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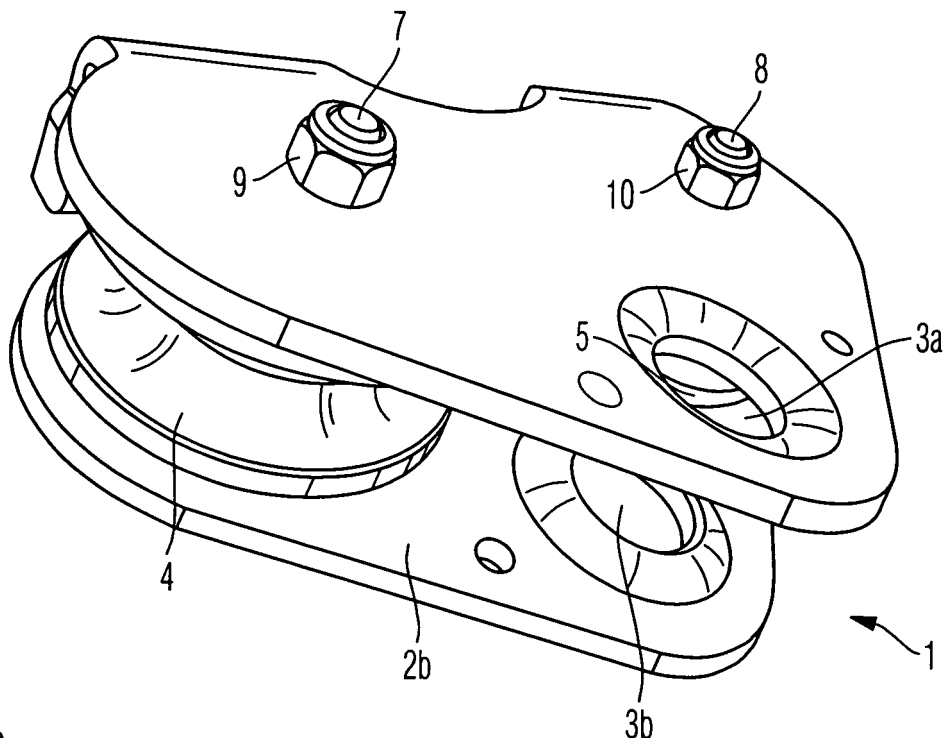
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(54) **TROLLEY FOR A ZIP LINE**

(57) The invention regards a trolley for a zip line system. The trolley (1, 1') comprises a frame in which at least one pulley (4, 4', 4'') is rotatably supported, wherein the frame is made from an electrically conductive material and wherein the trolley (1, 1') comprises at least one per-

manent magnet (16) that is positioned in an eccentric manner with respect to the rotation axis of the pulley (4, 4', 4'') to induce turbulent flow of current in the frame in order to generate a speed dependent braking force.



## Description

**[0001]** The invention regards a trolley for a zip line system.

**[0002]** A zip line system is a system that comprises a cable that is fixed with one end of the cable to a first point, for example a tree, and the other end fixed to a second point (another tree) wherein both ends have different heights. Thus, the cable is fixed so as to be inclined. A trolley comprises at least one pulley that can be set on the top of the cable at its highest point. A person which for example is secured in a harness is hooked to the trolley and slide along the cable. An example for such a trolley of the zip line system is disclosed in US 2015/0375758 A1. The trolley shown there comprises two pulleys that are arranged between side walls of a trolley frame. The side walls of the trolley frame are connected to each other but leave at least one side open so that the trolley can be set on the cable so that running surfaces of the pulleys have contact to the cable. The pulleys are rotatable supported in the trolley frame. The side walls extend at least in one direction over the pulleys and the harness in which a person is secured can be hooked at least to one side wall. For hooking the harness into the trolley the harness is connected to a snap hook that is inserted into at least one opening of the trolley.

**[0003]** One problem with the trolley that is disclosed in the prior art is that no means is foreseen to reduce the speed of the trolley and thus the person sliding along the cable. Of course several measures are known to reduce the speed but these mechanical structures are all based on friction and thus wear during lifetime of the trolley is problematic. For deceleration of the trolley at the end of the zip line other proposals have been made which are not included in the trolley but are arranged only at the end of the zip line like for example elastic elements against which the trolley drives.

**[0004]** It is thus desirable to provide a trolley for a zip line system that is capable of exerting a braking force during travel that increases with speed of the trolley.

**[0005]** A trolley with such brake force being dependent on the speed of the trolley is provided by the present invention. The trolley according to the present invention comprises a frame that supports at least one pulley rotatably. The frame is made from an electrically conductive material and the pulley comprises at least one permanent magnet. The permanent magnet is positioned with respect to the rotation axis of the pulley in an eccentric manner. As a consequence when the pulley rotates during the trolley travelling along the cable the motion of the permanent magnet relative to the frame of the trolley causes turbulent flow of current in the frame.

**[0006]** The inventive trolley has the advantage that no friction elements are needed for generating a braking force. Furthermore the permanent magnets are arranged on the pulleys so that heat that is generated from the turbulent flow of current is generated in the frame but not the pulley. Thus, rubber or resin that is used for a bearing

surface of the pulley is not subjected to excessive heat. The inventive trolley furthermore has the advantage that no complex mechanical structures are necessary as it is the case with friction brakes.

**[0007]** Advantageous embodiments are defined in the dependent claims system.

**[0008]** It is in particular advantageous if the pulley comprises a pulley body to which at least one permanent magnet is attached. Thus, by attaching different magnets, magnets of different sizes or a different number of same magnets the braking force can be adjusted to the needs of the particular zip line.

**[0009]** Furthermore, according to a preferred embodiment, the pulley comprises at least one recess in which the permanent magnet can be inserted. By inserting the permanent magnet into the pulley body it is possible to reduce the overall size of the structure, because no protruding elements are necessary on the pulley. Thus, the overall width of the trolley does not need to be increased due to the integrated braking system and even an upgrade of trolleys that are already in use is possible by substituting current pulleys with pulleys that comprise a permanent magnet(s).

**[0010]** According to a further advantageous embodiment the pulley body comprises a plurality of recesses that are arranged in a distributed fashion on at least one side surface of the pulley body. Of course such recesses with magnets, or in general permanent magnets, can be provided on both sides of the pulley. Providing a plurality of recesses in the pulley body has the advantage that it is easy to adjust the braking force. The permanent magnets that are inserted into the recesses can be varied in number and thus if a higher braking force is required a higher number of permanent magnets can be inserted in the provided recesses. If at another point in time only a reduced braking force is needed then the number of permanent magnets in the pulley can be reduced by simply removing some of them.

