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(54) **ICE SCRATCHING DEVICE FOR SNOWMOBILES AND RELATED METHODS**

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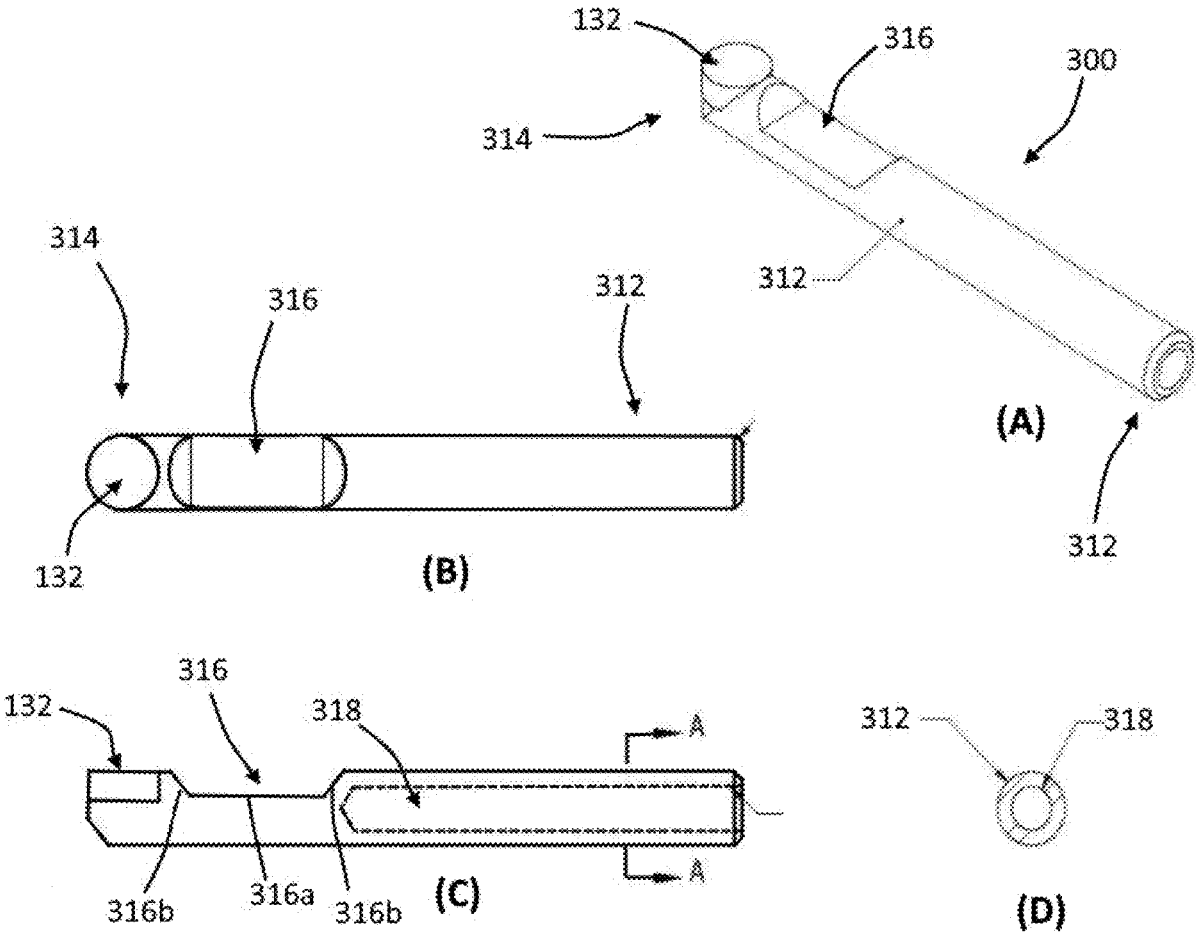
CPC ***B60K 11/02*** (2013.01); ***B62D 55/092*** (2013.01); *B62M 27/02* (2013.01)

(57) **ABSTRACT**

A scratching device and a method for scratching the icy surface for a snowmobile are disclosed. The scratching device, or ice scratcher, comprises a securing portion for laterally attaching the device towards the snowmobile; a scratching portion for scratching an icy surface when the snowmobile is travelling on the icy surface, thereby creating a stream of ice particles; and an orienting component cooperating with the scratching portion for directing the stream of ice particles towards the components of the snowmobile for cooling the components when the snowmobile is travelling. The scratching device may therefore direct, via the orienting component, a stream of ice particles toward the snowmobile components, e.g., for lubrication and cooling. A method of installing the scratching device on the snowmobile is also disclosed.



