(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 June 2017 (22.06.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/103696 A1

(51) International Patent Classification:
B60S 9/00 (2006.01) *B60S 9/22* (2006.01)
B60B 39/12 (2006.01) *B66F 3/35* (2006.01)
B60S 9/14 (2006.01) *E01B 23/00* (2006.01)
B60S 9/20 (2006.01)

(21) International Application Number:
PCT/IB2016/055581

(22) International Filing Date:
19 September 2016 (19.09.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
91226 13 July 2016 (13.07.2016) PA

(71) Applicant: **UNIVERSIDAD TECNOLÓGICA DE PANAMÁ** [PA/PA]; Avenida Universidad Tecnológica de Panamá, Vía Puente Centenario Campus Metropolitano Víctor Levi Sasso, Corregimiento de Ancón, Panamá (PA).

(72) Inventors: **VARGAS, Salvador**; San Miguelito, Brisas del Golf. Calle 46 Norte. Casa J-396., Panama (PA). **MONTERO, Pablo**; Coclé, Municipio de Aguadulce. Pocrí Calle del Puerto #5097., Panama (PA). **ALMANZA, Cesar**; Veraguas, Santiago, Av. Principal. La Peña. Casa 33, Panama (PA). **RUIZ, Giancarlo**; Coclé Aguadulce, urbanización Villa Belén, casa 216, Panama (PA). **ROVETTO, Carlos**; Chiriquí David, Santa Cruz. Urbanización Villa Olga. Casa 6A, Panama (PA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

— *upon request of the applicant, before the expiration of the time limit referred to in Article 21(2)(a)*

(54) Title: TRACTION ASSISTANCE DEVICE FOR RELEASING A STUCK MOTOR VEHICLE, AND MOTOR VEHICLE INCORPORATING SAID TRACTION ASSISTANCE DEVICE

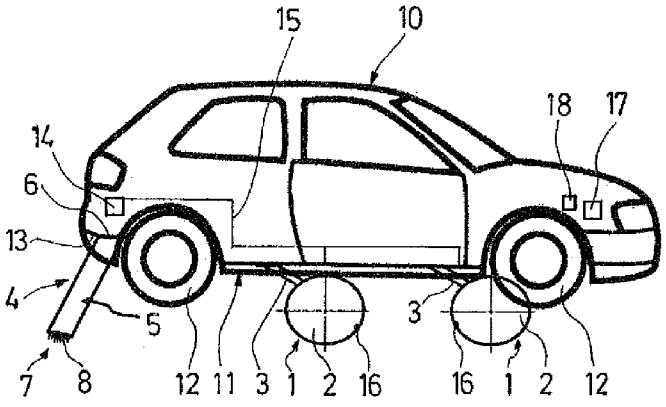

FIG.1

(57) Abstract: It comprises: at least two lifts, fixed to the vehicle underside by means of first connections, which can tilt between a forward position and a backward position with respect to the first connections, the lifts being inflatable with compressed air so as to lift 0 and support the vehicle; at least a pusher, fixed to the rear side of the vehicle, by means of second connections, and being inflatable with compressed air so as to expand longitudinally and contact the ground, providing a thrust that makes the vehicle move forward in cooperation with the lifts tilting.

WO 2017/103696 A1

TRACTION ASSISTANCE DEVICE FOR RELEASING A STUCK MOTOR VEHICLE, AND MOTOR VEHICLE INCORPORATING SAID TRACTION ASSISTANCE DEVICE

OBJECT OF THE INVENTION

The present invention finds application in the technological field of transport, in particular in that of motor vehicle transport.

More particularly, the object of the present invention, according to a first aspect, refers to an assistance device for releasing a motor vehicle being stuck, as well as, according to a second aspect, to a motor vehicle incorporating said assistance device.

BACKGROUND OF THE INVENTION

There are known solutions for pulling out vehicles which are stuck in mud, snow or sand and which need to be moved by an additional force different to that of the four wheels thereof. This technology has several applications in tropical areas, as well as in non-tropical areas where snow, mud or sand keep cars and other vehicles stopped in the roads. Existence of extreme sports is an incentive for using this technology, as it is the existence of areas where there are no roads, but where a supply of vital provisions is required. Other technologies usually feature very expensive operation, or require displacement of additional equipment.

