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(71) Applicant: **Whitmore Manufacturing, LLC.**
Rockwall TX 75087 (US)

(72) Inventors:
- **ANDERSON, Steve Donald**
  Rockwall, TX Texas 75087 (US)
- **ADKINS, Kevin Ray**
  Rockwall, TX Texas 75087 (US)
- **KRINKER, Randall**
  Rockwall, TX Texas 75087 (US)
- **CHIDDICK, Kelvin**
  Rockwall, TX Texas 75087 (US)
- **WILSON, Kyle**
  Rockwall, TX Texas 75087 (US)

(74) Representative: **Findlay, Alice Rosemary**
Reddie & Grose LLP
The White Chapel Building
10 Whitechapel High Street
London E1 8QS (GB)

(54) AN IMPROVED TOP OF RAIL APPLICATOR

(57) A top of rail (TOR) applicator has a bar positioned in a housing and an exit orifice on the upper portion of the bar for delivering a friction control composition to the crown of a railhead. The upper portion of the bar slopes away from the friction control composition exit orifices. The bar may be composed of an elastomer such as polyurethane. Passageway extend from an inlet or entry orifice to the exit orifices. The friction reduction composition is pumped into the entry orifice, through the passageways to the exit orifices and then onto the crown of the railhead. The friction reduction composition may be thixotropic.

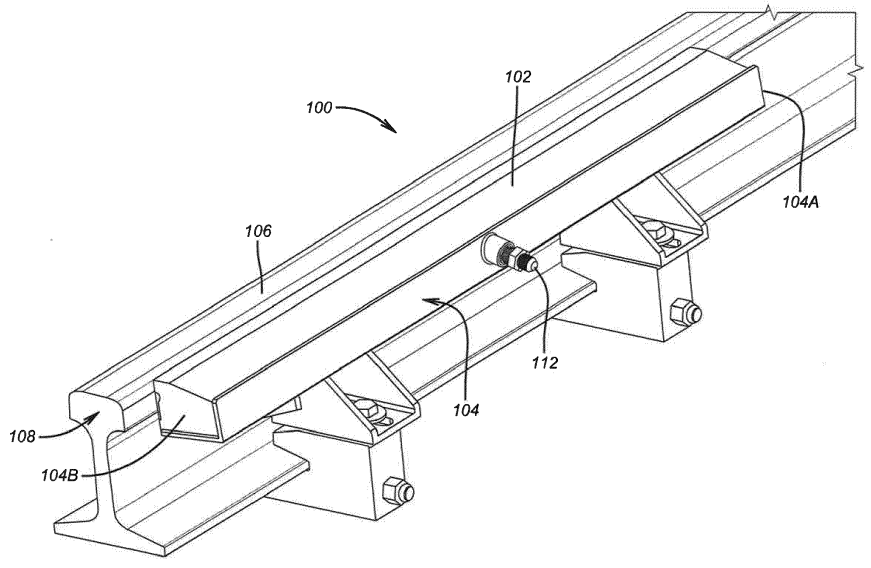

FIG. 1

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Description

[0001] The disclosure relates to an applicator for delivery of a friction control composition to a railhead.

[0002] The emission of high noise levels and extensive wear of steel wheels and steel rails is a common problem in rail systems, including freight, passenger and mass transit trains. Such problems are directly attributed to the frictional forces generated between the wheel and the railhead during operation of the system. In addition to noise problems and extensive wear of the wheels and rails, negative friction between the two sliding steel surfaces cause slip-stick oscillations. This, in turn, results in inefficient as well as sub-optimum performance.

[0003] In order to control friction, it has long been the practice to apply grease or friction control compositions onto the rail, including onto the railhead as well as the sides of the rail. Most notably, such compositions have been applied at curves, inclines, turnouts, switches, etc. Friction control compositions can either reduce or increase the friction when necessary to improve train performance and reduce wear on both the railhead and the train wheels.