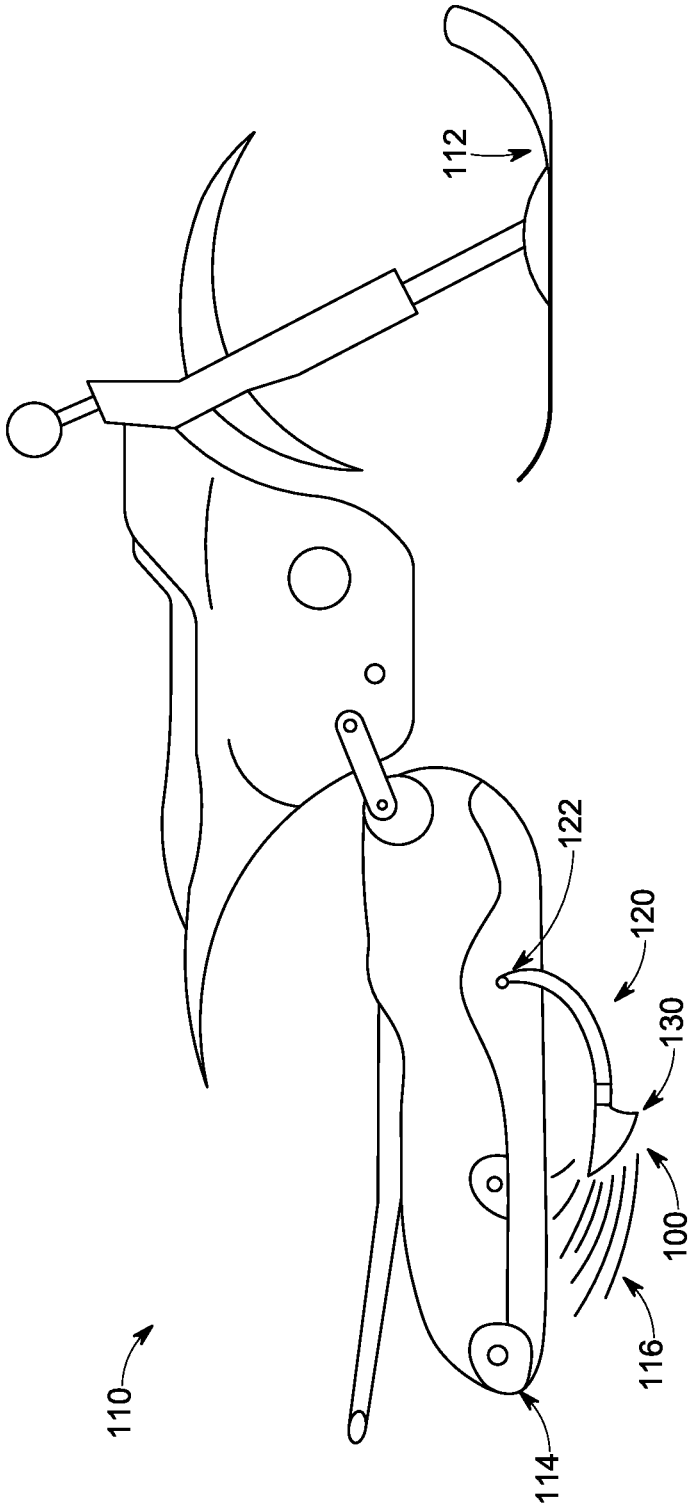


FIG. 1A

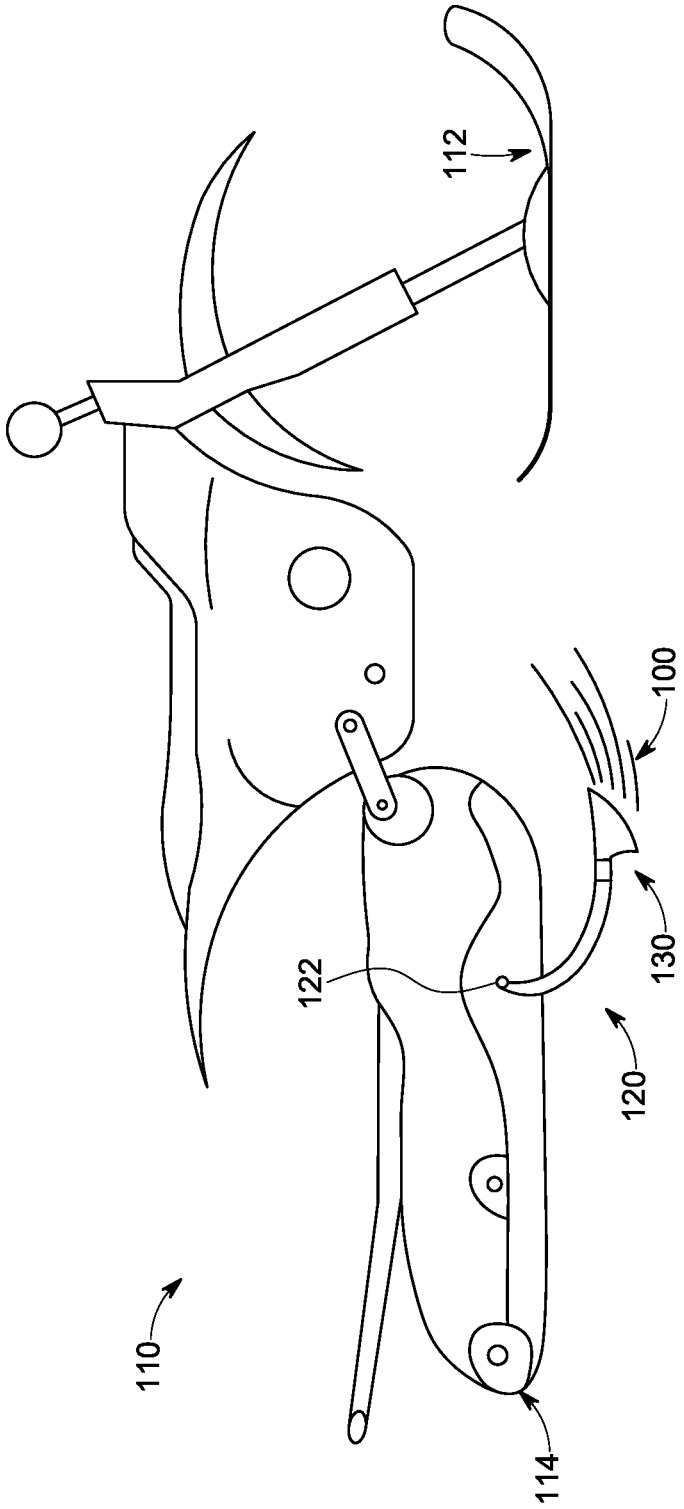


FIG. 1B

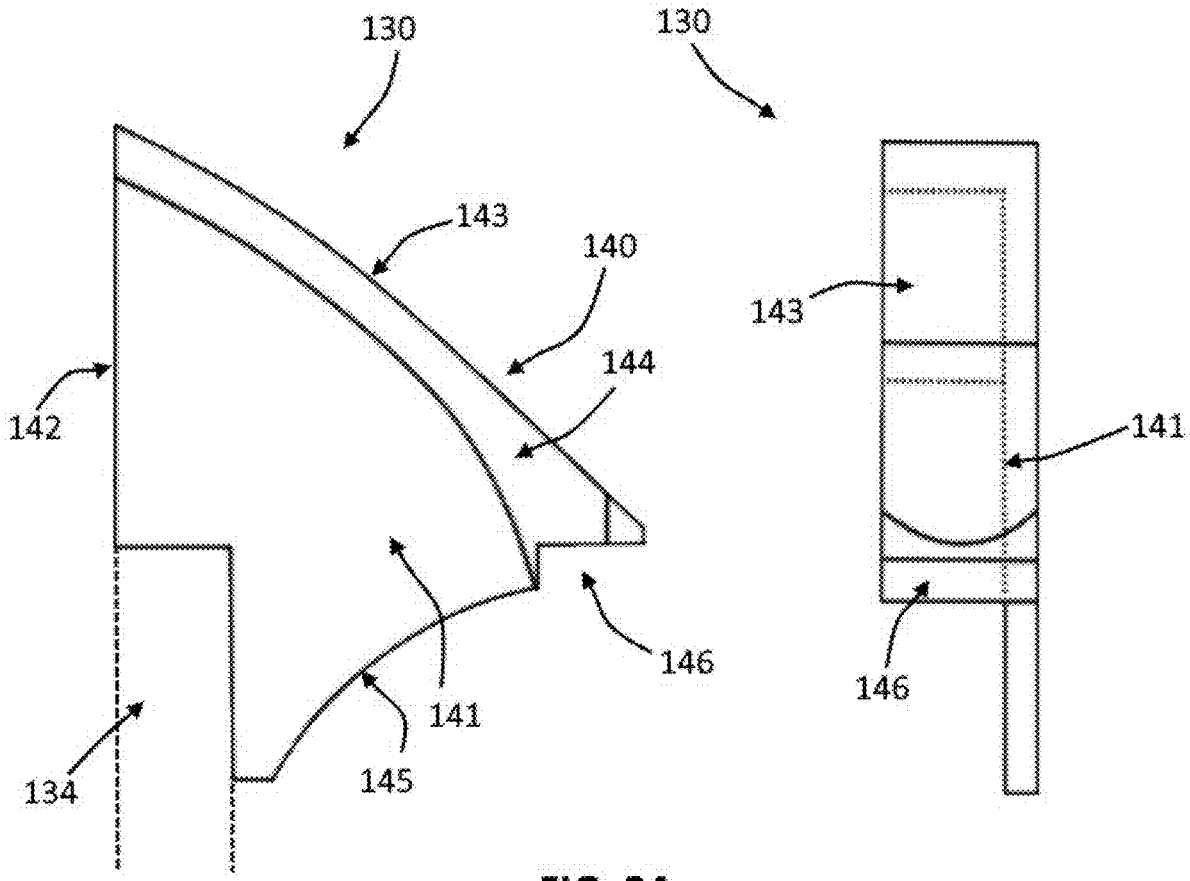


FIG. 2A

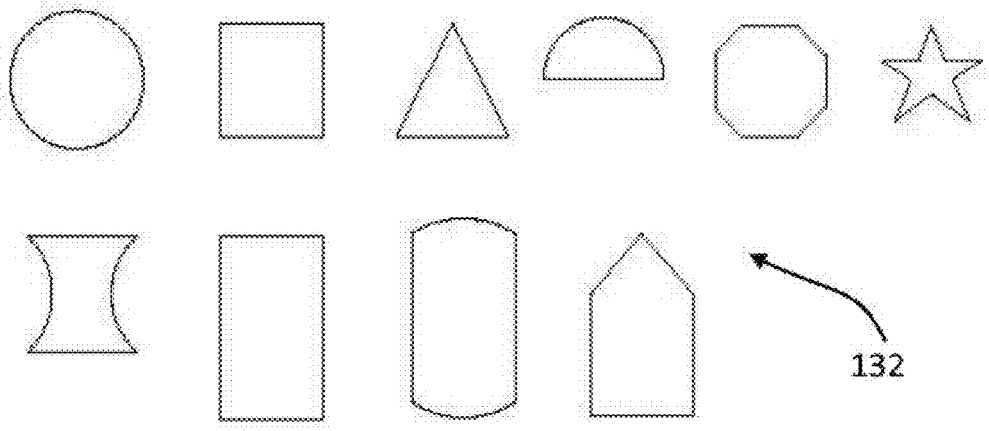
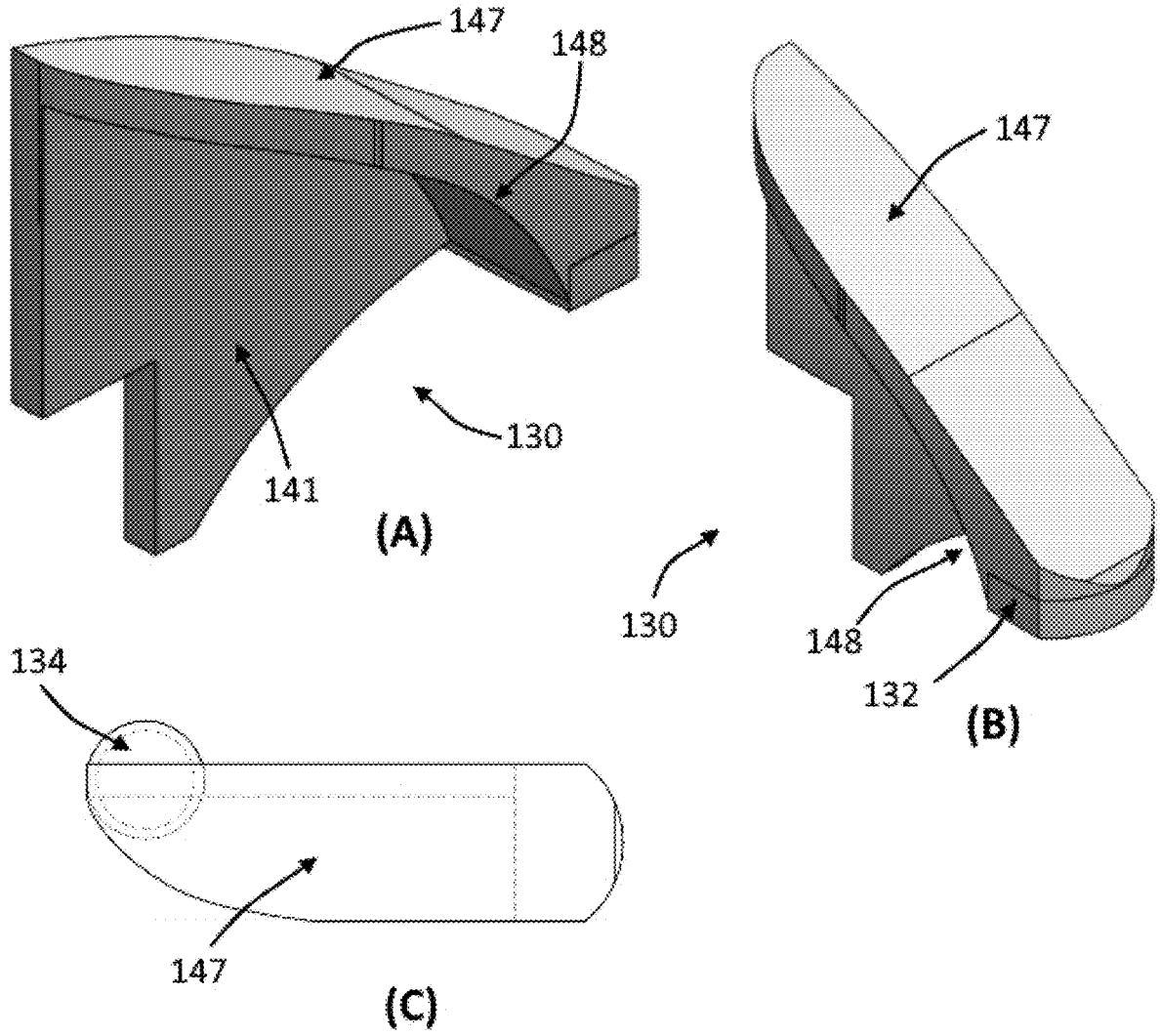


FIG. 2B


147
148
130
141
(A)
147
130
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132
(B)
134
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(C)
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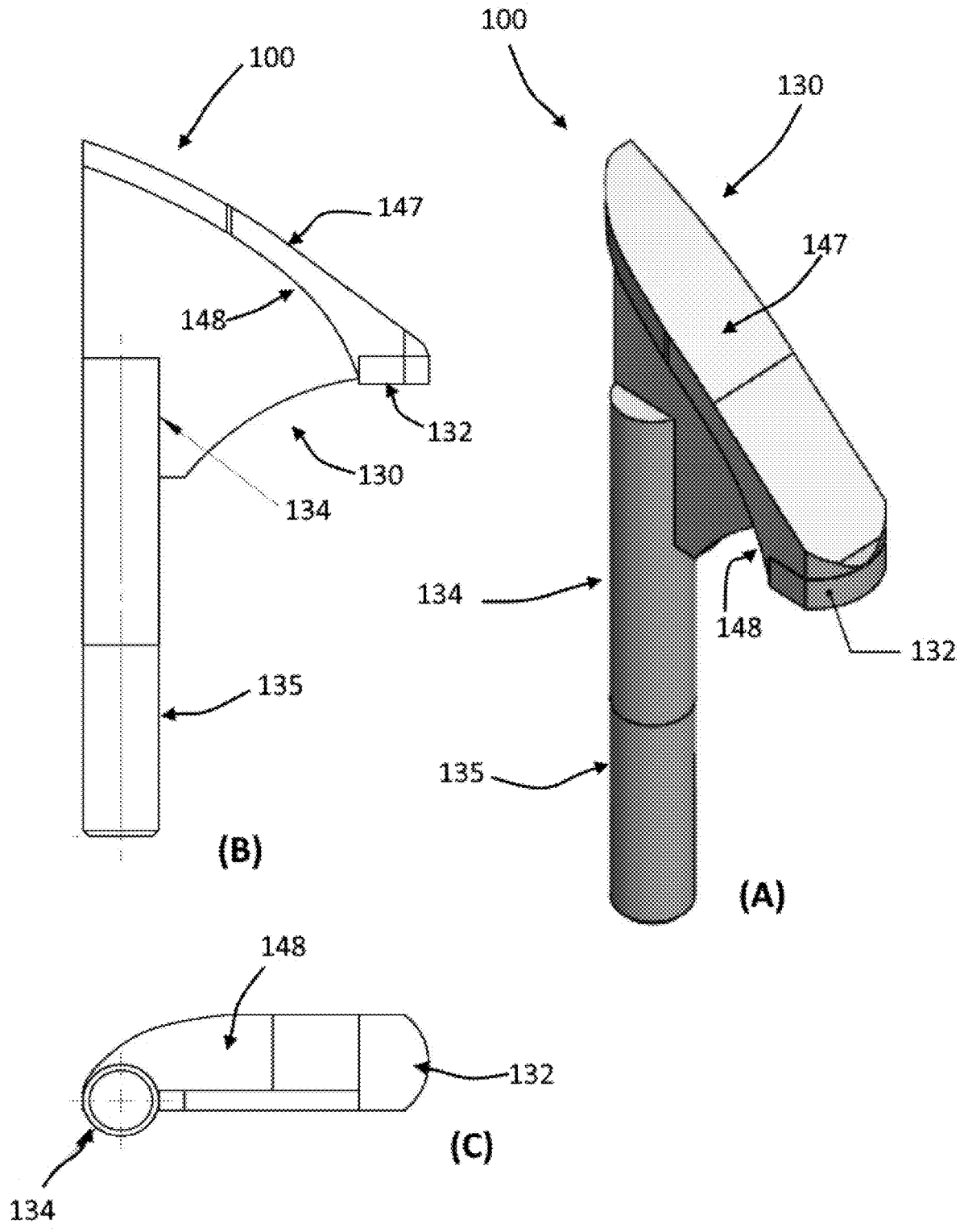
148
132
141
(D)
147
(E)

FIG. 3


100
147
148
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(B)
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(A)
148
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134
(C)

FIG. 4

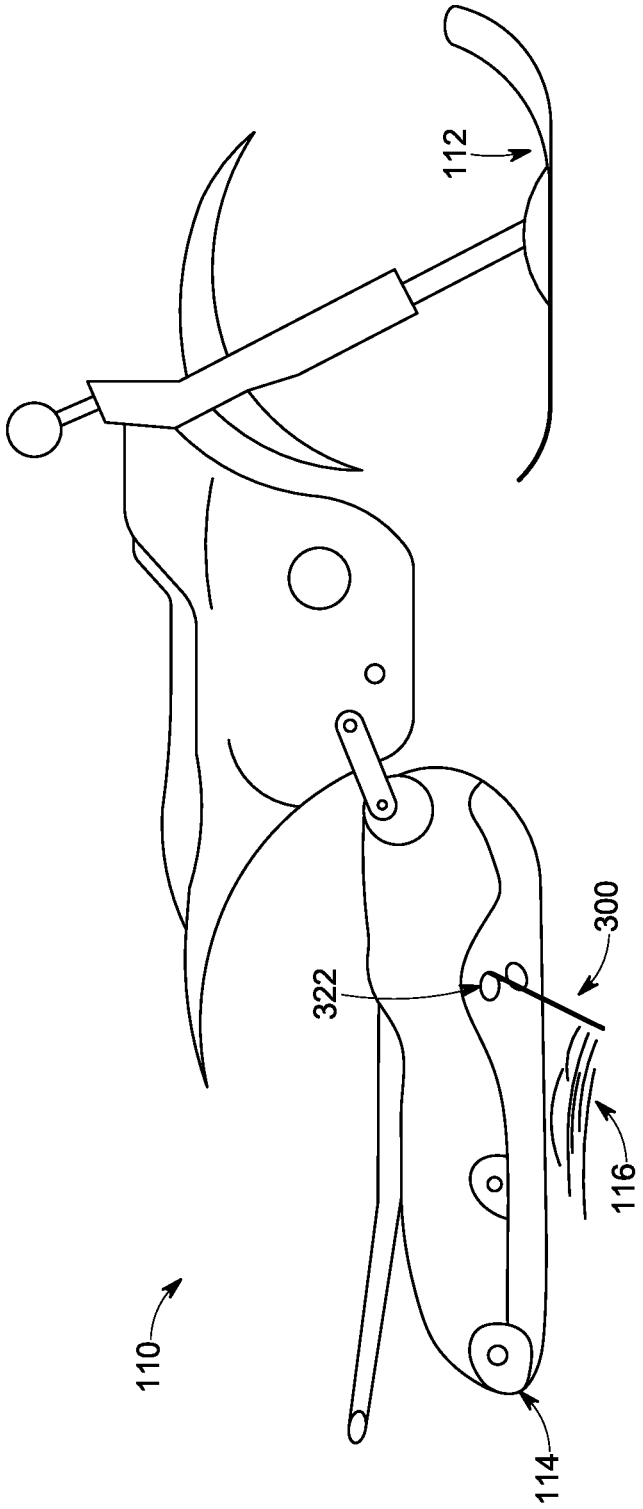


FIG. 5A

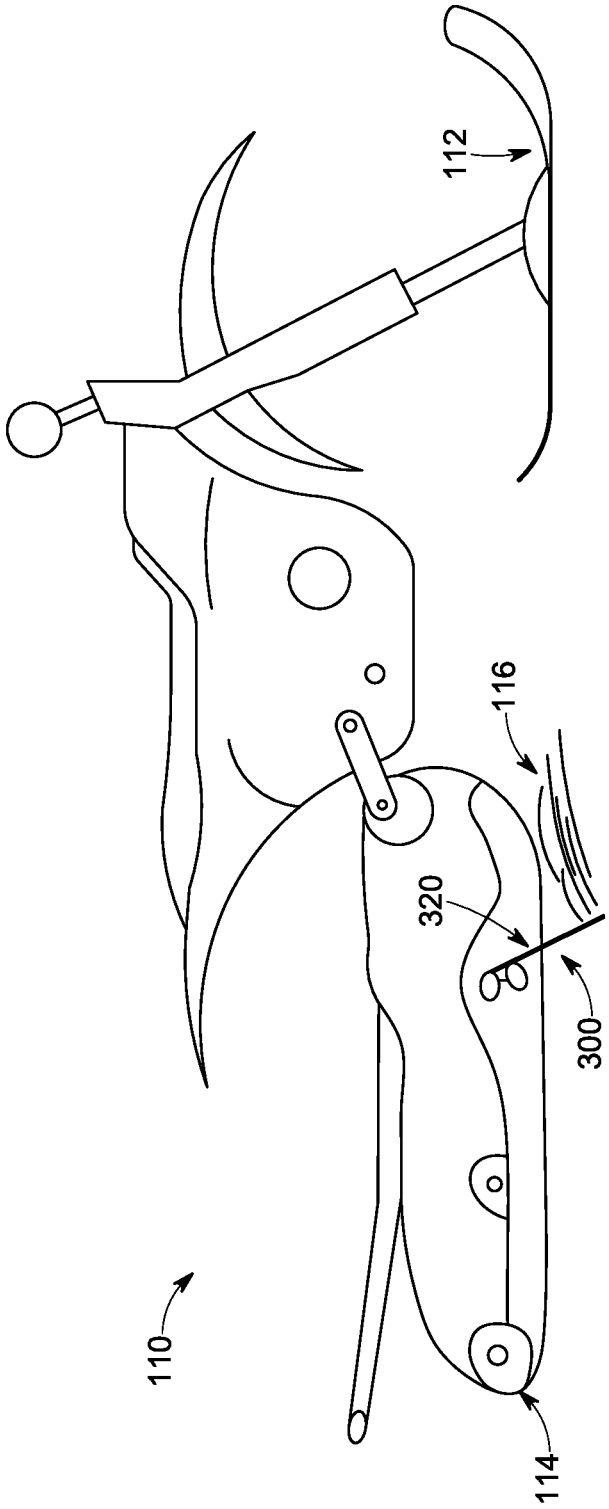
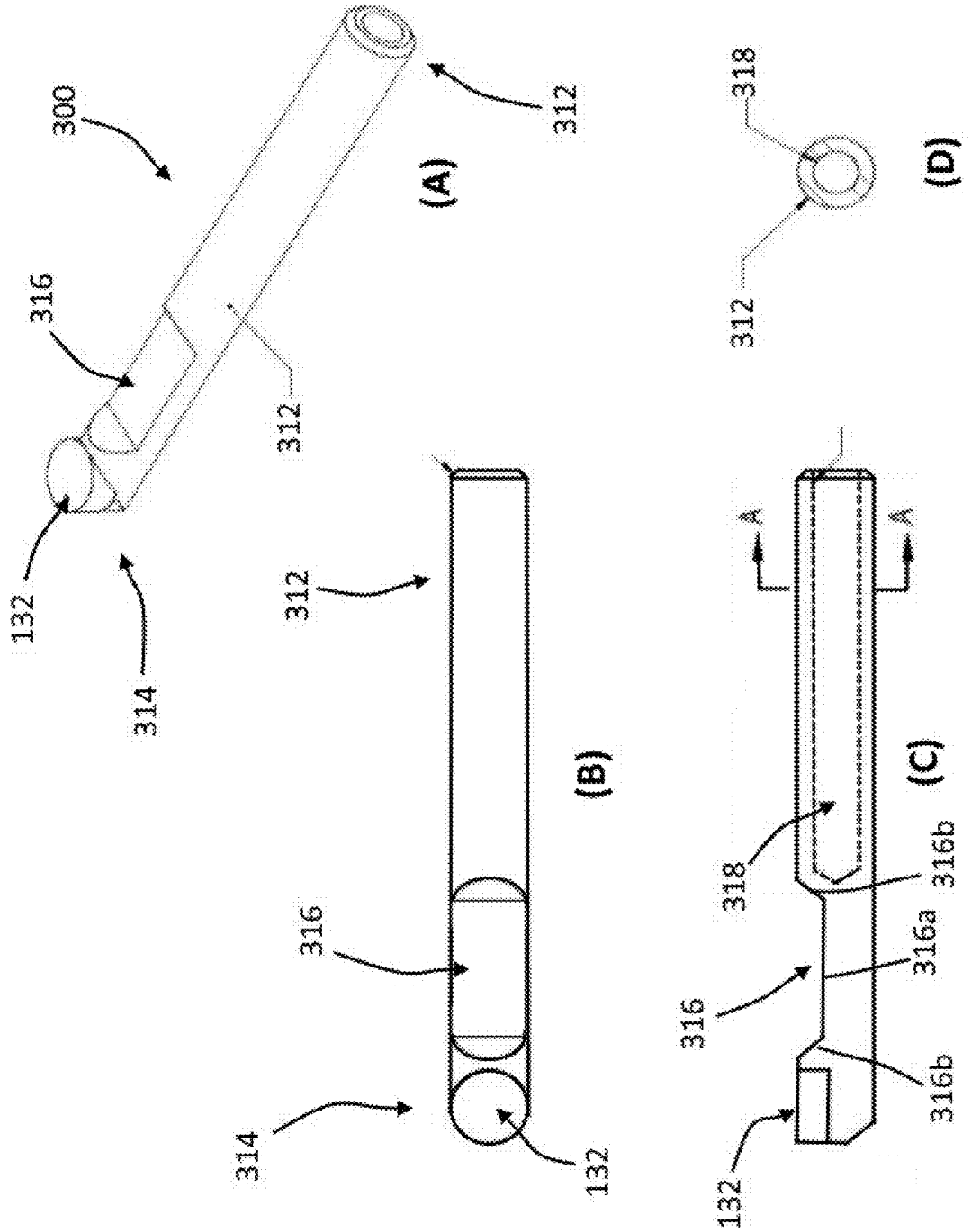


