

Fixing locking screws to the heads of rim screws.

The present invention relates to the fixing of locking screws to the heads, more particularly hexagon heads of rim screws, bolts or nuts for securing the hub of an anti-skid device for vehicle wheels with pneumatic tyres, especially on ice and snow-covered surfaces, which comprises the hub which is attachable to the wheel disk or rim, respectively, which is provided with perforations for the fixation to the rim screws, wheel bolts or the like, and a supporting disk retained and lockable by means of a retaining ring securable to an accommodating portion formed on to the hub, said supporting disk being fitted with a plurality of anti-skid arms extending radially and spaced apart from each other at uniform intervals, made up of a prebent section engaging over the tyre tread and carrying both on the inside and on the outside on its free ends a gripping section, the prebent section being fabricated from a plastic or some other suitable material with spikes or metal members on the outside.

For driving with motor vehicles in winter on snow-covered ascents and over downhill slopes, besides snow chains, also winter tyres, so-called grip tyres, are employed. Snow chains do not enjoy great popularity since their application on to the vehicle tyres often is laborious and because they have to be driven so as not to damage the roadway, i.e. that on dry roadway sections following snow or ice-covered roadway sections, the snow chains have to be removed, all the more since snow chains are subject to heavy wear when used on dry roadways and, apart from this, they do not allow driving at high speed. Particularly on roads covered with ice at short notice, e.g. in the case of icy surfaces produced by drizzle falling on frozen roadway surfaces, snow chains and grip tyres often are not available. Also the tyres provided with spikes cannot always be used either.

Apart from snow chains and grip tyres, starting aids are known which, however, do not represent a substitute for snow chains and grip tyres. Said starting aids which are comprised of retaining clamps mounted on the tyres merely serve to enable a vehicle to be driven a short distance out of a boggy patch or snow.

From the EP-A-01 34 309, which constitutes the prior art which is being set out from here, an anti-skid device for vehicle wheels with pneumatic tyres, especially for use on ice and snow-covered surfaces, is known which comprises a hub that is attachable to the wheel disk or rim, respectively, and which is provided with perforations for the fixing to the rim screws, wheel bolts or the like, and a supporting disk retained and lockable by means of a retaining ring with a plurality of anti-skid arms extending radially and spaced apart from each other at uniform intervals, made up of a prebent section engaging over the tyre tread and carrying both on the outside and on the inside on its free ends a gripping section, the prebent section being fabricated from a plastic or some other suitable material with spikes or metal members on the outside. For screwing the supporting disk to the wheel disk or the rim of a wheel, respectively, this anti-skid device is provided with a number of perforations for the rim screws, wheel bolts or the like, which centrally bears a hub having, in comparison with the diameter of the attachment disk, a smaller diameter, which, at a distance from the attachment disk, adjacent to its upper rim, on its circumference, possesses a plurality of bead-like lugs with slideways and guideways constructed below said lugs which taper conically from the insertion apertures and extend in the direction of the hub circumference, and which carries the supporting disk with the anti-skid arms which engages around the hub which is secured by means of a retaining ring mounted on the hub, which is provided with locking webs that are insertable into the slideways and guideways on the hub which bring about a bayonet-like locking,

said locking webs having sections that extend in the direction of the insertion apertures and taper conically and, on its inner wall area, at least one leaf spring-like spring-loaded catch which, in the locked position of the retaining ring on the attachment disk, engages into a recess in the circumference of the hub and is supported on a limit stop against unintentional unlocking and, by means of a release key, can be transferred from the locking position into a release position.

In this type of anti-skid device, the hub with the specially constructed retaining ring remains at all times on the wheel disk or wheel rim while, for the operative state of the anti-skid device, the supporting disk with the anti-skid arms is mounted on the hub and locked to the same with the aid of the retaining ring. In order to be able to secure the hub to the wheel disk or rim, the hub is provided with perforations for being fastened to the rims screws, wheel bolts or the like. For this purpose, the hub has a predetermined number of perforations for fastening to the rim screws, wheel bolts or the like. For securing this anti-skid device as well as for securing wheel bolt locks, wheel nut locks, special cover plates and measuring means, a plurality of locking screws, special wheel screws and wheel nuts having different threads, thread lengths, spheres, cones, naves, flat collars, slip-on grooves, spanner openings and materials is required. In addition, the fastening elements often change in new vehicle models. In this known anti-skid device, the problem of compensating for different spanner openings in such a way that it is possible to actuate different rim screw heads with only a few spanner openings is not solved.

The present invention solves the problem of providing a fastening device for an anti-skid device of the type stated in the beginning which is connectable to the heads of rim screws, bolts or nuts, with which it is possible to compensate different spanner openings and with which it is possible to bridge

relatively large tolerances of the spanner openings notwithstanding the circumstance that a secure fit is ensured, moreover, the fastening device is intended to be readily mounted without special tools. An easy detachability and a repeated re-usability is intended to be provided.

This technical problem is resolved by the features stated in the Claim 1. According to this an adapter for heads of rim screws, bolts or nuts for securing a hub of an anti-skid device for vehicle wheels with pneumatic tyres, especially on ice and snow-covered surfaces is provided, in which the anti-skid device comprises the hub that is attachable to the wheel disk or rim, respectively, which is provided with perforations for the fixing to the rim screws, rim bolts or the like, and a supporting disk retained and lockable by means of a retaining ring securable to an accommodating portion formed on to the hub, said supporting disk being fitted with a plurality of anti-skid arms extending radially and so disposed as to be spaced apart from each other at uniform intervals, made up of a prebent section engaging over the tyre tread and carrying both on the outside and on the inside on its free ends a gripping section, the prebent section being fabricated from a plastic or some other suitable material with spikes or metal members on the outside. In this case, the adapter is constructed in such a way that it engages around the head of the rim screw, bolt or nut, the adapter being comprised of a cap-like outer portion and a cap-like inner portion that is engaged over by the outer portion with fixed or loose shaped gripping means that are constructed from longitudinal slots within the inner portion wall in the form of collet-like sections or in the form of individual shaped members, in which, by screwing or pressing the outer portion over the inner portion, thus into each other in the longitudinal direction, the shaped gripping means can be urged against the head of the rim screw, bolt or

nut or the like in order to form a permanent, secure connection between the adapter and the bolts, nuts or the screw head, it being possible for the connection to be disengaged again and to be re-used, and in which, with the aid of the adapter, the hub of the anti-skid device is connected to the bolts, nuts, screw head or the like by means of the tapped holes constructed in the inner portions by means of locking screws.