However, there are few technologies being feasible for releasing stuck vehicles in roads or the like, partly due to complicated orographical, geographical, ecological and weather conditions, as well as the existence of difficult access areas which are found in some places in the world, particularly in Latin America.

Conventional methods used to provide mobility include external aid for anchoring the vehicle, such as a tree or a rock, but, however, there are several areas where this is not a possibility. On the other hand, there are large areas, for example the tropical rainforest, which are relatively inaccessible and which are inhabited by dispersed communities wherein assistance is practically impossible.

DESCRIPTION OF THE INVENTION

The present invention, according to a first aspect, refers to a traction assistance device intended to release a stuck vehicle. According to a second aspect, the invention refers to a vehicle incorporating said assistance device.

The vehicle carries the device before starting off the trip, as a caution measure in case the route may run across roads, cross-country, mud, sand, snow, etc, where the vehicle might be stuck.

The device incorporates at least two lifts for lifting the vehicle from the ground, when being stuck. The device also includes at least a pusher for, once the vehicle is lifted, when the wheels have lost contact with the ground, providing a thrust from behind which makes the car move forward. The device is also provided with at least a compressor for compressing air, and conduits for sequentially conveying the compressed air from the compressor towards the lifts and the pusher or pushers. When the lifts are inflated they lift the vehicle, and when the pusher is inflated it exerts a pressure against the ground that acts as thrust for the lifted vehicle to be released from being stuck, as it will be explained below in reference to a preferred embodiment thereof.

The device of the invention, which provides traction by means of compressed air and electricity, is also applicable to vehicles that do not use internal combustion engines, as it is intended for the future in order to reduce environmental pollution due to the use of energy from a fossil source. The technology described in the present invention, by using compressed air, can support vehicles of up to 3 tons for a limited time.

The time required for filling or emptying the air is very quick (around 3 minutes) compared with the technologies not using compressed air because the process depends on the compressor. Additionally, it is possible to parallelize the process with several compressor motors for higher efficiency thereof, as well as filling more than one lift simultaneously.

Particularly, according to the example described below, the present invention comprises two lifts and one pusher, each one of them being filled with air from a compressor, and being inflated and deflated in a predetermined sequential manner. The lifts, preferably

being cylindrical, are placed at the underside of the vehicle in order to lift it, and the pusher is located at the rear side so as to generate a forward thrust.

The device can be easily mounted and demounted from a vehicle, for it to be selectively transported depending on the route conditions.

Operation of the inflating and deflating processes may be both manual and automatized by means of a control unit. Where appropriate, the control unit could control the ingress of compressed air into the chambers depending on several circumstances, such as the vehicle weight or the conditions of the ground.

Since the most frequent use intended for the device, according to another object of the present invention, will be in remote areas, far from technical service providers or spare parts distributors, a robust and easy-to-service device is provided.

DESCRIPTION OF THE DRAWINGS

To implement the present description being made and in order to provide a better understanding of the characteristics of the invention, according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of this description, wherein with an illustrative but not limitative purpose, the following has been represented:

Figure 1.- It shows a general side view of a vehicle incorporating the pushing device object of the invention in a stage subsequent to the vehicle being lifted and previous to said vehicle moving forward.

Figure 2.- It shows a side view of the vehicle incorporating the pushing device, according to figure 1, after the vehicle having moved forward.

Figure 3.- It shows a general top view of the lift completely inflated with compressed air.

Figure 4.- It shows an enlarged detail of one of the lifts from figure 1.

Figure 5.- It shows an enlarged detail of one of the lifts from figures 1 and 4.

Figure 6.- It shows a side view of the pusher when it is totally inflated.

Figure 7:- It shows a general front view of the pusher when it is totally inflated.

Figure 8.- It shows a general top view of the pusher.

Figure 9.- It shows a bottom view of the pusher when it is completely inflated.