FIG. 5B


300
316
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(A)
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316
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(D)
A
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316a
316b
132
(C)

FIG. 6

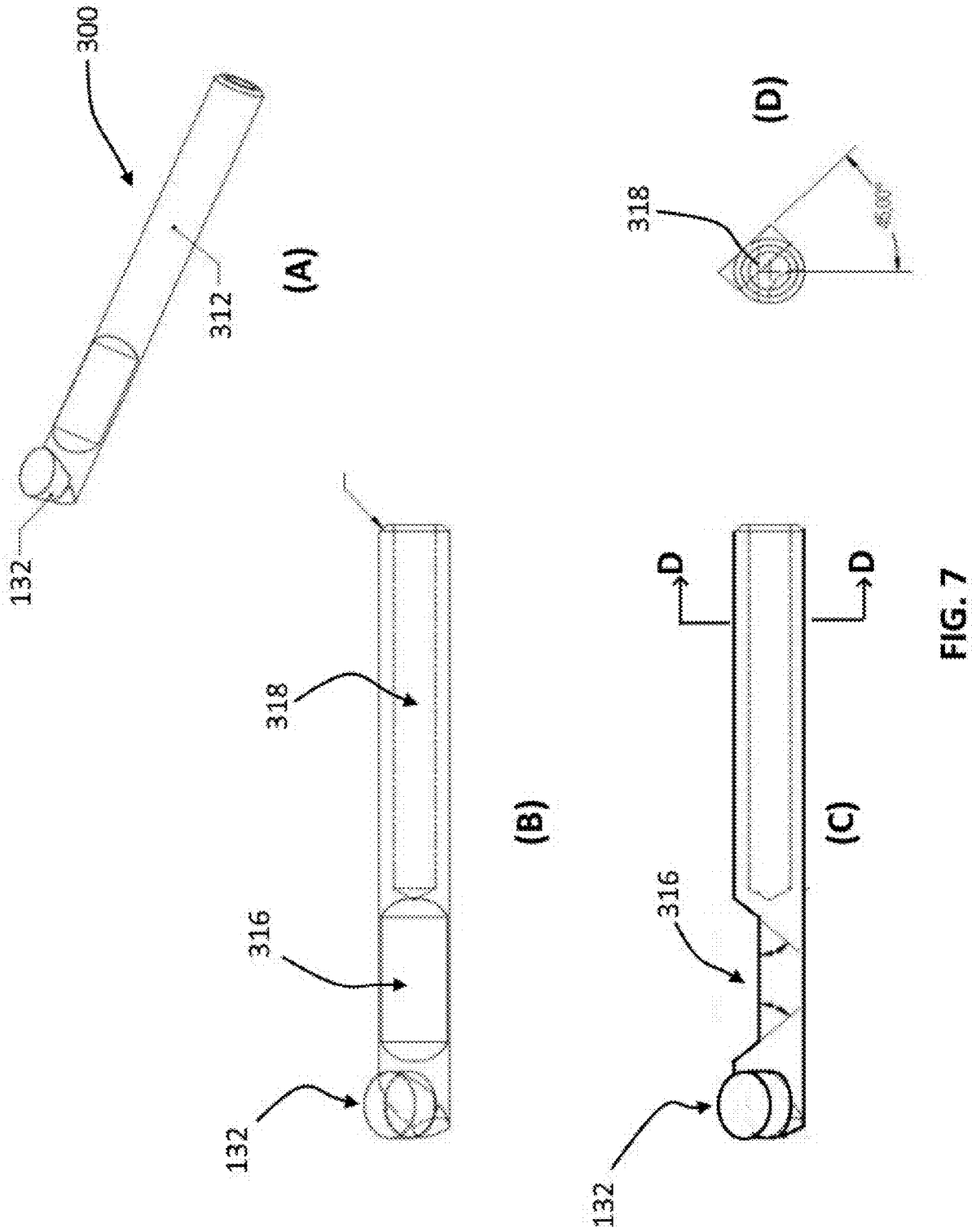


FIG. 7

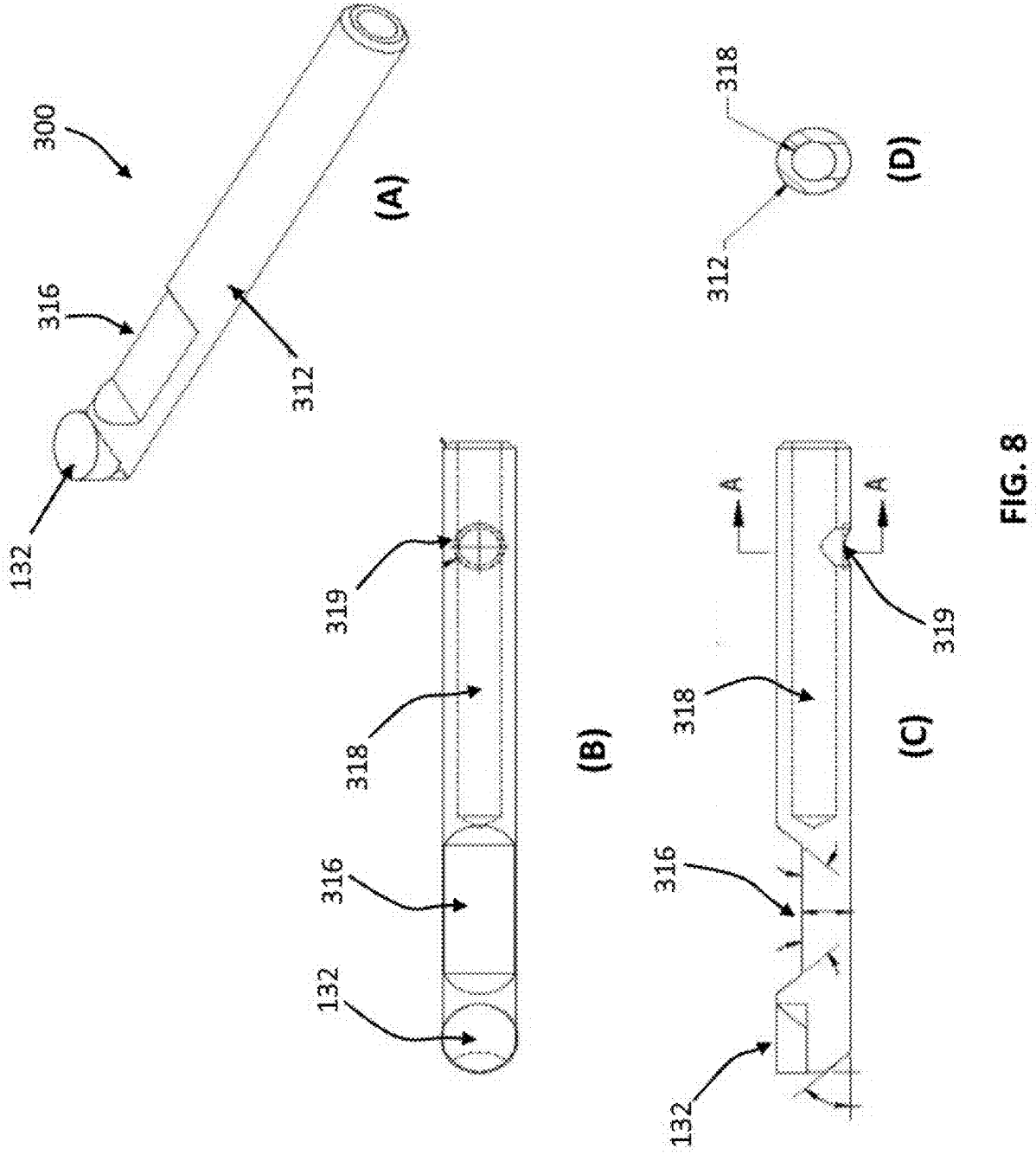


FIG. 8

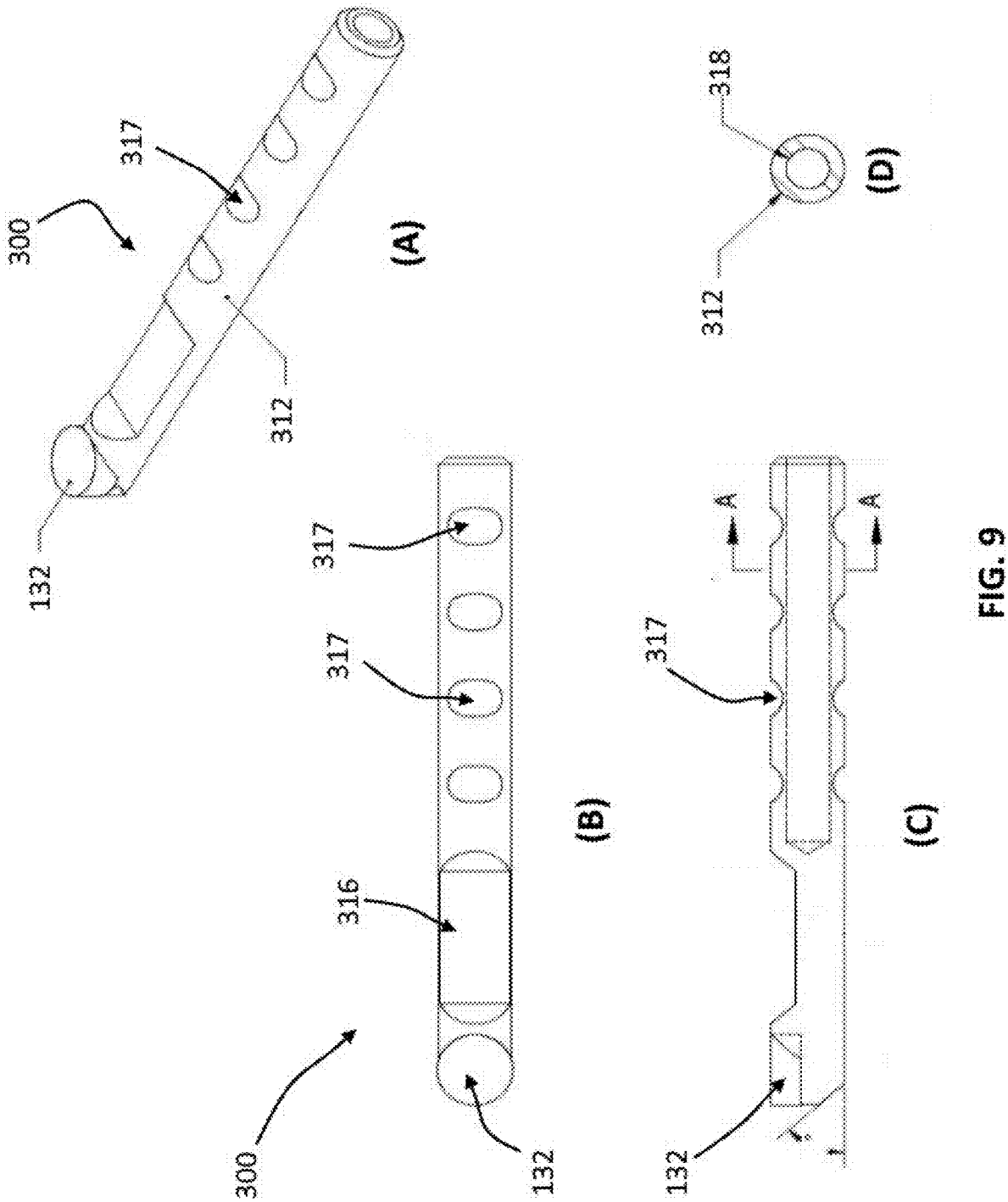