**[0011]** According to another preferred embodiment the recesses are at least partially shaped cylindrically. The axis of this cylindrically formed recesses extends in parallel to the rotation axis. Thus, if a cylindrical permanent magnet is inserted into such a recess this results in a flat surface, if the height of the permanent magnets corresponds to the height of the cylindrical recess. The cylindrical recess or recesses furthermore can be opened towards the rotation axis and the bottom surface of the recess can be made flat with the side surface of the pulley between the open recess side and a center recess of a pulley. Such a structure results in an inserted permanent magnet to show an open surface and thus removing the magnet from the pulley is particularly easy. With a simple tool like for example a screw driver it is possible to remove the permanent magnet. The screw driver just has to be pushed between the permanent magnet and the bottom surface of the recess from the side to which the recess is open.

**[0012]** According to another preferred embodiment the

lateral extension of the recess (diameter in case of cylinder shape) is bigger than the lateral extension of the permanent magnet to be inserted and a spacer is inserted into the gap that exists between the permanent magnet and the side wall of the recess. With such a spacer it is possible to reduce the accuracy during manufacturing of the pulley as well as the accuracy of the permanent magnets. It is furthermore to be noted that the pulley and the permanent magnet may have different temperature coefficients so that the spacer that is preferably made from an elastic material can compensate for different temperature extension.

**[0013]** Further it is preferred that at least a portion of the pulley body is made from a ferromagnetic material. The ferromagnetic material has the advantage that no separate measure is necessary to secure the permanent magnets of the trolley body.

**[0014]** In particular for larger pulleys it is preferred that the pulley body is made from a plurality of elements in particular three generally disc shaped elements. The three elements are assembled to constitute a stack. The middle element is made from a ferromagnetic material and at least one of the disc shaped elements comprises the at least one recess. The recess in that case is formed as a trough hole and the position of such trough hole in the outer disc shaped element is such that the bottom surface of the recess is constituted by the ferromagnetic material, i.e. by the middle, element disc shaped element. Thus, a permanent magnet that is inserted into the recess, namely the trough hole of the outer disc shaped element is secured by magnetic force to the middle disc shaped element. Such an arrangement has the advantage that despite the size of such larger pulleys nevertheless the weight of the pulley can be relatively small.

**[0015]** The frame of the inventive trolley preferably comprises two side walls that sandwich the at least one pulley. It is to be noted that of course the trolley may comprise more than only one pulley. All the information that is given herein with respect to the at least one pulley is of course also applicable to any further pulley that is provided in the inventive trolley.

**[0016]** It is preferred that each side wall comprises an opening at corresponding positions. The opening areas of the two corresponding openings are different. One is larger and allows that a securing element penetrates through this opening. The other opening is smaller so that the securing element may not be penetrated through this opening. Thus, when the securing element is attached to a snap hook after the snap hook is inserted into the openings it is possible to retract the snap hook at least from the bigger opening but not from the smaller opening. Thus, it is prevented that the snap hook gets lost.

**[0017]** Furthermore, it is in particular advantageous if a surrounding area of the first opening which is the one with smaller dimensions is bulged to an outside direction of the trolley to form an accommodation area on the inside of the sidewall that is capable of accommodating at least

part of the snap hook in an open state of the snap hook together with the securing element. Thus, the snap hook and the securing element can be accommodated at least partially in the space resulting from the bulged surrounding so that despite small lateral dimensions of the entire trolley it is easy to set the trolley onto the cable. The snap hook can be moved to one side of the trolley after the securing element was retracted from the second opening and then the pulley is easily accessible. As a consequence it is comfortable to set the entire trolley onto the cable.

**[0018]** According to another preferred embodiment the first opening is bulged to an outside direction and the opening itself has a width basically corresponding to a snap hook body's thickness. On the contrary the first opening has a longitudinal extension that allows the snap hook body to penetrate at an angle significantly deviating from 90 degree for example more than 30 degree. Thus, if the penetrating portion of the snap hook body does not penetrate the sidewall and the opening in a 90 degree angle, the orientation of the snap hook is well defined. Again this has the advantage that the comfort when setting the trolley onto the cable is increased. Furthermore the shape of the bulged surrounding and the longitudinal extension of the first opening are commonly adapted to the geometry of the snap hook. The shape of the bulged surrounding and the longitudinal extension are chosen such that when a moveable finger of the opened snap hook is pressed by an elastic force against an outer surface of the sidewall in which the first opening is provided, the securing element abuts an inside surface of the bulged surrounding and at least one of an outside of the snap hook body and an open end of the snap hook body abuts the sidewall at an respective end of the first opening in the longitudinal direction. Thus, the snap hook will be held in a position that a running surface of the pulley is freely accessible and thus the entire trolley can be set on a cable easily.

**[0019]** Further aspects and features will become apparent from the annexed drawings and the following description.

**[0020]** In the drawings

Fig. 1 shows a first perspective illustration of a trolley according to the invention;

Fig. 2 shows a second perspective of the same trolley according to the invention as shown in fig. 1;

Fig. 3 shows an example for a pulley with recesses for accommodating the permanent magnets;

Fig. 4 shows a second example for a pulley with a second geometry of the recesses;

Fig. 5 shows a second view of the pulley;

Fig. 6 shows a pulley assembled from a plurality of disc-shaped elements;

Fig. 7 shows a second perspective of the pulley of fig. 6;

Fig. 8 shows a first perspective of a second embodiment of a trolley with a snap hook attached to the

trolley

Fig. 9 shows a second perspective of the same trolley and snap hook; and

Fig. 10 shows the snap hook in a fixed position that allows easily setting the trolley onto a cable.

**[0021]** In fig. 1 there is shown a first perspective of an inventive trolley 1. The inventive trolley 1 comprises a frame that comprises of a first sidewall 2a and a second sidewall 2b. The first sidewall 2a and the second sidewall 2b are arranged in parallel to each other and are connected to each other via a transverse wall 6. The first sidewall 2a and the second sidewall 2b are arranged in parallel to each other with a distance therebetween. The distance therebetween basically corresponds to a width of pulleys that are supported in a rotatable manner between the first sidewall 2a and the second sidewall 2b. In the present embodiment two such pulleys are arranged between the sidewalls 2a, 2b. The first pulley 4 can be seen, whereas the second pulley 5 (as indicated by the dashed arrow) is hidden by the first sidewall 2a. In the sidewalls 2a, 2b of the trolley 1 holes at corresponding positions are provided. A screw 7 is inserted through the holes and also penetrates a center recess of the pulley 4. The screw 7 is secured by means of a nut 9. A similar arrangement with a screw 8 and a nut 10 is provided for securing the second pulley 5 in the frame of the trolley 6. As indicated only for the first sidewall 2a, the sidewalls 2a, 2b of the trolley 1 comprise through-holes 3a through which a snap hook can be inserted. The snap hook is intended for supporting the load to be carried. In particular a person that is secured by means of a harness can be hooked to the trolley.

