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(54) **Snow chains with a limited bulk**

Schneekette mit einer limitierten Aufbauhöhe

Chaîne anti-dérapante avec volume limité

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(73) Proprietor: **Thule S.p.A.**
23847 Molteno (Lecco) (IT)

(72) Inventors:
• **Arrigoni Neri, Marco**
23811 Ballabio (Lecco) (IT)

• **Farina, Luigi**
23843 Dolzago (Lecco) (IT)

(74) Representative: **Petruzziello, Aldo et al**
Racheli & C. S.p.A.
Viale San Michele del Carso, 4
20144 Milano (IT)

(56) References cited:
FR-A- 742 649 **FR-A- 2 755 644**
US-A- 1 667 686 **US-A- 1 855 279**
US-A- 2 281 655

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Description

[0001] The present invention refers to anti-skid devices or snow chains designed to be mounted on vehicle tyres and in particular to snow chains which, when mounted, have a limited bulk.

[0002] When a vehicle travels on a road surface covered with snow, sleet or ice, its tyres do not have a good grip and dangerous side slipping or skidding of the vehicle can occur. To avoid these problems it is customary to use anti-skid devices, commonly called snow chains.

[0003] The snow chains, normally mounted on the driving wheels of the vehicle, bite into the snow and/or the ice deposited on the road surface, increasing the tread traction and allowing the vehicle tires to achieve a good grip.

[0004] As is known, a snow chain generally consists of two side members (chains, flexible cables, steel wires, ropes or the like) which, during the use, are closed in a ring on the inner side and on the outer side of the wheel, respectively, and which will be referred to herein as the inner ring and the outer ring. These side members are connected by a series of chain portions variously disposed to achieve the tread traction, the whole being completed by a tensioning device for said members, known as a tensioner.

[0005] The snow chains normally have straight links, that is each link has a substantially elliptical shape and is disposed on a plane perpendicular to that of the adjacent links.

[0006] These snow chains, besides having a considerable bulk on the tread of the tyre, involve a considerable bulk above all on the sides thereof, also because of the joining means used. This contrasts with the increasingly great needs in modern vehicles to have extremely small spaces, especially between the inner side of the tyre and the mechanical members of the vehicle.

[0007] FR 742 649, US 1.855.279 and FR 2 755 644 disclose snow chains comprising portions of chain with twisted links and a triangular connection element connecting the end of the chain portions, according to the preamble of claim 1.

[0008] US 1.667.686 discloses an anti-skid device of the type embodying cross or tread members and side or retaining members.

[0009] US 2.281.655 discloses a snow chain comprising portions of chain with twisted links and a split sleeve for the connection of the chain portions to the ring of snow chain.

[0010] Object of the present invention is to overcome the drawbacks of the prior art by providing a snow chain that has a limited bulk, especially on the sides of the tyre and therefore does not interfere with the mechanical members of the vehicle.

[0011] Another object of the present invention is to provide a snow chain that is reliable and at the same time cheap and simple to produce.

[0012] Another object of the present invention is to pro-

vide a snow chain that is practical and simple to use for the user.

[0013] These objects are achieved, in accordance with the invention, with the characteristics listed in appended independent claim 1.

[0014] Preferred embodiments of the invention are apparent from the dependent claims.

[0015] The snow chain according to the invention comprises:

- an inner ring, designed to be closed on the side of the wheel destined to face toward the inside of the vehicle,
- an outer ring, designed to be closed on the side of the wheel destined to face toward the outside of the vehicle, and
- a series of portions of anti-skid chain, disposed on the tread of the tyre of the wheel, which join the outer ring and the inner ring.

[0016] The portions of chain are chains with twisted links, that is chains in which each link has undergone a twisting around its major axis. These portions of chain are connected to each other by means of joining elements shaped as triangular links and are connected to the inner ring by means of a U-bolt connecting system.

[0017] These systems for joining and for connecting the portions of chain are designed so as to allow the rotation of the portions of chain around the joining and connecting elements and at the same time to occupy the smallest space possible so as not to interfere with the mechanical members of the vehicle. Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the appended drawings, in which:

- Figure 1 is a perspective view illustrating a snow chain according to the invention, applied to a tyre of a wheel shown from the side facing towards the inside of the vehicle;
- Figure 2 is an enlarged view of a detail of the Figure 1 illustrating a triangular joining element for joining portions of chain to each other;
- Figure 3 is an enlarged view of a detail of Figure 1, illustrating two U-bolt connecting systems for joining the portions of chain of the inner ring of the snow chains;
- Figure 4 is a perspective exploded view illustrating the U-bolt connecting system of Figure 3; and
- Figure 5 is an enlarged view of a detail of Figure 1 illustrating a closing device for closing the inner ring of the snow chains.

[0018] Figure 1 shows a wheel of a vehicle provided with a tyre 1 on which a snow chain, denoted as a whole with the reference numeral 2, is applied as an anti-skid device.

[0019] The chain 2 comprises:

- a member 3 which can be closed in a circle or in a ring on the side of the wheel destined to face towards the inside of the vehicle, henceforth called the inner ring 3,
- a member (not shown) which can be closed in a circle or in a ring on the side of the wheel destined to face toward the outside of the vehicle, henceforth called the outer ring 4, and
- a series of portions (10, 10') of anti-skid chain, variously disposed on the tread of the tyre 1 of the wheel, which join the outer ring 4 and the inner ring 3.