FIG. 9

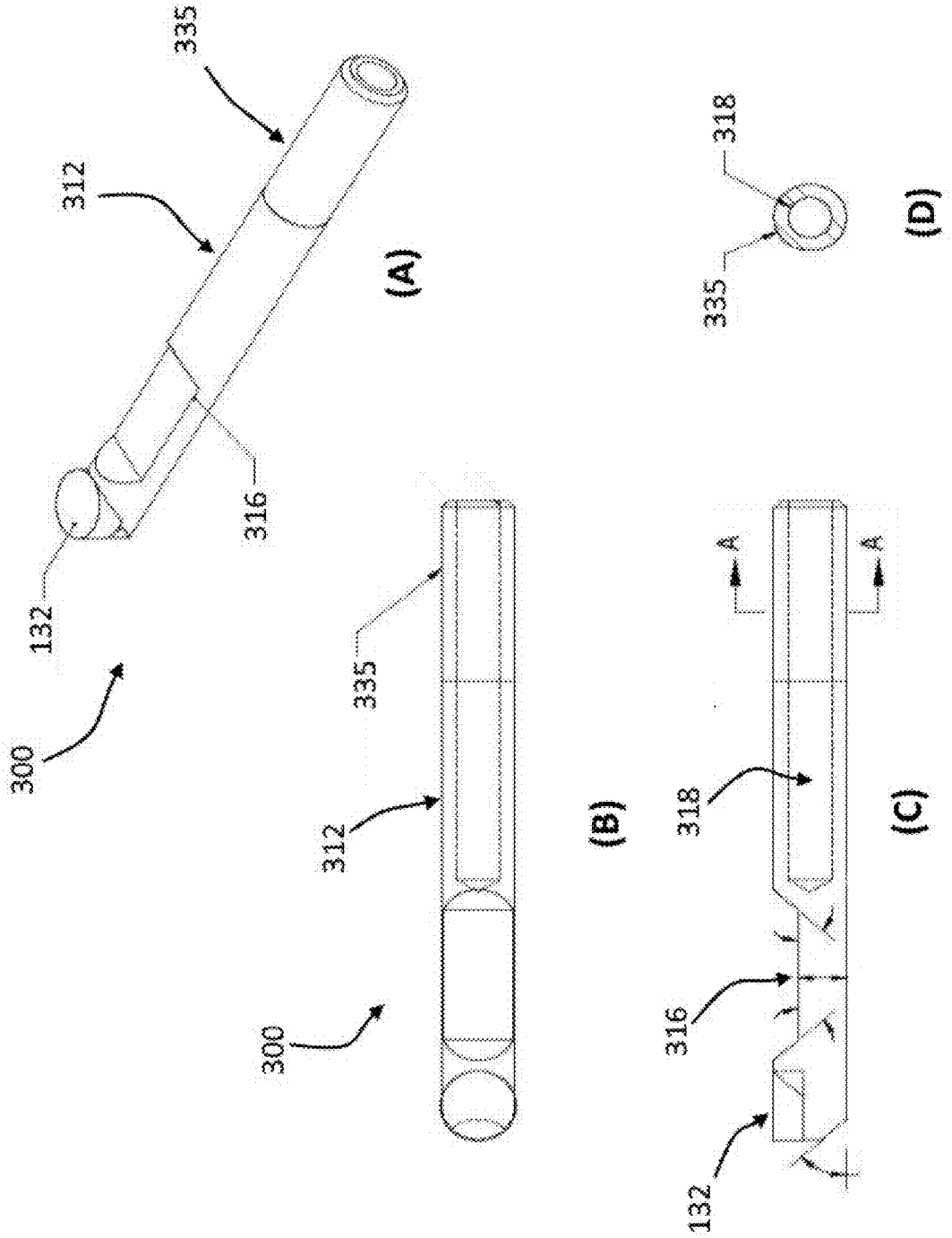


FIG. 10

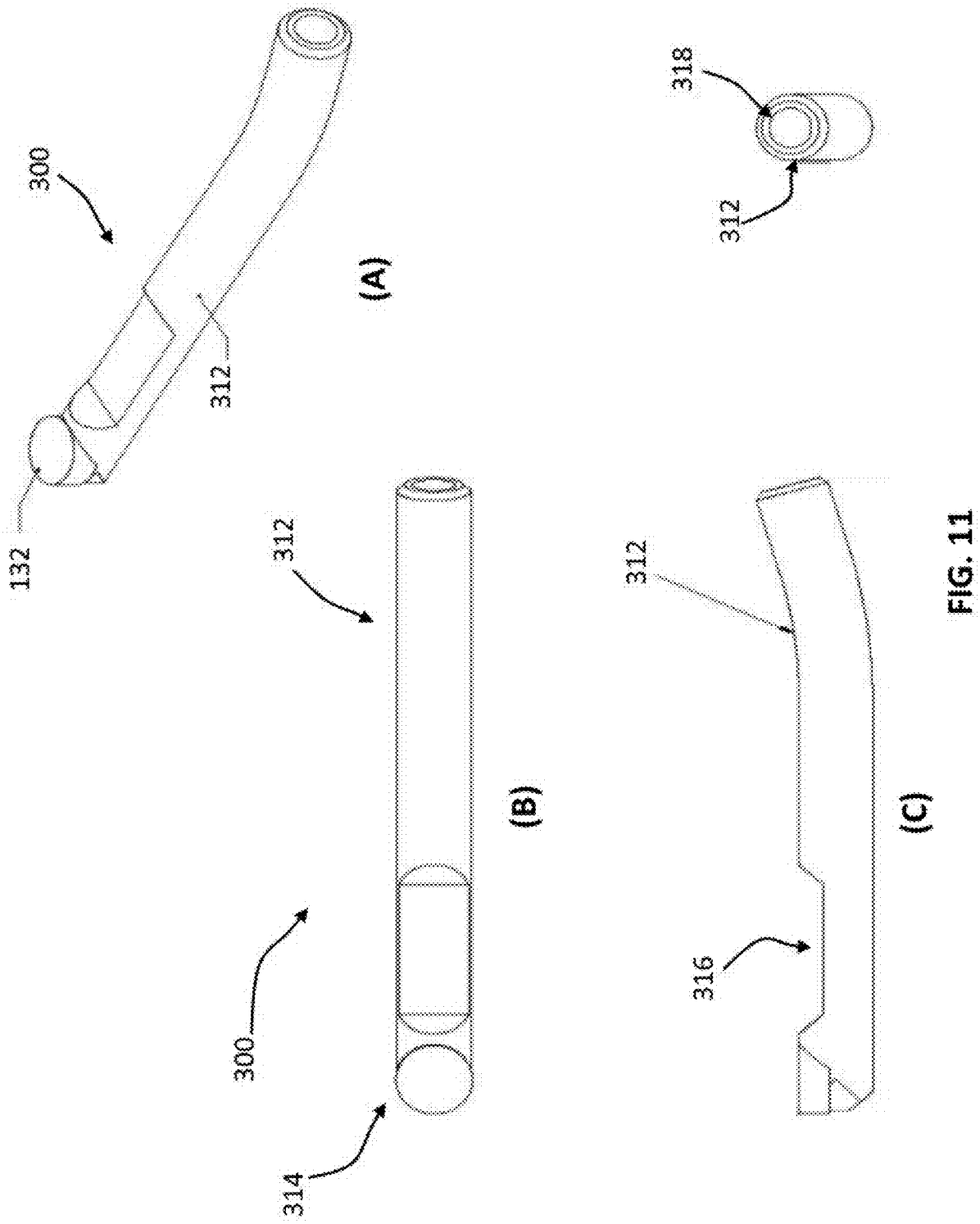


FIG. 11

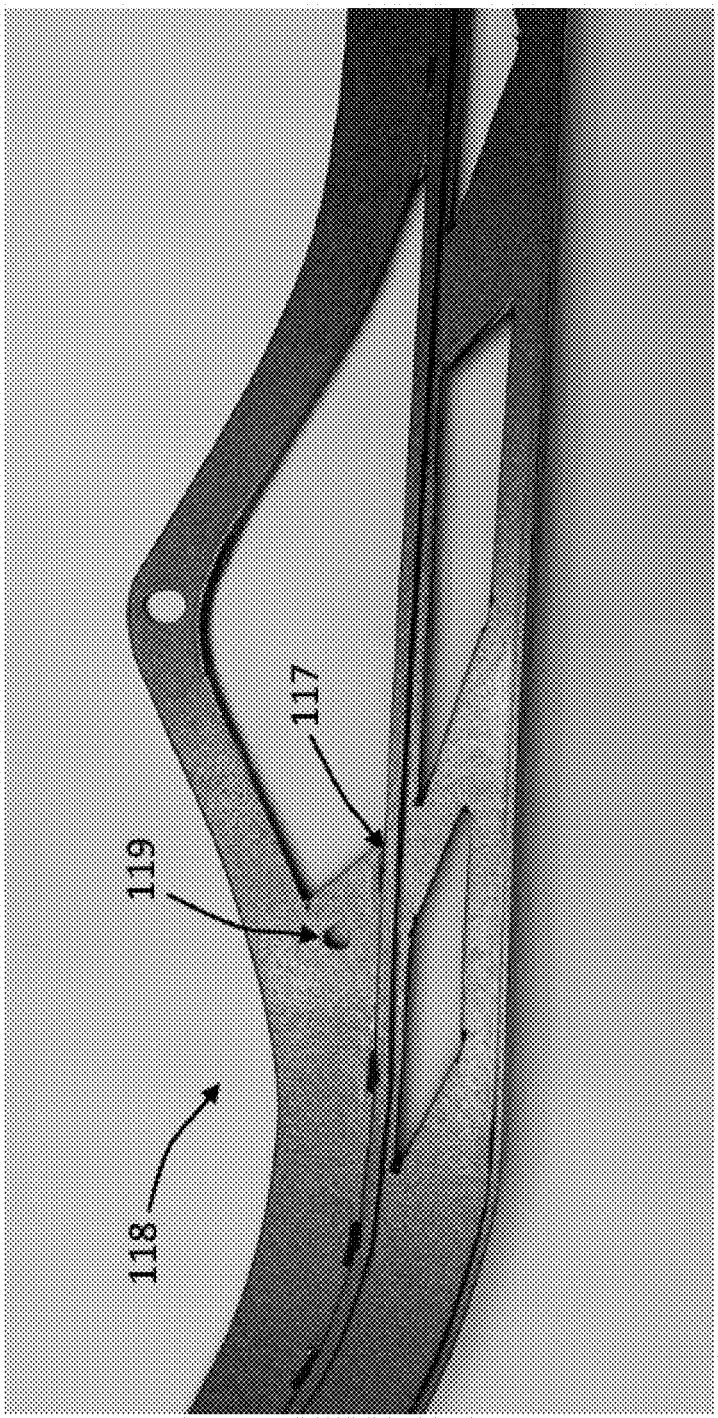
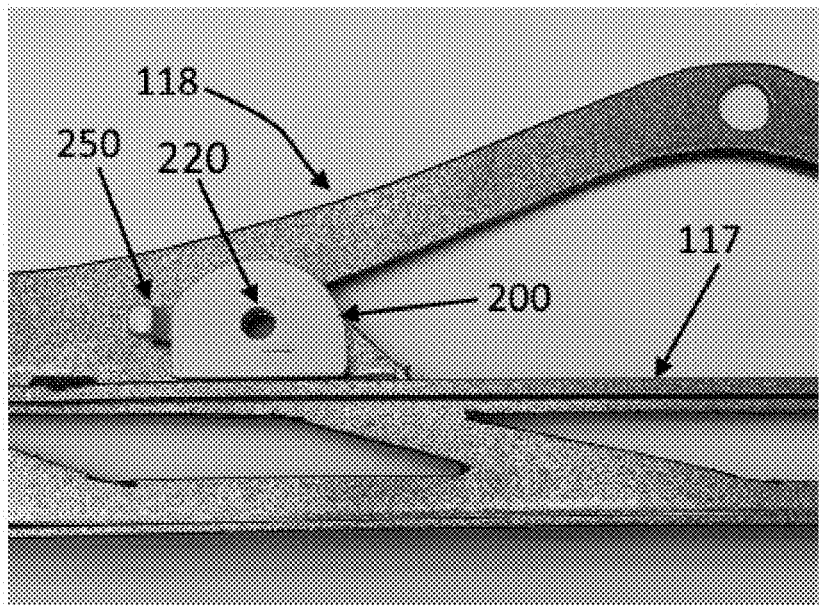
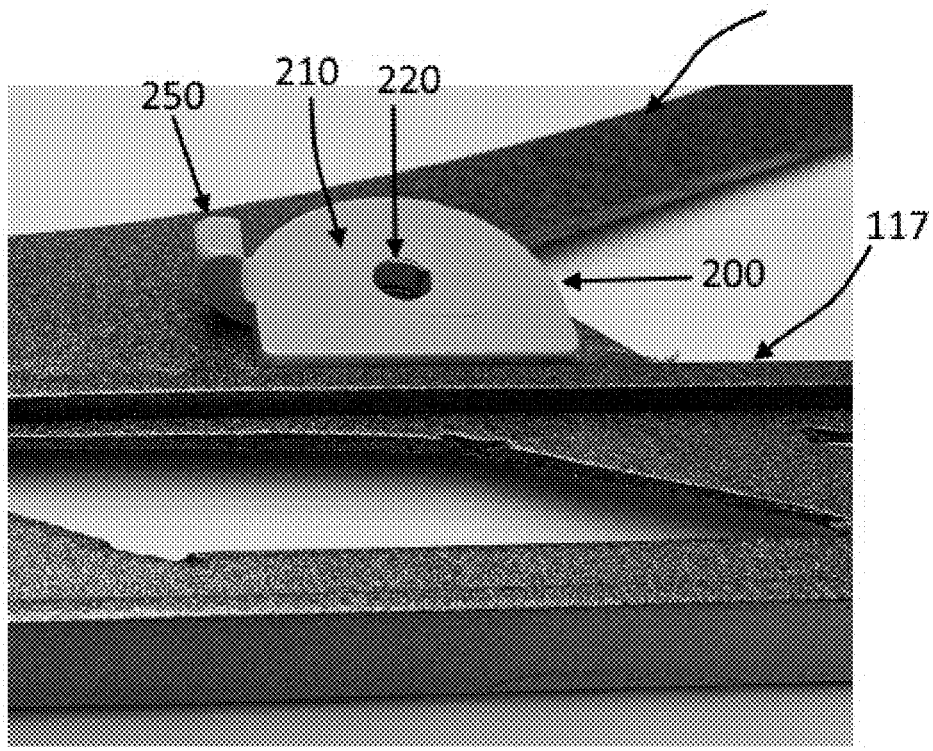


FIG. 12



(A)



(B)

FIG. 13

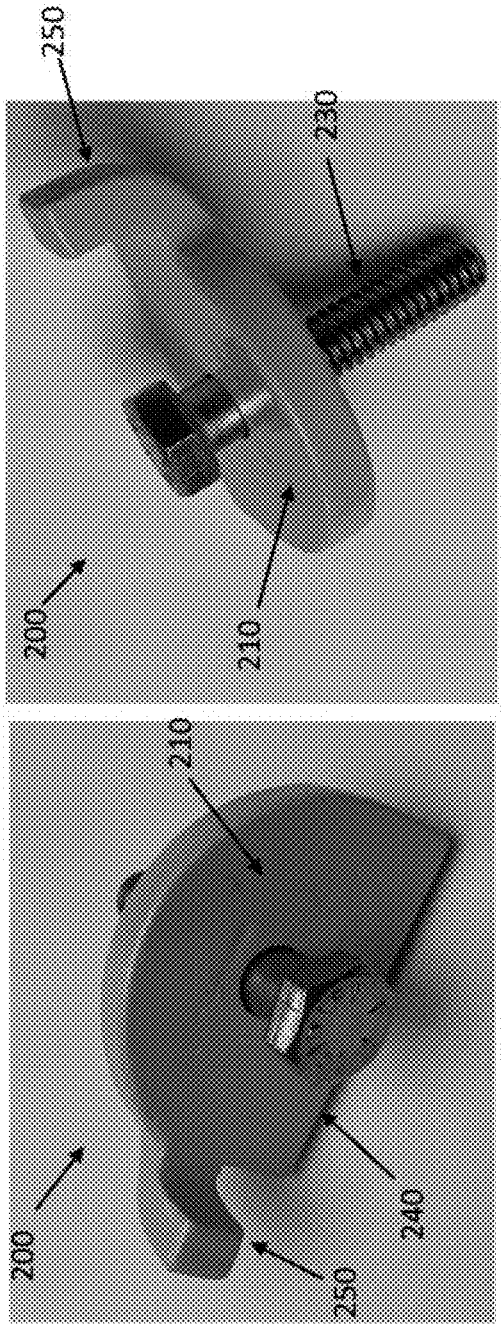


FIG. 14

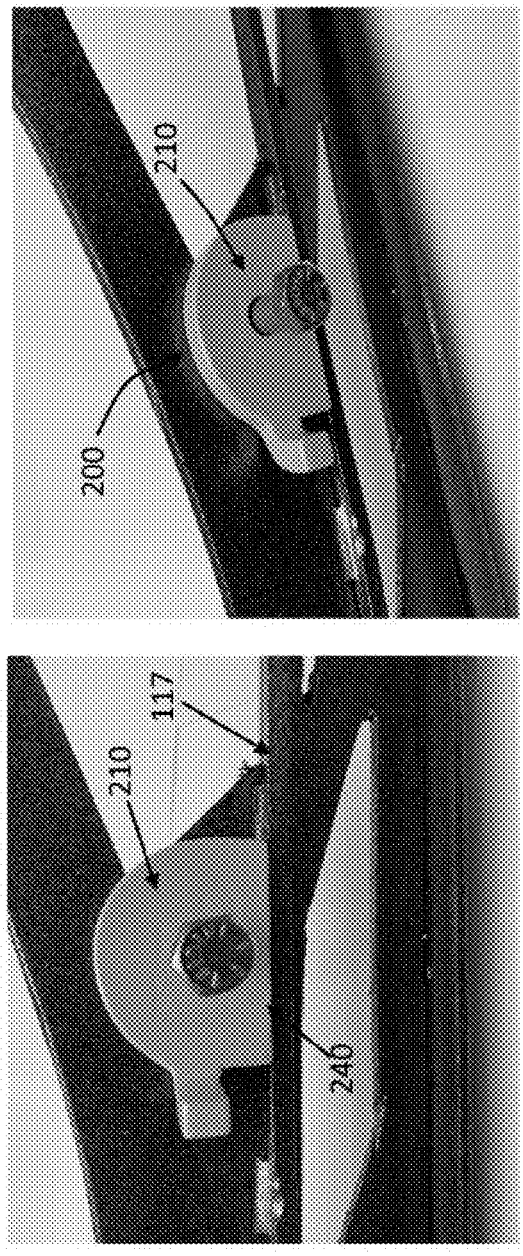
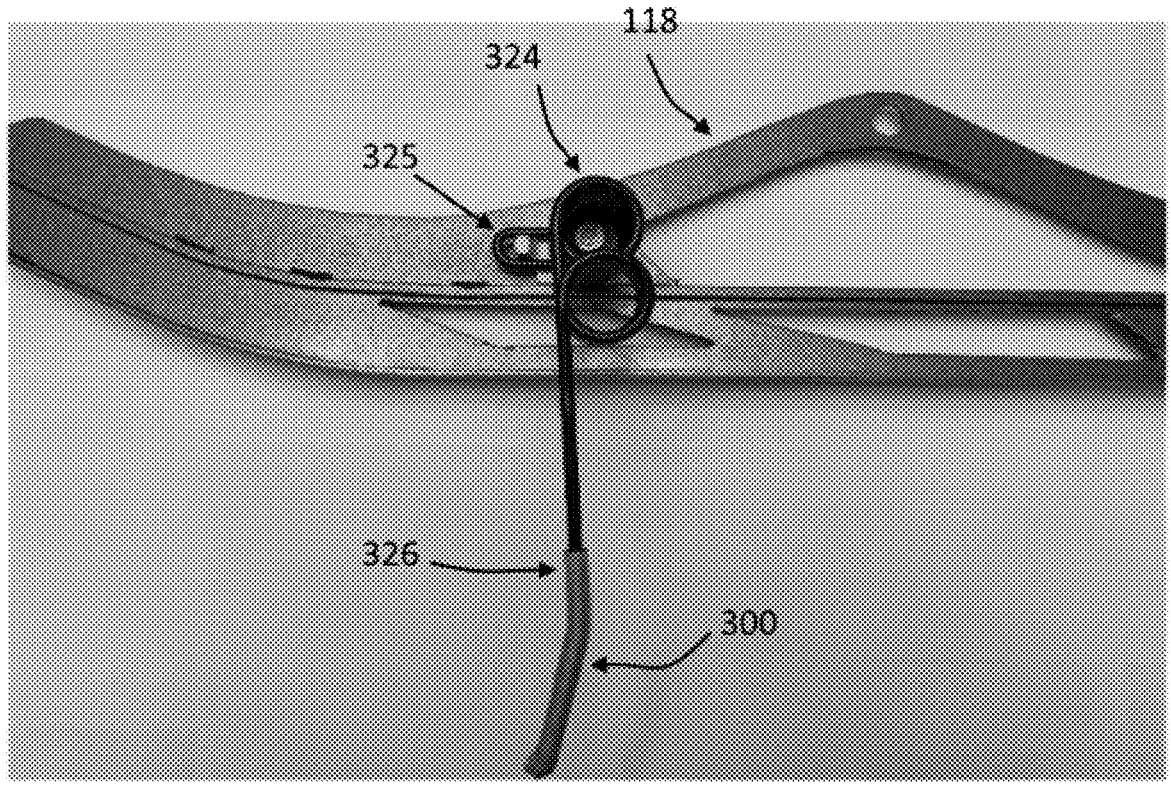