**[0022]** In the second perspective of the inventive trolley 1 it can be seen that also in the second sidewall 2b a through-hole 3b is provided. In the illustrated first embodiment the surrounding areas of these two through-holes 3a, 3b is bulged to an inside of the trolley 1. As it can be seen with the first pulley 4 the pulley 4 comprises a groove along its outer circumference. The trolley travels along the cable of the zip line system with the cable being inserted into the grooves of the pulleys 4 and 5. This will be explained later in greater detail with respect to the more detailed illustrations of the pulleys. It is to be noted that the frame of the trolley 1 has to be made from an electrically conductive material so that a permanent magnet that moves relative to the frame of the trolley 1 generates a turbulent flow of currents in the frame and thus a breaking force.

**[0023]** In order to generate such turbulent flow of current in the frame permanent magnets or at least one permanent magnet is attached to the pulley. An example for such a pulley is shown in fig. 3. This example shows a plurality of recesses 13 that all have the shape of a cylinder. Thus, the recesses 13 (for simplicity of the drawing only one of them is provided with reference numerals) each have a bottom surface 14 that is parallel with a side surface 12 of the pulley 4. The circumferential side sur-

face of the recesses 13 in the present example of pulley 4 is a closed side surface. This means that the diameter of the cylindrically shaped recess is smaller than the radius difference between a center recess 11 of pulley 4 and its outer circumference.

**[0024]** The center recess 11 is provided for accommodating one bearing or two bearings as in the present example. In the present example pulley 4 is formed symmetrically and the center recess 11 shows a flange to which the bearing abuts when it is assembled.

**[0025]** Furthermore in fig. 3 it can be seen that the pulley 4 at its outer circumference is provided with a groove 15. Usually the groove 15 is not in direct contact with the cable but the groove is filled with rubber or resin material.

**[0026]** In the illustrated embodiment of pulley 4 only one permanent magnet 16 is inserted into one of the recesses 13. As it can be seen from the figure the height of the permanent magnet 16 corresponds to the height of the recess 13. Thus, the outer surface of the permanent magnet 16 is flat with an outer surface 12 of pulley 4. Preferably the pulley 4 is made from a magnetic material so that the permanent magnet 16 fixes itself inside the recess 13 in particular by generating a magnetic force with the bottom surface 14.

**[0027]** Depending on the braking force that is needed one, two, three or even up to eight permanent magnets 16 can be inserted into the recesses 13 of one side of pulley 4. Since the recesses are provided on the other side of pulley 4 as well, a total of 16 permanent magnets 16 can be attached to the pulley body of pulley 4. Of course the permanent magnet 16 may also be removed from the pulley body again. In order to remove the permanent magnets 16 a stronger magnet is brought into contact with the permanent magnet 16 to be removed and thereby the permanent magnet 16 can be pulled out from the recess 13. Another embodiment is shown in fig. 4. The pulley 4' of fig. 4 basically has the same configuration as the pulley 4 of fig. 3. But contrary to pulley 4, the circumferential side surface of recesses 13' are open towards the center of the pulley 4', which means to the rotation axis of pulley 4'. The side surface 12 of the pulley body is machined so that the openings are made by removing material until the bottom surfaces 14' of the recesses 13 extend up to the center recess 11. It is to be noted that the side surfaces of the recesses 13' need to be maintained more than half in order to ensure that permanent magnets inserted into the recesses 13' are securely held by the side surfaces of the recesses 13. Otherwise, an unintended movement of the permanent magnets might occur.

**[0028]** In the embodiment that is shown in figure 4 a bearing 15 is inserted into the center recess 11. It can be seen that the bearing surface 15 is arranged such that the outer bearing ring is flat with a bottom surface 14' of the recesses 13' and an area 30 between the recesses 13' and the center recess 11.

**[0029]** Moving on to figure 5, an example for a groove 15 that is provided on the outer circumference of the pul-

ley 4 is shown. As it was already mentioned above, such groove 15 is not intended to be in direct contact with the cable, but to accommodate a running surface, which is made from an elastic material such as rubber or resin and that is provided in the groove 15 of the pulley body.

**[0030]** Figure 6 shows a third embodiment of an inventive pulley 4". Such an embodiment is in particular preferred if the diameter of the pulley 4" is relatively large. As it can be seen by the screws that are shown in the side surface of the pulley 4", the pulley 4" is assembled from a plurality of elements. The plurality of elements all are basically shaped like a disc, but have different diameters. The pulley 4" preferably is made from three disc-shaped elements. The first one is the one seen in figure 6 in top view, which is similar to the one of the opposite side, because pulley 4" is constructed symmetrically. Thus, between the two outer disc-shaped elements, a third disc-shaped element is provided which can be seen to be smaller in diameter. At least this third disc-shaped element is made from a ferromagnetic material and is clamped between the two other disc-shaped elements. The two outer disc-shaped elements may be for example made from aluminium and are provided with through holes and threadholes so that the two outer disc-shaped elements can be fixed to each other with the middle disc-shaped element clamped there between. Since the diameter of the middle disc-shaped element and the position of the through holes in the outer disc-shaped elements are chosen correspondingly, the bottom surfaces 14" of the recesses 13" of the pulley 4" according to the third embodiment is constituted by the middle disc-shaped element being made from a ferromagnetic material. Furthermore, the flange in the center recess 11" can also be established by the middle disc-shaped element. Since securing the permanent magnets 16 in the recesses 13" is ensured by the ferromagnetic material of the middle disc-shaped element, the outer disc-shaped elements can be made of a not ferromagnetic material, for example aluminium. This has the advantage of the overall weight of such a pulley 4" can be reduced compared to a pulley made from a ferromagnetic material such as steel.

**[0031]** Furthermore, as it can be seen with respect to the inserted permanent magnet 16, the diameter of the recesses 13" may be larger than the outer diameter of the permanent magnet 16. To compensate the gap that exists between the permanent magnet 16 and the side surface of the recess 13" as spacer 17 is inserted. This spacer can be in particular made from an elastic material that has damping characteristics.

**[0032]** On the one side, the spacer 17 can help to remove permanent magnet 16 from the recess 13" because it can be pushed aside or even removed before the permanent magnet 16 is removed. Thus, the gap allows using a tool for removing the permanent magnet 16. Of course, similar as it was explained with respect to the other embodiments, here also another strong magnet can be used to remove permanent magnet 16 from

the recess 13'.