[0020] As shown better in Figure 2, the portions of chain (10, 10') consist of twisted link chains, that is to say each portion of chain comprises a plurality of twisted links 11, interlinked with one another. Each twisted link 11 consists of a substantially elliptical annular element, which is twisted around its major axis.

[0021] In this manner, each twisted link 11 has two opposite portions which abut on the tyre 1 and two opposite portions which protrude outward with respect to the tread of the tyre 1, acting as ice-breaking elements and helping to improve the friction on the tyre tread.

[0022] Returning to Figure 1, the portions of chain 10 are preferably disposed on the tyre 1 in a diamond configuration and are connected to each other by connecting portions 10' disposed along the middle portion of the tread of the tyre 1. Consequently, a joining element 4 is used to link together the two portions of chain 10 which form the two sides of the diamond and the portion of connecting chain 10'.

[0023] As shown better in Figure 2, the joining element 4 consists of a link of chain shaped as an equilateral triangle twisted to adapt to the twisted links 11 of the portions of chain (10, 10'). That is to say, a twisting is performed around the axes of the various sides of the triangular link 4.

[0024] In this manner the central portions 40 of the triangular link of the joining element 4 are curved towards the outside of the tyre, whilst the angular portions of the joining element 4 are curved towards the tyre 1 to receive, in an interlinked configuration, the end links 11 of the portions of chain (10, 10').

[0025] Returning to Figure 1, the inner ring 3 comprises a core 31 consisting of an interrupted metal cable or of a plurality of twisted metal strands, covered with an interrupted plastic sheath 30. U-bolt connecting systems 5 are used to connect to the inner ring 3 the ends of the portions of chain 10 which form the diamonds.

[0026] As shown better in Figures 3 and 4, the U-bolt connecting system 5 comprises a U-bolt element 50 destined to be mounted on the inner ring 3 and a joining

element 60 destined to be connected to the end link 11 of the portion of chain 10.

[0027] The U-bolt element 50 is obtained from a metal plate bent in U-shape around the core 31 of the inner ring 3, so as to form a substantially semi-cylindrical portion 51 which surrounds the core 31 of the inner ring. In this manner the U-bolt element 50 can rotate around the core 31 of the inner ring.

[0028] The semi-cylindrical portion 51 of the U-bolt element 50 continues with two substantially pentagonal flat portions 52 which have two through holes 53 aligned in a transverse direction with respect to the axis of the semi-cylindrical portion 51. The flat portions 52 of the U-bolt element are disposed parallel to each other and spaced apart so as to leave an empty space between them.

[0029] Narrowings 54 defined by external grooves and by ribs toward the inside are provided between the semi-cylindrical portion 51 and the flat portions 52, so as to avoid the disengagement of the core 31 of the inner ring 3 from the semi-cylindrical portion 51 of the U-bolt element 50.

[0030] The joining element 60 is made from a metal plate bent in U-shape around the twisted end link 11 of the respective portion of chain 10 and having flattened, overlapping terminal edges 62. In this manner the joining element 60 has two flat overlapping edges 62 and a curved portion 61 of smaller width which defines an opening 65 through which the twisted end link 11 of the portion of chain 10 passes. The curved portion 61 of the joining element can be twisted with respect to the overlapping edges 62 so as to adapt to the shape of the twisted link 11.

[0031] A through hole 63 is formed in the overlapping edges 62 of the joining element 60. The overlapping edges 62 of the joining element 60 are disposed inside the empty space between the two flat portions 52 of the U-bolt element 50, so that the holes 53 of the flat portions of the U-bolt element are in register with the holes 63 of the joining element 60. A locking pin or pivot 55 is then inserted into the aligned holes 53 and 63 so as to hinge the joining element 60 to the U-bolt element 50 around the axis of the pin 55.

[0032] It should be noted that the U-bolt element 50 can rotate around the core 31 of the inner ring and that the joining element 60 can rotate, with respect to the U-bolt element 50, around the transverse pin 55. Furthermore the U-bolt system 5 obtained by coupling the U-bolt element 50 with the joining element 60 occupies a reduced thickness on the inner ring 3 and thus does not interfere with the mechanical members of the vehicle.

[0033] The second U-bolt element 60 can be obtained from a single parallelepiped block, having the size and the thickness of the two flat overlapping edges 62, which has a U-shaped curved portion corresponding to the curved portion 61.

[0034] Furthermore the joining element 60 can be replaced by a straight or flat chain link hooked to the twisted end link 11 and to the cross pin 55 of the U-bolt element 50.

[0035] Returning to Figure 1, the ends of the core 31 of the inner ring 3 are constrained to two engagement elements 80 and 90 forming part of a closing device 8 of the inner ring, per se known.

[0036] As shown better in Figure 5, each engagement element 80 and 90 of the closing device 8 consists of two half shells in the form of plates which form a seat to lock rotatably the respective ends 31a and 31b of the core 31 of the inner ring 3. Furthermore, each engagement element 80 and 90 of the closing device 8 comprises a respective pivot (81, 91) disposed inside the end link of the respective portion of chain 10. An engagement element 90 comprises a hook-shaped curved end 92 that engages in a pin 82 provided at the end of the other engagement element 80.

[0037] In this case also, the flattened shape of the two engagement elements (80, 90), each formed from two superimposed plate-shaped half-shells, helps to prevent the closing device 8 from interfering with the mechanical members of the vehicle.

[0038] The end links of the portions of chain 10 can be connected to the outer link by means of any per se known connecting system which is therefore not illustrated. In fact in this case the bulk of the connecting system is less influential.