FIG. 15



(A)

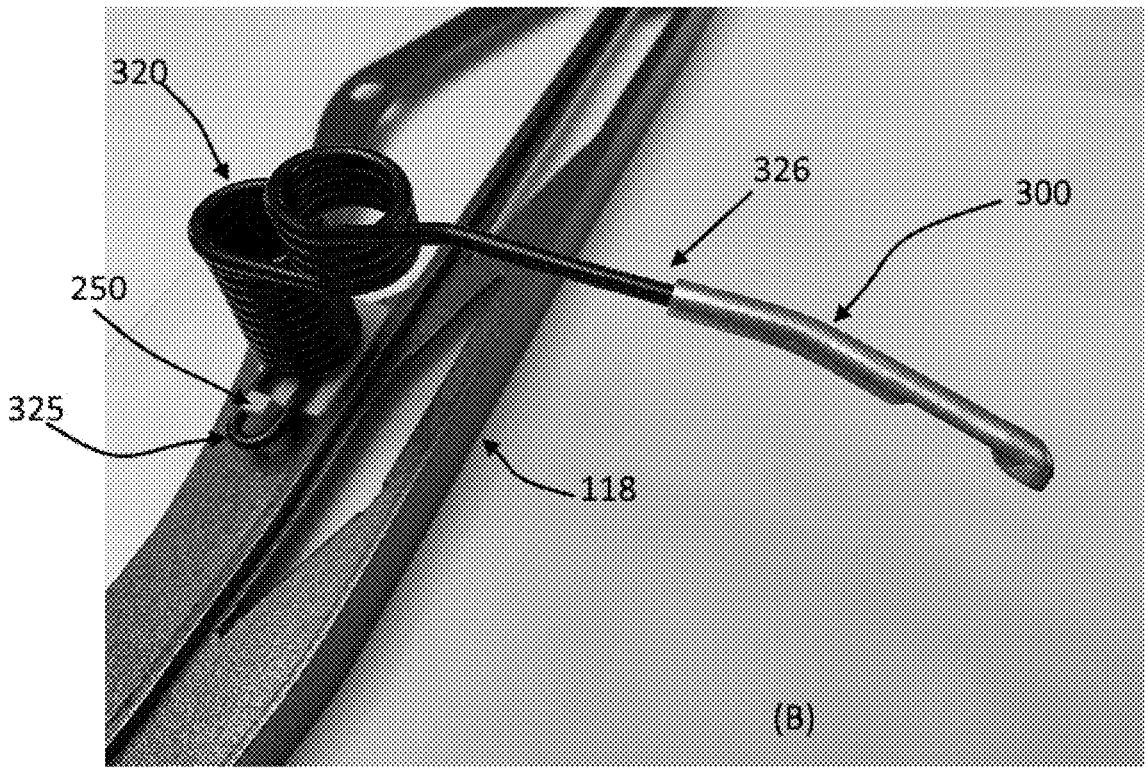
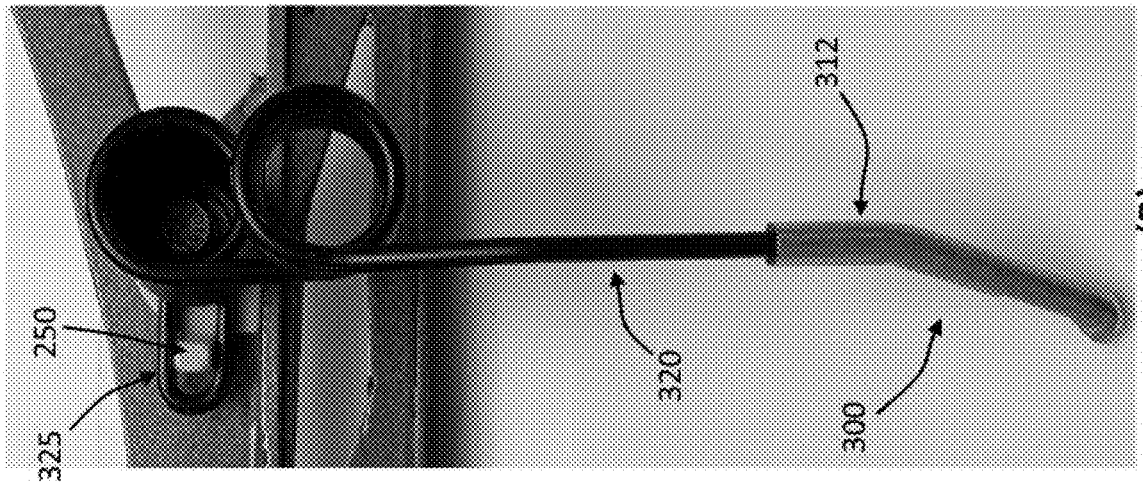


