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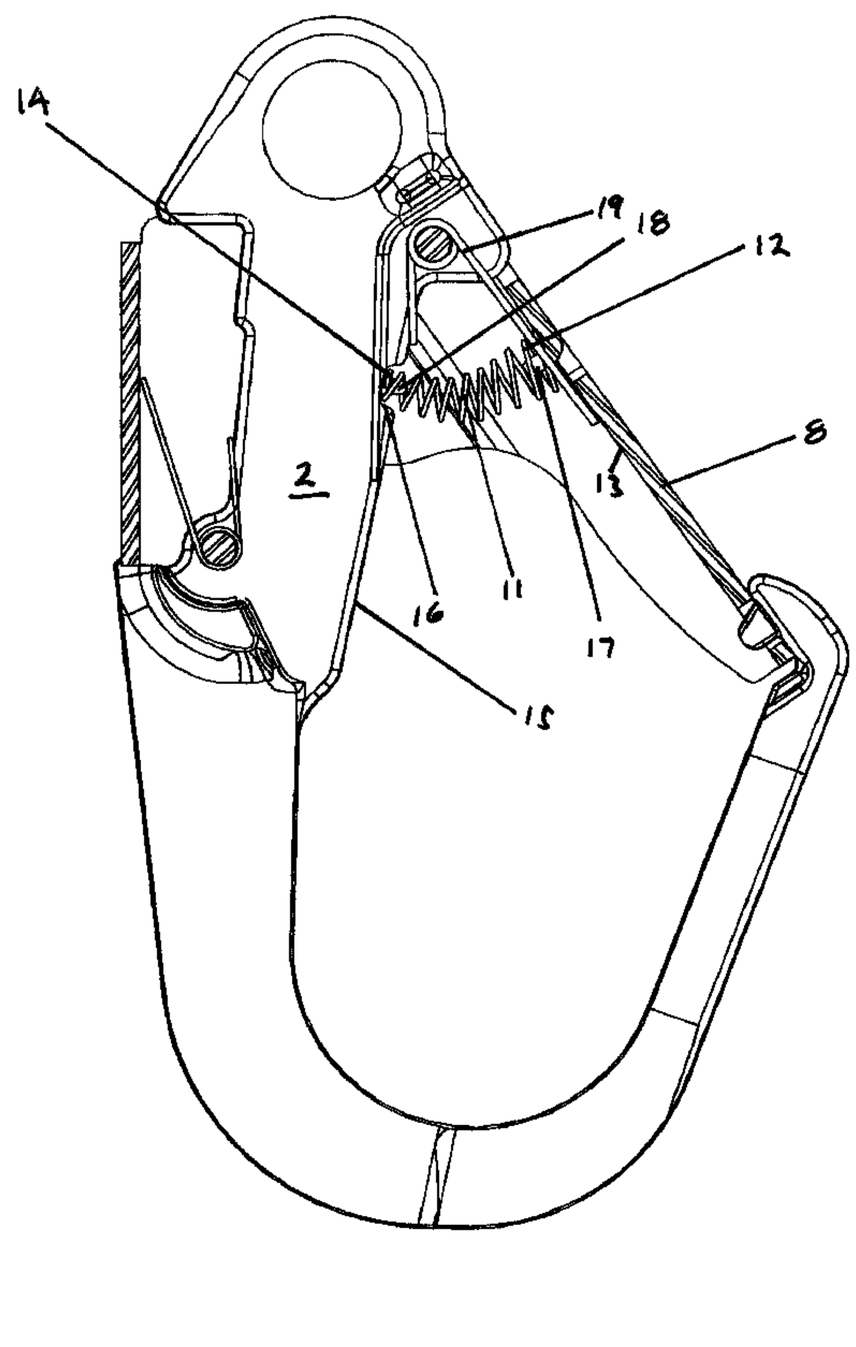
(54) Title: SNAP HOOK WITH IMPROVED GATE KEEPER



(57) Abrégé/Abstract:
A snap hook comprising a shank having a hook member at one end, a gate keeper pivotally mounted to the shank, and a biasing member. The hook member has a hook bowl and a free end with the free end of the hook member and the shank defining a gateway opening therebetween. The gate keeper has an open position and a closed position. When in its open position the gate keeper permits access through the gateway opening. When in its closed position the gate keeper at least partially restricts access through the gateway opening. The biasing member urges the gate keeper into the closed position and comprises a conical spring positioned between the gate keeper and the shank.

ABSTRACT OF THE DISCLOSURE

A snap hook comprising a shank having a hook member at one end, a gate keeper pivotally mounted to the shank, and a biasing member. The hook member has a hook bowl and a free end with the free end of the hook member and the shank defining a gateway opening therebetween. The gate keeper has an open position and a closed position. When in its open position the gate keeper permits access through the gateway opening. When in its closed position the gate keeper at least partially restricts access through the gateway opening. The biasing member urges the gate keeper into the closed position and comprises a conical spring positioned between the gate keeper and the shank.

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CANADA

File No. 389-HD32

TITLE: SNAP HOOK WITH IMPROVED GATE KEEPER

APPLICANT: HAUN DROP FORGE CO. LTD.

TITLE OF THE INVENTION

Snap Hook With Improved Gate Keeper

FIELD OF THE INVENTION

This invention relates to snap hooks. In particular, the invention relates to a new and improved gate keeper and a mechanism for operating a gate keeper on a snap hook.