**[0033]** Figure 7 shows a second perspective of the pulley 4" of figure 6. It can be seen that a running surface 17 is provided between the two outer disc-shaped elements. Contrary to the pulleys that are shown with respect to the first and second embodiment of pulleys 4 and 4', here the entire geometry of the running surface can be provided by a resin that is arranged between the outer disc-shaped elements.

**[0034]** Figure 8 shows a further embodiment of the inventive trolley. The embodiment shown in figure 8, 9 and 10 comprises a snap hook 20 that is already inserted through the openings 3a and 3b of the sidewalls 2a' and 2b'.

**[0035]** A snap hook 20 basically consists of a snap hook body 21. Connected with this snap hook body 21 is a movable finger 22. The movable finger 22 is movably connected to the snap hook body 21 by means of a hinge 23 that is positioned at one end of the snap hook body 21 and is biased by an elastic force towards the closed state of the snap hook 20. Thus, the movable finger 22 can be rotated around the hinge 23. The other end, which is called open end 25 of the snap hook body 21 can then be inserted through both of the openings 3a', 3b'. After being inserted through both openings 3a', 3b', a securing element 24 is attached and fixed to the snap hook body 21 near the open end 25. In the present embodiment, the securing element 24 is a metallic ring that is secured to the snap hook body 21 by means of a small screw. As it can be seen in figure 8, the second opening 3b' has a circular shape with a diameter that is a little bit greater than the outer diameter of the securing element 24. Thus, if the snap hook 20 is brought to its open state, the open end 25 together with the securing element 24 can be retracted through the second opening 3b'.

**[0036]** Looking now at figure 9, which shows the other sidewall 2a' of the trolley, it can be seen that the first opening 3a' extends in a longitudinal direction, which is perpendicular to a connecting line between the rotation axes of the two pulleys. Furthermore, an area surrounding 26 the first opening 3a' is bulged outwardly so that on the inside of the first sidewall 2a an accommodation space is established. The function of the accommodation space gets clearer if figure 10 is used for explanation. Since the surrounding of the first opening 2a' is bulged to the outside, the securing element 24 can be accommodated in the such generated space at least partially. It is preferred that the shape of the bulged surrounding 26 is adapted to the shape of the securing element 24 as well as the snap hook 20 that is used for the trolley 6'. The illustration of figure 10 shows that when the snap hook 20 is brought into its open state by pressing the movable finger 22 towards the snap hook body 21, the open end 25 of the snap hook body 21 can be pulled out of through hole 3b', but not out of the first opening 3a' because the width of the first opening 3a' is smaller than the diameter of the securing element 24. Thus, at some point the securing element 24 abuts the inner surface of

the first side wall 2a'. If in this position the movable finger 22 is released, an elastic force tries to move the movable finger 22 back into its closed position. Thus, if the movable finger 22 is released, it will abut on the outer surface of the first side wall 2a'. As a consequence, a rotational force is exerted to the snap hook 20 that is compensated by the securing element 24 abutting the inner surface of the first sidewall 2a' and either an outer side of the snap hook body 21 abutting one end of the first opening 3a' and/or the open end 25 abutting the other end of the longitudinal direction of the first opening 3a'. It is in particular preferred that the open end 25 can be inside the first opening 3a'. In that position as it can be seen from figure 10, pulleys that are arranged between the first sidewall 2a' and second sidewall 2b' are easily accessible. Consequently, the trolley can be set on a cable of a zip line system easily.

[0037] Further, it has to be noted that due to the width of the first opening 3a' that basically corresponds to the thickness of the snap hook body 21, but the extension of the first opening 3a' in the longitudinal direction being significantly larger than the thickness of the snap hook body 21, it is possible that the snap hook body 21 penetrates through the first opening 3a' at an angle that deviates from 90° significantly. In particular, as shown in the embodiment, it is preferred that the angle is approximately between 30° and 45°. This corresponds to a position of the snap hook 20 as shown in figure 10 where the longitudinal direction of the snap hook 20 is approximately in parallel to the sidewall 2a' and sidewall 2b' of trolley 6'. In this position and with the open end 25 lying inside the first opening 3a', the portion of the snap hook 20 and the securing element 24 that protrudes to an inside of trolley 6 is relatively small and thus does not hinder the trolley 6 being set onto a cable of the zip line system. It is obvious that the aspects explained with respect to the individual embodiments can be combined with other embodiments.

## Claims

1. Trolley for a zip line system, the trolley (1, 1') comprising a frame in which at least one pulley (4, 4', 4'') is rotatably supported, wherein the frame is made from an electrically conductive material and wherein the trolley (1, 1') comprises at least one permanent magnet (16) that is positioned in an eccentric manner with respect to the rotation axis of the pulley (4, 4', 4'') to induce turbulent flow of current in the frame.
2. Trolley according to claim 1, **characterized in that** the pulley comprises a pulley (4, 4', 4'') body to which at least one permanent magnet (16) is attached.
3. Trolley according to claim 2, **characterized in that** the pulley body comprises at least one recess (13, 13', 13'') in which the permanent magnet (16) can be inserted.
4. Trolley according to claims 3, **characterized in that** the pulley body comprises a plurality of recesses (13, 13', 13'') arranged in a distributed fashion on at least on one side surface (12) of the pulley body.
5. Trolley according to claim 4, **characterized in that** the recesses (13, 13', 13'') are partially shaped cylindrically with the cylinder axis extending in parallel to the rotation axis.
6. Trolley according to any one of claims 3 to 5, **characterized in that** the at least one recess (13, 13', 13'') is open towards the rotation axis and the bottom surface (14, 14', 14'') of the recess (13, 13', 13'') is flat with a side surface (30) of the pulley between the open recess side and a center recess (11, 11') of the pulley.
7. Trolley according to any one of claims 3 to 6, **characterized in that** the height of the at least one recess (13, 13', 13'') corresponds to the height of the permanent magnets (16).
8. Trolley according to any one of claims 3 to 7, **characterized in that** the lateral extension of the recess (13'') is bigger than the lateral extension of the permanent magnet (16) to be inserted and that a spacer (17) is inserted into the recess (13'') to compensate the difference in lateral extension.
9. Trolley according to claim 2 or 8, **characterized in that** at least a portion of the trolley body is made from a ferromagnetic material.
10. Trolley according to any one of claims 2 to 9, **characterized in that** the pulley body is built from three generally disc shaped elements that are assembled to constitute a stack, wherein the middle element is made from a ferromagnetic material and at least one of the other disc shaped elements comprises the at least one recess (13'') as a through hole at a position that overlaps with the middle element.
11. Trolley according to any one of claims 1 to 10, **characterized in that** the frame comprises two side walls (2a, 2b, 2a', 2b') that sandwich the at least one pulley (4, 5).
12. Trolley according to claim 11,

**characterized in that**

each of the side walls (2a, 2b, 2a', 2b') comprises an opening (3a, 3b, 3a', 3b') at corresponding positions, wherein the opening areas of the two openings (3a', 3b') are different, so that a securing element (24) attached to a snap hook (20) after inserting the snap hook (20) into at least the first opening (3a') can be pushed through second opening (3b') but not pulled back through the first opening (3a').