[0004] In order to increase friction between the train wheel and the rail, the friction control composition is typically placed on the railhead. Applicators used to place friction control compositions onto railheads are called top of rail (TOR) applicators. In normal practice, TOR applicators are periodically spaced along the length of the rail track. The spacing of TOR applicators is typically dependent on the ability of the friction control composition to carry down the rail. Unfortunately, when compared to applicators placed on the side of the rail, TOR applicators, in direct contact with the train wheel, are more likely to be damaged or destroyed by train wheels.

[0005] TOR applicators have been developed over the years to address this issue. However, such applicators have proved to be inadequate for a number of reasons. For example, in some prior art applicators, the friction control composition typically does not reach the center of the railhead. As a result, the friction control composition is not effectively carried down the rail. In other cases, substantial amounts of the friction control composition are wasted because the friction control composition ends up leaking down the sides of the rail and off the railhead. In other instances, while prior art TOR applicators place the friction control composition on the railhead, the applicator itself is damaged or destroyed by impact when hit by train wheels. Thus, such TOR applicators of the prior art become inoperable from impact damage.

[0006] TOR applicators that effectively place the friction control composition onto the railhead such that the friction control composition is efficiently carried down the track are desired. In addition, such TOR applicators need to be relatively safe from being damaged or destroyed from the impact of train wheels.

[0007] In an embodiment of the disclosure, an applicator is provided for delivering a friction control composition to a railhead. The applicator is composed of a housing, a bar positioned in the housing and an exit orifice on the upper portion of the bar for delivering the friction control composition to the crown of the railhead.

[0008] In another embodiment of the disclosure, an applicator is provided for delivering a friction control composition to a railhead. The applicator is composed of a housing, an elastomeric bar positioned in the housing, an entry port for pumping the friction control composition into a passageway, and an exit port for pumping the friction control composition onto the railhead.

[0009] In another embodiment of the disclosure, an applicator is provided for delivering a friction control composition to a railhead. The applicator is composed of a housing, a bar positioned in the housing, an entry port located on the lower portion of the slope for feeding the friction control composition into a passageway and an exit orifice on the upper portion of the bar for delivering the friction control composition to the crown of the railhead from the passageway. The upper portion of the bar slopes away from the friction control composition exit orifice. In an embodiment, the upper portion of the bar slopes away from the friction control composition exit at an angle between from about 5 to about 15 degrees. The applicator assembly may also contain a platform for the bottom surface of the housing, a clamp for coupling the applicator onto the railhead via the platform and a leveler.

[0010] In another embodiment of the disclosure, an applicator assembly is provided for delivering a friction control composition to a railhead. The applicator assembly comprises an applicator composed of a housing, a bar positioned in the housing and an exit orifice on the upper portion of the bar for delivering the friction control composition to the crown of the railhead. The applicator assembly may also contain a platform for the bottom surface of the housing, a clamp for coupling the applicator onto the railhead via the platform and a leveler.

[0011] In another embodiment of the disclosure, an applicator assembly is provided for delivering a friction control composition to a railhead; the applicator assembly comprising a housing, an elastomeric bar positioned in the housing, an entry port for pumping the friction control composition into a passageway and an exit port for pumping the friction control composition onto the railhead. The applicator assembly further contains a platform onto which the bottom surface of the housing is seated, a leveler attached to the platform and a clamp coupled to the platform for affixing the applicator assembly onto the railhead.

[0012] In another embodiment of the disclosure, an applicator assembly is provided for delivering a friction control composition to a railhead. The applicator assembly comprises an applicator composed of a housing, a bar positioned in the housing, an entry port located on the lower portion of the slope for feeding the friction control composition into a passageway and an exit orifice on the upper portion of the bar for delivering the friction control composition to the crown of the railhead from the pas-

sageway. The applicator assembly may also contain a platform for the bottom surface of the housing, a clamp for coupling the applicator onto the railhead via the platform and a leveler.