With this a collet-like adapter is provided which is made up of two component parts, i.e. an inner portion which, on one end, is provided with a tapped hole and an external thread. On the other end it has a collet-like hexagon socket recess which is slotted and, on the outside, constructed with a formed-on cone; furthermore, the outer portion which, on one of its ends, has a tapped hole which matches the external thread of the inner portion and an external hexagon head having the same width across the flats as the hexagon recess of the inner portion. On the other end, the outer portion is provided with a counter cone to the inner portion. When the outer portion is screwed on over the inner portion, the collet-like hexagon socket recess is compressed by the two cones and the adapter, when it is pushed over a hexagon nut or over the hexagon head of a screw, is rigidly and securely connected to the latter. By the outer portion being screwed back, the connection is disengaged again. The tapped hole in the inner portion serves for securing the hub of the anti-skid device to the adapter by means of a locking screw. Since the end of the inner portion with the tapped hole projects over the outer portion, the distance from the nut or screw is not changed by tolerances in the spanner opening or width across the flats. Since only a few spanner opening sizes exist, only a few adapter types are required and have to be stocked for all models and makes of automobiles.

Advantageous embodiments and constructions of the invention are characterized in the subclaims.

In the following the subject matter of the invention is explained with the aid of the drawings. Thus

Figure 1, in the form of a partly vertical section, shows a motor vehicle wheel with anti-skid arms of an anti-skid device engaging over a tyre tread,

Figure 2, in a view from above, shows a section of the supporting disk of the anti-skid device bearing the anti-skid arms,

Figure 3, in a view from above, shows the hub of the anti-skid device,

Figure 4 shows a vertical section of the hub,

Figure 5 shows a side view of the hub,

Figure 6 shows the locking zone on the hub,

Figure 7, in a view from above, shows the retaining ring of the hub for the anti-skid device,

Figure 8 shows a release key in a view from above,

Figure 9 shows the release key in a front view,

Figure 10, partly in a view and partly in a vertical section, shows an adapter fitted on to a wheel locking screw in an embodiment in which the conically constructed wall area sections of the outer portion and of the inner portion press against each other,

Figure 11, partly in a view and partly in a vertical section, shows an adapter fitted on to a wheel locking screw in an embodiment in which the outer portion cone pulls against the inner portion cone,

Figure 12, partly in a view and partly in a vertical section, shows an adapter fitted on to the wheel locking nut in an embodiment in which the outer portion is pushed over the inner portion,

Figure 13, partly in a view and partly in a vertical section, shows an adapter fitted on to a wheel locking nut in an embodiment in which a double cone with loose gripping members is provided,

Figure 14, in a side view, shows a nut that is screwable on to the external thread of the collarlike section of the cap-like component part of the adapter,

Figure 15 shows a vertical section through the nut according to Figure 14,

Figure 16 shows a vertical section of the cap-like adapter component part with collet-like shaped gripping means,

Figure 17 shows a view from below on to the component part according to Figure 16,

Figure 18 shows a vertical section through the clamping sleeve mounted on the cap-like component part, and

Figure 19, in a vertical section, shows the adapter comprised of the nut, the cap-like component part and the clamping sleeve.

As is shown by the Figures 1 and 2, the anti-skid device 10 comprises a supporting disk 20 provided with a central perforation, thus annular in configuration, to which a number of radially extending anti-skid arms 40 are secured which are disposed at uniform distances from each other and that are swivellable within a small area about axes 41 which extend parallel to the bearing axis of the wheel disk. This swivellability of the anti-skid arm within a small area makes it

possible for the anti-skid device to be mounted while the vehicle is stationary. In the course of the first revolutions of the vehicle wheel, the anti-skid arms 40 all rise at a uniform distance from each other, even if, during the mounting operation, within the area of the tyre bearing area on a substrate, such as a road or the like, the anti-skid arms come to lie laterally to the tyre bearing area.

The anti-skid device is secured to the wheel provided with a tyre 13, which at the same time constitutes the rim. The wheel 11 is fitted with a brake part not depicted in the drawing. The tread area of the tyre 13 is identified with 14 and the outer lateral face of the tyre with 15 (Fig.1).

The attachment of each anti-skid arm 40 to the supporting disk 20 is effected with the aid of bolt or rivet-like connecting means, in which connection also a detachable attachment of the anti-skid arms 40 to the supporting disk 20 is possible so as to enable one to replace worn anti-skid arms 40. As is shown in Fig. 2, eight anti-skid arms 40 are provided on the supporting disk 20. The number of the anti-skid arms may be arbitrarily selected. However, there must be at least two anti-skid arms. All anti-skid arms are arranged at the same angular distance from each other. Each anti-skid arm 40 consists of springily resilient material such as e.g. spring steel, so that an elastic bending aside of the free terminal section of each anti-skid arm 40 into the area of the tread 14 of the tyre 13 is possible. The anti-skid arms 40 are preshaped in such a way that, subsequent to the anti-skid device 10 having been mounted on to a vehicle wheel, the anti-skid arms engage over the tyre tread 14 with their free ends. In lieu of spring steel, it is also possible for other suitable materials to be made use of for the manufacture of the anti-skid arms 40. Thus the anti-skid arms 40 may also consist of accordingly suitable plastics.

On the free ends, the anti-skid arms 40 are constructed with slip-proof contours on the outside so that a high degree of skid resistance can be achieved. These slip-proof contours may also be constructed in the form of spikes.