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13. Trolley according to claim 13,

**characterized in that**

a surrounding area (26) of the first opening (3a') is bulged to an outside direction of the trolley (1') to form an accommodation area on the inside of the trolley that is capable of accommodating at least part of the snap hook (20) in an open state together with the securing element (24).

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14. Trolley according to claim 12 or 13,

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**characterized in that**

a surrounding area (26) of the first opening (3a') is bulged to an outside direction, the first opening (3a') has a width basically corresponding to a snap hook body's (21) thickness and a longitudinal extension that allows the snap hook body (21) to penetrate at an angle significantly deviating from 90°.

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15. Trolley according to 13 and 14,

**characterized in that**

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the shape of the bulged surrounding (26) and the longitudinal extension of the first opening (3a') are chosen such that when a movable finger (22) of the opened snap hook (20) is pressed by an elastic force against an outer surface of the sidewall (2a') in which the first opening (3a') is provided the securing element (24) abuts an inside surface of the bulged surrounding (26) and at least one of an outside of the snap hook body (21) and an open (25) end of the snap hook body (21) abuts the side wall (2a') at a respective end of the first opening (3a') in the longitudinal direction such that the snap hook (20) is held in a position that a running surface of the pulley is freely accessible.

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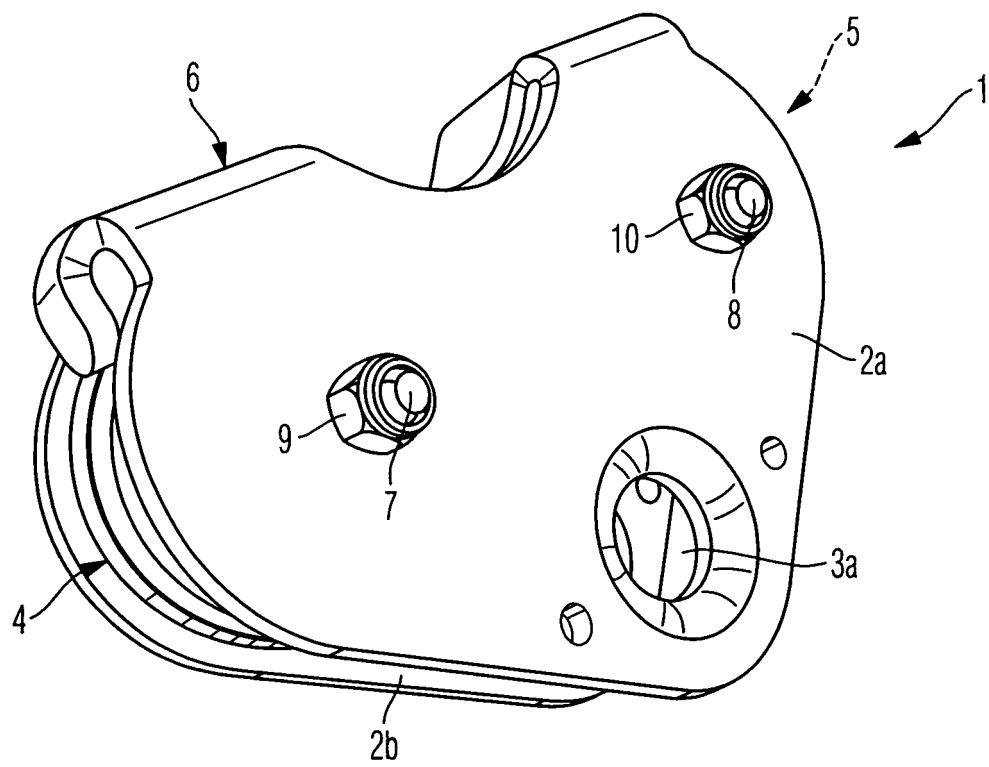