[0013] In another embodiment of the disclosure, an applicator assembly is provided for delivering a friction control composition to a railhead. The applicator assembly comprises an applicator composed of a housing, a bar positioned in the housing having a sloped downwardly top, an entry port located on the lower portion of the sloped downwardly top for feeding the friction control composition into a passageway and at least two exit orifices on the upper portion of the bar for delivering the friction control composition to the crown of the railhead from the passageway. The applicator assembly may also contain a platform for the bottom surface of the housing, a clamp for coupling the applicator onto the railhead via the platform and a leveler.

[0014] In another embodiment of the disclosure, an applicator assembly is provided for delivering a friction control composition to a railhead. The applicator assembly comprises an applicator composed of a housing, a bar positioned in the housing having a sloped downwardly top, an entry port located on the lower portion of the sloped downwardly top for feeding the friction control composition into a passageway and at least two exit orifices on the upper portion of the bar for delivering the friction control composition to the crown of the railhead from the passageway. The applicator assembly may also contain a platform for the bottom surface of the housing, a clamp for coupling the applicator onto the railhead via the platform and a leveler.

[0015] Accordingly, the present disclosure includes features and advantages at least in preferred embodiments which are believed to enable it to most effectively place friction control compositions onto rails.

[0016] The invention will now be further described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a front perspective view of a top of rail (TOR) applicator assembly affixed to the side of a rail.

FIG. 2 is a side view of a TOR applicator assembly and illustrates the interaction of the TOR applicator and a train wheel.

FIG. 3 is a top perspective view of a TOR applicator assembly.

FIG. 4 is a cut-away front view of a TOR applicator assembly.

FIG. 5 is a cut-away side view of a TOR applicator demonstrating the passageway for feeding a friction control composition onto the crown of a railhead.

FIG. 6 is a top perspective view of an alternate embodiment of a TOR applicator assembly.

FIG. 7 is a cross-sectional view taken along line 7-7 in FIG. 6.

FIG. 8 is a cross-sectional view taken along line 8-8 in FIG 7.

FIG. 9 is a top perspective view of yet another alternate embodiment of a TOR applicator assembly.

FIG. 9a is a detail view of a portion of the TOR applicator shown in FIG. 9.

FIG. 10 is a cross-sectional view taken along line 10-10 in FIG. 9.

FIG. 11 is a cross-sectional view taken along line 11-11 in FIG 10.

[0017] In showing and describing preferred embodiments in the appended figures, common or similar elements are referenced with like or identical reference numerals or are apparent from the figures and/or the description herein. The figures are not necessarily to scale and certain features and certain views of the figures may be shown exaggerated in scale or in schematic in the interest of clarity and conciseness.

[0018] As used herein and throughout various portions (and headings) of this patent application, the terms "disclosure", "present disclosure" and variations thereof are not intended to mean every possible embodiment encompassed by this disclosure. Thus, the subject matter of each such reference should not be considered as necessary for, or part of, every embodiment hereof merely because of such reference.

[0019] The term "coupled" and the like, and variations thereof, as used herein are intended to mean either an indirect or direct connection or engagement. Thus, if a first device couples to a second device, that connection may be through a direct connection, or through an indirect connection via other devices and connections.

[0020] Certain terms are used herein to refer to particular components. As one skilled in the art will appreciate, different persons may refer to a component by different names. This document does not intend to distinguish between components that differ in name but not function.

[0021] Also, the terms "including" and "comprising" are used herein in an openended fashion, and thus should be interpreted to mean "including, but not limited to ...." Further, reference herein to components and aspects in a singular tense does not necessarily limit the present disclosure to only one such component or aspect, but should be interpreted generally to mean one or more, as may be suitable and desirable in each particular instance.

[0022] The top of rail applicator (TOR) disclosed herein may be used to deliver a friction control composition (or a lubricant) to a railhead, most notably the crown of the railhead. The TOR applicator, when affixed to a railhead, is less likely to be damaged by a train wheel. As such, the friction control composition is more efficiently carried down the top of the railhead.