BACKGROUND OF THE INVENTION

Safety and the prevention of falls is of primary importance for individuals working at heights, around areas of excavation, or where a fall could result in serious injury or death. In such cases the employment of a safety system to prevent falls is often not only desirable but a statutory requirement. Typically safety systems that are commonly used involve the placement of a harness or belt around an individual and the subsequent use of a rope, cable or strap that physically secures the individual to a solid structure. For example, individuals working on bridges, towers or tall buildings will commonly wear belts, safety harnesses or fall arresters. Such devices usually include a lifeline comprised of a rope or strap having one end secured to the structure upon which the individual is working. In the logging industry, and in situations where individuals work on utility poles, a worker is often fitted with a safety belt having a rope or strap that is connected to the belt at one end, is passed around the tree or pole, and then has its free end connected to the opposite side of the belt. So that the worker may readily engage and disengage the lifeline, rope, cable or strap, at least one end must be fitted with a means to releasably secure it to either a safety belt or a fixed structure. The other end of the rope or strap may be equally fitted with a means to releasably secure it to the worker's belt or harness, or it may be a more permanent attachment.

In theory, should a worker slip or fall while wearing a safety belt or a harness secured to a solid structure, the worker will only be allowed to fall a very limited distance after which his decent will be stopped and he will be suspended until he can regain his balance or be rescued. Unfortunately, in practice the safety harness and fall arrest systems currently in use do not always function as designed and accidents, injuries and fatalities sometimes occur. Where a snap hook on the end of a lifeline fails or is not used property the results can be devastating.

Due to their convenience and ease of use, snap hooks having a gate keeper that encloses the hook's bowl are one of the most widely used methods to secure the end of a lifeline to a safety belt or a fixed object. Gate keepers on snap hooks are typically designed to pivot about a point on the hook's shank so that the keeper may be moved from a closed position (where it encloses the gate opening) to an open position (where it allows free access to the hook's bowl). Pivotal movement of gate keepers is normally accomplished through the use of a pin connecting the keeper to the hook's shank. For safety reasons the gate keeper is normally biased in a closed position by a torsion spring mounted about the connecting pin. The torsion spring maintains the gate keeper in a normally closed position so that when the hook is received around a rope, cable, strap, D-ring or other anchorage type connector the hook cannot be removed unless the gate keeper is first moved to its open position.

The spring used to bias the hook's keeper toward a normally closed position therefore plays an important role in the overall safety of the product. In general, the stronger the spring the better. A strong spring will ensure that the gate keeper remains closed against reasonable forces that may be applied to it during use. In addition, there is generally a desire for the gate keeper to quickly move to its closed position once the hook has been received about an object to prevent the hook from accidentally becoming disengaged before the gate keeper has a chance to close. The spring should also not interfere with the ability of the gate keeper to fully open. Any restriction upon the range of movement of the gate keeper will have the effect of reducing the size of the gate opening.

Bearing in mind the above design considerations, others have developed a variety of different types of torsion springs that may be placed about the pin used to secure a gate keeper to a hook's shank. Unfortunately, the relatively small amount of space available about such pins in many instances prevents the use of springs having sufficient strength to quickly and forcefully close the gate keeper. For larger hooks (for example, rebar hooks) the gate opening is often of sufficient size that an over sized gate keeper is required. Existing torsion springs are less that desirable in terms of their ability to close large gate keepers, and to thereafter maintain such keepers in a closed position.

To combat the deficiencies of torsion springs in these regards, some have proposed inserting a coil spring between the hook shank and the interior surface of the gate

keeper. Unfortunately, there is a tendency for coil springs to be subjected to severe lateral stress when compressed under a situation where their ends are not maintained in a parallel configuration. Typically, coil springs when used within a snap hook are not compressed in a parallel manner. In such cases the ability of the spring to drive the gate keeper into a closed configuration will be diminished. There also exists the possibility that the spring may be ejected from within the hook. In addition, a compressed coil spring situated between the hook's shank and the interior surface of the gate keeper will present a physical limitation to the pivotal movement of the gate keeper toward an open position, and a corresponding limitation on the effective size of the gate opening that will be available for use.

SUMMARY OF THE INVENTION

The invention therefore provides a snap hook and an improved gate keeper assembly for a snap hook that address the deficiencies in the prior art and that permits the hook's gate keeper to be quickly and forcefully closed, particularly in larger hook applications where the gate keeper is of significant size and weight.

Accordingly, in one of its aspects the invention provides a snap hook comprising a shank having a hook member at one end, said hook member having a hook bowl and a free end, said free end of said hook member and said shank defining a gateway opening therebetween, a gate keeper pivotally mounted to said shank, said gate keeper having an open position and a closed position, when in said open position said gate keeper permitting access through said gateway opening, when in said closed position said gate keeper at least partially restricting access through said gateway opening; and, a biasing member to urge said gate keeper into said closed position, said biasing member comprising a conical spring positioned between said gate keeper and said shank.

In a further aspect the invention provides an improved gate keeper assembly for enclosing the gateway opening of a snap hook of the type that includes a shank ending in a hook member having a hook bowl and a gateway opening, the gatekeeper assembly comprising a gate member having an open and a closed position, when in said closed

position said gate member at least partially enclosing said gateway opening, when in said open position said gate member permitting access through said gateway opening, said gate keeper further comprising a biasing member in the form of a conical spring positioned between the shank of said snap hook and said gate member, said conical spring biasing said gate member toward said closed position.