Fig. 1



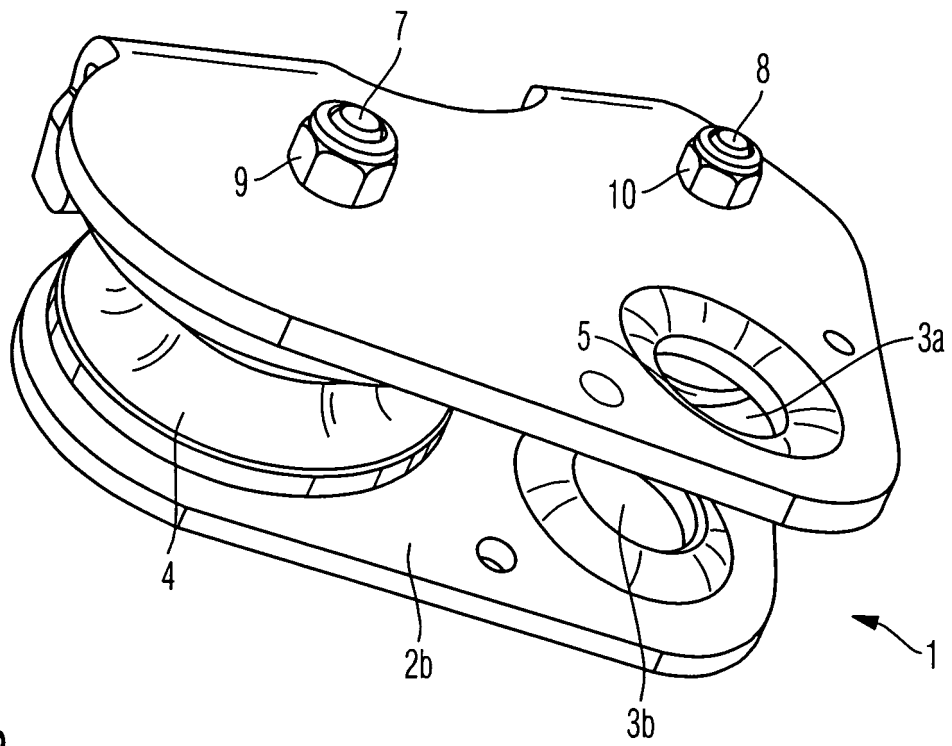


Fig. 2

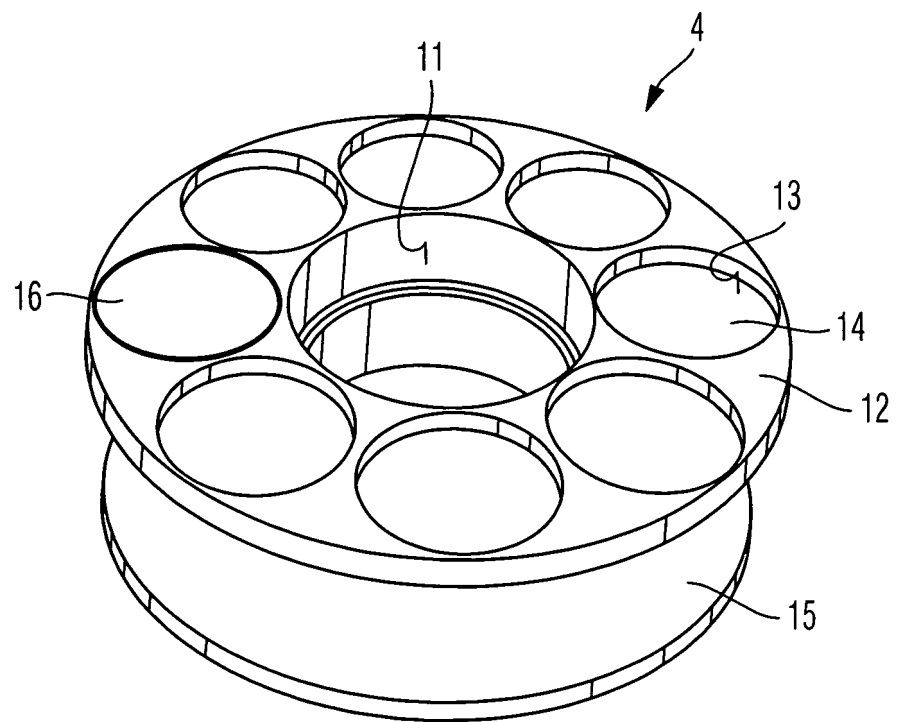


Fig. 3

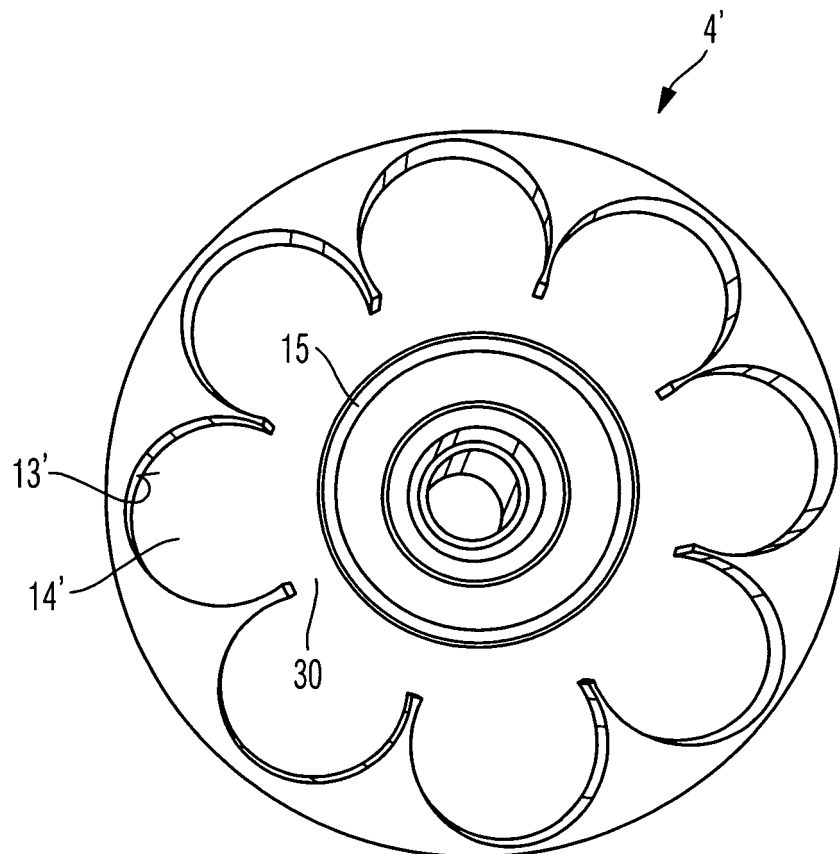


Fig. 4

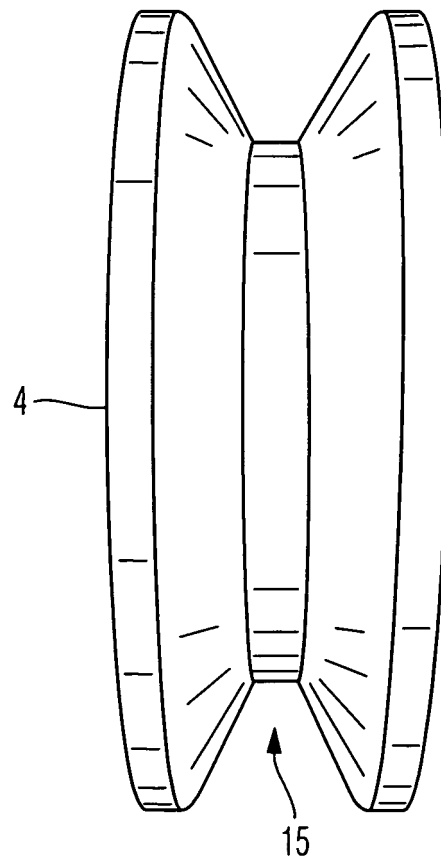