FIG. 16



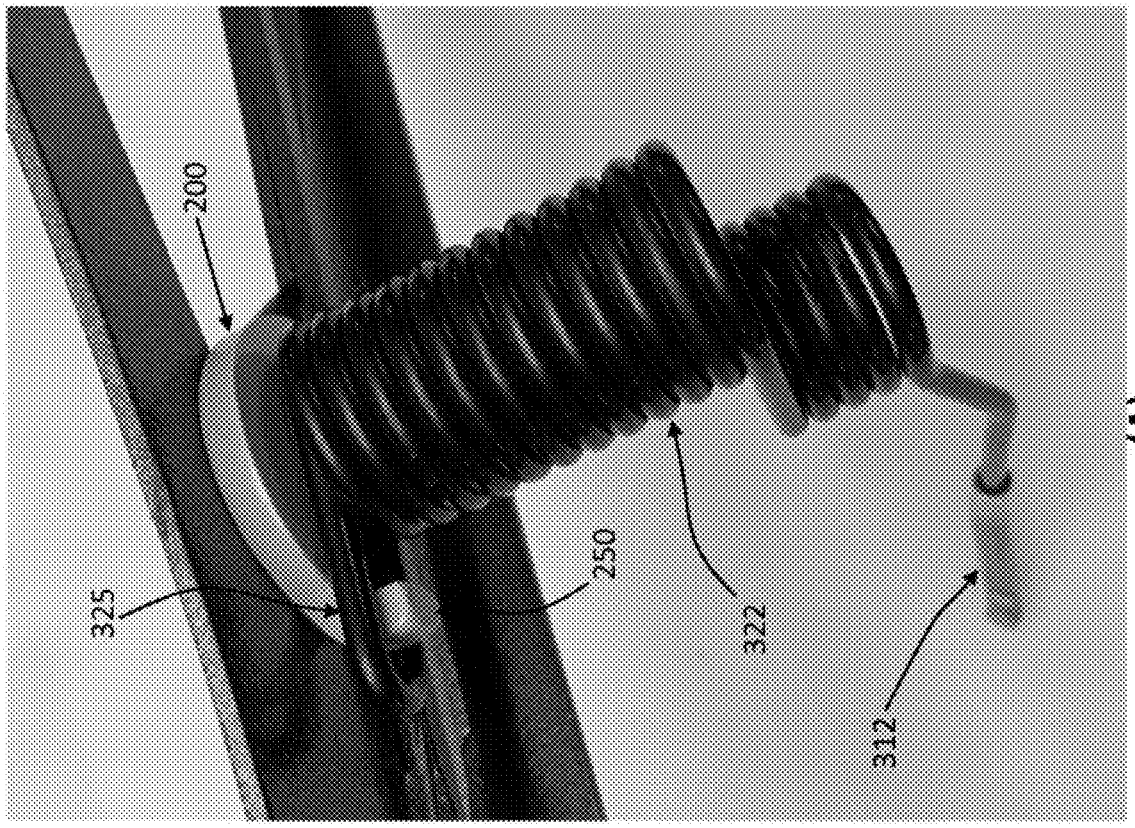


FIG. 17

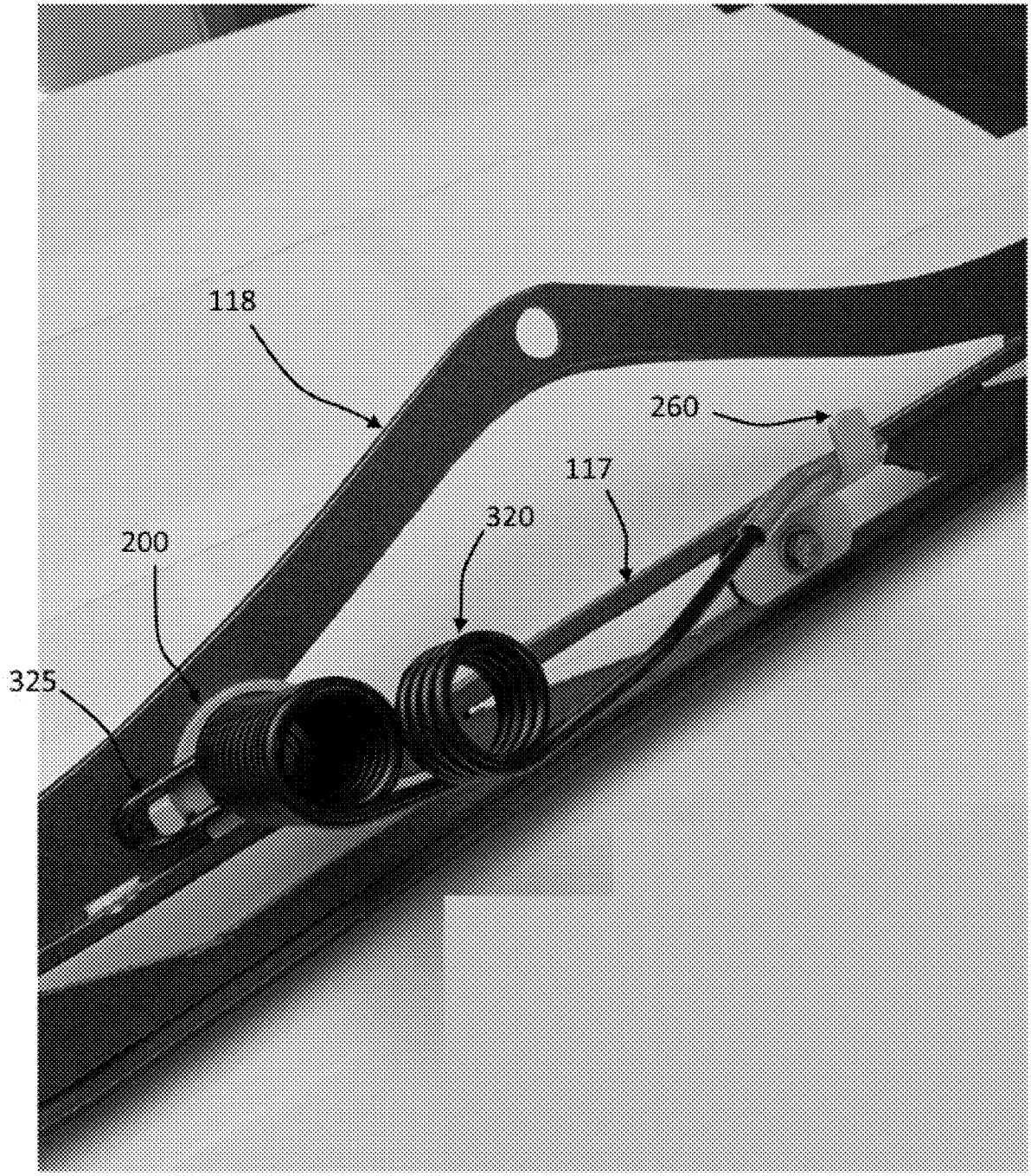


FIG. 18A

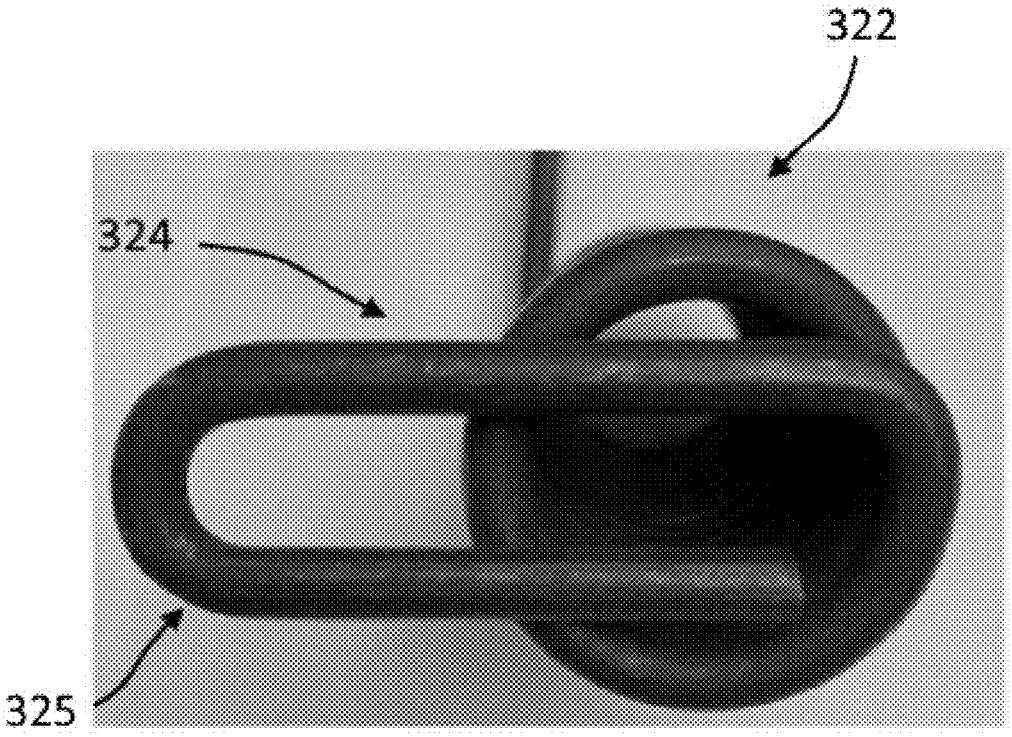


FIG. 18B

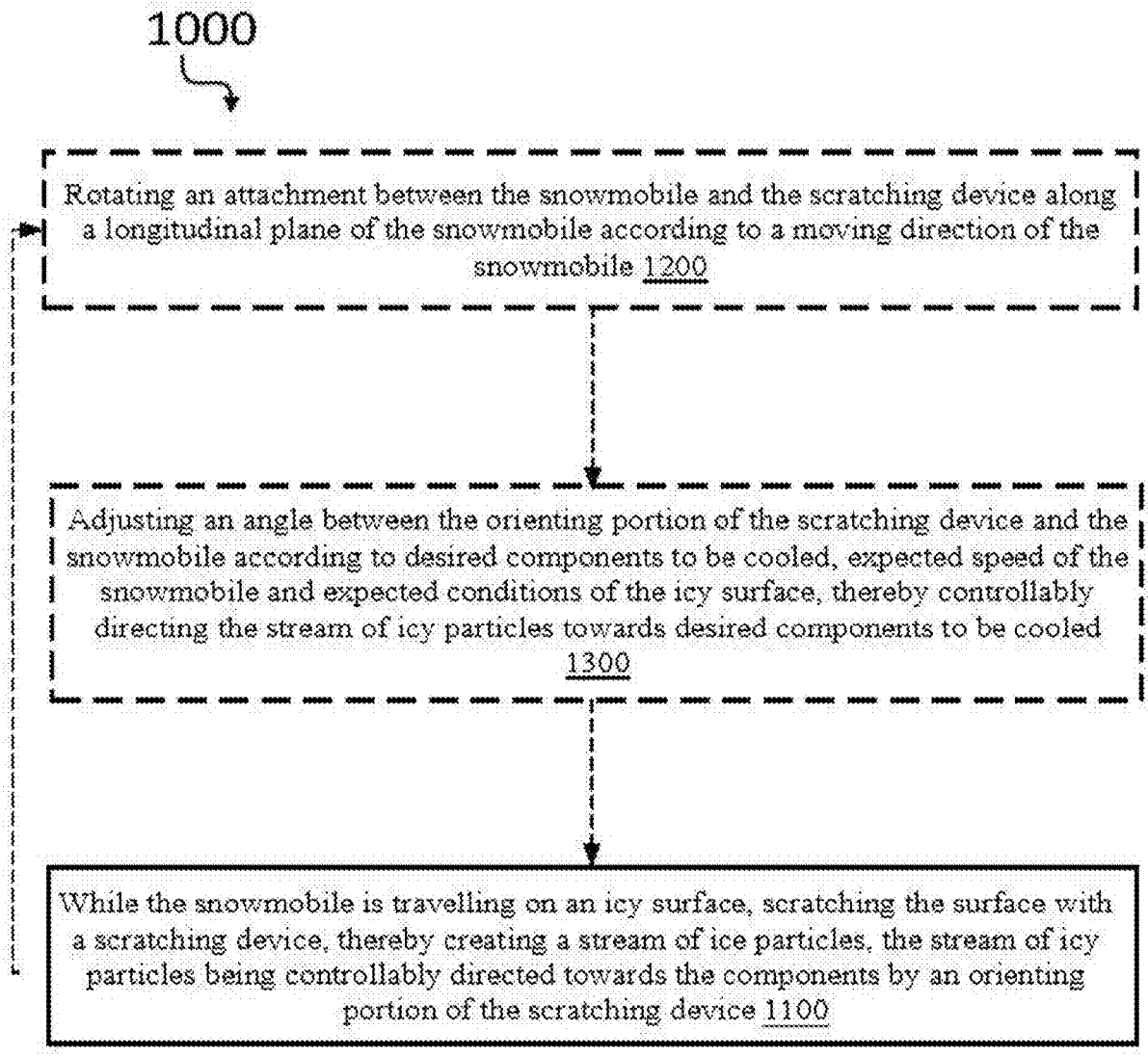

1000
Rotating an attachment between the snowmobile and the scratching device along a longitudinal plane of the snowmobile according to a moving direction of the snowmobile 1200
Adjusting an angle between the orienting portion of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface, thereby controllably directing the stream of icy particles towards desired components to be cooled 1300
While the snowmobile is travelling on an icy surface, scratching the surface with a scratching device, thereby creating a stream of ice particles, the stream of icy particles being controllably directed towards the components by an orienting portion of the scratching device 1100

FIG. 19

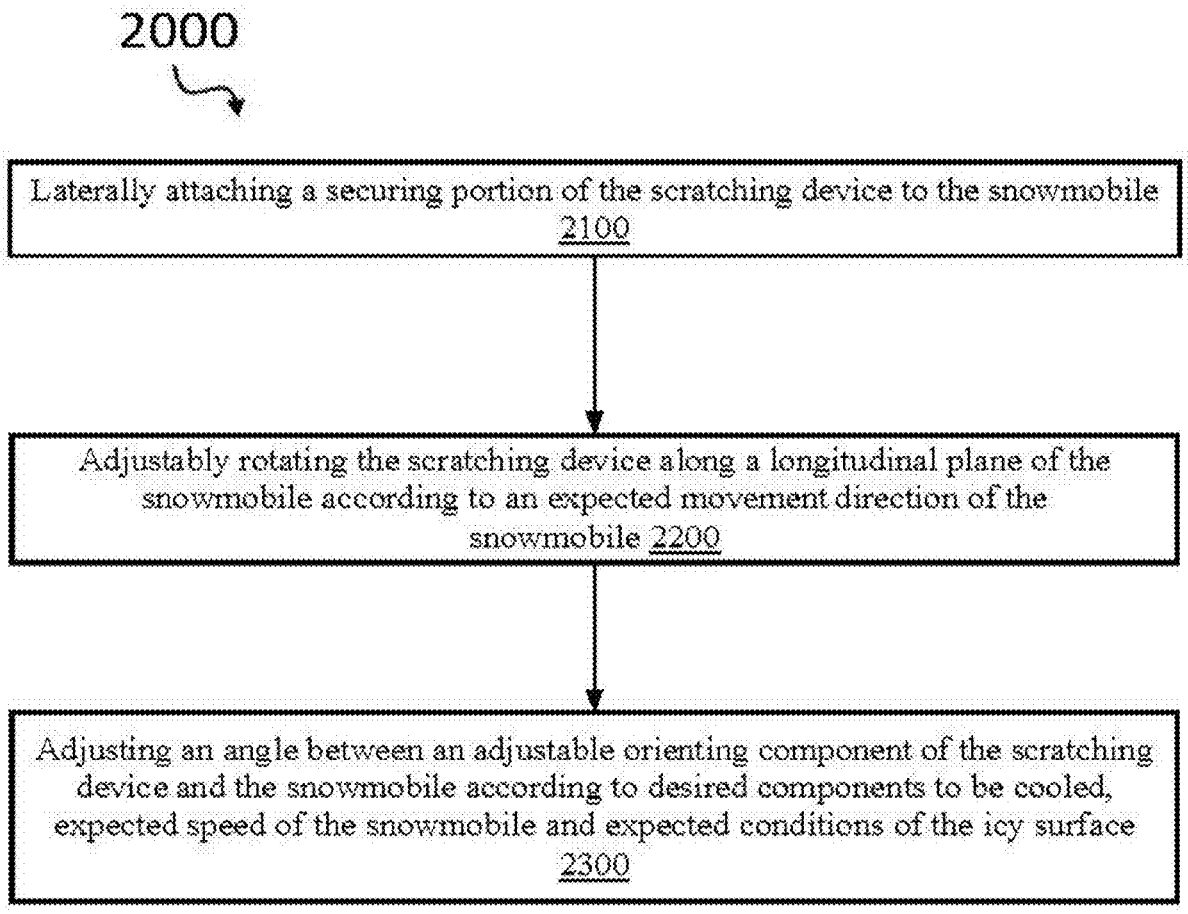

2000
Laterally attaching a securing portion of the scratching device to the snowmobile 2100
Adjustably rotating the scratching device along a longitudinal plane of the snowmobile according to an expected movement direction of the snowmobile 2200
Adjusting an angle between an adjustable orienting component of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface 2300

FIG. 20

ICE SCRATCHING DEVICE FOR SNOWMOBILES AND RELATED METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority of U.S. provisional application No. 63/418,853 filed on Oct. 24, 2022, the content of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention generally relates to ice scratching devices or ice scratchers. More particularly, the invention relates to ice scratchers for snowmobiles.

BACKGROUND

[0003] Various components of a snowmobile are cooled and lubricated during operation on loose snow by streams of snow sprayed to the various components during normal operation. However, when a snowmobile operates on hard packed snow or on an icy surface, there may be no spray at all and an additional component is required in order to alleviate that problem. Unfortunately, current solutions are only partially successful. An improved solution is described herein.

SUMMARY

[0004] The shortcomings are generally mitigated by the scratching device as described herein for a snowmobile.

[0005] According to a first aspect, it is disclosed a scratching device for a snowmobile, the device being configured to be operatively affixed to a securing element for laterally attaching the device towards the snowmobile. The scratching device comprises a scratching element for scratching an icy surface when the snowmobile is travelling on the icy surface, thereby creating a stream of ice particles, the scratching element comprising: a contacting head for contacting the ice, and an orienting portion adjacent the contacting head and configured to be affixed to the securing element, wherein the orienting portion cooperates with the contacting head for orienting the stream of ice particles towards components the snowmobile that need to be cooled, and maximizing as such an amount of ice sent towards the components of the snowmobile when the snowmobile is travelling.

[0006] According to a preferred embodiment, the contacting head and the orienting portion are permanently secured to one another.

[0007] According to a preferred embodiment, the contacting head is removable from the scratching element.

[0008] According to a preferred embodiment, the contacting head is made of a first material and the scratching portion is made of a second material, the first material being harder than the second material.

[0009] According to a preferred embodiment, when the securing element is a flexible wire affixed at one end to the snowmobile and at the opposite end to the scratching device, the scratching element almost forms a triangular shape with a triangular surface and having: a first edge configured to be aligned and affixed with the securing portion; a second edge opposite the securing portion and forming a ridge extending perpendicularly from the triangular surface for defining the orienting portion; a third edge extending from the securing portion, and a recess defined at the junction of the second and third edges and configured for receiving and maintaining the contacting head therein. Preferably, the ridge forms a curved outside surface along the second edge, the orienting portion being angled towards the snowmobile vis-à-vis the icy surface.

[0010] According to a preferred embodiment, the scratching device is hingely secured to the securing element towards the snowmobile for allowing rotation of the scratching device along a longitudinal plane of the snowmobile.

[0011] According to another preferred embodiment, when the securing element is a coil affixed at one end to the snowmobile and at the opposite end to the scratching device, the scratching element has a longitudinal tubular shape with: a first end configured to be aligned and affixed with the securing portion; a second end opposite the first end and comprising the contacting head; and a gutter adjacent the second end and forming the orienting portion.

[0012] According to a preferred embodiment, the first end forms a tube configured to insert the opposite end of the coil therein.

[0013] According to a preferred embodiment, the opposite end of the coil is affixed to the tube by welding or gluing.

[0014] According to a preferred embodiment, the tube defined a lateral threaded hole, the opposite end of the coil being affixed to the tube by screwing a screw in the hole.

[0015] The scratching device of claim **9**, wherein the opposite end of the coil is affixed to the tube by pressing portions of the tube towards the opposite end.

[0016] According to a preferred embodiment, the opposite end of the coil is affixed to another tube configured to be secured to the tube of the scratching device by screwing.

[0017] According to a preferred embodiment, the tube is curved.

[0018] According to a preferred embodiment, the coil is a double coil.

[0019] According to a preferred embodiment, the contacting head is misaligned with the gutter of an angle, preferably an angle of about 45 degrees.

[0020] According to a preferred embodiment, the coil has one end to be affixed at to a frame of the snowmobile and at an opposite end connected to the scratching device, the one end forms a boucle or longitudinal loop configured for accepting a fixing pin of the fixing element therein for blocking a rotation of the coil around a screw to the fixing element when the coil is screwed to the frame through an orifice of the fixing element.

[0021] According to a preferred embodiment, the snowmobile comprises a longitudinal axis defined by a rear end and a front end of the snowmobile such that the scratching device is positioned behind the securing portion when the snowmobile is in forward movement and positioned in front of the securing portion when the snowmobile is in rearward movement. Although not shown in the drawings, inversely the scratching device may be positioned in front the securing portion when the snowmobile is in forward movement and positioned behind of the securing portion when the snowmobile is in rearward movement

[0022] According to a second aspect, it is disclosed a method for cooling components of a moving snowmobile. The method comprises, while the snowmobile is travelling on an icy surface, scratching the surface with a scratching device, thereby creating a stream of ice particles, the stream

of icy particles being controllably directed towards the components by an orienting portion of the scratching device.

[0023] According to a second aspect, it is disclosed a kit for fixing a scratching device, such as the one disclosed herein, to a frame of a snowmobile, comprising at least one double-coil spring and a fixing element, such as those disclosed herein in the present description in reference to FIGS. **12** to **18**.

[0024] According to a preferred embodiment, the method comprises rotating an attachment between the snowmobile and the scratching device along a longitudinal plane of the snowmobile according to a moving direction of the snowmobile.

[0025] According to another embodiment, the method comprises adjusting an angle between the orienting portion of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface, thereby controllably directing the stream of icy particles towards desired components to be cooled.

[0026] According to a third aspect, it is disclosed a method of installing a scratching device on a snowmobile. The method comprises laterally attaching a securing portion of the scratching device towards the snowmobile, adjustably rotating the scratching device along a longitudinal plane of the snowmobile according to an expected movement direction of the snowmobile, and adjusting an angle between an orienting component of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface.

[0027] Advantageously, the cooperation between the orienting portion and the contacting head allows orienting the stream of ice or snow particles towards components the snowmobile that need to be cooled, while maximizing the amount of ice or snow sent towards the components of the snowmobile when the snowmobile is travelling

[0028] Other and further aspects and advantages of the present invention will be better understood upon the reading of the illustrative embodiments about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The above and other aspects, features and advantages of the invention will become more readily apparent from the following description, reference being made to the accompanying drawings in which:

[0030] FIG. **1**A illustrates a side view of an ice scratching device according to a first preferred embodiment, secured towards a snowmobile in a first position when the snowmobile is going forward;

[0031] FIG. **1**B illustrates a side view of an ice scratching device according to a first preferred embodiment, secured towards a snowmobile in a second position when the snowmobile is going backwards;

[0032] FIG. **2**A illustrates a side view (left view) and a front view (right view) an ice scratching device according to the first preferred embodiment with the securing element and scratching portion removed;

[0033] FIG. **2**B illustrates shapes of the scratching portion according to different preferred embodiments;

[0034] FIG. **3** illustrates different views of the ice scratching device according to the first preferred embodiment with the securing element removed (left view) with (A) front lateral isomeric view, (B) back lateral isomeric view, (C) a top plan view, (D) a side plan view and (E) a front plan view;

[0035] FIG. **4** illustrates different views of the ice scratching device according to the first preferred embodiment with (A) a back lateral isomeric view, (B) a side plan view and (C) a bottom plan view;

[0036] FIG. **5**A illustrates a side view of an ice scratching device according to a second preferred embodiment, secured towards a snowmobile in a first position when the snowmobile is going forward;

[0037] FIG. **5**B illustrates a side view of an ice scratching device according to a second preferred embodiment, secured towards a snowmobile in a second position when the snowmobile is going backwards;

[0038] FIG. **6** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion aligned with the scooping portion: with (A) back lateral isomeric view, (B) top plan view, (C) lateral view, (D) cut view along A-A in view C;

[0039] FIG. **7** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion rotated related to the scooping portion with: (A) back lateral isomeric view, (B) top view, (C) lateral view, and (D) cut view along D-D in view C;

[0040] FIG. **8** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion aligned with the scooping portion, the connecting portion comprising threaded hole for attachment: with (A) back lateral isomeric view, (B) top plan view, (C) lateral view, (D) cut view along A-A in view C;

[0041] FIG. **9** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion aligned with the scooping portion, the connecting portion comprising compressed portions for attachment: with (A) back lateral isomeric view, (B) top plan view, (C) lateral view, (D) cut view along A-A in view C;

[0042] FIG. **10** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion aligned with the scooping portion, the connecting portion comprising threaded portions for attachment: with (A) back lateral isomeric view, (B) top plan view, (C) lateral view, (D) cut view along A-A in view C;

[0043] FIG. **11** illustrates different views of the ice scratching device according to the second preferred embodiment with the scratching portion aligned with the scooping portion, the connecting portion for attachment being curved: with (A) back lateral isomeric view, (B) top plan view, (C) lateral view, (D) back view;

[0044] FIG. **12** is a picture showing a section of a frame of a snowmobile configured to receive the ice scratching device, according to a preferred embodiment;

[0045] FIG. **13** is a picture showing a section of a frame of a snowmobile where the ice scratching device is fixed and a first fixing element with (A) front view and (B) bottom inclined view, according to a preferred embodiment;

[0046] FIG. **14** are closer views of the first fixing illustrated on FIG. **12** with a fixing bolt, with (A) front isomeric view and (B) lateral inclined view, according to a preferred embodiment;

[0047] FIG. **15** are closer views of the first fixing illustrated on FIG. **12** partially affixed tot eh frame with a fixing bolt, with (A) front view and (B) lateral isomeric view, according to a preferred embodiment;

[0048] FIG. **16** are pictures showing a section of the frame of a snowmobile where the ice scratching device is affixed using a double coil spring in the scratching position, with (A) a side view and (B) a side isomeric view, according to a preferred embodiment;

[0049] FIG. **17** are closer views of the double coil spring in the scratching position illustrated on FIG. **16**, with (A) top view and (B) side view, according to a preferred embodiment;

[0050] FIG. **18**A is a picture showing a section of the frame of a snowmobile where the ice scratching device is affixed using a double coil spring in the non-scratching position;

[0051] FIG. **18**B is a picture showing in detail the longitudinal fixing loop of a double coil spring in the non-scratching position according to a preferred embodiment;

[0052] FIG. **19** is a flowchart of a method for cooling components of a moving snowmobile, according to a preferred embodiment; and

[0053] FIG. **20** is a flowchart of a method for installing a scratching device on a snowmobile, according to a preferred embodiment.