Further aspects and advantages of the invention will become apparent from the following description taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings which show the preferred embodiments of the present invention in which:

Figure 1 is a side view of a locking snap hook incorporating the improved gate keeper and spring assembly of the present invention;

Figure 2 is a plan view of the snap hook shown in Figure 1 taken from direction "A" as noted in Figure 1;

Figure 3 is a side view of the snap hook shown in Figure 1 with the hook's gate keeper and lock shown in cross-section;

Figure 4 is a view corresponding to Figure 3 wherein the gate keeper is in a partially open position; and,

Figure 5 is a view corresponding to Figure 3 wherein the gate keeper is in a fully open position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention may be embodied in a number of different forms. However, the specification and drawings that follow describe and disclose only some of the specific forms of the invention and are not intended to limit the scope of the invention as defined in the claims that follow herein.

Figure 1 illustrates a relatively standard snap hook 1 that is comprised generally of a shank 2 having an eye 3 at one end and a hook member 4 at the opposite end. Hook member 4 is comprised of a hook bowl 5 and a free end 6, with free end 6 and shank 2 together defining a gateway opening 7. For illustration purposes the snap hook shown in Figure 1 and the drawings that follow is generally in the form of a rebar hook, however, it will be appreciated from a thorough understanding of the invention that the invention may be applied to essentially any form of snap hook and not only the particular hook depicted in the enclosed drawings.

As is common with snap hooks, hook 1 includes a gate keeper 8 pivotally mounted to shank 2 by means of a fastener 9 which may be in the form of a pin, rivet, screw, bolt or similar device. The particular snap hook shown in the drawings further includes a locking member 10. Such locking members are common in the art and are not essential

to the function of the current invention. In Figure 1 gate keeper 8 is shown in its closed position such that it encloses gateway opening 7 and limits or restricts access through the gateway opening into the hook bowl. When pivoted about fastener 9, gate keeper 8 may be rotated into an open position (see Figure 5) where it permits access through the gateway opening to allow an object to pass into hook bowl 5. As is also common with most snap hooks, hook 1 includes a biasing member or spring to urge the gate keeper toward its closed position.

Without considering the structure and operation of locking member 10, moving the gate keeper 10 from its closed to its open position requires the application of a force tending to drive the gate keeper toward shank 2 to overcome the effect of the biasing means that is used to maintain the gate keeper in its closed position. The removal or relaxation of the force will allow the biasing means to pivot the gate keeper once again to its closed position. Of importance to the present invention is the particular structure of the biasing means that is utilized in these regards. According to the invention, snap hook 1 includes a biasing means or member that is comprised of a conical spring 11 positioned between the gate keeper and the hook's shank. In particular, and as shown in Figure 3, conical spring 11 is positioned with its first end 12 bearing against the inside surface 13 of gate keeper 8 and with its second end 14 bearing against the inside surface 15 of shank 2. Conical spring 11 is preferably frustoconical in shape with first end 12 having a larger diameter than second end 14. The individual coils of spring 11 have a decreasing

diameter in a direction toward second end 14 with the coils designed so that they may be received at least partially within one another as the spring is compressed.

The interior surface 15 of shank 2 preferably includes a recess 16 into which second end 14 of spring 11 is at least partially received when gate keeper 8 is in its open position. To help maintain the spring in place between the shank and gate keeper, inside surface 13 of gate keeper 8 and inside surface 15 of shank 2 may further include retainers, 17 and 18 respectively, that engage ends 12 and 14 of conical spring 11. While retainers 17 and 18 may be formed with a variety of different physical configurations, in one embodiment both retainers are comprised of outwardly extending tabs, with each end of spring 11 received over one of the respective tabs (see Figure 3). If desired, snap hook 1 may further include a torsion spring 19 to assist in movement of gate keeper 8 from its open to its closed position, and to thereafter help maintain the gate keeper in a closed configuration.

Figures 3, 4 and 5 depict snap hook 1 with gate keeper 8 in various stages of opening. In Figure 3 the gate keeper is fully closed and shown as received against free end 6 of hook member 4, and thereby completely closing gateway opening 7. Figure 4 shows the same snap hook where a force "F" has been applied to the exterior surface 20 of gate keeper 8 causing the gate keeper to partially rotate about fastener 9. As the force is maintained against the exterior surface of the gate keeper, the keeper rotates further

about fastener 9 until it comes to rest against interior surface 15 of shank 2. At that point the gate keeper is in its fully open position (see Figure 5).

It will be appreciated that due to the nature of conical spring 11, as the gate keeper is opened the spring effectively compresses at least partially into itself with individual coils received at least partially into the interior of adjacent large diameter coils. In contrast, when a cylindrical spring is compressed there comes a point where the coils of the spring come into contact with each other and the spring effectively acts as a solid cylinder. At that point further compression of the spring is not possible without deformation of the coils. On the other hand, compression of conical spring 11 will allow individual coils to be compressed down to a point where the overall height of the spring is less than an equivalent cylindrical spring. As conical spring 11 is compressed into itself through the pivotal movement of gate keeper 8 the spring will therefore provide a reduced limitation (or in some cases effectively little or no limitation) upon the degree to which gate keeper 8 can be opened. As shown in Figure 5, the gate keeper may thus be pivoted about fastener 9 until interior surface 13 comes into contact with shank 2.