The fastening device for the anti-skid device 10 on the rim 11 of a vehicle wheel comprises a hub 50 and a retaining ring 150 (Figs. 3 and 7).

The hub 50 is provided with a plurality of perforations 51 which serve for the attachment to the rim screws 18. As is shown by Fig. 1, the rim screws 18 may, for the securing of the hub 50, be provided with tapped holes for receiving locking screws 85 by means of which the hub 50 can be secured with the aid of the rim screws to the wheel rim 11 and which serve for securing the hub 50 to the adapter disk described in greater detail in the following or to the wheel bolts or nuts.

The circular disk-shaped hub 50 is centrally provided with an accommodating portion 52 that is circular in cross-section and which is constructed in the form of a shaped member and which is an integrated component of the hub 50. This accommodating portion 52 possesses a diameter which, in comparison with the diameter of the hub 50, is smaller.

On its outer circumference, to be more precise, adjacent to the upper circumferential rim 53, the accommodating portion 52 possesses a number of bead-like lugs 55 which are disposed at uniform distances from each other. In the embodiment depicted in Fig. 3, on the accommodating portion 52 of the hub 50, four bead-like lugs 55 are provided that project laterally from the circumference of the accommodating portion.

A slideway and guideway 60 is constructed below each bead-like lug 55. Said slide and guideway 60 is constructed in the form of a recess and has an insertion aperture 56 from which the

slide and guideway tapers conically in the direction of the terminal area so that the insertion aperture 56, in comparison with the terminal area 56a, is dimensioned so as to be larger. Following this, the recess forming the slide and guideway 60 extends in a cuneiform fashion and, within the area adjacent to the hub 50, is delimited by an annular bead 57. The terminal area 56a of the slide and guideway 60 likewise has a limitation in the form of a limit stop, however, its existence is not mandatory.

The annular bead 57 which is formed on to the outer circumference of the accommodating portion 52, likewise represents the upper limitation of the supporting disk 20 mounted on the accommodating portion 52 of the hub 50 (Fig.3). Within the area of the perforations 51, this annular bead 57 is discontinued since a partial section of each perforation 51 is carried, in the form of a partial drilled hole, as far as into the accommodating portion 52 (Fig.3).

All slide and guideways 60 below the bead-like lugs 55 are constructed and disposed in such a way that their insertion apertures 56 face the terminal area 56a preceding in each case.

Each bead-like lug 55 is advantageously provided with a flattened portion 55a within its upper area in order to facilitate the mounting of the retaining ring 150.

The accommodating portion 52 of the hub 50 serves to receive the supporting disk 20 with the anti-skid arms 40 of the anti-skid-device 10 as well as for receiving the retaining ring 150.

The securing of the supporting disk 20 of the anti-skid device 10 mounted on the hub 50 is effected by means of the retaining ring 150. This retaining ring 150 has an external diameter which is somewhat smaller than the diameter of the hub 50, or equal to the diameter of said hub, it is, on its internal wall area 150a, provided with a number of locking webs 155, whose

number corresponds to the number of the bead-like lugs 55 or to the number of slide and guideways 60 on the accommodating portion 52 of the hub 50. These locking webs 155 are constructed in such a way that they are introduceable into the slide and guideways 60 in such a way that a bayonet-like locking between the retaining ring 150 and the accommodating portion 52 or the hub 50 takes place (Fig. 7). According to this the locking webs 155 are constructed in a cuneiform manner so that, when the retaining ring 150 is mounted on the hub 50, the terminal sections extending or ending in a conical taper of each locking web 155 of the insertion aperture 56 which is faced by the recesses forming the slide and guideways 60 between the bead-like lug 55 and the annular bead 57 so that, when the retaining ring 150 is rotated about its vertical centre axis in the direction of arrow X, the locking webs 155 are inserted into the slide and guideways 60 and the bayonet-like locking is thus achieved (Figs. 6 and 7).

In order to mount the retaining ring 150 on the accommodating portion 52 of the hub 50 in such a way that the locking webs 155 of the retaining ring 150 can be inserted into the slide and guideway, the locking webs 155 have a length which corresponds to the distance between two bead-like lugs 55 on the hub 50. In this way the locking webs 155 can, while the retaining ring 150 assumes the mounting position, be passed through between two bead-like lugs 55 each until the retaining ring 150 comes to rest on the annular bead 57 and the locking webs 155 are insertable into the recesses which form the slide and guideways 60.

In order to avoid a self-acting disengagement of the retaining ring 150 from the accommodating portion 52 or the hub 50, the retaining ring 150 is provided with additional arresting means. Said arresting means are constructed in the form of leaf spring-like spring-loaded catches or detent assemblies 160 and this in the form of springily resilient tabs or blades which are

disposed in recesses 156 in the inner wall area 150a of the retaining ring 150. The disposition and construction of these leaf spring-like spring loaded catches 160 is such that, when the retaining ring 150 is mounted on the accommodating portion 52 of the hub 50, but still in an unlocked position, the leaf spring-like spring-loaded catches 160 are, by the bead-like lugs 55 on the accommodating portion 52, pressed into their recesses 156 in the inner wall area 150a of the retaining ring 150. If the locking of the retaining ring 150 is effected in that the latter is rotated, then the leaf spring-like spring-loaded catches 160 come to be located within the area of the recesses 152 which are constructed in the circumference of the accommodating portion 52. Since the leaf spring-like spring-loaded catches 160 endeavour to automatically spring out of their recesses 156 in the direction of arrow X1, the leaf spring-like spring-loaded catches come to lie within the recesses 152 in the accommodating portion 52 and there form the locking means insofar as the free ends of the leaf spring-like spring-loaded catches come to bear against limit stops 153 which delimit the recesses 152 in the accommodating portion 52. The free ends of the leaf spring-like spring-loaded catches 160 engaging into these recesses with the limit stops 153 thus prevent that the retaining ring 150 disengages against its direction of rotation for locking and comes off the accommodating portion 52.