[0023] FIG. 1, a front perspective view, illustrates a TOR applicator assembly affixed to the side of the rail. The TOR applicator assembly contains the TOR applicator. The TOR applicator includes the bar, housing and the optional platform and/or sealant, as described herein. FIG. 2, a side view, illustrates the interaction of the TOR applicator assembly and a train wheel. FIG. 3 is top per-

spective view of the TOR applicator assembly. FIG. 4 is a cut-away front view of the TOR applicator assembly.

[0024] As illustrated, TOR applicator assembly 100 includes a TOR applicator. The TOR applicator contains bar 102. Bar 102 may be seated in bar housing 104. Bar housing 104 may be characterized as having a front wall 104A (which faces, when attached to the rail, the field side of the rail), a side wall 104B, a back wall 104C and a bottom wall 104D. As illustrated in FIG. 1, bar 102 may be seated onto the housing such that the bottom of the bar interfaces with the inside surface of bottom wall 104D. Bar 102 may be releasably attached to and from the inside surface of bottom wall 104D using such conventional fasteners such as snap fit, bolts, screws, nails, adhesives, Velcro, etc.

[0025] Since bar 102 sits inside of housing 104 and may be releasably attached, it can easily be replaced. Thus, when bar 102 is damaged, destroyed or otherwise rendered less efficient due to wear and tear, it may be removed and replaced with a fresh bar. Bar 102 may be releasably attached to bar housing 104 with mechanical fasteners or self-tapping screws.

[0026] As shown in FIG. 1, in an embodiment, bar housing 104 may not have a top wall such the bar may rest simply in the housing, the upper surface of the bar being exposed to the environment. This arrangement facilitates replacement of a worn or damaged bar with a fresh bar.

[0027] In an alternative embodiment, the bar may be integrally formed with the housing.

[0028] In some instances, front wall 104A and side wall 104B of bar housing 104 (as illustrated in FIG. 2) may be lower than the upper surface of bar 102 and the back wall 104C of housing 104. When affixed to railhead 108, this arrangement renders it less likely for the wheel 107 of a train to impact and damage the housing and the bar. Strategically placing the bar lower than railhead 108 enables bar housing 104 and bar 102 to withstand impact from the train wheel as from a false flange of a badly worn train wheel.

[0029] In a preferred embodiment, shown in FIG. 4, the upper surface 102A of bar 102 is sloped such that, when affixed to railhead 108, the upper surface of the bar slopes away from railhead 108. Such downward sloping is inapposite to TOR applicators of the prior art. In TOR applications of the prior art, the bar, when the TOR applicator is attached to the rail, slopes towards the railhead. In such instances, the TOR applicator is designed to form a reservoir to keep lubricants or friction modifiers on the top of the rail, especially on crown 106 of railhead 108. Such lubricants or friction control compositions are much less viscous than those disclosed herein. Such sloping of the bar towards the railhead makes the bar of the TOR applicator of the prior art more likely to be damaged by train wheels.

[0030] In a preferred embodiment, front wall 104A and side wall 104B may be sloped such that the top surface of the front wall and side wall is sloped away from exit orifice 114, typically between 0.5 inches and 1.25 inches below the exit orifice.

[0031] Thus, in an embodiment, such as shown in FIG. 1 and FIG. 2, the upper surface of bar 102 slopes away from railhead 108 when TOR applicator assembly 100 is affixed onto railhead 108. The top surface of the bar of the TOR applicator defined herein exhibits a downward slope from exit orifice 114 from railhead 108 to the side of bar 102 closest to the field. When affixed to railhead 108, the configuration of the TOR applicator makes it less likely that TOR applicator will be negatively impacted by the train wheel. When attached to railhead 108, the slope of bar 102 may be from about 5 to about 15 degrees, more preferably from about 8 to about 10 degrees, off the horizontal plane defined by railhead 108.

[0032] As illustrated in FIG. 3, friction control composition is pumped through entry port 112 into passageway 110. The composition then exits onto railhead 108 through exit orifice 114 from passageway 110.