The manner in which conical spring 11 is compressed (with smaller coils being received at least partially into larger coils) has the further and significant advantage of helping to maintain spring 11 in place between the hook shank and gate keeper. It will be

appreciated that the structure of a snap hook necessitates that upon compression of the spring's end surfaces will not be maintained in a parallel configuration. In the case of a standard cylindrical spring, compressing the spring while the ends are non-parallel will have a tendency to cause the middle of the spring to buckle or "kick" in an outward direction. At that point the ability of the spring to resist a compressive force is significantly diminished and continued force applied to the spring may result in damage being caused to it. Further, should the middle of the spring "kick" outwardly, the spring will have a tendency to move in a direction generally perpendicular to its longitudinal axis. Where such a spring is used within a snap hook there is a possibility that the spring may be completely ejected from between the hook's shank and gate keeper upon compression. In contrast, the utilization of conical spring 11 in snap hook 1 minimizes the likelihood of the spring buckling or "kicking" in an outward direction, and also minimizes the chance of the spring being ejected from between shank 2 and gate keeper 8. In the case of conical spring 11, as the spring is compressed with the smaller coils received at least partially within the internal opening of larger adjacent coils, a generally shallow cone or plate-like mass will be created. Accordingly, the tendency of the spring to buckle or "kick" outwardly in a sideways direction is significantly reduced. The spring is also able to maintain a force against the interior surface of the gate keeper throughout a complete range of movement of the gate keeper.

It will therefore be appreciated that the utilization of conical spring 11 will have a

significant effect upon the overall ability of snap hook 1 to both maintain the gate keeper in a closed position and to rotate the gate keeper closed when the force causing the keeper to open is removed. The advantages of conical spring 11 are even more pronounced when used in association with large hooks (such as the rebar hook shown in the attached drawings) where the gateway opening is of significant size requiring a large and relatively heavy gate keeper. In such cases standard torsion springs alone are often not able to quickly close the keeper and to then maintain it in a closed position. Furthermore, the size of the gateway opening requires the gate keeper to move over an extended distance. In such cases a relatively long conical spring is necessary in order to extend between the shank and the interior surface of the gate keeper. Conical spring 11 has been found to be particularly effective where a rather long spring is required. In applications of this nature spring 11 has been shown to be capable of being compressed over a significant distance without buckling, "kicking", or becoming ejected from its position within the hook.

It is to be understood that what has been described are the preferred embodiments of the invention and that it may be possible to make variations to these embodiments while staying within the broad scope of the invention. Some of these variations have been discussed while others will be readily apparent to those skilled in the art.

CLAIMS

WE CLAIM:

1. A snap hook comprising:

(i) a shank having a hook member at one end, said hook member having a hook bowl and a free end, said free end of said hook member and said shank defining a gateway opening therebetween;

(ii) a gate keeper pivotally mounted to said shank, said gate keeper having an open position and a closed position, when in said open position said gate keeper permitting access through said gateway opening, when in said closed position said gate keeper at least partially restricting access through said gateway opening; and,

(iii) a biasing member to urge said gate keeper into said closed position, said biasing member comprising a conical spring positioned between said gate keeper and said shank.

2. The device as claimed in claim 1 wherein said shank includes a recess into which said conical spring is at least partially received when said gate keeper is in said open position.

3. The device as claimed in claim 1 wherein each of said shank and said gate keeper include a retainer, said retainers on said shank and said gate keeper engaging opposite ends of said conical spring to assist in maintaining said spring in its position between said shank and said gate keeper.

4. The device as claimed in claim 3 wherein said retainers on said shank and said gate keeper comprise outwardly extending tabs, each end of said conical spring received over one of said tabs.

5. The device as claimed in claim 1 wherein said biasing member further includes a torsion spring operatively positioned between said shank and said gate keeper.

6. The device as claimed in claim 1 wherein said conical spring is frustoconical in shape with first and second ends, said first end greater in diameter than said second end, said first end engaging said gate keeper and said second end engaging said shank.

7. An improved gate keeper assembly for enclosing the gateway opening of a snap hook of the type that includes a shank ending in a hook member having a hook bowl and a gateway opening, the gatekeeper assembly comprising a gate member having an open and a closed position, when in said closed position said

gate member at least partially enclosing said gateway opening, when in said open position said gate member permitting access through said gateway opening, said gate keeper further comprising a biasing member in the form of a conical spring positioned between the shank of said snap hook and said gate member, said conical spring biasing said gate member toward said closed position.

8. The device as claimed in claim 7 wherein said shank of said snap hook and said gate member each include an outwardly extending tab, the opposite ends of said conical spring each received over one of said tabs.

9. The device as claimed in claim 8 wherein said shank of said snap hook further includes a recess, said tab on said shank positioned within said recess such that said conical spring is at least partially received into said recess when engaging said tab on said shank.

10. The device as claimed in claim 7 wherein said conical spring is frustoconical in shape with first and second ends, said first end greater in diameter than said second end, said first end engaging said gate member and said second end engaging said shank.