The number of the leaf spring-like spring-loaded catches 160 on the inner wall area 150a of the retaining spring 150 may be arbitrarily selected. In the embodiment shown in Fig. 7, two leaf spring-like spring-loaded catches 160 are provided which are disposed on the inner wall area 150a of the retaining ring 150a spaced apart at equal distances from each other. The number of the recesses 152 in the circumference of the accommodating portion 52 of the hub 50 does in this case correspond to the number of the leaf spring-like catches 160.

The leaf spring-like spring-loaded catches 160 are constructed contemporaneously with the manufacture of the retaining ring 150. The retaining ring 150 consists of plastics having a springily resilient behaviour if the constructions are in the form of tongues or tabs, as is the case with the leaf spring-like spring-loaded catches 160.

It is also possible for otherwise constructed locking means to be employed in lieu of leaf spring-like spring-loaded catches 160. Thus, by way of example, the possibility exists of using radially displaceable and spring-loaded bolts which engage into corresponding recesses in the circumference of the accommodating portion 52 of the hub 50, however, pertinent steps must be taken for effecting an unlocking insofar as the locking bolts have to be withdrawn into their initial position in order to be able to remove the retaining ring 150 from the hub 50.

In order to be able to remove the retaining ring 150 from the hub 50, it is necessary to transfer the leaf spring-like spring-loaded catches 160 from their locking position into their initial position in the recesses 156 in the inner wall area 150a of the retaining ring 150. For this purpose, the release key 70 depicted in the Figs. 8 and 9 is provided which consists of a grip-like handle 71 which, on one of its free ends, bears two spaced-apart pressure tabs 72,73 which are disposed so as to be positioned approximately vertically relative to the grip-like handle 71. The distance between these two pressure tabs 72,73 corresponds to the distance of the oppositely located leaf spring-like spring-loaded catches 160 from each other so that the pressure tabs 72,73 can be inserted into the two recesses 152 on the hub 50. For this purpose, according to Fig. 7, the two recesses 152 possess, on the accommodating portion 52, additional recesses 75, into which the two pressure tabs 72,73 of the release key can be introduced.

Once the pressure tabs 72,73 of the release key 70 are introduced into these recesses 75 and once the release key 70 is swivelled into the direction of arrow X2 (Fig. 7), then the two leaf spring-like spring-loaded catches 160 which come to lie in the recesses 152 of the accommodating portion 52, are pressed out of said recesses 152 and moved into the recesses 156 in the inner wall surface 156a of the retaining ring 150. In the process, the leaf spring-like spring-loaded catches 160 are inserted so far into their recesses 156 that, within the terminal area of the path of movement of the two pressure tabs 72,73, a limit stop 76 is released, against which the two pressure tabs 72,73 are brought to bear. Once the pressure tabs 72,73 are brought to bear against these limit stops 76, and the release key 70 is continued to be rotated in the direction of arrow X2, then the pressure tabs 72, 73 carry the retaining ring 150 along and, when the rotation is continued, the locking webs 155 are moved out of the slide and guideways 60 of the hub 50, until the locking webs 155 come to be located between the bead-like lugs 55 so that, in this position, it is then possible to remove the retaining ring 150 from the accommodating portion 52.

The mounting of the retaining ring 150 on the accommodating portion 52 is also effected with the aid of the release key 70 in the way that the pressure tabs 72,73 of the release key 70 are inserted into the recesses 75 and, when the release key 70 is rotated in the direction of arrow X (Fig.7), the pressure tabs 72,73 carry the retaining ring 150 along until the locking webs 155 come to lie in the slide and guideways 60 and the bayonet-like locking state is brought about. For the carrying along of the retaining ring 150 by the pressure tabs 72,73 of the release key 70, the recesses 75 within the attachment area of the leaf spring-like spring-loaded catches 160 are provided with limit stops 78 (Fig.7).

As is shown in Fig. 1, the hub 50, on its wall area 50a which faces away from the accommodating portion 52, within the area of the rim screw or wheel bolt perforations 51, is provided with annular spacers or distance members 80 which are constructed in the form of interchangeable adapters. Thereby the possibility is provided, by means of annular spacers 80 of varying dimensions, of being able to adapt the fastening device to different tyre sizes.

The fastening of an anti-skid device 10, comprising the supporting disk 20 with the anti-skid arm 40, on the rim or the wheel 11 of a vehicle while utilizing the fastening device comprised of the hub 50 and the retaining ring 150, is effected in such a way that, subsequent to the hub 50 having been secured with the aid of locking screws 85 that are screwed into the rim screws 18 or into nuts, on the wheel rim 11, the supporting disk 20 of the anti-skid device 10 is mounted on the accommodating portion 52 of the hub 50. Hereupon the retaining ring 150 is mounted so that its locking webs 155 come to be located in the interspaces between the bead-like lugs 155 on the accommodating portion 52. Then the pressure tabs 72, 73 of the release key 70 are inserted into the recesses 75 and the subsequent swivelling of the release key 70 in the direction of the arrow X (Fig. 7), whereby the retaining ring 150 is swivelled about its vertical centre axis until the locking webs 155 on the inner wall area 150a of the retaining ring 150 come to lie in the recesses which form the slide and guideways 60. In a self-resilient manner the leaf spring-like spring-loaded catches 160 engage into the recesses 152 in the accommodating portion 52, whereby the locking against an unintentional detachment or disengagement of the retaining ring 150 is brought about. Due to the circumstance that the free ends of the leaf spring-like spring-loaded catches 160 come to rest inside the limit stop-like recesses 153, a secure locking is ensured. Because of the undercut construction of

these limit stop-like recesses 153 and owing to the free ends of the leaf spring-like spring-loaded catches 160 having an approximately cuneiform configuration, it is ensured that the leaf spring-like spring-loaded catches 160 cannot spring out of said limit stop-like recesses 153 with their free ends.