PREFERRED EMBODIMENT OF THE INVENTION

The following is a detailed description, with the help of figures 1-9 referred above, of an exemplary preferred embodiment of the traction assistance device for releasing a stuck motor vehicle according to the present invention.

Figure 1 is a side view showing a motor vehicle (10), in this case a passenger car, provided with an underside (11) and with two axles for front and rear wheels (12), wherein the traction assistance device object of the present invention is mounted in said vehicle (10) and comprises at least two lifts (1). Each lift (1) comprises a first elongated chamber (2) defining a first longitudinal direction, being the first deformable chamber (2) intended to be inflated, increasing the dimensions thereof in directions being perpendicular to the first longitudinal direction when it is filled with compressed air. Each lift further comprises a first connection (3), for example as a tab for connecting the first chamber (2) to the underside (11) of the vehicle (10), between the wheel axles (12), in an articulated manner with respect to a parallel direction to the first longitudinal direction. Preferably, the first longitudinal direction is perpendicular to the vehicle (10) running direction when the device is mounted.

Figure 1 also illustrates that the device of the invention further comprises at least one pusher (4), wherein each pusher (4) comprises a second chamber (5) being elongated and defining a second longitudinal direction, wherein the second chamber (5) is deformable and intended to be inflated increasing the volume thereof along the second longitudinal direction when it is filled with compressed air. Figure 1 shows the second chamber (5) partly inflated, such that it hangs from the vehicle (10) according to a given angle with respect to the plane of the underside (11) of the vehicle (10). The pusher (4)

also comprises a second connection (6), for example as a tab, so as to fix an end of the second chamber (5) to the rear side of the vehicle (10). The second connection (6) can connect the second chamber (5) to a rear bumper (13) of the vehicle (10), or alternatively to the rear part of the underside (11), or even to both. Preferably, the second chamber (5) may have, when inflated, a length between 150 and 200 centimetres.

In the figures, particularly in figures 1-4, 6 and 7, it is shown that the opposite end of the second chamber comprises friction means (7), so as to provide friction with the ground when the second chamber (5) is inflated. The friction means (7) may comprise studs (8), surface conformations (9) in the form of a tyre tread, etc. The friction means (7), particularly the surface conformations (9), and/or the studs (8) may consist of materials such as plastic, rubber or metal, or some combinations thereof, etc.

The device of the invention additionally comprises at least one compressor (14), for compressing air, and conduits (15), for example hoses, for the compressed air to be ducted from the compressor (14) or compressors (14) towards the chambers (2, 5), as well as releasing means (16), for example valves, for releasing said air from the chambers (2, 5). A single compressor (14) may be provided for inflating all the chambers (2, 5) or, alternatively, more than one compressor (14) may be provided, in particular one compressor (14) per chamber (2, 5).

The device of the invention also comprises an electric power supply (17). The power supply (17) is preferably a battery provided by the vehicle (10).

Preferably, the first chambers (2) may have a cylindrical shape, preferably having a diameter, when inflated, between about 18 and 30 centimetres, and preferably having a length between 150 and 200 centimetres.

The first connections (3) and/or the second connections (6) may be of the tab type, as it has been indicated above, wherein they can inflatable or may not require being inflated.

There follows an explanation of the operation of the device of the invention.

In a first position, when the vehicle (10) is running and it is not in a stuck condition, the lifts (1) and the pusher (4) or pushers (4) are deflated and hidden, without hindering the vehicle (10) movement.

When the vehicle (10) is stuck, for example, in snow, mud, etc., the user deploys the lifts (1) and the pusher (4) or pushers (4). Thus, a second position is reached in which the first chambers (2) are arranged, with respect to the first corresponding connections (3), in an forward position, that is, more advanced in the running direction, as the second chambers (2) fall towards the ground.

Then, the compressor (14) or compressors (14) are actuated, such that the first chambers (2) increase the dimensions thereof in directions being perpendicular to the longitudinal direction, reaching a third position in which the first chambers (2) press against the ground and thus provide the vehicle (10) with lifting force, supporting the vehicle (10) weight by means of the compressed air pressure.