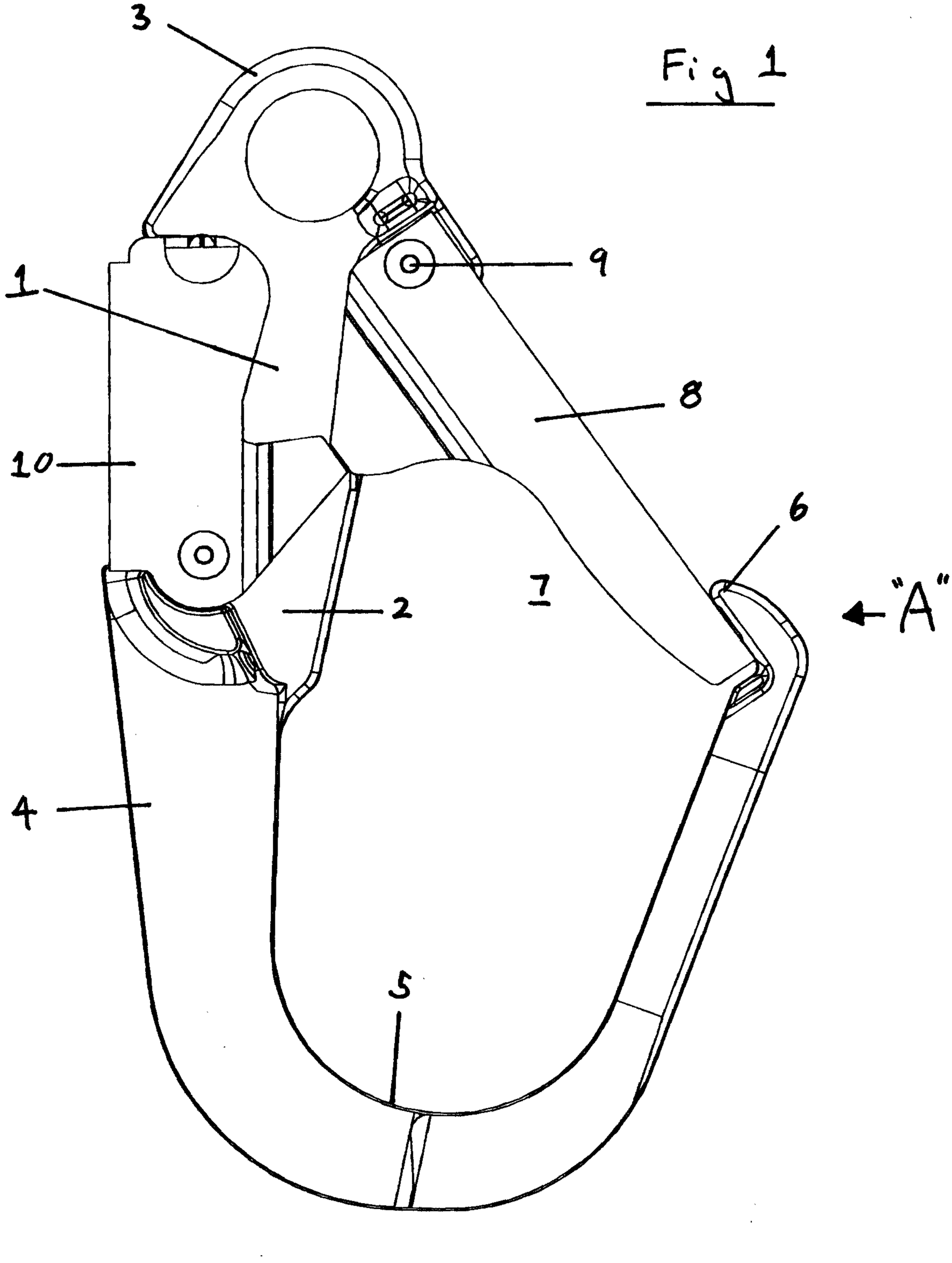


Fig 1

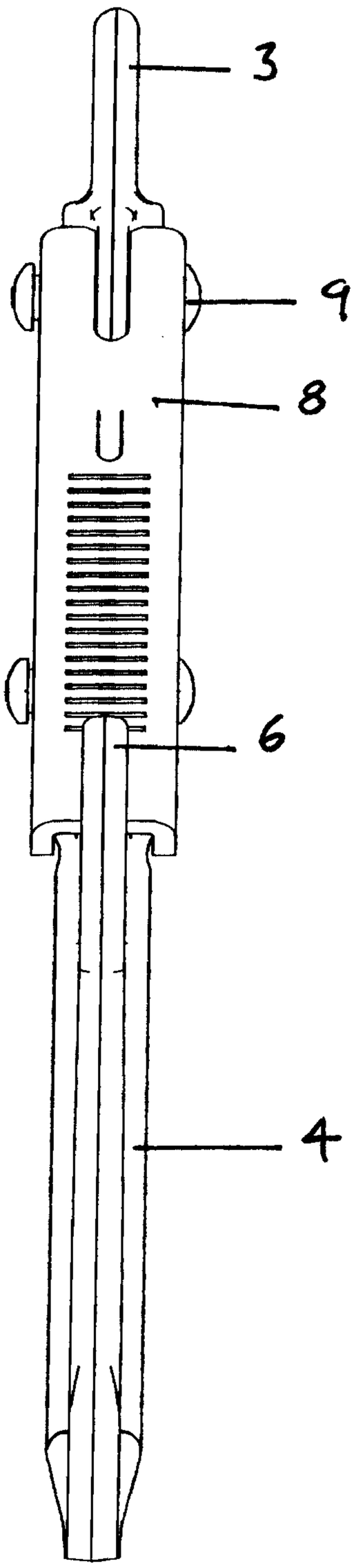


