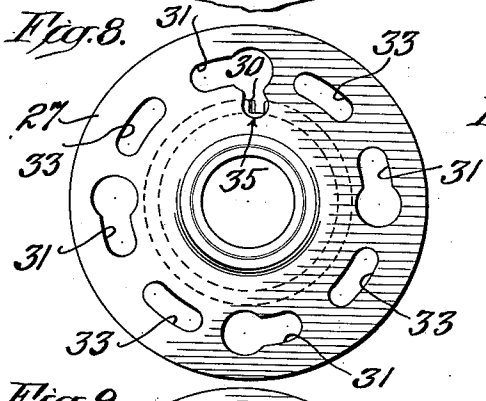


Fig. 12.

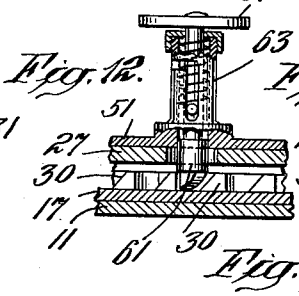


Fig. 13.

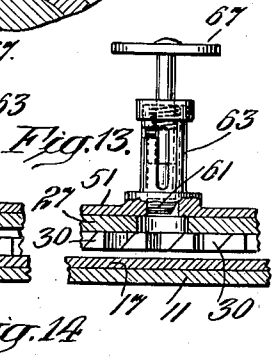


Fig. 14

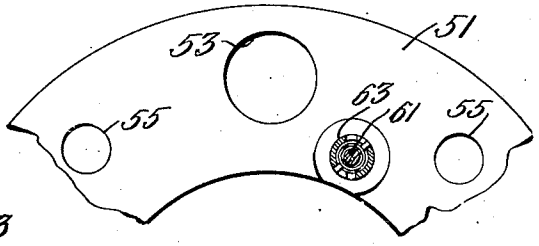
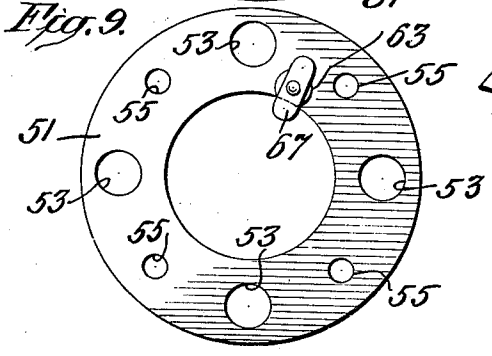


Fig. 9.



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UNITED STATES PATENT OFFICE

2,244,083

LOCKING DEVICE

Herman Richter, Tuckahoe, N. Y.

Application April 25, 1940, Serial No. 331,504

8 Claims. (Cl. 301—9)

The present invention relates to locking devices, and more particularly to devices for detachably locking to a hub member a co-operating member such as a vehicle wheel, propeller or the like.

An object of the invention is to provide a readily removable locking plate and in association therewith a simple construction of holding plate, the assembly being such that it can readily be brought to locked and unlocked position by means of a simple tool.

Other objects of the invention will appear from the following description taken in connection with the accompanying drawings which illustrate a preferred embodiment of the invention and in which,—

Figure 1 is a vertical transverse view, partly in section, showing by way of example a vehicle wheel detachably locked to a hub member by means of the present construction;

Figure 2 is a group view of the parts of Figure 1, with the exception of the hub cap, and showing them axially separated from each other;

Figure 3 is a vertical outside elevation showing the vehicle wheel in locked position without the hub cap;

Figure 4 is a fragmentary outside elevation showing the locking plate tool in position for locking movement;

Figure 5 is a side elevation of the tool;

Figures 6, 7, 8, and 9 are elevations showing the outside faces of the axle hub, the wheel center, the lock plate, and the holding plate respectively;

Figure 10 is a similar view of the lock plate but showing it in rear elevation;

Figure 11 is a fragmentary view thereof on an enlarged scale showing co-operating parts;

Figure 12 is a sectional view through one of the co-operating plates and the holding detent, the parts being in locked position;

Figure 13 is a view of the same parts in unlocked position ready for locking operation by the tool; and

Figure 14 is a sectional view through the holding detent, taken on line 14—14 of Figure 2, and showing part of the holding plate.