Then, the compressor (14) or compressors (14) are actuated again so as to inflate the second chamber (5), increasing the dimension thereof along the longitudinal direction, reaching the ground and causing an impulse against the ground that, in cooperation with the friction caused by the friction means (7), makes the vehicle (10) move forward along the running direction, cooperating with tilting of the first chambers (2) around the corresponding connections (3) thereof, in order to reach a fourth position in which the vehicle (10) has moved and the first chambers (2) occupy, with respect to the corresponding first connections (3) thereof, more backward positions. The fourth position is shown in figure 2. Tilting of the first chambers (2) makes the required thrust force be very small.

Maybe at this point the stuck condition has already been overcome, so then the chambers (2, 5) are deflated through the conduits (15), reaching a fifth position. Firstly, the first chambers (2) are deflated and then the second chamber or chambers (5). In the fifth position, the vehicle (10) is supported by the wheels (12) thereof. If the vehicle (10) forward movement being caused by the fourth position and by the fifth position is enough to allow the vehicle (10) to start riding again, the lifts (1) and the pusher (4) or pushers (4) are folded over, and the vehicle (10) continues running. Otherwise, additional forward movement cannot be provided directly, since tilting of the first

chambers (2) is not possible anymore. Therefore, in order to provide additional forward movement, the chambers (2, 5) are arranged according to the second position described above and the sequence is repeated. Thus, the vehicle (10) is displaced a step forward each time until it is released.

Figure 3 is a general top view of the first chambers (2) when they are filled with air in the second position, in correspondence with figure 1. This figure shows the first chamber (2), the perimeter of which is completely full, as well as the first connection (3), attached to the underside (11) of the vehicle (10). As it can be seen, the first connection (3) attachment to the underside (11) of the vehicle (10) is behind the first connection (3) attachment to the first chamber (2). Figure 4 shows a side view in detail of one of the lifts (1) in the second position, and figure 5 shows a detailed front view of the lift (1).

Figure 6 is a detailed view of the pusher (4) shown in figure 2, with the second chamber (5) totally inflated. The embodiment illustrated in figure 6 shows the second connection (6) and the friction means (7) in the form of a tyre tread (9) and rubber studs (8). Figure 7, on the other side, shows a detailed front view of the pusher (4).

Figure 8 is a general top view of the pusher (4) showing the second connection (6) being sectioned. On the other hand, figure 9 is a bottom view of the pusher (4) when it is totally inflated. Figure 9 shows the tyre tread (9) and the rubber studs (8).

According to the explanation above, the main function of the device is transforming the forces from the pressurized air within the chambers (2, 5) into lifting forces, in the case of the lifts (1), and into thrust force in the case of the pusher (4) or pushers (4), using the corresponding shape of the chamber (2, 5). It is known that forces against the volume of a chamber (2, 5) are proportional to the pressure inside the chamber (2, 5), and the shape adopted by this chamber (2, 5) depends on the reaction force of the chamber (2, 5) surface against the forces applied by the pressurized air, which are normal to the chamber (2, 5) surface. By combining both concepts, the reaction forces of the chamber (2, 5) surfaces and the forces from pressurized air render the chambers (2, 5) rigid, and in the case of lifts (1), they cause the car to be lifted, and in the case of the pusher (4) or pushers (4), they cause said pusher(s) to behave as a force oriented along the second chamber (5), pushing the vehicle (10) forward.

The components, which are or may be in contact with the ground, are made of materials which are resistant so as to avoid fractures, holes, etc., for example, the compressor (14), the conduits (15), and the chambers (2, 5).

Operation of the device may be controlled by the control unit (18), which may be located within the vehicle (10). The control unit (18) may be actuated, although it is within the vehicle (10), both manually and remotely.