Fig 2

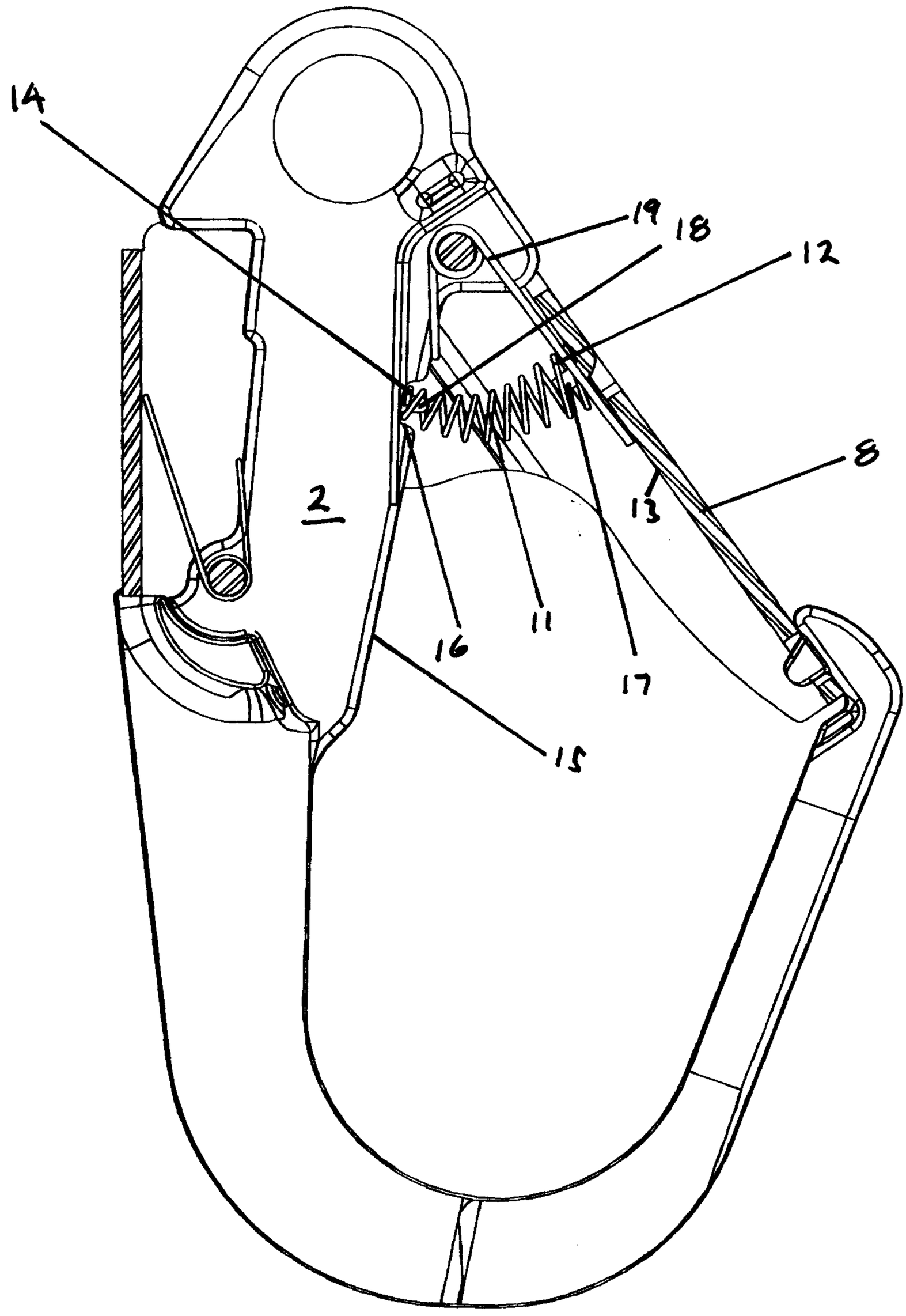


Fig 3

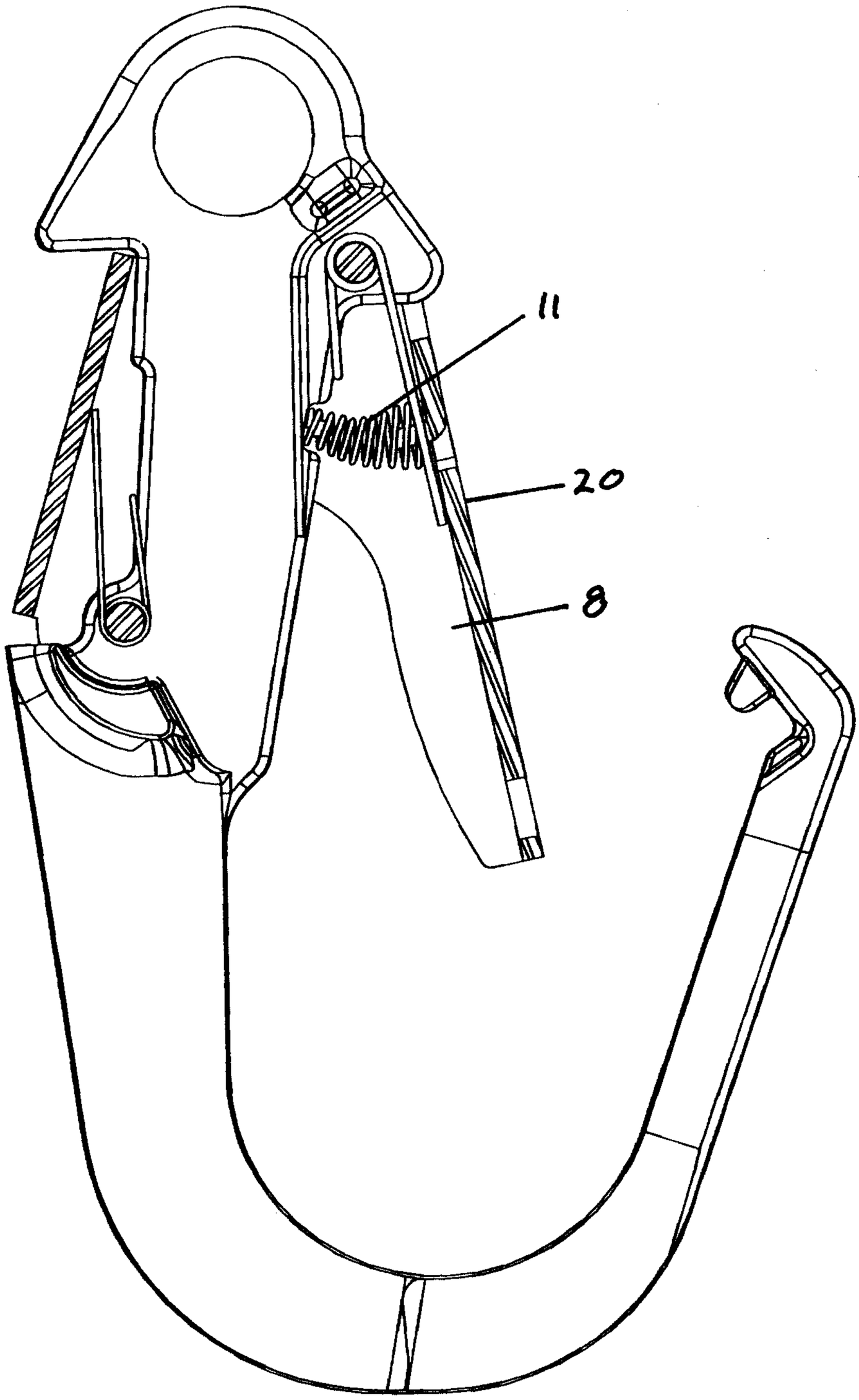