[0039] Many changes and modifications of detail within the reach of a person skilled in the art can be made to the present embodiment of the invention without thereby departing from the scope of the invention set forth in the appended claims.

Claims

1. A snow chain (2) comprising:

- an inner ring (3), designed to be closed on the side of the wheel destined to face towards the inside of the vehicle,
- an outer ring, designed to be closed on the side of the wheel destined to face toward the outside of the vehicle, and
- a series of portions of anti-skid chain (10), disposed on the tread of the tyre (1) of the wheel, which join the outer ring and the inner ring (3),
- said portions of chain (10) are chains with twisted links, connected to each other by means of joining elements (4) shaped as triangular links,

characterised in that

said portions of chain (10) are connected to said inner ring (3) by means of a U-bolt connecting system (5) comprising:

- a U-bolt element (50) hinged to the end link (11) of a respective portion of chain (10), said U-bolt element consisting in a plate bent in U-shape around the core (31) of said inner ring (3),

so as to form a substantially semi-cylindrical portion (51) which surrounds the core (31) of the inner ring, so as to be able to rotate around said core (31)

and **in that** said hinging is achieved by means

- of a pivot or pin (55) mounted in said U-bolt element (50) in a transverse direction with respect to the axis of said semi-cylindrical portion (51), and
- of a joining element (60) mounted rotatably around said transverse pin (55) of the U-bolt and interlinked with the twisted end link (11) of said portion of chain with twisted links (10).

2. A snow chain (2) according to claim 1, **characterised in that** said joining element (60) comprises a flattened part (62) provided with a hole (63) designed to be engaged by said pin (55) of the U-bolt element (50) and a U-shaped curved portion (61) on said flattened part (62) to interlink said twisted end link (11) of said portion of chain with twisted links (10) with said joining element (60).

3. A snow chain (2) according to claim 2, **characterised in that** said U-shaped curved portion (61) of the joining element (60) is twisted with respect to said flattened part (62).

4. A snow chain (2) according to any one of preceding claims, **characterised in that** said joining element (60) is obtained from a plate bent in U-shape around the twisted end link (11) of said portion of chain with twisted links (10), with said flattened edges (62) overlapping.

5. A snow chain (2) according to claim 1, **characterised in that** said joining element (60) is a straight or a flat chain link.

6. A snow chain (2) according to any one of claims 1 to 5, **characterised in that** said U-bolt element (50) comprises a semi-cylindrical portion (51) destined to be disposed rotatably around the core (31) of the inner ring (3) and two flat portions (52) parallel and spaced apart from each other so as to leave an empty space between them to receive said joining element (60).

7. A snow chain (2) according to any one of the preceding claims, **characterised in that** said portions of chain with twisted links (10) are disposed in a diamond configuration on the tread of the tyre (1) and are connected by portions of connecting chains with twisted links (10') disposed along the middle portion of the tyre, the two portions of chain (10) forming two sides of the diamond and the respective portion of

connecting chain (10') being connected to each other by means of said joining element (4) shaped as a triangular link.

8. A snow chain (2) according to any one of the preceding claims, **characterised in that** said joining element (4) shaped as a triangular link is twisted around the axes of the respective sides to adapt to receive three respective twisted end links (11) of portions of chain (10, 10').
9. A snow chain (2) according to any one of the preceding claims, **characterised in that** said inner ring (3) is closed by means of a closing device (8) comprising a first engagement element (80), constrained to one end of the inner ring and to a portion of chain (10), which engages with a second complementary engagement element (90) constrained to the other end of the inner ring and to another portion of chain, each of said engagement elements (80, 90) being obtained by means of a pair of plates coupled together.

Patentansprüche

1. Schneekette (2), umfassend:

- einen Innenring (3), der derart ausgelegt ist, dass er auf der Seite des Rads geschlossen sein soll, die der Innenseite des Fahrzeugs zugekehrt ist,
- einen Außenring, der derart ausgelegt ist, dass er auf der Seite des Rads geschlossen sein soll, die der Außenseite des Fahrzeugs zugekehrt ist,
- eine Reihe von Abschnitten einer Gleitschutzkette (10), die auf der Lauffläche des Reifens (1) des Rads angeordnet sind und den Außenring und den Innenring (3) verbinden,
- wobei die Abschnitte der Kette (10) Ketten mit gewundenen Gliedern sind, die mithilfe von Verbindungselementen (4) miteinander verbunden sind, welche als dreieckige Glieder geformt sind,

dadurch gekennzeichnet, dass

die Abschnitte der Kette (10) mithilfe eines U-Bolzenverbindungssystems (5) mit dem Innenring (3) verbunden sind, das folgendes umfasst:

- ein U-Bolzenelement (50), das an das Endglied (11) eines jeweiligen Abschnitts der Kette (10) angelenkt ist, wobei das U-Bolzenelement aus einem Blech besteht, das derart in U-Form um den Kern (31) des Innenrings (3) gebogen ist, dass einen im Wesentlichen halbzyllindrischen Abschnitt (51) ausbildet, der den Kern (31) des Innenrings umgibt, sodass es imstande ist, um

den Kern (31) zu drehen,

und **dadurch**, dass die Gelenkverbindung mithilfe

- eines Drehzapfens oder Stifts (55), der in dem U-Bolzenelement (50) in einer bezüglich der Achse des halbzyllindrischen Abschnitts (51) schräg verlaufenden Richtung angebracht ist, und
- eines Verbindungselements (60), das um den schräg verlaufenden Stift (55) des U-Bolzens drehbar angebracht ist und mit dem Glied (11) mit gewundenem Ende des Kettenabschnitts mit gewundenen Gliedern (10) verbunden ist,

erzielt ist.