In this manner, the anti-skid device 10 is, by means of the fastening device of the hub 50 and the retaining ring 150, secured in such a way on the vehicle wheel rim 11 that the anti-skid arms 40 of the anti-skid device 10 engage over the tyre tread.

The removal of the anti-skid device 10 is carried out by having recourse to the release key 70, which, in turn, is introduced with its pressure tabs 72,73 into the recesses 75. By the release key 70 being swivelled, the leaf spring-like spring-loaded catches 160 are displaced from their locking position into their initial position into the recesses 156 in the inner wall area 150a of the retaining ring 150. At the same time, the retaining ring 150 is rotated so far until the locking webs 155 of the retaining ring 150 are moved out of the slide and guideways 60 on the accommodating portion 52. The retaining ring 150 can then be lifted off. A pulling off of the supporting disk of the anti-skid device 10 from the accommodating portion 52 of the hub 50 follows next. In a continued non-use of the anti-skid device 10, but while the fastening device is kept in readiness, solely the retaining ring 150 is mounted on the hub 50 and locked there, so that the possibility exists at all times of fitting the anti-skid device 10, should this become necessary.

The supporting disk 20 of an anti-skid device 10 is provided with a central perforation so that the supporting disk 20 can be mounted on the accommodating portion 52 of the hub 50. However, the diameter of this central perforation is larger than the diameter of the accommodating portion 52 so that

the supporting disk 20 of the anti-skid device 10 on the accommodating portion 52 is able to execute eccentric movements. In this way it is possible for the anti-skid arms 40 which engage around the tyre tread in connection with the supporting disk 20, to adapt to the kneading motions of the rolling tyre. In addition, the diameter of the central perforation in the supporting disk 20 is dimensioned in such a way that the supporting disk 20 can be passed over the annular bead 57 on the accommodating portion 52. The upward securing of the supporting disk 20 is effected with the aid of the retaining ring 150 engaging over the supporting disk by sections, while the securing in the direction of the rim is effected by the hub 50 itself.

In order to be able to fasten the anti-skid device 10 to the rim 11 of a vehicle wheel, it is necessary for the hub 50 of the anti-skid device to be connected to the rim. This is done by means of rim screws which, however, must possess a special design in order to be able to accommodate the actual locking screws 85 of the hub 50. It is necessary for this reason to employ rim screws which have a special design in order to be able to secure the hub 50. For this purpose, specially constructed rim screws are mostly used and, on account of the multitude of motor vehicle types it is also necessary that a great number of wheel rim screws are then available and kept in stock so as to be able to use the anti-skid device for the different motor vehicle models.

By the use of an adapter 400, as depicted in the Figs. 10 to 19, the possibility exists of employing rim screws that are on hand and of being able to attach the locking screws which serve to secure the hub 50 by means of the adapter. This adapter 400 in its various embodiments is constructed in such a way that the adapter fitted to the head of a rim screw brings about the connection between the rim screw and the locking screw 85 of the hub. Since the adapter 400 can be appropriately

employed for the different rim screws, bolts or nuts, it will not be necessary to produce a multitude of adapters and to keep these in stock, but it suffices if e.g. three adapter sizes are on hand. Surprisingly it is possible to operate with these three adapter sizes all the rim screws of known motor vehicle models.

The adapter 400 engages around or engages over the head 435, such as a hexagon head or the like of a rim screw 434 or a nut or the head of a wheel bolt.

In the embodiment depicted in Fig. 10, the adapter 400 is comprised of a cap-like outer portion 401 and of a cap-like inner portion 405 engaged over by the outer portion. The outer portion 401 is screwed over the inner portion 405 by means of a thread indicated with 431. As appears from Fig. 10, the inner portion 405 possesses a collar-like constricted upper shoulder which is provided with an external thread, while the upper collar-like constriction of the outer portion 401 is provided with an internal thread so that the outer portion 401 can be screwed over the inner portion 405 by means of the thread 431. The outer portion 401, adjacent to its lower circumferential rim, on the inner wall side, has a wall section 416 which tapers conically in the direction of the rim, while the inner portion 405, adjacent to its lower circumferential rim, on the outer wall side, has a wall section 417 which widens conically in the direction of the rim, so that, in the connected state of the outer portion 401, the conical wall area 416 is, with the inner portion 405, pressed against the conical wall area 417.

The cap-like part of the inner portion 405 has a plurality of arm-like shaped gripping means 409 which are separated from each other by vertically extending slots 413 within the inner wall area, in which, however, said arm-like shaped gripping means 409 are rigidly connected with their upper ends to the shaped member of the inner portion 405. By means of this

slot construction, the shaped gripping means 409 are in a certain respect movable, i.e. resilient and, when the outer portion 401 is screwed on to the inner portion 405, pressed against the head 435 of the screw 434 in such a way that a firm fit of the adapter 400 on the screw head 435 is ensured. The mounting of the inner portion 405 of the adapter 400 on the screw head with the aid of the shaped gripping means 409 is in this case effected in a collet-like fashion so that the shaped gripping means 409, by means of the outer portion 401, which is engaged over the inner portion 405, are kept subjected to a press fit and bear firmly against the screw head 435. If it is assumed that the screw head 435 in question of the screw 434 is a hexagon head, in that case both the inner portion 405 as well as the outer portion 401 are appropriately contoured and hexagonally configured so that an engagement over the screw head is ensured, in which case the shaped gripping means 409 which possess a certain resilience or mobility, rest against the outer surfaces of the hexagon screw head. The number of the slots 413 in the inner portion 405 is selected in such a way that six arm-like shaped gripping means 409 are formed. However, it is not necessary for the outer and inner portions to be constructed so as to be hexagonal.