CLAIMS

1.- Traction assistance device for releasing a stuck motor vehicle, wherein the vehicle comprises axles having wheels mounted thereon, underside, and a rear side;
wherein the assistance device comprises:

- at least two lifts, each off which also comprises:
  - a first chamber, deformable, elongated in a first longitudinal direction, and intended to be inflated with compressed air, transversally to the first longitudinal direction; and
  - a first connection, for connecting the first chamber in a releasable manner to the underside of the vehicle, between the wheel axles, being articulated according to a direction parallel to the first longitudinal direction, between a forward position, in which the chamber is more advanced than the first connection, and a backward position, in which the chamber is more backward than the first connection;
- at least a pusher, wherein each pusher comprises:
  - a second chamber, deformable, elongated in a second longitudinal direction, and intended to be inflated with compressed air, along the second longitudinal direction;
  - a second connection for fixing to the rear side of the vehicle, in a releasable manner, an end of the second chamber; and
  - friction means, located in the opposite end of the second chamber, for providing friction with the ground when the second chamber is inflated, so as to push the vehicle forward;
- at least a compressor, for compressing air;
- conduits for the compressed air to be ducted from the compressor or the compressors towards the chambers, and
- releasing means for releasing said air from the chambers.

2.- Device according to claim 1, wherein the first chambers have a cylindrical shape.

3.- Device according to claim 2, wherein the first chambers have a diameter, when inflated, from 18 cm to 30 cm.

4.- Device according to claim 1, wherein the first chambers have a length from 150 cm to 200 cm.

5.- Device according to claim 1, wherein the second chambers have a length, when inflated, from 150 cm and 200 cm.

6.- Device according to claim 1, wherein the friction means comprise studs and/or surface conformations featuring a tyre tread.

7.- Device according to claim 6, wherein the friction means comprise materials such as plastic, rubber, metal or some combination thereof.

8.- Device according to claim 1, wherein the first connections and/or the second connection or connections comprise tabs.

9.- A motor vehicle comprising axles with wheels mounted thereon, an underside, and a rear side along a running direction, further comprising the device described in claims 1-8.

10.- Motor vehicle according to claim 9, wherein the first longitudinal direction is perpendicular to the running direction of the vehicle.

11.- Motor vehicle according to claim 9, wherein the second connection connects the second chamber to a rear bumper of the vehicle, and/or to the rear part of the underside.

12.- Motor vehicle according to claim 9, wherein the power supply is a battery provided by the vehicle.

13.- Motor vehicle according to claim 9, comprising a control unit.

14.- Motor vehicle according to claim 13, wherein the control unit can be remotely actuated.

15.- Motor vehicle according to claim 13, wherein the control unit is located inside the vehicle.

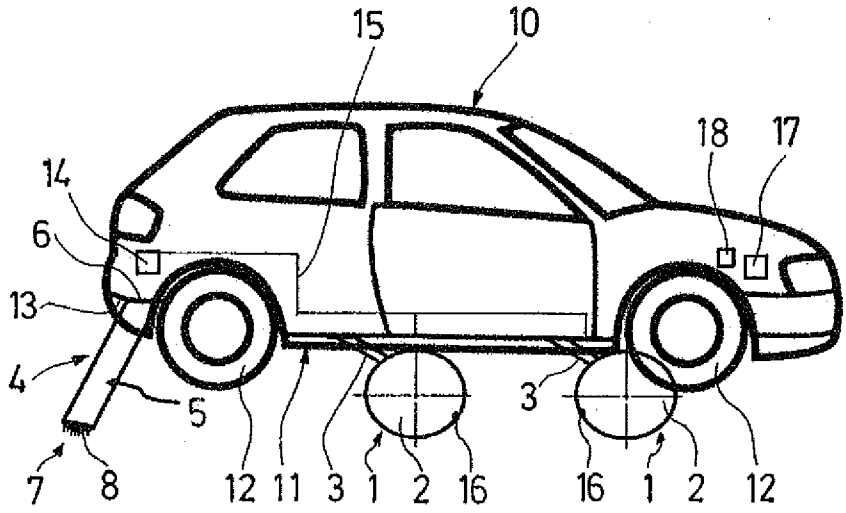
15
10
18
17
14
6
13
4
5
3
7
8
12
11
3
1
2
16
16
1
2
12