DETAILED DESCRIPTION

[0054] In order to cool and/or lubricate components of a snowmobile, ice scratchers may be positioned on each side and deployed onto a frozen surface (ice and/or snow). During operation, the ice scratchers detach snow and/or ice and some of the detached snow and/or ice ends up on the track and slide rails of the snowmobile, which may thereby be cooled and/or lubricated. However, the ice scratchers are largely inefficient and a large portion of the detached snow and/or ice is simply lost. Furthermore, the ice scratchers may not provide enough snow or ice to properly cool and/or lubricate components.

[0055] There is thus a need for an improved ice scratcher capable of directing scratched ice particles toward components of the travelling snowmobile to enhance the cooling and lubrication effect of the scratched ice. The lubrication and/or cooling may be useful in order to prevent overheating and premature wear and tear of the snowmobile components.

[0056] A novel scratching device for attachment to a snowmobile will be described hereinafter. Although the invention is described in terms of specific illustrative embodiments, it is to be understood that the embodiments described herein are by way of example only and that the scope of the invention is not intended to be limited thereby.

[0057] The terminology used herein is in accordance with definitions set out below.

[0058] By "about", it is meant that the value can vary within a certain range depending on the margin of error of the device used to evaluate or measure. A margin of error of 10% is generally accepted.

[0059] Current ice scratchers displace ice particles from icy surfaces as the snowmobile is travelling in order to cool and lubricate components of the snowmobile. However, the majority of scratched ice particles never reach the snowmobile components since they are scattered everywhere around the travelling snowmobile. Indeed, only a small portion of the scratched ice becomes useful for cooling and lubrication.

[0060] Exemplary scratching devices for a snowmobile, in accordance with the teachings of the present invention, will be described herein. An exemplary method of installing a scratching device on a snowmobile and an exemplary method for cooling components of a moving snowmobile will also be described.

[0061] A first embodiment is illustrated on FIGS. **1** to **4** of the drawings, in which FIG. **1** shows an exemplary snowmobile **110**. A longitudinal axis of the snowmobile **110** is defined along skis **112** of the snowmobile at a front end thereof and drive tracks and rails **114** reaching at a rear end of the snowmobile **110**. Scratching devices **100** are typically positioned on each side of the snowmobile **110**, between the front end and the rear end, but skilled persons will recognize that a single device on a single side could be used. The front end and rear end of the snowmobile **110** are defined herein having in mind an expected and most common travel direction of the snowmobile **100** and is used as such throughout the description.

[0062] The scratching device **100** secured towards a snowmobile **110** is shown in FIG. **1**. The scratching device **100** is configured to be attached to a securing element **120** that may be directly secured to an attachment point **122** on the snowmobile **110** or may be secured to the snowmobile via an interconnecting member (not shown) secured to the attachment point **122**. In the first embodiment is illustrated on to FIGS. **1** to **4**, the securing element **120** is a wire, such as semi-rigid stranded wire, i.e. preferably protected with a plastic coating or sheath. The scratching device **100** comprises a scratching element **130** for scratching an icy surface when the snowmobile **110** is travelling on the icy surface, thereby creating a stream of ice particles **116**.

[0063] As better illustrated on FIGS. **2** to **4**, the scratching element **130** comprises a contacting head **132** for contacting the ice, and an orienting portion **140** adjacent the contacting head and configured to be affixed to the securing element.

[0064] As aforesaid, when the securing element **120** is a flexible wire, such as the one illustrated on FIG. **1**, it is affixed at one end **122** to the snowmobile **110** and at the opposite end to the scratching element **130** comprising a securing portion **134**, such as the one illustrated on FIG. **4** having a tubular shape. Different types of possible securing portions will be discussed hereafter in reference to the second embodiment and FIGS. **6** to **11**.

[0065] According to the first embodiment as illustrated on FIGS. **1** to **4**, the scratching element **130** forms a triangular-like shape with a triangular-like surface **141** having:

[0066] a first edge **142** configured to be aligned and affixed with the securing portion **134**;

[0067] a second edge **143** opposite the securing portion and forming a ridge **144** extending perpendicularly from the triangular-like surface **141**, the ridge **144** cooperating with the triangular-like surface **141** to form the orienting portion **140**;

[0068] a third edge **145** extending from the securing portion **134** towards the second edge **143**, and

[0069] a recess **146** defined at the junction of the second and third edges **143**, **145** and configured for receiving and maintaining the contacting head **132** therein.

[0070] Several different shape of contacting heads **132** are illustrated on FIG. **2**B.

[0071] As better visible on FIGS. **3** and **4**, the ridge **144** forms a curved outside surface **147** along the second edge, and a curved inside surface **148** adjacent the scratching head, that an be oriented at an angle towards the snowmobile vis-à-vis the icy surface.

[0072] The triangular-like surface **141**, the ridge **144**, preferably a curved ridge, of the orienting portion **140** cooperates with the contacting head **132** for orienting the stream of ice particles towards components the snowmobile that need to be cooled, and for maximizing the amount of ice sent towards the components of the snowmobile when the snowmobile is travelling.

[0073] As previously mentioned, the scratching device may or may not be directly secured to the attachment point **122** as the scratching device **100** may further include an interconnecting member (not shown). As an example of the scratching device **100** being directly secured to the snowmobile **110**, the attachment point **122** may comprise an inner threaded receiver portion configured to receive a threaded portion of the securing portion **120**. Alternatively, an interconnecting member may be secured to the attachment point **122** on the snowmobile **110** from one end and to the securing portion **120** of the scratching device **100** from another end, thereby interconnecting the scratching device **100** to the snowmobile **110**. The interconnecting member may present rigidity characteristics for allowing the scratching portion **130** to apply a force directed on the icy surface, thereby displacing enough ice particles for providing the stream of icy particles **116** to be directed by the orienting component **140** to cool and/or lubricate the snowmobile components (e.g., the interconnecting member may comprise a semi-rigid stranded wire). Yet, the interconnecting member may still present flexibility characteristics to allow bending thereof in order, for instance, to get around and/or over obstacles encountered on the icy surface as the snowmobile **110** is traveling. Likewise, the flexibility characteristics allow bending of the interconnecting member when the snowmobile **110** is traveling on harder surfaces (e.g., roads and the likes) thereby diminishing premature wear of the scratching portion **130**. Although the semi-rigid stranded wire may function as an interconnecting member, the scratching device **100** may also comprise the semi-rigid stranded wire such that the scratching device **100** is configured to be directly secured to the attachment point **122** on the snowmobile **110**. Any suitable interconnecting element may be utilized while remaining within the teachings of the present invention. Variations of interconnecting elements for securing ice scratchers on snowmobiles may be suitable depending on the specific configuration of the securing portion **120** and the model of the snowmobile **110**. For example, any kind of suitable semi-rigid shaft may be configured for being secured to a snowmobile from one end and to the securing portion **120** of the scratching device **100** from another end.

[0074] Referring to FIG. **1**A, the scratching device **100** is secured towards a snowmobile **110** travelling forward. In these conditions, the scratching element **130** of the scratching device **100** is in the forward position as it is rearwardly oriented relative to the attachment point **122**. The ice particles **116** are directed towards the drive tracks and rails **114** as well as other components of the snowmobile **110**. In this position, the proximity of the scratching element **130** to the drive tracks and rails **114** improves distribution of the ice particles **116** onto components of the snowmobile **110**.

[0075] Referring to FIG. **1**B, the scratching element **130** and orienting component **140** of the scratching device **100** can be forwardly oriented relative to the attachment point **122** in the reverse position when the snowmobile **110** is travelling rearward, as exemplified. Although the scratching device **100** is not as efficient at directing ice particles **116** towards the drive tracks and rails **114** when the scratching portion **130** is forwardly positioned, the scratching device **100** may still provide some cooling and lubricating when travelling rearward, e.g., especially when travelling rearward for long distances and/or at high speeds.

[0076] According to a preferred embodiment, the scratching device **100** may be hingely secured to the snowmobile **110** to allow rotation of the scratching device **100** along a longitudinal plane of the snowmobile **110**, thereby allowing for changing of a position of the scratching device **110** between the forward and reverse positions.

[0077] As illustrated on FIG. **4**, the scratching device **100** includes a securing portion **134** for laterally attaching the scratching device **100** to the securing element **120**. The securing element **120** may include an attaching portion **135** for mating with the securing portion **134** of the ice scratching device **100** forming as such interconnecting members. For instance, the interconnecting members may be secured using respective threaded portions, a hole and nut (such as the illustrated on FIG. **8**). For example, the threaded portion **124** may be a ⅜ bolt although different size bolts maybe be used without deviating from the teachings of the present invention. As such, the securing portion **120** may provide a detachably attachable mechanism to make it easier for a user to replace, clean, maintain and/or repair the scratching device **100**.

[0078] The different components of the scratching device **100** are typically made of any suitable material comprising metal and/or plastic well known in the art. For instance, the components may be made from steel, stainless steel or aluminium, preferably stainless steel. Alternatively, the components may also be made from any form of suitable plastic material. In some instances, a single material may be used for the different components of the scratching device **100**.

[0079] In other embodiments, different materials may be combined. The scratching element **130** comprises a contacting head **132**, which may be harder than the scratching element **130** to prevent wear and tear of the scratching portion **130**, especially when the snowmobile **110** is not travelling on an icy surface. Paved or gravel roads are sometimes unavoidable as travel from one icy surface to another is required and even short distances may be sufficient to unduly damage the scratching portion **130**. A contact member **132** made of carbide, for example, may help addressing a premature wear problem by providing a scratching portion **130** capable of withstanding harder and rougher surfaces. Moreover, if the contact member **132** is damaged, the scratching device **100** may be removed from the snowmobile **110** and a replacement contacting (such as those illustrated on FIG. **2**B) may then be mounted on the scratching element **130**.

[0080] As illustrated on FIG. **2**B, the scratching head **132** may be provided in different shapes and sizes, e.g., in order to address specific needs. The scratching head **132** may for example have a rounded shape, a square shape, a triangle shape, octagon shape, half-moon shape or may have a diamond tip shape. It is to be understood that these shapes

are only examples and the scratching head **132** may be provided in additional shapes while still remaining within the teachings of the present invention.

[0081] As the snowmobile **110** travels on any icy surface, the scratching device **100** creates a stream of ice particles **116**. The orienting portion **140** limits the scattering of the ice particles cooperating with the scratching head **132** for directing the stream of ice particles **116** toward the components of the snowmobile **110**.

[0082] In the depicted example, the orienting portion **140** comprises a flat surface **141**. It is to be understood that orienting component **140** can be of different shapes and sizes while still remaining within the teachings found herein. In addition, the securing portion **134** and/or the surface **141** may be curved or otherwise bended, which may be helpful when adapting the scratching device **100** to a specific model of snowmobile. Similar example of a securing portion **134** being bended is depicted on FIG. **11** in relation with the second embodiment disclosed herein after.

[0083] The curving or bending of the securing portion **134** and/or the orienting surface **141** may be useful in modifying the contact angle with the icy surface and/or the angle between the orienting portion **140** and the snowmobile **110**, which may in turn modify the force exerted on the ice scratcher and modify the stream of ice particles **116** which may improve scattering of the ice particles **116** towards the components of the snowmobile **110**. The orienting portion **140** may be fixed by design or may be adjustable, e.g., after installation on a snowmobile **110**. In some embodiments, the orienting component **140** can be fixed according to desired components to be cooled, expected speed of the snowmobile **110** and expected conditions of the icy surface for controllably directing the stream of icy particles **116** towards desired components to be cooled. Having the orienting component **140** adjustable may be helpful for adapting to different surface conditions and/or installation on different snowmobile **110**.

[0084] The orienting portion **140** may be angled towards the snowmobile **110** vis-à-vis the icy surface to maximize ice particles reaching components of the snowmobile **110**. The scratching element **130** and the orienting component **140** may be permanently secured to one another by any method well known in the art such as welding. Alternatively, the orienting component **140** may comprise the scratching portion **130** contiguously thereto. For instance, a single stainless steel or plastic component may be shaped as to provide different surfaces which, when combined, perform functions described herein for the scratching portion **130** and the orienting component **140**.

[0085] A downward force is exerted on the ice scratcher **100**, which may be from the gravitational force alone or may be assisted by additional forces, for example, by forces generated by the securing element **120** secured to the snowmobile **110**. The downward force may modulated by the speed of the travelling snowmobile **110**, the configuration of the securing portion **120** and the configuration of the attachment between the securing portion **120** and the attachment point **122**. In contrast, since the icy surface exerts a force in the opposite direction to the downward force, variations of characteristics of the icy surface will affect the opposite force exerted by the icy surface such that different quantities of ice particles are detached. For example, a solid ice surface will exert a greater force on the ice scratcher **100** and will therefore allow smaller quantities of ice particles to be detached compared to a powdery snow surface which exerts a smaller force on the ice scratcher **100** and therefore allow greater quantities of ice particles to be detached. When in use while the snowmobile **110** is travelling forward, the contacting head **132** of the scratching element **130** scratches the icy surface and detaches icy particles therefrom. The icy particles are detached considering the downward force and the movement of the snowmobile **110**. The icy particles move in many directions upon detachment. The trajectory of the icy particles that are detached on an interior side of the ice scratcher **100** (i.e., between the ice scratcher **100** and the snowmobile **110**) is affected by the orienting component **140** in order to provide the stream of icy particles **116** in a more controlled manner.

[0086] More specifically, in the example of FIGS. **2** to **4**, the orienting portion **140** comprises a ridge forming an upward curved surface **148** and a substantially flat surface **141** substantially perpendicular to the upward curved surface). As an example, the upward curved surface **148** may have a width and thickness of about ⅜" and a length of about 2" 5/16. It is to be understood that these measurements are approximate and may vary according to a specific need. As such, the upward curved surface **148** may have a width ranging between about ⅛" and 1" whereas the length may vary between about 1" and 4". The fin shape flat portion **144** may have a curved surface of about 2" 5/16 with a variation of between ½" and 3" while the distance between the contacting head **132** and the securing element **120** may be about ½" although variations between about ½" and 1"½ may be acceptable within the teachings of the present invention. Moreover, the diameter of the securing element **134** may be about ⅜" with an acceptable variation of between about ¼" and ½" whereas the height of the contacting head **132** may be about ⅜" with an acceptable variation of between about ⅛" and 1". These measurements will be understood as still remaining within the teachings of the present invention as long as the dimensions allow the scratching device to exert its function of scratching an icy surface and directing a stream of ice particles towards components of a snowmobile for cooling the components when the snowmobile is travelling.