If the outer portion 401 is placed over the inner portion 405 and screwed on to the inner portion 405, then the outer portion 401 is displaced in the direction of arrow A, while the cuneiformly constructed circumferential wall section 416 then moves the cuneiformly constructed wall sections 417 of the shaped gripping means inwardly so that the shaped gripping means 409 are pressed in the direction of arrow Z against the screw head 435. Also the outer portion 401 is, for actuation purposes, provided on the outside with a hexagon head 428 which is advantageously constructed like the hexagon head 435 of the rim screw 434 so that no special tools will be required

for screwing the outer portion 401 on to the inner portion 405. The inner portion 405 is provided, centrally and extending in the longitudinal direction of the screw, with a tapped hole 424 which serves to receive a screw not shown in the drawing, with the aid of which extraneous parts, such as e.g. the hub 50 of the anti-skid device 10, are subsequently secured. Thus the adapter 401 is retained while subject to clamping fit on the screw head 435 of the screw 434. By rotation in the opposite direction, the outer portion 401 can be screwed off from the inner portion 405 so that it is possible to lift the adapter 400 from the screw head 435 of the screw 434.

Figure 11 shows an embodiment of an adapter 400, in which the outer portion 402 is provided with a drawing or pulling cone 418 which presses pullingly against the cone 419 of the inner portion 406 when the outer portion 402 is screwed on to the inner portion 406 in the direction of arrow B by means of the thread 432. In the process, the movable shaped gripping means 410 constructed by the slots 414 in the inner portion wall against the hexagon head 437 of the wheel nut 436. For actuation purposes, the outer portion 402 has, on the outside, a hexagon head 429 and a tapped connecting bore 425. In this embodiment, too, the outer portion 402, adjacent to its lower circumferential rim, on the inner wall side, has a wall area 418 which expands conically towards the rim, while the inner portion 406, adjacent to its lower circumferential rim, on the outer wall side, has a wall area 419 which tapers conically towards the rim so that, in the connected state of the outer portion 402 with the inner portion 406, the conical wall area 418 pulls against the conical wall area 419, the shaped gripping means 410 being pressed against the screw head in the process.

Figure 12 shows an embodiment of an adapter 400, in which a round outer portion 403 is provided with an internal conical

wall area 420 which presses against the conical wall area 421 of the inner portion 407 when the outer portion 403, by tightening the screw 442 in the receiving thread 427, when securing a device 443 in the direction of arrow A, is pushed over the inner portion 407. By means of this also the shaped gripping means 411 constructed in this embodiment on the inner portion 407, which are formed by vertically extending slots 415 in the inner portion wall and which consequently are movable, e.g. can be bent aside, are pressed against the hexagon head 439 of the rim screw 438. The circumferential marginal areas of the outer portion 403 and of the inner portion 407 which engage over each other possess a conical construction of their inner and outer surface areas, as has also been provided in the embodiment according to Fig. 10.

In the embodiment of an adapter shown in Fig. 13, an inner portion 408 is provided with a hexagon actuating head 430 and a tapped receiving hole 426 which, by being screwed over the thread 433 into the outer portion 404 in the direction of arrow A, brings the two conical wall areas 422, 423 together and, in so doing, presses the shaped gripping means 412, 412a constructed on the inner portion 408 in the same manner as in the embodiments described in the foregoing against the hexagon head 441 of the wheel disk 440. As Fig. 13 shows, a double conicity is provided here, viz. firstly, within the lower inner wall area of the outer portion and, secondly, within the lower wall area of the inner portion which, in comparison with the outer portion, has a shorter length.

If the outer portions 401, 402, 403, 404 are moved opposed to the directions of arrows A and B to the inner portions 405, 406, 407, 408, then the shaped gripping means 409, 410, 411, 412, 412a disengage from the hexagonal surfaces of the hexagon heads 435, 437, 439, 441 of a rim screw, a nut or the head of a bolt.

The construction of the adapter 400 is not restricted to the form depicted in the Figs. 10 to 13 and described in the foregoing; it depends on the intended use and area of application of the adapter; the adapter is thus not only employable in the area of motor vehicles, but can be used wherever two fasteners are intended to be non-positively interconnected.

A further embodiment of an adapter 400 is depicted in Fig. 19. This adapter is comprised of a nut 450, a cap-like component part 460 and a sleeve 470. At the bottom, the nut 450 is provided with a circumferential rim 451; it has a longitudinal drilled hole 452 and an internal thread indicated with 453 (Figs. 14 and 15). The longitudinal drilled hole 452 is so dimensioned that the nut 450 can be screwed on to the component part 460 of the adapter, which component part will be described in the following in greater detail.

According to the Figs. 16 and 17, the cap-like component part 460 is comprised of a shaped member with an upper constricted collar or neck-like section 462 which is provided with an axial longitudinal drilled hole 463 which has an internal thread indicated with 464. With 462, an external thread is indicated. The diameter and the dimensions of this collar-like section 462 are selected in such a way that the nut 450 shown in the Figs. 16 and 17 can be screwed on to the collar-like section 462 of the component part 460. The internal drilled hole 463 of the component part 460 serves to receive a securing or locking screw not shown in the drawing for attaching the hub 50 for fastening the anti-skid device described in the foregoing.

The collar-like section 462 of the component part 460, while forming a circumferential shoulder 461, passes into a cap-like section, whose wall area 466 is provided with a number of longitudinal slots 467 so that, between two longitudinal slots, an arm-like shaped gripping means 469 is formed. The

wall area 466 with the shaped gripping means corresponds in its construction with reference to the shaped gripping means 409, 410, 411, 412, 412a to the adapter embodiment depicted in the Figs. 10 to 13. Also these shaped gripping means 466 possess a certain mobility due to the material used and, as described in greater detail in the following, allow themselves to be moved in the direction of arrow Z subsequent to the nut 450 having been tightened and after the sleeve 470 has been mounted (Fig. 18), so that the adapter, after the mounting of its component 460 on a hexagon screw not depicted in the drawing, is securely held in position and secured in such a way on the head of the hexagon screw that a pulling off or self-acting disengagement is not possible.