Referring in detail to the drawings, a vehicle hub plate 11 is provided with four studs 13, each of which has a neck portion 15 near the bottom of the stud. The neck 15 is slightly wider than the thickness of the lock plate, and the stud body between the neck 15 and the hub plate 11 is longer axially of the stud than the combined thicknesses of the wheel flange 17 and the lock plate toothed ring, hereinafter referred to.

The wheel flange 17 is provided with openings corresponding to the studs 13 and, referring to Figure 2, the wheel 19 is placed on the hub 11 by movement to the left so that wheel flange 17 abuts hub 11 and the studs 13 project through the stud openings 21 in the wheel flange 17.

The wheel flange 17 carries four holding plate studs 25 for a purpose hereinafter referred to.

Referring now to the lock plate of the present invention, this plate comprises two parts, a wheel lock plate proper 27 and a toothed thrust plate 29 threaded therein.

The lock plate 27 is provided with a plurality of hub stud slots 31, one for each hub stud 13. One end of each of these slots is enlarged to fit over the main body portion of the co-operating stud, and the other end of each slot 31 is less wide than the stud diameter but wide enough to receive the hub stud necks 15. The lock plate 27 is provided also with a plurality of slots 33 arranged to receive the wheel studs 25 and permit limited relative rocking motion of the lock plate with respect to the studs into and out of locking position.

The lock plate 27 is also provided with a detent opening 35 arranged directly over the circumferential path of movement of the toothed thrust plate 29.

When the lock plate 29 is positioned upon the wheel studs 25, receiving the hub studs 13 in slots 31, it can be rocked clockwise, as viewed in Figure 8, into locking relation with the stud necks 15. The threaded hub of the toothed thrust plate 29 extends through the lock plate 27 and is provided at its outer end with a pair of diametrically opposite slots or notches 41 for engagement with a pair of lugs 43 on the tool 45, by means of which the toothed thrust plate may be given a rotary movement clockwise, as viewed in Figure 3, with respect to the lock plate 27.

Owing to the threaded engagement of the toothed thrust plate 29 in the lock plate 27, at the beginning of such clockwise movement of the thrust plate by the tool the thrust plate 29 carries with it the lock plate 27, moving it into stud neck engaging locked position. This locking movement of the lock plate, however, is limited by the length of its locking stud slots 31 and therefore rotary movement of the tool 45 will cause rotary movement of the toothed thrust plate 29 with respect to the lock plate 27, the threaded engagement of the parts being such as to cause the toothed thrust plate 29 to travel to the left, as viewed in Figure 2, with respect to the

lock plate itself, until its inner face abuts and thrusts against the wheel flange 17.

Figure 13 shows the relation of these parts at the beginning of clockwise rotary movement by the tool 45 before the toothed thrust plate 29 has begun to rotate with respect to the locking plate. Figure 12 shows the position of the same parts when the toothed thrust plate has arrived against the wheel flange 17. Further movement by the tool 45 forces the lock plate 27 toward the outer ends of necks 15 and against the heads of the locking studs 13 with such force as may be desired.

This grip of the parts, by means of which the wheel flange 17 is held against hub flange 11 by considerable pressure, can be relieved and released only by reverse rotary motion of the toothed thrust plate 29 by the tool 45.

The invention provides a releasable device to prevent such reverse rotation even by means of the tool.

Referring to Figures 2, 9, 11, 12, and 13, the holding plate 51 is provided with a plurality of circular openings 53 to receive freely the lock studs 13 and a plurality of openings 55 to receive the wheel flange studs 25. Directly over the opening 35 in the lock plate 27 the holding plate 51 is provided with a spring pressed detent for co-operation with the circumferentially arranged teeth 30 of the toothed thrust plate 29.