[0087] When installed on the snowmobile **110**, it has been shown that an angle of between about 45° to about 90° between the contacting head **132** and the icy surface is effective. The angle can be defined as the angle created between the contacting head **132** and a direction vector when the snowmobile **110** is traveling. Of course, experimentation may prove that a smaller range is more effective or, conversely, that a broader range is still effective. Such experimentation should not be viewed as excluding those other ranges from the scope of the claims defined herein below. The contacting head **132** terminates upward onto the orienting portion **140**, at the intersection between the upward curve surface **147** and the flat surface **141**. The icy particles detached by the contacting head **132** are limited in their transverse interior distribution by the surface **141** while being directed upwards by the upward curve surface **148**, thereby providing the stream of icy particles **116**.

[0088] Skilled persons will readily recognize that the perpendicularity between the upward curve **148** and the flat surface **141** is not essential in all embodiments and that the selection of the angle therebetween shall take into consideration the type of distribution desired for the stream of icy particles **116** (e.g., a narrower angle limiting spread of the

stream of icy particles **116** while a wider angle would expand the spread. Skilled persons will readily recognize that the length and curvature of the upward curve **148** shown in the figures shall be determined taking into consideration the type of distribution desired for the stream of icy particles **116**. More specifically, considering the angle between the ice scratcher **100** and the icy surface, a shorter and/or narrower upward curved surface **148** would increase backward spread and likely limit the upward spread of the stream of icy particles **116** while a longer and/or wider angle would limit the backward spread and likely augment the upward spread). It should also be understood that the direction of the stream of icy particles **116** is influenced by the manner in which the ice scratcher **100** is secured towards the snowmobile **110** and, more specifically, by a rotational angle defined along the longitudinal axis of the ice scratcher **100**; a downward angle defined between the longitudinal axis of the ice scratcher **100** and the icy surface as well as a transverse angle defined between the longitudinal axis of the snowmobile **110** and the longitudinal axis of the ice scratcher **100**.

[0089] Reference is now concurrently made to FIGS. **5** to **11** in order to describe another exemplary embodiment of a scratching device in accordance with the present invention.

[0090] FIGS. **5**A and **5**B shows scratching device **300** secured towards a snowmobile **110**. The scratching device **300** includes a securing element **320** which may be directly secured to an attachment point **322** on the snowmobile **110** or indirectly secured to the attachment point **322** via an interconnecting member (not shown).

[0091] In FIG. **5**A, the scratching device **300** is secured towards the snowmobile **110** travelling forward, the scratching device **300** being in the forward position and are rearwardly positioned relative to the attachment point **322**. The ice particles **116** are directed towards the drive tracks and rails **114** as well as other components of the snowmobile **110**. Proximity of the scratching portion **330** to the drive tracks and rails **114** may help improving contact of the ice particles **116** with the components. With reference to FIG. **5**B, the scratching element **330** of the scratching device **300** can be forwardly positioned relative to the attachment point **322** in the reverse position when the snowmobile **110** is travelling rearward, as exemplified.

[0092] The scratching device **300** as illustrated on FIGS. **6** to **11** is preferably used when the securing element **320** is a coil, or a double-coil such the one illustrated on FIGS. **16** to **18**, with one end **324** affixed at to a frame **118** of the snowmobile **110** and at an opposite end **326** connected to the scratching device **300**.

[0093] According to this second embodiment, the scratching element **310** has a longitudinal tubular shape, such as the one closely described on FIGS. **6** to **11**, with:

[0094] a first end **312** configured to be aligned and affixed with the securing element **320**;

[0095] a second end **314** opposite the first end **312** and configured for comprising the contacting head **132**; and

[0096] a gutter **316** adjacent the second end **314** and forming the orienting portion **340**.

[0097] As for the first embodiment of the scratching device **100** disclosed in FIGS. **1** to **5**, the gutter **316** of the orienting portion **140** cooperates with the contacting head **132** for orienting the stream of ice particles towards components the snowmobile that need to be cooled, and for maximizing the amount of ice sent towards the components of the snowmobile when the snowmobile is travelling.

[0098] As shown on FIG. **6**, the contacting head **132** is aligned with the gutter **316**. Alternatively, as shown on FIG. **7**, the contacting head **132** may be misaligned with the gutter **316** of an angle, preferably an angle of about 45 degrees. The orienting portion **340** may be angled towards the snowmobile **110** vis-à-vis the icy surface to maximize ice particles reaching components of the snowmobile **110**.

[0099] FIGS. **6** to **11** shows different ways the ice scratching device **300** is connected to the securing element **320**. In general, the first end **312** of the scratching device forms a tube having a longitudinal hole **318** configured to received the opposite end **326** of the coil **320** therein.

[0100] According to a preferred embodiment, the opposite end of the coil is affixed to the tube by welding or gluing.

[0101] According to a preferred embodiment, such as the one illustrated on FIG. **8**, the tube **312** may have a lateral threaded hole **319** going through the tube's wall, the opposite end of the coil being affixed to the tube by screwing a screw in the hole.

[0102] According to a preferred embodiment, such as the one illustrated on FIG. **9**, the opposite end of the coil is affixed to the tube **312** by at least one pressing point **317** of the tube **312** towards the opposite end.

[0103] According to a preferred embodiment, such as the one illustrated on FIG. **10**, the opposite end of the coil is affixed to another tube **335** configured to be secured to the tube **312** of the scratching device, for instance by screwing two matching threaded tubes.

[0104] According to a preferred embodiment, such as the one illustrated on FIG. **11** or **17**, the tube **312** may be curved for orienting the scratching device towards the snowmobile.

[0105] The securing portion **320** may comprise at least one spring element, preferably two springs as the one illustrated on FIGS. **16-18**, having sufficient rigidity for allowing the scratching portion to apply a force directed on the icy surface that is capable of displacing enough ice particles to provide the stream of icy particles **116** to be directed by the orienting component **340** to cool and/or lubricate the snowmobile components.

[0106] The scratching head **132** may be provided in different shapes and sizes in order to address specific needs, such as the ones illustrated on FIG. **2**B. The scratching head **132** may for example have a rounded shape, a square shape, a triangle shape, octagon shape, half-moon shape or may have a diamond tip shape. It is to be understood that these shapes are only examples and the scratching element **330** may be provided in additional shapes while still remaining within the teachings of the present invention.

[0107] The orienting component **340** may be provided with a variety of shapes and sizes according to the model of the snowmobile **110** and the location of the components to be cooled. As such, generic shapes may be produced for different snowmobile models but may also be custom-made according to specific requirements.

[0108] A downward force is exerted on the ice scratcher **300** which may be limited to the gravitational force or may be assisted by additional forces, for example, by forces generated by an interconnecting member secured to the snowmobile **110**, depending on the configuration of the interconnecting member selected according to the model of the snowmobile **110**. The interconnecting member may comprise a spring shaft configured to exert downward force onto the scratching portion **330** of the scratching device **300** . . . . When in use while the snowmobile **110** is travelling

forward, the contacting head **332** of the scratching element **330** scratches the icy surface and detaches icy particles therefrom. The icy particles are detached considering the downward force and the movement of the snowmobile **110**. The icy particles move in many directions upon detachment. The trajectory of the icy particles that are detached on an interior side of the ice scratcher **300** (i.e., between the ice scratcher **300** and the snowmobile **110**) is affected by the orienting component **340** in order to provide the stream of icy particles **116** in a more controlled manner. More specifically, in the example of FIGS. **6** to **11**, the orienting portion **340** comprises a gutter **316** with a substantially flat portion **316***a* between two inclined walls **316***b*, with an angle of about 40-50 degrees, preferably of about 48 degrees, forming a scoop. The icy particles detached by the contacting head **132** are directed upwards by the scoop thereby providing the stream of icy particles **116**.

[0109] Skilled persons will readily recognize that the angle between the flat surface **316***a* and the walls **316***b* is not essential in all embodiments and that the selection of the angle therebetween shall take into consideration the type of distribution desired for the stream of icy particles **116** (e.g., a narrower angle limiting spread of the stream of icy particles **116** while a wider angle would expand the spread). It should also be understood that the direction of the stream of icy particles **116** is influenced by the manner in which the ice scratcher **300** is secured to the snowmobile **110** and, more specifically, by a rotational angle defined along the longitudinal axis of the ice scratcher **300**; a downward angle defined between the longitudinal axis of the ice scratcher **300** and the icy surface as well as a transverse angle defined between the longitudinal axis of the snowmobile **110** and the longitudinal axis of the ice scratcher **300**.

[0110] FIGS. **12** to **18** illustrate a novel equipment for fixing the securing element **320** comprising a coil, or a double coil as illustrated, to the frame **118** of a snowmobile. The lateral frame **118** is illustrated in part on FIG. **12**. The frame has a hole **119** above and adjacent a longitudinal horizontal flange **117**. A fixing element **200** is provided with a flat portion **210** having a hole **220** configured to match with the hole **119** of the frame **118** (FIGS. **13**A and **13**B) and to receive a fixing screw **230** (FIGS. **14**A and **14**B). The fixing element **200** has a straight edge **240** configured for being supported by the flange **117** of the frame when the fixing element is screwed to the frame (FIGS. **15**A and **15**B). The fixing element **200** also comprises a fixing pin **250** extending upwardly from the flat portion.

[0111] As illustrated on FIGS. **16** and **17**, the coil or double-coil has one end **324** to be affixed at to the frame **118** of the snowmobile **110** and at an opposite end **326** connected to the scratching device **300**. The one end **324** forms a boucle or longitudinal loop **325** (see FIG. **18**B) configured for accepting the fixing pin **250** of the fixing element therein, and as such blocking a rotation of the coil around the screw **230** to the fixing element **200** when the coil **320** is screwed to the frame through the hole of the fixing element. FIGS. **16** and **17** show the securing element **320** in the active position for scratching the ice, whereas FIG. **18** shows the securing element **320** in a non-active position where the securing element **320** is maintained aligned with the flange **117** and maintained in this position with a hook **260** fixed to the frame.

[0112] Advantageously, the new fixing element **200** with its fixing pin **250** in conjunction with the loop **325** of the coil, and its straight edge **240** in conjunction with the flange **117** the frame **118**, allows the ice starching device to be attached to the frame using a single hole through the frame, thus avoiding weakening the frame.

[0113] FIG. **19** shows a flow chart of an exemplary method **1000** for cooling components of a moving snowmobile. The method **1000** comprises, while the snowmobile is travelling on an icy surface, scratching **1100** the surface with a scratching device, thereby creating a stream of ice particles, the stream of icy particles being controllably directed towards the components by an orienting portion of the scratching device. Optionally, method **1000** may further comprise, before scratching **1100** (e.g., at the time of installation and/or before a snowmobile ride), rotating **1200** an attachment between the snowmobile and the scratching device along a longitudinal plane of the snowmobile according to a moving direction of the snowmobile. The method **1000** may also optionally further comprise adjusting **1300** an angle between the orienting portion of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface, thereby controllably directing the stream of icy particles towards desired components to be cooled.

[0114] FIG. **20** shows an exemplary flow chart of a method **2000** of installing a scratching device on a snowmobile. The method comprises laterally attaching **2100** a securing portion of the scratching device to the snowmobile, adjustably rotating **2200** the scratching device along a longitudinal plane of the snowmobile according to an expected movement direction of the snowmobile and adjusting **2300** an angle between an orienting component of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface.

[0115] Although a snowmobile **110** has been presented herein, aspects of the present description could be applied to other types of tracked vehicles operating on snow or ice, such as snowbikes or all-terrain vehicles (ATVs), including three-wheel ATVs and motocross, provided with track and snow groomers.

[0116] While illustrative and presently preferred embodiments of the invention have been described in detail hereinabove, it is to be understood that the inventive concepts may be otherwise variously embodied and employed and that the appended claims are intended to be construed to include such variations except insofar as limited by the prior art.

1. A scratching device for a snowmobile, the device being configured to be operatively affixed to a securing element for laterally attaching the device towards the snowmobile, the scratching device comprising a scratching element for scratching an icy surface when the snowmobile is travelling on the icy surface, thereby creating a stream of ice particles, the scratching element comprising:

a contacting head for contacting the ice, and

an orienting portion adjacent the contacting head and configured to be affixed to the securing element,

wherein the orienting portion cooperates with the contacting head for orienting the stream of ice particles towards components the snowmobile that need to be cooled, and maximizing as such an amount of ice sent towards the components of the snowmobile when the snowmobile is travelling.

2. The scratching device of claim 1, wherein the contacting head and the orienting portion are permanently secured to one another, or the contacting head is removable from the scratching element.

3. The scratching device of claim 1, wherein the contacting head is made of a first material and the scratching portion is made of a second material, the first material being harder than the second material.

4. The scratching device of claim 1, wherein when the securing element is a flexible wire affixed at one end to the snowmobile and at the opposite end to the scratching device, the scratching element almost forms a triangular shape with a triangular surface and having:

a first edge configured to be aligned and affixed with the securing portion;

a second edge opposite the securing portion and forming a ridge extending perpendicularly from the triangular surface for defining the orienting portion;

a third edge extending from the securing portion, and

a recess defined at the junction of the second and third edges and configured for receiving and maintaining the contacting head therein.

5. The scratching device of claim 4, wherein the ridge forms a curved outside surface along the second edge, the orienting portion being angled towards the snowmobile vis-à-vis the icy surface.

6. The scratching device of claim 4, wherein the scratching device is hingely secured to the securing element towards the snowmobile for allowing rotation of the scratching device along a longitudinal plane of the snowmobile.

7. The scratching device of claim 1, wherein when the securing element is a coil affixed at one end to the snowmobile and at the opposite end to the scratching device, the scratching element has a longitudinal tubular shape with:

a first end configured to be aligned and affixed with the securing portion;

a second end opposite the first end and comprising the contacting head; and

a gutter adjacent the second end and forming the orienting portion.

8. The scratching device of claim 7, wherein the first end forms a tube configured to insert the opposite end of the coil therein, the opposite end of the coil being affixed to the tube by welding or gluing, or by pressing portions of the tube towards the opposite end.

9. The scratching device of claim 7, wherein the tube further defined a lateral threaded hole, the opposite end of the coil being secured to the tube by screwing a screw in the hole.

10. The scratching device of claim 7, wherein the opposite end of the coil is affixed to another tube configured to be secured to the tube of the scratching device by screwing.

11. The scratching device of claim 7, wherein the tube is curved.

12. The scratching device of claim 7, wherein the coil is a double coil.

13. The scratching device of claim 7, wherein the contacting head is misaligned with the gutter of an angle.

14. The scratching device of claim 13, wherein the angle is about 45°.

15. The scratching device of claim 7, wherein the coil has one end to be affixed at to a frame of the snowmobile and at an opposite end connected to the scratching device, the one end forms a boucle or longitudinal loop configured for accepting a fixing pin of the fixing element therein for blocking a rotation of the coil around a screw to the fixing element when the coil is screwed to the frame through an orifice of the fixing element.

16. The scratching device of claim 1, wherein the snowmobile comprises a longitudinal axis defined by a rear end and a front end of the snowmobile such that:

the scratching device is positioned behind the securing portion when the snowmobile is in forward movement and positioned in front of the securing portion when the snowmobile is in rearward movement; or

the scratching device is positioned in front the securing portion when the snowmobile is in forward movement and positioned behind of the securing portion when the snowmobile is in rearward movement.

17. A method for cooling components of a moving snowmobile comprising:

while the snowmobile is travelling on an icy surface, scratching the surface with the scratching device as claimed in claim 1, thereby creating a stream of ice particles, the stream of icy particles being controllably directed towards the components by an orienting portion of the scratching device.

18. The method of claim 17, further comprising rotating an attachment between the snowmobile and the scratching device along a longitudinal plane of the snowmobile according to a moving direction of the snowmobile.

19. The method of claim 17, further comprising adjusting an angle between the orienting portion of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface, thereby controllably directing the stream of icy particles towards desired components to be cooled.

20. A method of installing a scratching device on a snowmobile, the scratching device being as claimed in claim 1, the method comprising:

laterally attaching the securing element to the scratching device and to the snowmobile,

adjustably rotating the scratching device along a longitudinal plane of the snowmobile according to an expected movement direction of the snowmobile, and

adjusting an angle between an orienting portion of the scratching device and the snowmobile according to desired components to be cooled, expected speed of the snowmobile and expected conditions of the icy surface.

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