Subsequent to the sleeve 470 having been fitted to the component part 460, as shown in the Fig. 19, the nut 460 is screwed on to the collar-like section 462 of the component 460, as a result of which the circumferential rim 451 of the nut 450 rests upon the upper circumferential rim 471 of the sleeve 470. By tightening, i.e. by a further screwing-in of the nut 450, the sleeve 470 is moved downwardly in the direction of arrow C, with the result that, due to the conical design of the lower marginal areas, the shaped gripping means 469 are pressed in the direction of arrow Z against the surfaces of the hexagon screw on which the adapter is intended to be secured. In order to bring this about, the shaped gripping means 469 are, within their lower marginal areas, provided with a circumferential wall section 468 which expands in a conical fashion in the outward direction. The lower circumferential rim 472 of the mounted sleeve 470 then comes to bear against the oblique wall area 468 of the component part 460 and, when a further vertical downward movement of the sleeve 470 is effected, owing to the pressing effect taking place, an urging of the shaped gripping means 469 against the hexagon head of a screw is achieved. The circumferential

contact rim 472 of the sleeve 470 can, as depicted in Fig. 18, be constructed so as to be outwardly bevelled in order to achieve a perfect gliding or sliding on the conical wall area 468 of the component 460 when the sleeve 470, when the nut 450 is tightened, is moved downwardly in the direction of arrow C. On account of the annular construction of the sleeve 470, the wall area of the sleeve constitutes a counterpressure area when being slid on to the shaped gripping means 469, so that the wall area of the sleeve 470 cannot avoid the pressure of the shaped gripping means 469, but the shaped gripping means 469 are moved in the direction of the arrows Z in order to press against the hexagon head. Within the area of the upper and/or lower circumferential rim, the inner wall area of the sleeve 470 is constructed so as to taper conically in the outward direction.

The cap-like section of the component part 460 may, as shown in the Fig. 17, be circular, however, the possibility also exists of selecting a cross-sectional configuration which corresponds to the shape of a hexagon head. The circular shape of the cross-section of the shaped member 460 results in the advantage that the component 460 can be mounted not only on screws having a hexagon head, but also on heads having different shapes. It is surprising that, due to the design of the adapter 400, the same fits so firmly on every shape of head and, in particular, on hexagon heads, that a pulling off or detachment from the hexagon head of a screw is not possible.

The individual parts of the adapter 400 consist of metallic materials. The movability, or the possibility of the slight bending aside and springing back into the initial position of the shaped gripping means 409, 410, 411, 412, 412a and 469 is achieved on the basis of selecting suitable materials. Suitable types of steel, in particular steel possessing springily resilient properties, may be used. However, also other suitable materials may be made use of. The cap-like section of

the component 460 has the shape of a cylinder which is open at the bottom and whose cylinder wall is provided with the longitudinal slots 467, while the outer wall area of the cylinder to the bottom rim, extends so as to expand conically in the outward direction.

With the adapter 400 according to Fig. 19 on the other hand, a device is provided which renders it possible to attach components by means of fastening screws on available and common screws. The adapter is merely placed on the head of the screw on hand and, by tightening the nut 450, by means of the downward movement of the sleeve 470, the shaped gripping means 469 are pressed against the screw head and the adapter is retained on the screw head by press fit, the adapter being secured against being pulled off from the screw head due to the shaped gripping means 469 engaging around the screw head in a collet-like manner. It is only when the nut 450 of the adapter is loosened that the pressing effect of the shaped gripping means 469 on the screw head is abolished in that the sleeve 470, due to being moved upwardly, is detached from the conical wall sections 468 of the shaped gripping means 469, it then being possible to pull the adapter off the screw head. The adapter can be fitted on to all common screw heads when the dimensions of the adapter are appropriately selected. Since all known rim screws for vehicle wheels lie within a dimension range having slight upward or downward divergences, the possibility exists of being able to manage with only e.g. three sizes in order to cover all known rim screws or bolts. Due to the circumstance that the nut of the adapter is provided on the outside with a hexagon, an actuation of the nut with known and available tools is possible. The component of the adapter constructed in a cap-like manner possesses an internal and a cross-sectional shape which renders a fitting on conventional screw heads possible, in which connection it is also possible for the cross-section of the cap-like component

part to likewise be hexagonal, whereby the possibility then exists of mounting the adapter on screw heads that possess a circular cross-section. An adapter with a component whose cap-like section possesses a circular cross-section can also be fitted on the head of a hexagon screw since, in all cases, when the nut 450 is tightened, the shaped gripping means 469, with the aid of the sleeve 470 acted upon by the nut, are pressed against the screw head around which they engage in a collet-like manner.

This effect of the shaped gripping means is achieved in that the externally located conical wall areas 468 within the area of the downward movement of the sleeve 470, when the nut is turned, are pressed in the direction towards the screw head with the result that the shaped gripping means are pressed against the screw head. The securing of the hub of the anti-skid device described in the foregoing is brought about by means of a locking or securing screw which is screwed into the longitudinal drilled hole of the inner portion of the adapter after the nut has been screwed on to this adapter component in such a way that the adapter is retained on the head of the rim screw.

PATENT CLAIMS

1. Fixing a locking screw (85,442) to the heads (435,437,439, 441), more particularly hexagonal heads, of rim bolts (18,434,438,440), wheel bolts or nuts (436) for securing the hub (50) of an anti-skid device (10) for vehicle wheels with pneumatic tyres, especially on ice and snow-covered surfaces, which comprises the hub (50) that is attachable to the wheel disk or rim (11), respectively, which is provided with perforations for the fixing to the rim bolts (18,434,438,440), wheel bolts or the like, and a supporting disk (20) retained and lockable by means of a retaining ring (150) securable to an accommodating part (52) formed on to the hub (50), said supporting disk (20) being fitted with a plurality of anti-skid arms (40) extending radially and spaced apart from each other at uniform intervals, made up of a prebent section engaging over the tyre tread (14) and carrying both on the outside and on the inside on its free ends a gripping section, the prebent section being fabricated from a plastic or some other suitable material with spikes or metal members on the outside, characterized in that,
in each case, between a locking screw (85,442) and a rim screw, rim bolt or nut, an adapter (400) is disposed, in that the adapter (400) engages around the head (435,437, 439,441) of the rim screw, bolt or nut and comprises a cap-like outer portion (401;402;403;450) and a cap-like inner portion (405;406;407;408;460) that is engaged over by the outer portion with fixed or loose shaped gripping means (409;410;411;412;412a;469) which are constructed from longitudinal slots (413;414;415;467) within the inner portion wall in the form of collet-like sections or in the form of individual shaped members (412,412a), in which, by screwing or pressing the outer portion (401;402;403;404;450) over the inner portion (405;406;407;408;460), thus into each other in the longitudinal direction, the shaped gripping