Thus when the lock plate 27 is in locking position the tooth engaging end of the detent extends through the opening 35 into the toothed periphery of thrust plate 29.

The spring pressed detent 61 is movable in detent housing 63 fixed on the holding plate, and the forward end of the detent is beveled on one side for co-operation with the beveled forward faces of the thrust plate teeth 30. On its opposite side the detent has a flat stop face for co-operation with the flat rear faces of teeth 30. During rotation of the thrust plate 29 into locked position, the detent 61 is moved into its housing by each tooth, and under its spring pressure into the space behind the tooth. This continues until the thrust plate 29 has been turned to its final position (Figure 12) against the wheel 17.

The detent then prevents reverse rotation of the toothed thrust plate, and thereby prevents release of the pressure grip of the locked parts.

To facilitate intentional unlocking, however, the detent housing 63 is provided with a right angled slot, in which rides a side pin fixed to the detent. By means of its outer head 67 the detent may be pulled against its thrust spring and then turned to bring the detent side pin into the outer or holding part of the right angled slot (Figure 13) whereupon the detent can be released, its side pin then holding it in withdrawn position out of co-operative relation with the teeth 30. By means of the tool 45, the thrust plate 29 may now be reversely rotated until it abuts the lock plate 27. Slight further rotation in the same direction (clockwise as viewed in Figures 3 and 8) rocks the lock plate 27 out of locking engagement with the studs 15, whereupon the parts may be moved as indicated in Figure 2, to detach the wheel.

The tool 45 is preferably provided with a plurality of detent return lugs 71, so that when the parts are again locked by the tool one or another of the lugs 71 will engage the detent head and move it from the full to the dotted line position of Figure 4. This brings the detent side pin out of the holding portion of its right angled slot and allows the detent spring to return the forward end of the detent into operative engagement with the teeth 30, and continued rotation of the tool clockwise (Figure 4) will lock the assembly as above described.

Means are provided for maintaining the holding plate 51 in pressure engagement with the lock plate. This means of course may be varied in practice but as here shown comprises a plurality of coil springs 75 encircling the studs 25 bearing at their inner ends against the holding plate 51 and at their outer ends against cotter pins 77 or the like, inserted diametrically in openings near the outer ends of the studs 25. It will be understood, however, that other releasable means may be used for this purpose.

It will also be noted that the tool 45 is not an essential element of the present invention since in place of the notches 41 in the threaded hub of the thrust plate 29, said hub may be extended further outwardly and provided with a pin, handle or other gripping means whereby it may be readily rotated. In any event, the locking assembly mechanism per se may be completely concealed by any usual or suitable hub cap 79 which may be spring held in position as indicated in Figure 1.

The detent acts as a positive lock to prevent pressure relieving rotation of the thrust plate, even should such rotation be attempted deliberately when the detent is in locking position. It will be apparent however that the detent is not essential to the construction described, since the thread pitch of the thrust plate and locking plate is in any case such that mere rotation of the lock plate will lock the assembly under such pressure as may be desired.

What is claimed is:

1. A locking device assembly for detachable rotary members, comprising a hub provided with locking studs, a detachable member having positioning openings therein for receiving said studs, a rockable lock plate having locking openings to receive said locking studs, thrust means between the lock plate and detachable member and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said plates for pressing the detachable member against its hub and the lock plate against the locking studs, and a holding plate having releasable stop means cooperating with the thrust means for preventing thrust-pressure relieving movement of the thrust means.

2. A locking device assembly for detachable rotary members, comprising a hub provided with locking studs, a detachable member having positioning openings therein for receiving said studs and itself having holding plate positioning studs fixed thereto, a rockable lock plate having openings to receive said positioning studs and having locking openings to receive said locking studs, a thrust plate between the lock plate and detachable member and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said plates for pressing the detachable member against its hub and the lock plate against the locking studs, a holding plate positioned by said positioning studs and having releasable stop means cooperating with the thrust plate for preventing thrust-pressure relieving movement of the thrust plate, and means for securing said holding plate in position.