2. Schneekette (2) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verbindungselement (60) ein abgeflachtes Teil (62), das mit einem Loch (63) versehen ist, welches dazu gestaltet ist, von dem Stift (55) des U-Bolzenelement (50) in Eingriff genommen zu sein, und einen U-förmigen, gekrümmten Abschnitt (61) auf dem abgeflachten Teil (62) zum Verbinden des Glieds (11) mit gewundenem Ende des Kettenabschnitts mit gewundenen Gliedern (10) mit dem Verbindungselement (60) umfasst.

3. Schneekette (2) nach Anspruch 2, **dadurch gekennzeichnet, dass** der U-förmige, gekrümmte Abschnitt (61) des Verbindungselements (60) bezüglich des abgeflachten Teils (62) gewunden ist.

4. Schneekette (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Verbindungselement (60) aus einer U-förmig um das Glied (11) mit gewundenem Ende des Kettenabschnitts mit gewundenen Gliedern (10) erzielt ist, wobei die abgeflachten Kanten (62) überlappen.

5. Schneekette (2) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verbindungselement (60) ein gerades oder ein flaches Kettenglied ist.

6. Schneekette (2) nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** das U-Bolzenelement (50) einen halbzyllindrischen Abschnitt (51), der dazu bestimmt ist, drehbar um den Kern (31) des Innenrings (3) angeordnet zu sein, und zwei flache Abschnitte (52) umfasst, die parallel zueinander und voneinander beabstandet sind, sodass sie zwischen sich einen leeren Raum zum Aufnehmen des Verbindungselements (60) freilassen.

7. Schneekette (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Kettenabschnitte mit gewundenen Gliedern (10) in einer Rautengestaltung auf der Lauffläche des Rei-

fens (1) angeordnet sind und durch Abschnitte von Verbindungsketten mit gewundenen Gliedern (10') verbunden sind, welche den Mittelabschnitt des Reifens entlang angeordnet sind, wobei die zwei Abschnitte der Kette (10) zwei Seiten der Raute ausbilden und der jeweilige Abschnitt der Verbindungskette (10') mithilfe des als dreieckiges Glied ausgebildeten Verbindungselement (4) miteinander verbunden ist.

8. Schneekette (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das als dreieckiges Glied geformte Verbindungselement (4) um die Achsen der jeweiligen Seiten gewunden ist, um zum Aufnehmen von drei jeweiligen Gliedern (11) mit gewundenem Ende von Abschnitten der Kette (10, 10') geeignet zu sein.

9. Schneekette (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Innenring (3) mithilfe einer Schließvorrichtung (8) geschlossen ist, die ein erstes Eingriffselement (80) umfasst, welches zu einem Ende des Innenrings und einem Abschnitt der Kette (10) gezwungen ist und mit einem zweiten, ergänzenden Eingriffselement (90) in Eingriff steht, welches zu dem anderen Ende des Innenrings und zu einem anderen Kettenabschnitt gezwungen ist, wobei jedes der Eingriffselemente (80, 90) mithilfe eines zusammengekuppelten Blechpaars erzielt ist.

Revendications

1. Chaîne à neige (2) comprenant :

- un anneau interne (3) conçu pour être fermé sur le côté de la roue destinée à être orientée vers l'intérieur du véhicule,
- un anneau externe conçu pour être fermé sur le côté de la roue destinée à être orientée vers l'extérieur du véhicule, et
- une série de portions de chaînes antidérapantes (10) disposées sur la bande de roulement du pneu (1) de la roue qui relie l'anneau externe et l'anneau interne (3),
- lesdites portions de chaîne (10) sont des chaînes avec des maillons torsadés connectés entre eux au moyen d'éléments de jonction (4) ayant une forme de maillon triangulaire, **caractérisé en ce que**

les dites portions de chaîne (10) sont connectées audit anneau interne (3) au moyen d'un système de boulon en U (5) comprenant :

- un élément de boulon en U (50) accroché au maillon final (11) d'une portion respective de

chaîne (10), ledit élément de boulon en U étant constitué par une plaque incurvée en forme de U autour du noyau (31) dudit anneau interne (3) de manière à former une portion sensiblement semi-cylindrique (51), qui entoure le noyau (31) de la bague interne de manière à être capable de tourner autour dudit noyau (31),

et en ce que ledit accrochage est obtenu au moyen

- d'un pivot ou d'une broche (55) montée dans ledit élément de boulon en U (50) dans une direction transversale par rapport à l'axe de ladite portion semi-cylindrique (51) et

- d'un élément de jonction (60) monté de manière rotative sur ladite cheville transversale (55) du boulon en U et interconnecté avec le maillon d'extrémité torsadé (11) de ladite portion de chaîne avec les dits maillons torsadés (10) .

2. Chaîne à neige (2) selon la revendication 1,

caractérisée en ce que

ledit élément de jonction (60) comprend une partie aplanie (62) munie d'un trou (63) engagé avec ladite cheville (55) dudit élément de boulon en U (50) et une portion incurvée en U (61) sur ladite partie aplanie (62) pour interconnecter ledit maillon d'extrémité torsadé (11) de ladite portion de chaîne avec lesdits maillons torsadés (10) avec ledit élément de jonction (60).

3. Chaîne à neige (2) selon la revendication 2, **caractérisée en ce que** ladite portion incurvée en forme de U (61) de l'élément de jonction (60) est torsadée par rapport à ladite partie aplanie (62).