FIG.1

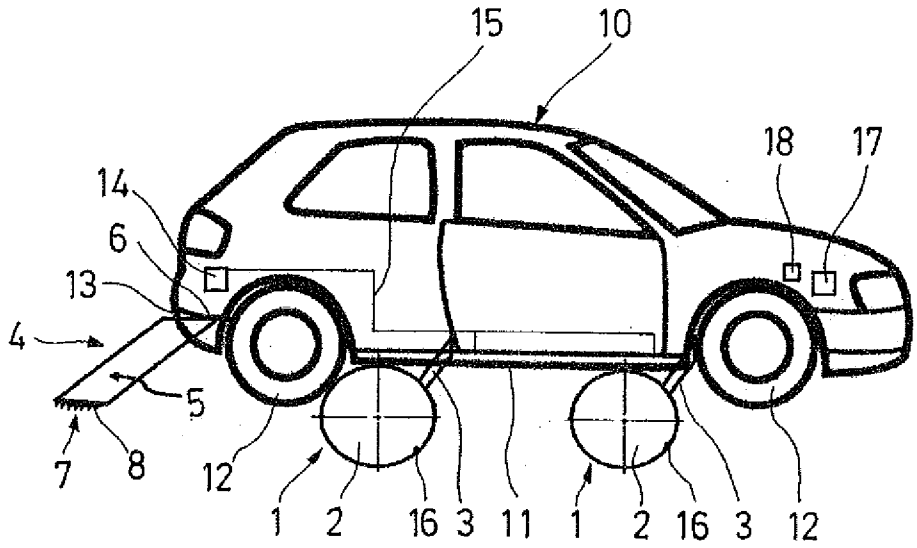
15
10
18
17
14
6
13
4
5
7
8
12
1
2
16
3
11
1
2
16
3
12