Fig. 5

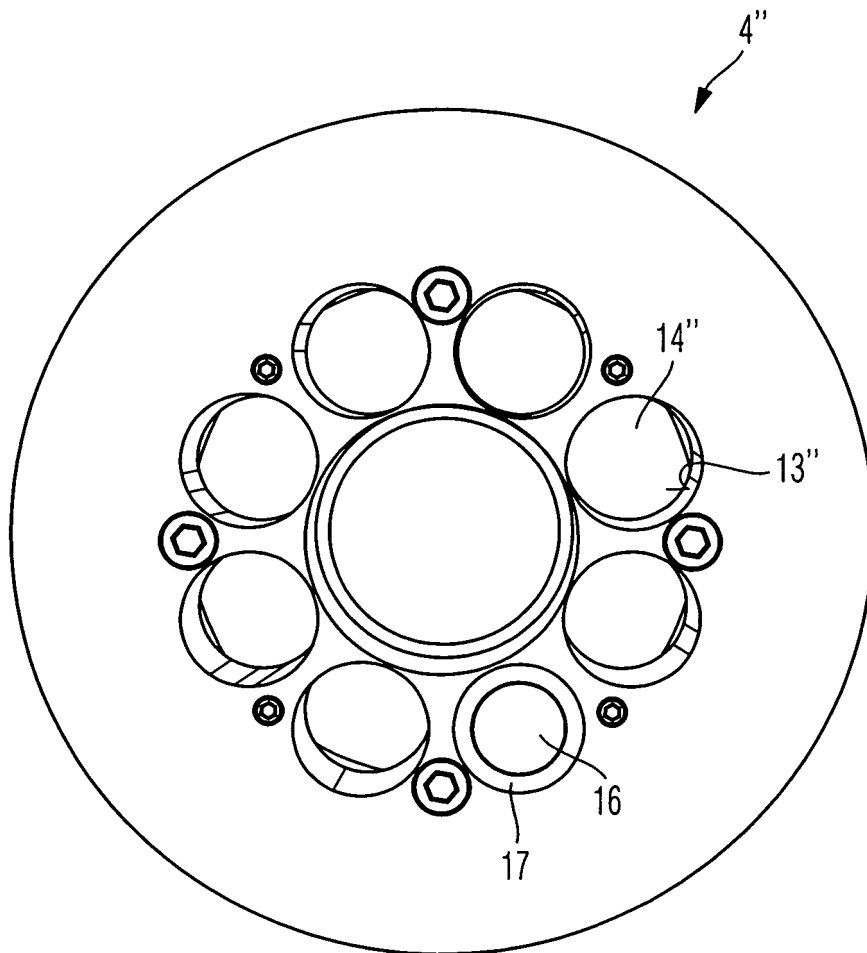


Fig. 6

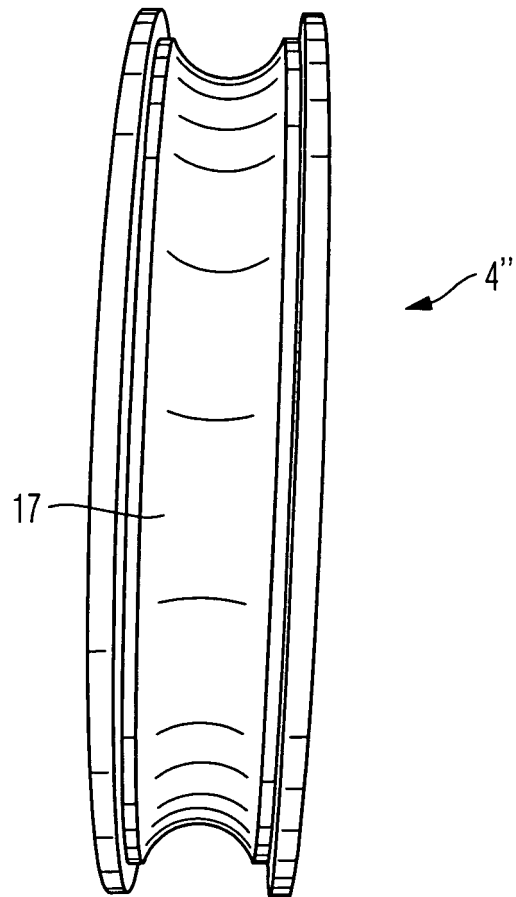


Fig. 7

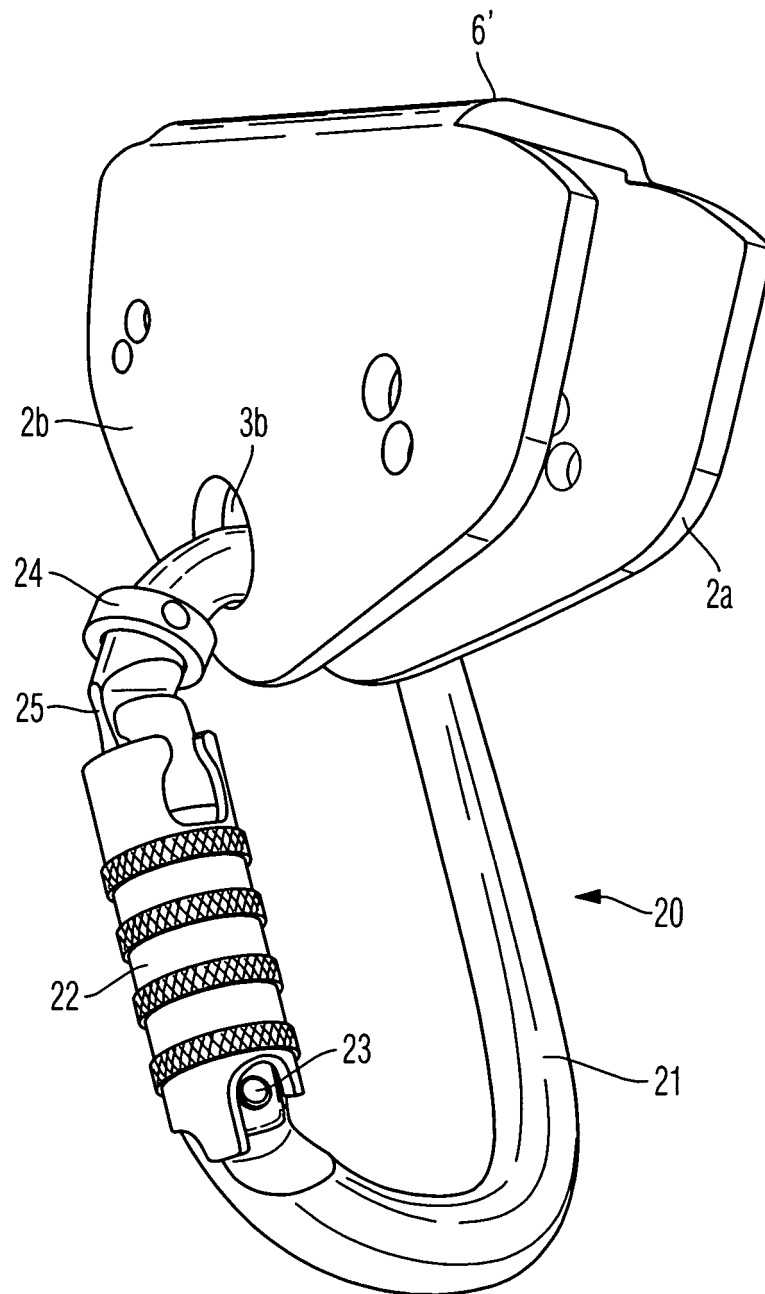


Fig. 8

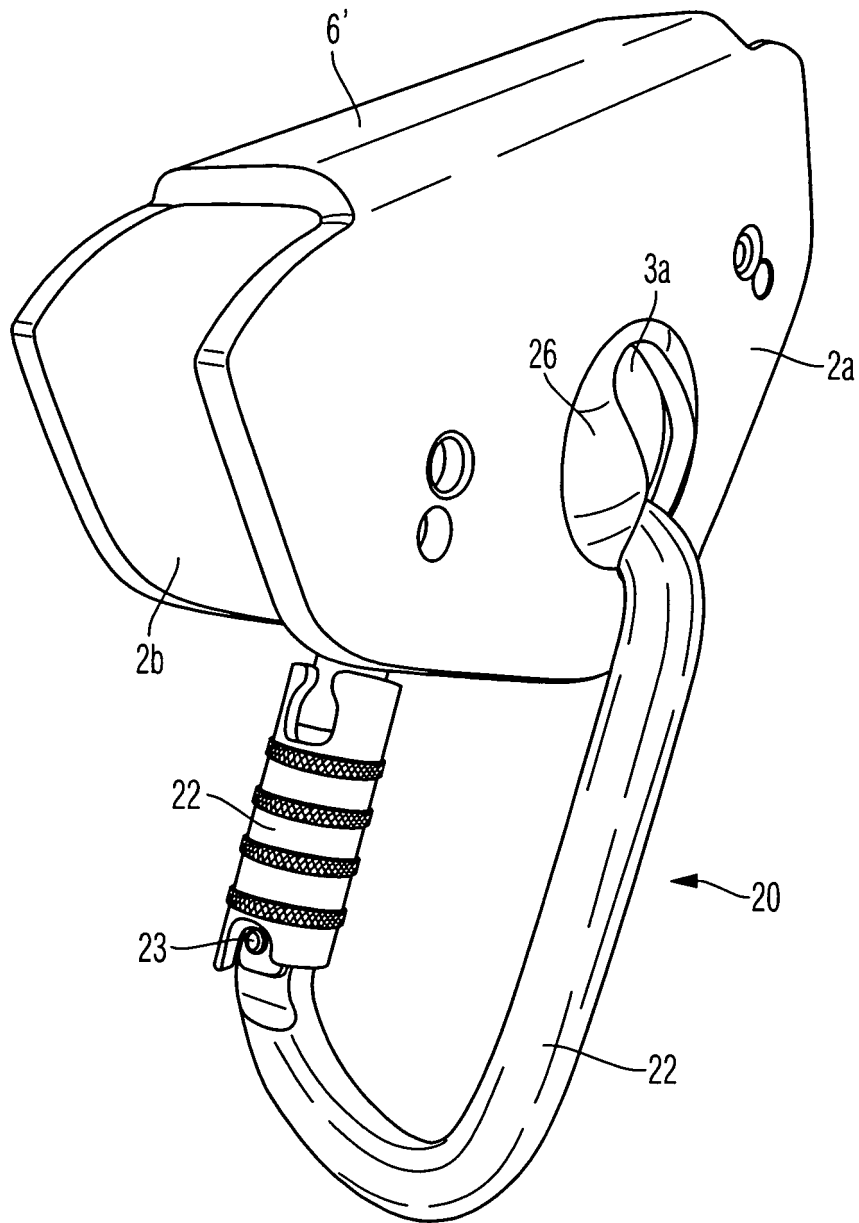