[0033] FIG. 2 shows threaded screw 113 with entry port 112 at one end. The other end of the threaded screw is secured into platform 120 which, in turn, is fed into bar 102 via front wall 104A of the housing. In an alternative embodiment, the port for receiving the friction control composition may be part of the housing such that the entry port and housing are one unified element.

[0034] As shown in FIG. 5, passageway 110 provides a path for the flow of the friction control composition from the pump onto railhead 108. The diameter of passageway 110 is preferably between from about 0.50 to about 0.75 inches. When the diameter of passageway 110 is smaller than 0.50 inches, it may be subject to clogging. When the diameter of passageway 110 is larger than 0.75 inches, a larger pump may be required to force the friction control composition through entry port 112 and into the passageway. In certain embodiments, entry port 112 and/or exit orifice 114 may be a mere slit which is opened by pressure from a pump.

[0035] A conventional pump, valves and hoses are used for supplying the friction control composition to port 112, through passageway 110 and onto railhead through exit orifice 114.

[0036] In FIG. 5, entry port 112 on threaded screw 113 is shown as being connected to passageway 110 within bar 102 that leads to the exit orifice. The pump can be activated in a variety of ways well known in the art including electronic wheel sensors.

[0037] In an alternative embodiment, the TOR applicator may not have a housing such that entry port 112 feeds into a unitary element having an exit orifice.

[0038] Bar 102 may further include sealant 116, as illustrated in FIG. 4. Sealant 116 assists in the prevention of friction control composition flowing from crown 106 of railhead 108 onto bar 102 of the TOR applicator. Without sealing member 116, the friction control composition, once applied onto railhead 108, may flow onto any surface of the TOR applicator including any side of bar 102 or housing 104. Sealant 116 may thus provide an imper-

meable membrane between the side of railhead 108 and housing 104. Sealant 116 may be unnecessary in those instance where the friction control composition tends not to flow such as, for instance, when the friction control composition is thixotropic.

[0039] In an embodiment, sealing member 116 may be a gasket. Suitable gaskets include Teflon ropes, such as those available commercially from McMaster Carr as product Part # 8824K11 Flange Mount PTFE Rope Seal. In addition, sealing member 116 may be composed of an elastomer or a rubber.

[0040] At times it may be desirable to move the TOR applicator away from railhead 108 during maintenance such as during rail grinding where the railhead 108 is reverted back to its original profile. Rail grinding requires that objects in the path of the grinder (including the TOR applicator) be moved.

[0041] Movement of the TOR applicator away from railhead 108 and towards the field may be accomplished by the use of pivot points 118. As illustrated in FIG. 3, the bottom surface of housing 104 may rest, directly or indirectly, on solid platform 120. Downward brackets 122A and 122B are shown as extending from the bottom of platform 120. Such brackets may be attached to platform 120 or may be integrally formed with the platform. Downward brackets 122A and 122B further have slots 124 for receiving pivot points 135A and 135 B, respectively. The opposite ends of downward brackets 122A and 122B are rail clamps 128A and 128B for securing the rest of the TOR applicator onto railhead 108. Rail clamps 128 and 128B are pivotally coupled to the platform by downward brackets 122A and 122B. Downward brackets 122A and 122B are shown as forming an integral unit with rail clamps 128A and 128B, though they may exist as separate and distinct elements from each other. While pivot points 118A and 118B are illustrated as nuts and bolts, other securement elements may be used. Using pivoting bolts 118A and 118B and slots 124, TOR applicator may be moved up and down. In addition, pivoting bolts 118A and 118B may be used to loosen the attachment between platform 120 and rail clamp 128 such that platform 120 (and the TOR applicator) can be rotated away from railhead 108 in a counter clockwise motion, as can be viewed from FIG. 1.