means (409;410;411;412;412a;469) can be pressed against the head (435;437;439;449;441) of the rim screw, bolt or nut in order to form a permanent, secure connection between the adapter (400) and the head (435;437;439;441), it being possible for the connection to be detached again and to be re-used, and in that, with the aid of the adapter (400), the hub (50) of then anti-skid device (10) is connectable with the heads (435;437;439;441) by means of the tapped holes (424;425;426;427;464) constructed in the inner portions and for the locking screws (442) being screwed there-into.

2. Fastening device according to Claim 1, characterized in that the outer portion (401;403) of the adapter, adjacent to its circumferential rim, on the inner wall side, has a wall area (416;420) which tapers conically towards the rim, and that the inner portion (409;407), adjacent to its lower circumferential rim, on the outer wall side, has a wall area (417;421) which enlarges conically towards the rim, while, in the connected state of the outer portion (401;403), the conical wall area (415;420) presses with the inner portion (416;420) against the conical wall area (417;421).
3. Fastening device according to Claim 1, characterized in that the outer portion (402) of the adapter (400), adjacent to its lower circumferential rim, on the inner wall, has a wall area (418) which enlarges conically towards the rim, and in that the inner portion (406), adjacent to its lower circumferential rim, on the outside wall, has a wall area (419) which tapers towards the rim, while, in the connected state of the outer portion (402), the conical wall area (418), with the inner portion (406), pulls against the conical wall area (419).



4. Fastening device according to Claim 1, characterized in that the outer portion (404), within its lower area, on the inner wall, has a wall area (423) that widens towards the rim, and in that this conical wall area (423) and a conical wall area (422) on the inner portion (408) press against the double cones of the loose shaped gripping members (412;412a).
5. Fastening device according to Claims 1 to 4, characterized in that the outer portion and the inner portion of the adapter (400) are provided with a conical thread.
6. Fastening device according to Claims 1 to 5, characterized in that the outer portion (401;402) is screwed over the inner portion (405;406).
7. Fastening device according to Claims 1 to 6, characterized in that the outer portion (403) is slidable over the inner portion (407).
8. Fastening device according to Claims 1 to 7, characterized in that the inner portion (408) can be screwed into the outer portion (404).
9. Fastening device according to Claims 1 to 8, characterized in that the inner portion is constructed in the form of a sheet metal part.
10. Fastening device according to Claims 1 to 9, characterized in that the inner portion (408;412;412a) is constructed so as to form several parts.
11. Fastening device according to Claims 1 to 10, characterized in that the outer portion is constructed in the form of a drawn metal part.
12. Fastening device according to Claims 1 to 11, characterized in that the inner and the outer portion are constructed in the form of shaped parts.



13. Fastening device according to Claims 1 to 12, characterized in that the inner portion is provided with a threaded connecting bolt.
14. Fastening device according to Claims 1 to 13, characterized in that the shaped gripping means (409;410;411;412; 421a;469) have a slip-resistant surface on the inside.
15. Fastening device according to Claims 1 to 14, characterized in that the inner portion is provided with a recess for a retention locking means.
16. Fastening device according to Claims 1 to 15, characterized in that the outer portion is provided with a recess for a retention locking means.
17. Fastening device according to Claims 1 to 16, characterized in that the inner portion is provided with a locking connection.
18. Fastening device according to Claim 1, characterized in that the adapter (400) comprises a nut (450) with a laterally projecting circumferential rim (451) and with a coaxial longitudinal drilled hole (452) with an internal thread (453), of a cap-like internal component part (460) that can be mounted on the hexagonal head of the rim screw, which is provided with an upper throat-like constricted section (462) with an external thread (465) for receiving the internal thread (453) of the nut (450) and with a central longitudinal drilled hole (463) with an internal thread (464) for receiving the locking or securing screw of the hub (50) of the anti-skid device (10), in which the cap-like section of the component part (460) is provided with a circular cross-section and with longitudinal slots (467) in its wall for forming a plurality of positionally changeable shaped gripping means (469) that can be bent aside laterally and which spring back into their initial position,



and of a sleeve (470), the internal diameter of which corresponds approximately to the outer diameter of the cap-like section of the component part (460) and the lower circumferential rim (472) of which, with the sleeve (470) mounted on the component part (460) and with the nut (450) screwed on to the conically outwardly widening lower wall area (468) of the shaped gripping means (469) of the component part (460), while exerting a pressing effect on the shaped gripping means (469) while simultaneously forming a press fit of the shaped gripping means (469), is seated upon the hexagonal head of the rim screw.

19. Anti-skid device for vehicle wheels with pneumatic tyres, especially on ice and snow-covered surfaces, which comprises a hub (50) attachable to the wheel disk or rim (11), respectively, which is provided with perforations for the fixing to the rim bolts (180, 434, 438, 440), wheel bolts or the like, by means of a supporting disk (20) retained and lockable by means of a retaining ring (150) securable to an accommodating part (52) formed on to the hub (50), said supporting disk (20) being fitted with a plurality of anti-skid arms (40) extending radially and spaced apart from each other at uniform intervals, made up of a prebent section which engages over the tyre tread and which carries on the outside and on the inside, on its free ends, a gripping section, the prebent section being fabricated from a plastic or some other suitable material with spikes or metal members on the outside, characterized in that the anti-skid device (10) comprises a fastening device with an adapter (400) according to the Claims 1 to 18.