3. A locking device assembly for detachable rotary members, comprising a hub provided with

locking studs, a detachable member having positioning openings therein for receiving said studs and itself having holding plate positioning studs fixed thereto, a rockable lock plate having openings to receive said positioning studs and having locking openings to receive said locking studs, a thrust plate between the lock plate and detachable member and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said plates for pressing the detachable member against its hub and the lock plate against the locking studs, a holding plate secured to the locking plate, having positioning openings therethrough to receive said positioning studs, and carrying releasable spring pressed means interlocking with the thrust plate for preventing thrust-pressure relieving movement of the thrust plate, and means cooperating with said positioning studs for securing said holding plate in position.

4. A locking device assembly for detachable rotary members, comprising a hub provided with locking studs, a detachable member having positioning openings therein for receiving said studs and itself having holding plate positioning studs fixed thereto, a rockable lock plate having openings to receive said positioning studs and having locking openings to receive said locking studs, a thrust plate between the lock plate and detachable member and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said plates for pressing the detachable member against its hub and the lock plate against the locking studs, said thrust plate having a plurality of closely arranged projections thereon, a holding plate, releasable stop means carried thereby and cooperating with said thrust plate projections for preventing thrust-pressure relieving movement of said thrust plate, and means for securing said holding plate in position.

5. A locking device assembly for detachable rotary members, comprising a hub provided with locking studs, a detachable member having positioning openings therein for receiving said studs and itself having holding plate positioning studs fixed thereto, a rockable lock plate having openings to receive said positioning studs and having locking openings to receive said locking studs, a thrust plate between the lock plate and detachable member and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said lock plate and detachable member for pressing the detachable member against its hub and the lock plate against the locking studs, said thrust plate having a peripherally arranged series of beveled teeth, a holding plate positioned by said positioning studs, spring pressed releasable beveled detent means carried thereby and engageable with said teeth for preventing thrust-pressure relieving rotation of said thrust plate, and pressure means co-operating with said positioning studs for maintaining said holding plate in position.

6. A detachable wheel locking assembly comprising a vehicle hub provided with a plurality of locking studs each having a locking neck, a wheel having a disc portion provided with positioning openings to receive said studs, said disc portion having holding plate positioning studs fixed thereto, a rockable lock plate having slots to receive said positioning studs and having locking openings to receive said locking studs, said locking openings each having a narrowed portion to fit interlockably a stud neck, a thrust plate between the lock plate and wheel disc portion and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said lock plate and wheel disc portion for pressing the wheel against its hub and the lock plate against the locking studs, said thrust plate having a peripherally arranged series of beveled teeth, a holding plate positioned by the positioning studs, a detent housing carried by the holding plate, a spring pressed beveled detent movable within the housing into and out of engagement with the beveled teeth, and spring means cooperating with the positioning studs and holding plate for maintaining said holding plate in position.

7. A detachable wheel locking assembly comprising a vehicle hub provided with a plurality of locking studs each having a locking neck, a wheel having a disc portion provided with positioning openings to receive said studs, said disc portion having holding plate positioning studs fixed thereto, a rockable lock plate having slots to receive said positioning studs and having locking openings to receive said locking studs, said locking openings each having a narrowed portion to fit interlockably a stud neck, and a thrust plate between the lock plate and wheel disc portion and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said lock plate and wheel disc portion for pressing the wheel against its hub and the lock plate against the locking studs.

8. A locking assembly comprising a member provided with a plurality of locking studs each having a locking neck, a detachable member having a disc portion provided with positioning openings to receive said studs, said disc portion having holding plate positioning studs fixed thereto, a rockable lock plate having slots to receive said positioning studs and having locking openings to receive said locking studs, said locking openings each having a narrowed portion to fit interlockably a stud neck, a holding plate on said positioning studs and having means urging it toward said lock plate, and a thrust plate between the lock plate and disc portion and having threaded engagement in said lock plate and being thereby movable axially of the whole assembly between said lock plate and disc portion for pressing the detachable member against said first named member and the lock plate against the locking studs.

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