FIG.2

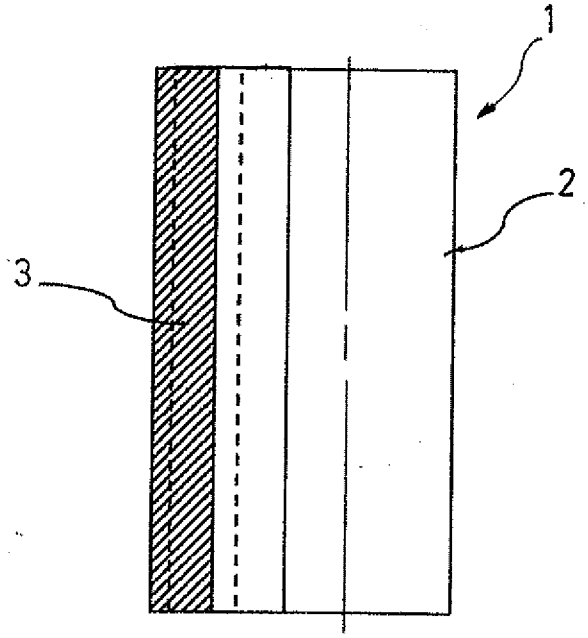

FIG.3

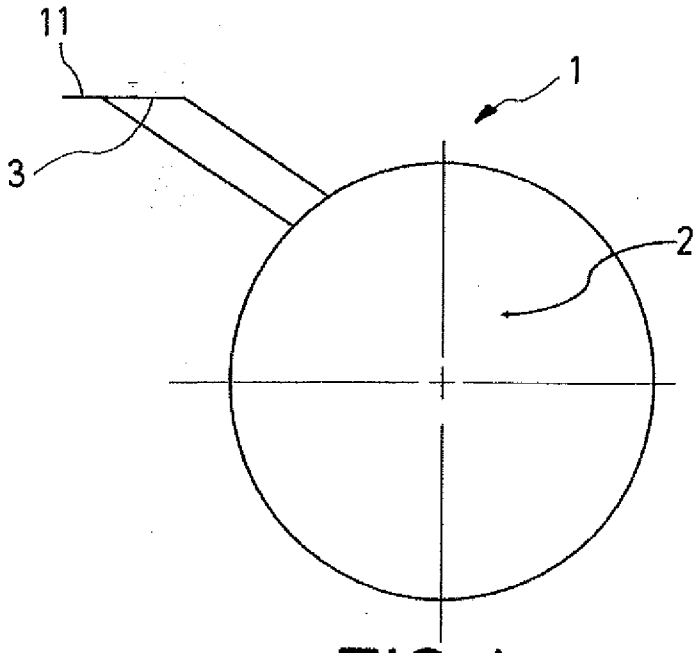

FIG.4

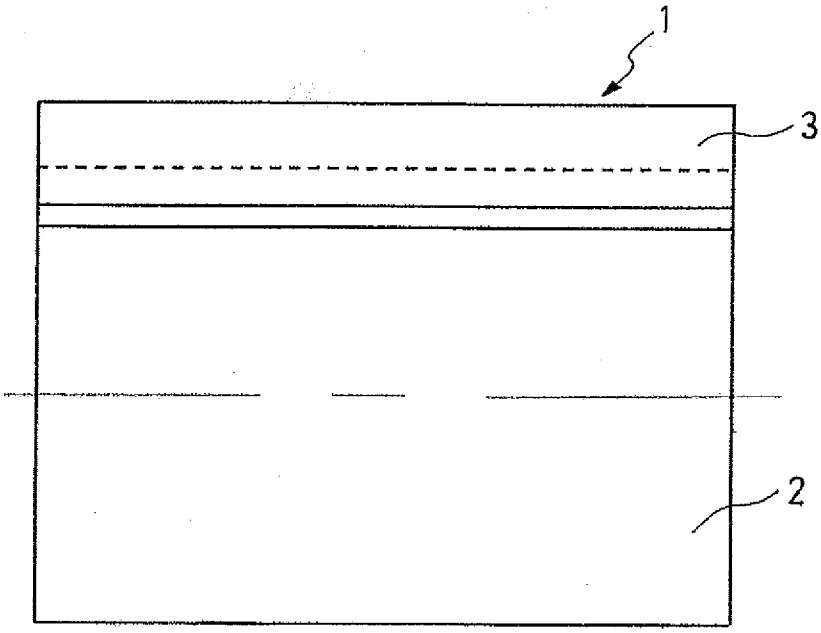

FIG.5

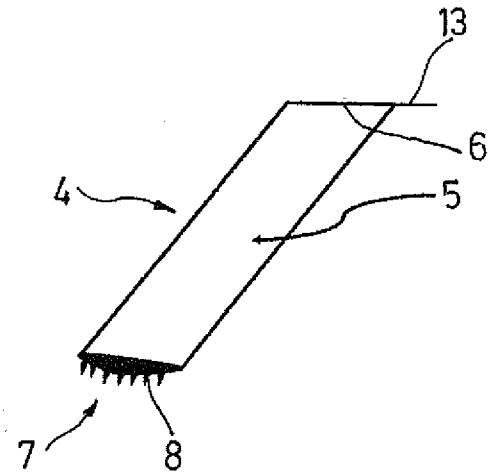

FIG.6

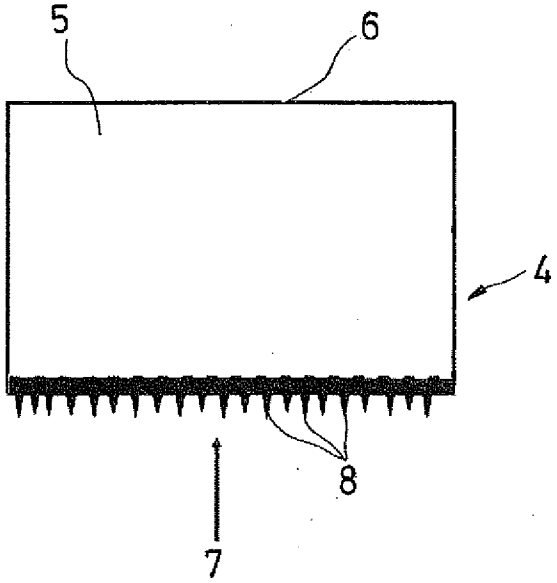

FIG.7

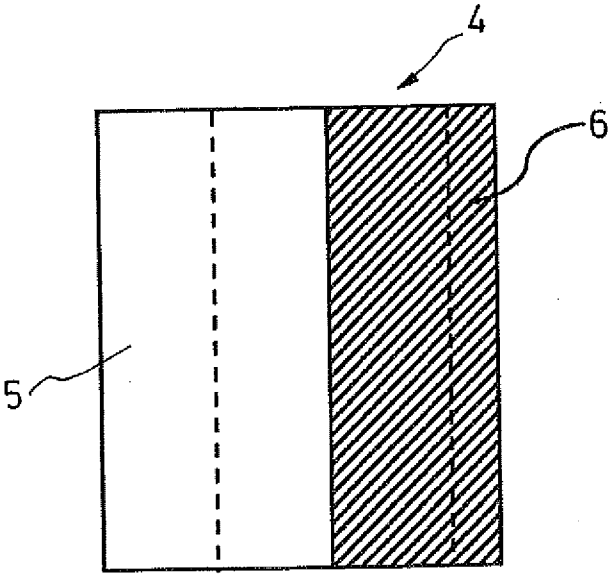

FIG.8

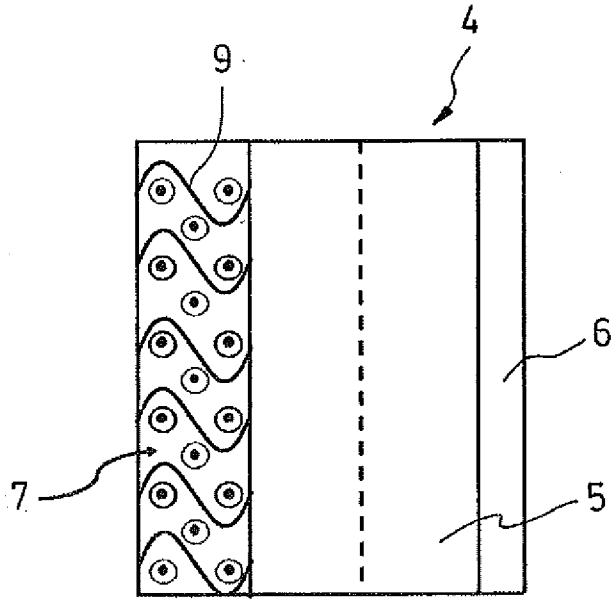

FIG.9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2016/055581

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B60S 9/00; B60B 39/12; B60S 9/14; B60S 9/20; B60S 9/22; B66F 3/35; E01B 23/00 (2016.01)
CPC - B60S 9/00; B60B 39/12; B60S 9/14; B60S 9/20; B66F 3/35; E01B 23/00 (2016.11)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC - B60B 39/12; B60S 9/00; B60S 9/14; B60S 9/20; B60S 9/22; B66F 3/35; E01B 23/00
CPC - B60B 39/12; B60S 9/00; B60S 9/14; B60S 9/20; B66F 3/35; E01B 23/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 152/208; 180/183; 180/7.1; 180/15; 238/14; 254/35; 254/45; 254/93H; 254/93VA; 254/423; 404/35 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, Google Patents, Google Scholar, Google, YouTube
Search terms used: automobile, car, truck, vehicle, stuck, immobilized, stranded, traction, grip, pneumatic, air, compressor, inflate, expand, push, bumper, attach, connect, couple, fasten, lift, raise, chamber, bag, container, pocket

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/0032606 A1 (HERMANN et al) 05 February 2009 (05.02.2009) entire document	1-8
A	US 6,021,860 A (JONES) 08 February 2000 (08.02.2000) entire document	1-8
A	US 4,280,684 A (LEVERT) 28 July 1981 (28.07.1981) entire document	1-8
A	US 5,765,810 A (MATTERA) 16 June 1998 (16.06.1998) entire document	1-8
A	US 2005/0045859 A1 (WILLIAMS, SR) 03 March 2005 (03.03.2005) entire document	1-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 December 2016	26 JAN 2017
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2016/055581

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 9-15
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.