4. Chaîne à neige (2) selon l'une des revendications précédentes, **caractérisée en ce que** ledit élément de jonction (60) est obtenu à partir d'une plaque pliée en forme de U autour du maillon terminal torsadé (11) de la dite portion de la chaîne avec les maillons torsadés (10), desdits angles plats (62) se chevauchant.

5. Chaîne à neige (2) selon la revendication 1, **caractérisée en ce que** ledit élément de jonction (60) est un maillon droit ou plat de chaîne.

6. Chaîne à neige (2) selon l'une des revendications 1 à 5, **caractérisée en ce que** ledit élément de boulon en U (50) comprend une portion semi-cylindrique (51) destinée à être disposée rotative autour du noyau (31) dudit anneau interne (3) et de deux portions plates (52) parallèles et espacées l'une de l'autre de manière à laisser un espace vide entre eux pour recevoir ledit élément de jonction (60).

7. Chaîne à neige (2) selon l'une des revendications

précédentes, **caractérisée en ce que** lesdites portions de chaîne avec des maillons torsadés (10) sont disposées en formant un diamant sur la bande de roulement du pneu (1) et sont connectées par des portions de chaîne de connexion aux maillons torsadés (10') disposés le long de la portion médiane du pneu, les deux portions de chaîne (10) formant deux faces du diamant et la portion respective de la chaîne de connexion (10') étant connectées entre elles au moyen dudit élément de jonction (4) ayant la forme d'un maillon triangulaire.

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8. Chaîne à neige (2) selon l'une des revendications précédentes, **caractérisée en ce que** ledit élément de jonction (4) ayant la forme d'un maillon triangulaire est torsadé autour des axes des faces respectives pour permettre de recevoir trois maillons terminaux torsadés respectifs (11) des portions de chaîne (10, 10').

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9. Chaîne à neige (2) selon l'une des revendications précédentes, **caractérisée en ce que** le dit anneau interne (3) est fermé au moyen d'un dispositif de fermeture (8) comprenant un premier élément d'engagement (80) contraint à une extrémité de l'anneau interne et à une portion de la chaîne (10) qui s'engage avec un second élément d'engagement supplémentaire (90) contraint à l'autre extrémité de l'anneau interne et à l'autre portion de la chaîne, chacun des dits éléments d'engagement (80, 90) étant obtenu au moyen d'une paire de plaques couplées ensemble.