Fig. 9



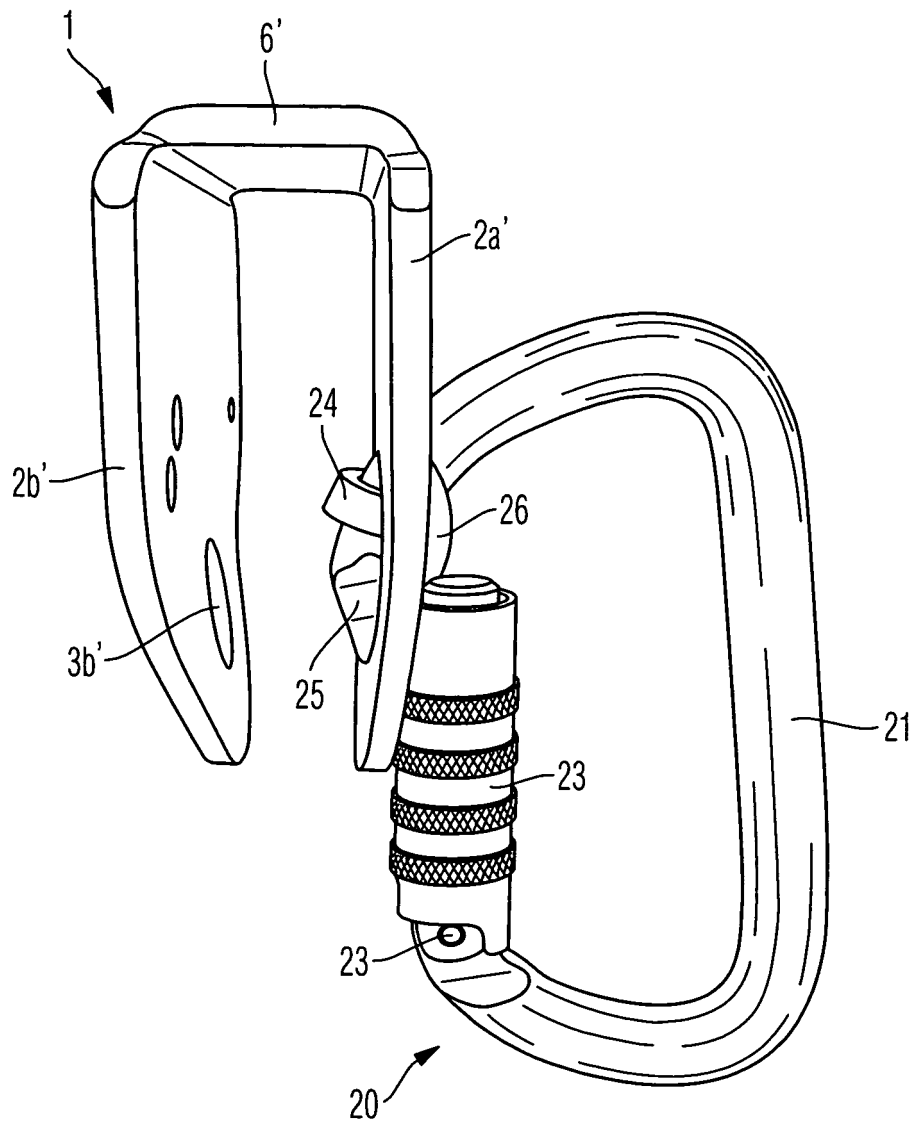


Fig. 10



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Application Number  
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