Fig 4

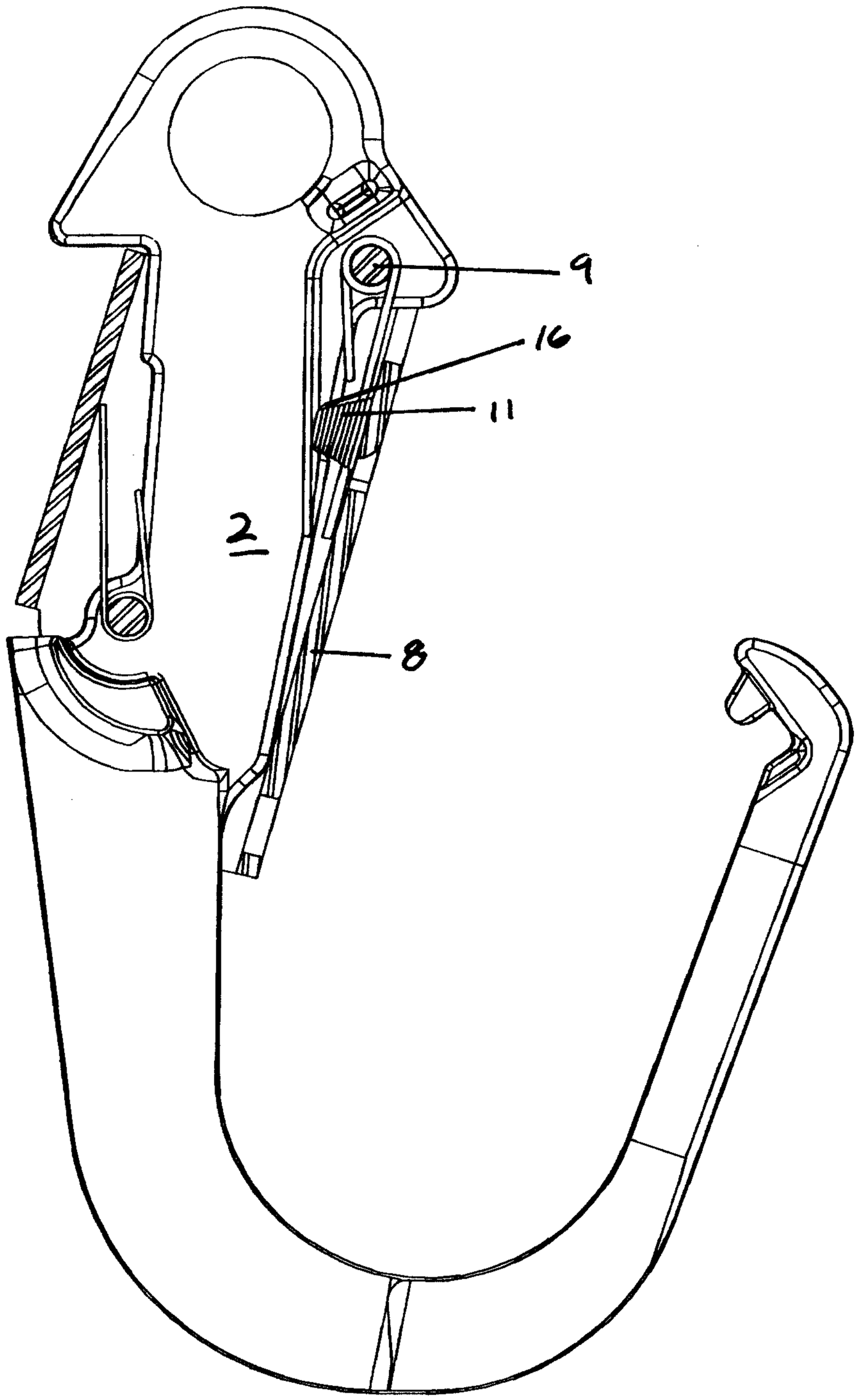