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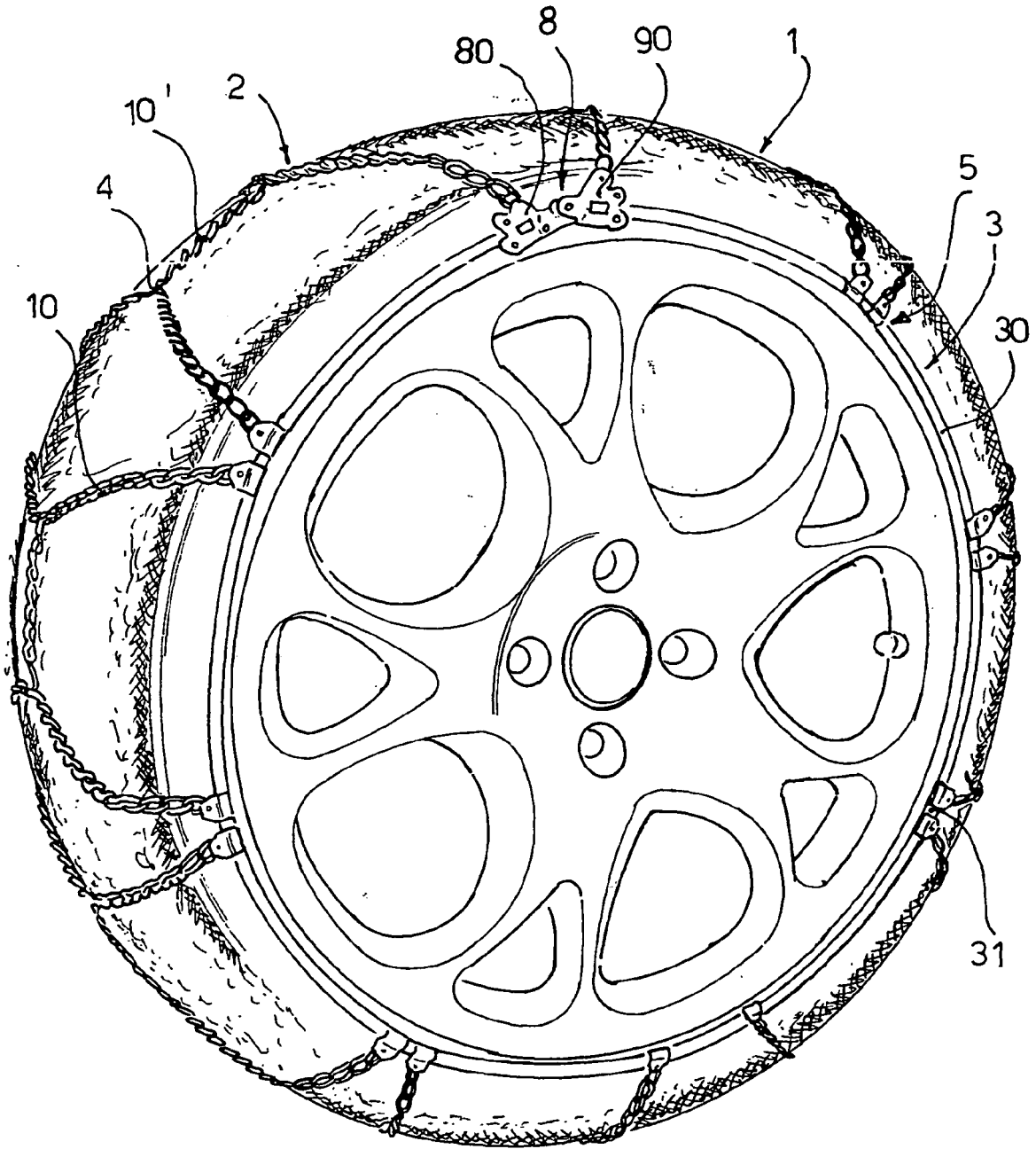
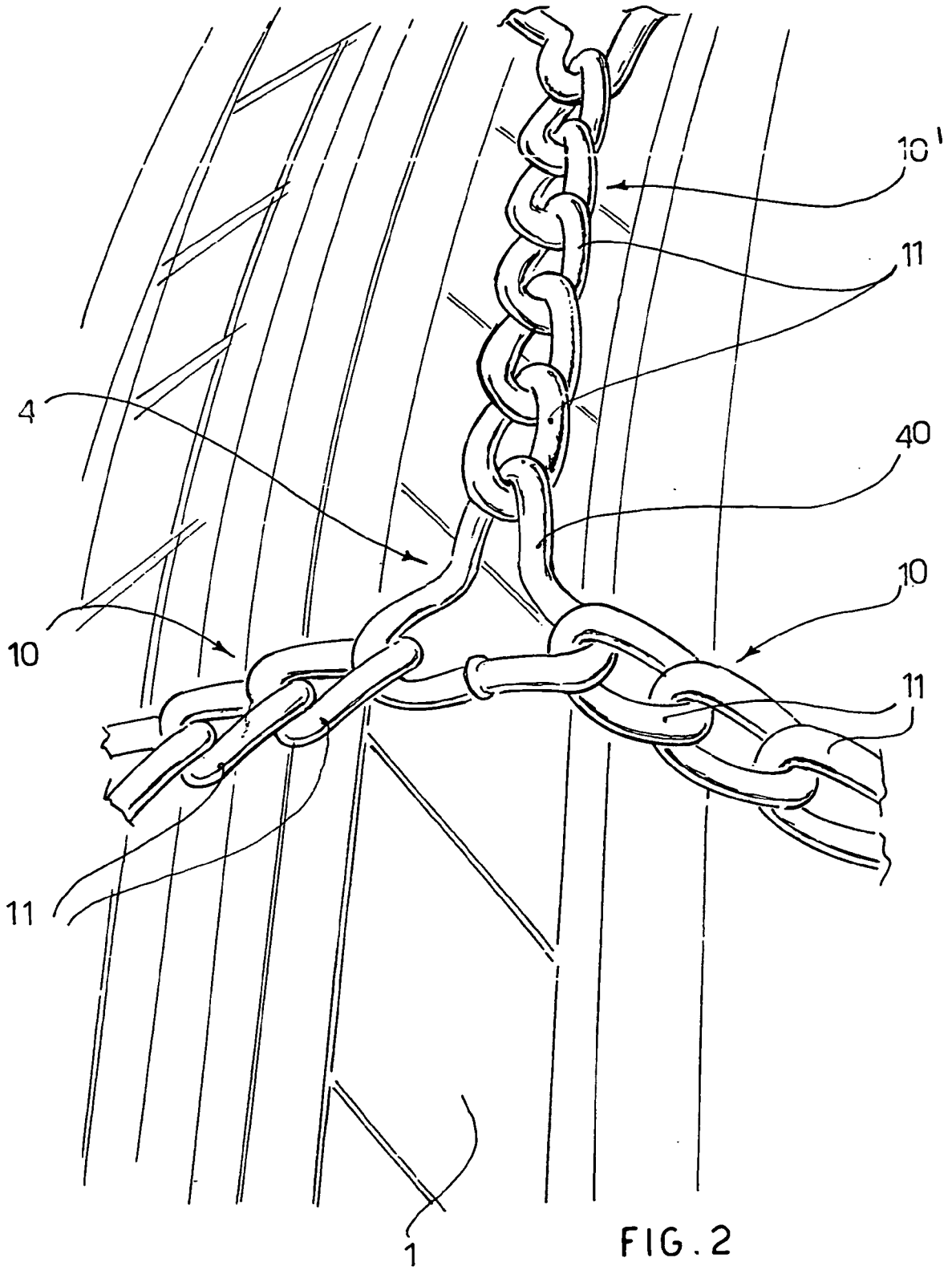


FIG. 1



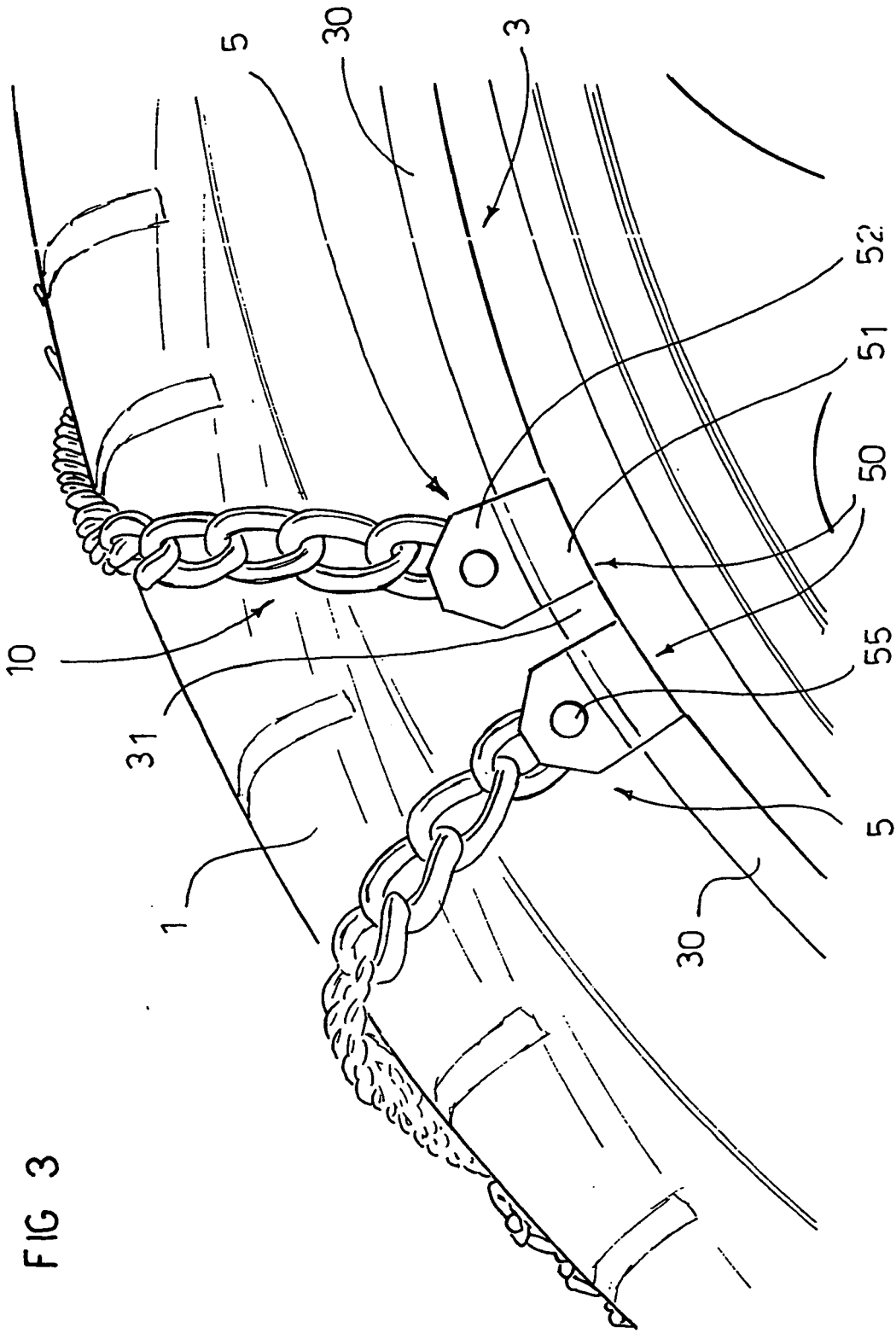


FIG 3

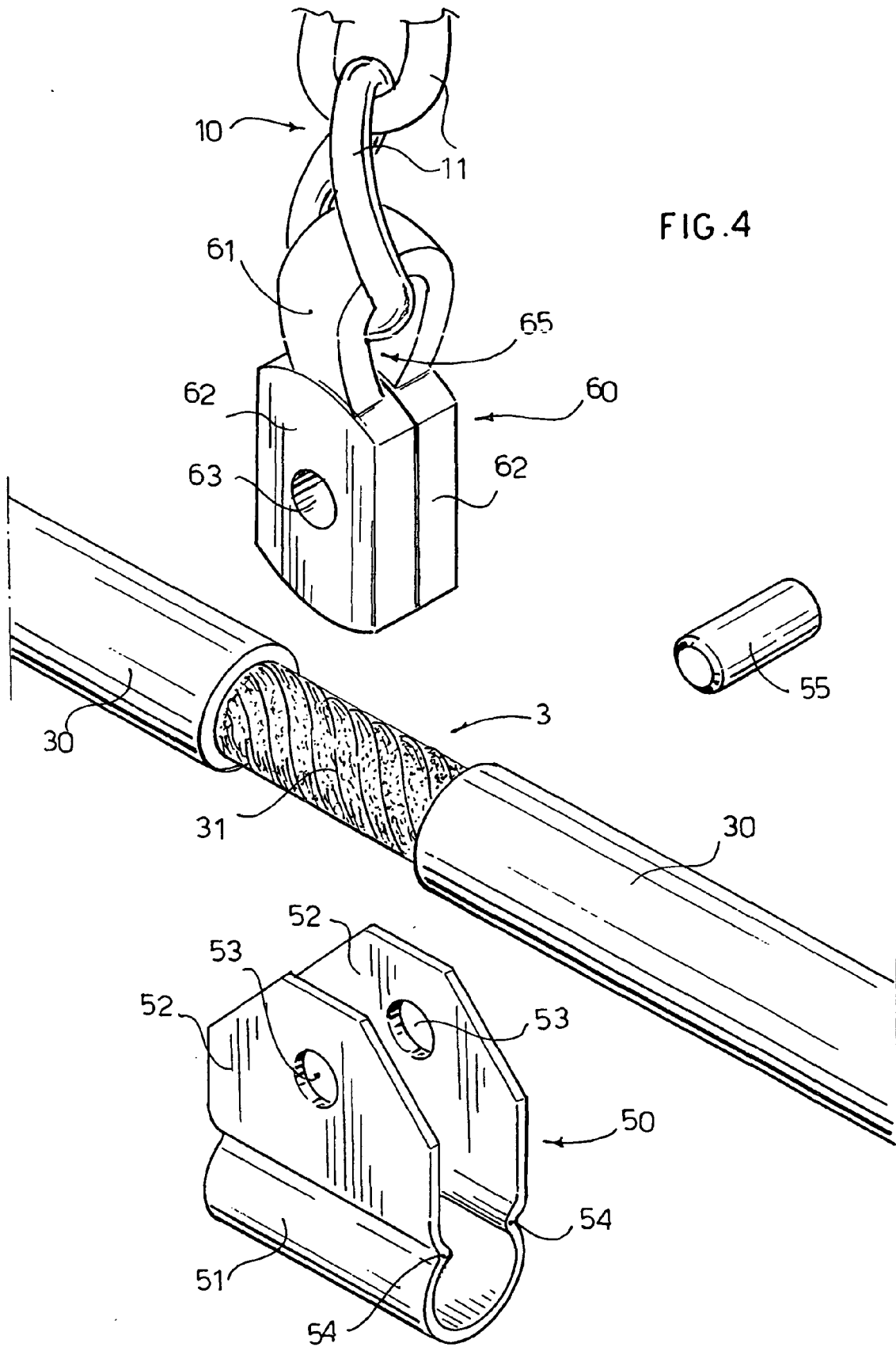
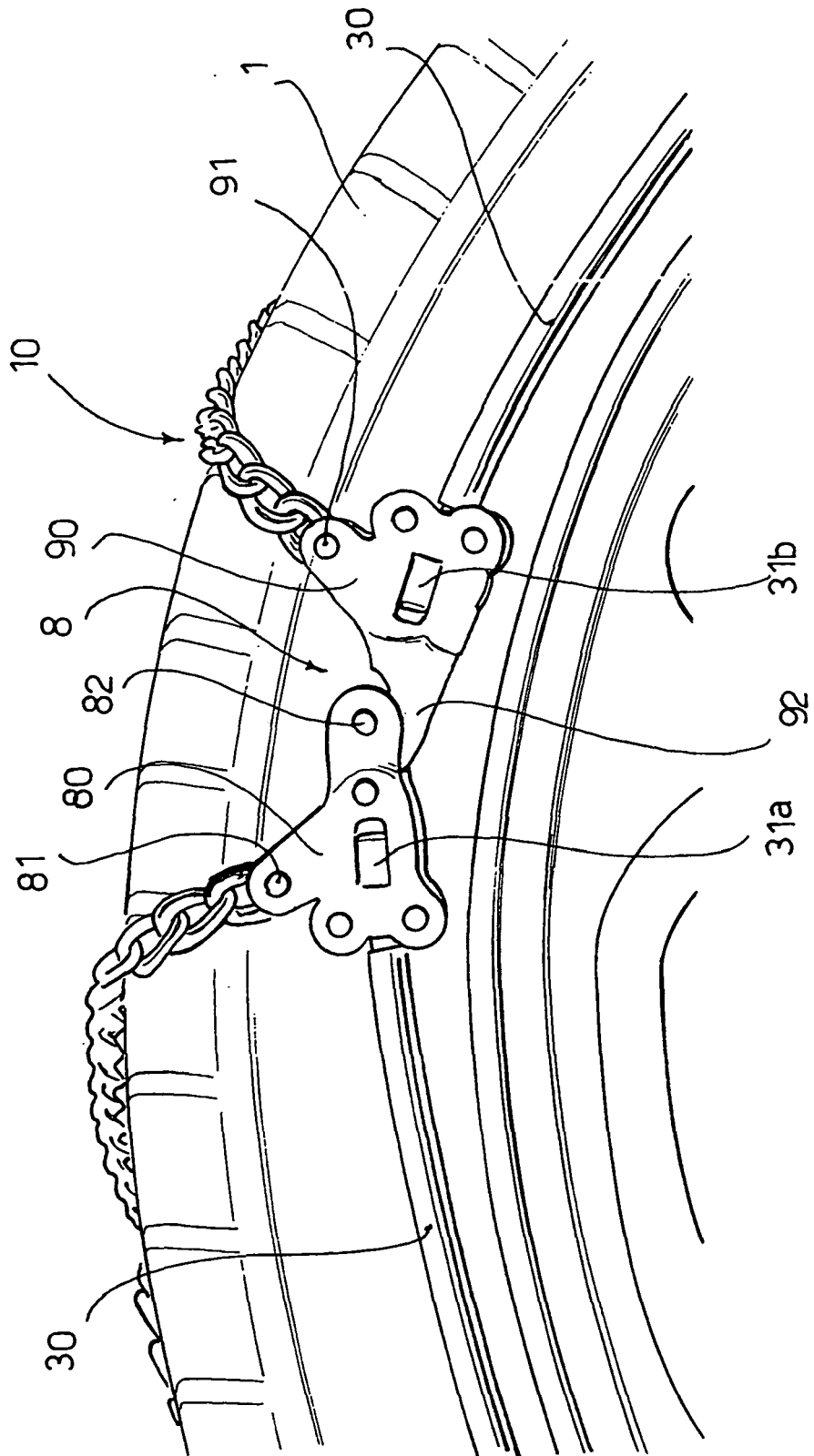


FIG. 4

FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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