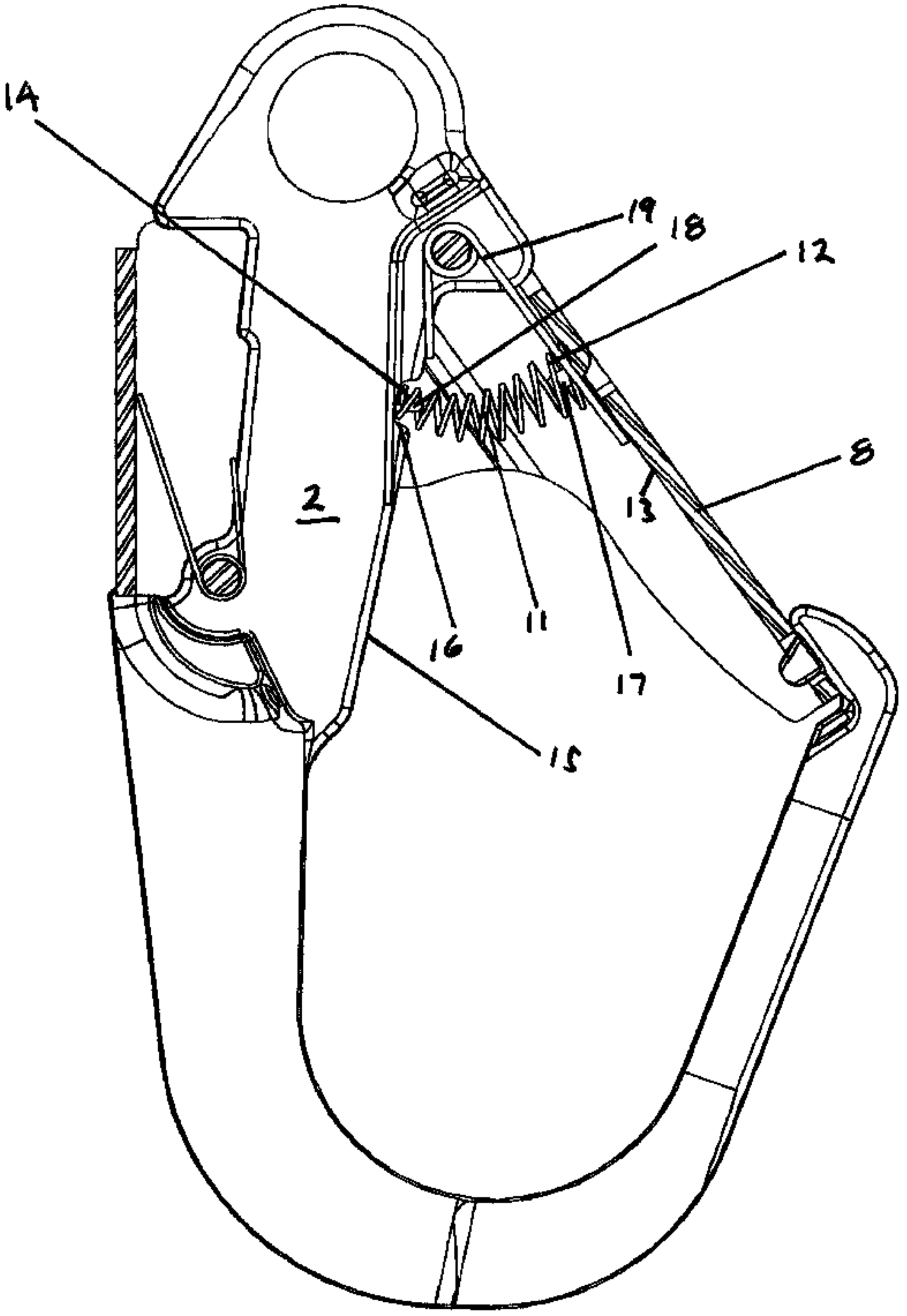


Fig 5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