[0042] The surface of platform 120 may further have slots 134 for receiving leveling bolts 136. Leveling bolts 136 in FIG. 5 are shown as being threaded into receiving base 115 which is affixed to rail footer 109 of the rail with J-bolt 137. Leveling bolts 136 may be used to assure that exit orifice 114 from passageway 110 is positioned 1/8th inch or more below railhead 108. In some instances, the bar may be placed higher than 1/8th of an inch below railhead 108 if the bar is composed of tough material and/or if the bar sloping away from the railhead makes the impact by a rail wheel less damaging.

[0043] To assure that bar 102 is correctly positioned vis-à-vis railhead 108, leveling bolts 120 on rail foot 20 may be turned and move TOR applicator and thus bar 102 up and down.

[0044] TOR applicator may further have one or more shock absorbers 130 to assist in minimizing damage to bar 102. As illustrated in FIG. 1, shock absorbers 130 may be placed between platform 120 and the bottom surface of housing 104. Suitable shock absorbers 130 include a series of washers used with bolts 132 as well as springs and pneumatic absorbers. In a preferred embodiment, bar 102 flexes if stricken by a train wheel. It is important, however, that the bar have the requisite resistance for exit orifice 114 to remain at an optimum elevation vis-à-vis railhead 108. It further is desirable for the bar to be UV resistant and/or water resistant.

[0045] In at least one embodiment, bar 102 is elastomeric. In a preferred embodiment, the elastomeric bar exhibits a hardness of between 50 Shore A and 75 Shore A. Elastomeric bar 102 is preferably composed of polyurethane, such as a polyurethane commercially available from H&H Urethane and can molded or shaped by methods well known in the art (e.g. injection molding, machining etc).

[0046] In certain embodiments of the disclosure, the parts of applicator 50 that are not intended to flex (i.e. bar 102 and shock absorbers 130 are intended to flex) are made of rigid, strong materials that are intended to last much longer than bar 102. Some examples include certain metals such as 1060 Carbon Steel, and 4130 Molybdenum Steels. These parts can be formed by well-known processes found in the prior art such as machining, stamping and molding.

[0047] In at least one embodiment of the disclosure, the friction control composition changes the friction, or coefficient of friction, between the steel surfaces from negative to positive and thereby reduces or eliminates the lateral, longitudinal and/or spin creeps with a corresponding reduction or elimination of lateral forces and wheel-rail wear while increasing stability of the train.

[0048] The friction control composition may be placed on crown 106 of railhead 108 through orifice exit 114.

[0049] The friction control composition is sufficiently viscous to be pumped to be pushed up to the top of the rail from exit orifice on the applicator bar. In some instance, the friction control composition may have a viscosity of at least 2,000 cP @ 25°C, measured on a Model 35 Fann viscometer having a R1B1 rotor and bob assembly rotating at 300 rpm. The problem with a friction modifier with a viscosity of at least 2,000 cP, is that it may require a larger tubular passage through the applicator bar and also a more powerful pump to push the more viscous friction modifier.

[0050] Because exit orifice 114 is intended in some embodiments to be at least 1/8th of an inch below railhead 108, it is important that the friction modifier be thixotropic so that it can be "pushed" up hill onto the top of railhead 10. This assures that a significant amount of the friction modifier ends up on the top surface of the rail and is subsequently carried down the track.

[0051] Referring now to FIGs. 6-8, an alternate em-

bodiment of the present invention is show. Bar 1102 is similar in configuration and structure to bar 102 except that it includes two exit orifices 1114a and 1114b, each exit orifice in fluid communication with a corresponding passageway 1110a and 1110b as shown in FIG 8. Each passageway 1110a and 1110b is in fluid communication with manifold passageway 1128 which is in turn in fluid communication with entry orifice 1113. As in the case of the embodiment shown in FIGs. 1-5, lubricant enters through entry orifice 1113 and passes through passageways 1128, 1110a, and 1110b exiting through corresponding exit orifices 1114a, and 1114b. In this manner, more than one exit orifice is provided in the event either passageway 1110a or 1110b or either exit orifice 1114a or 1114b becomes clogged, restricted or blocked. As in the case of the embodiment shown in FIGs. 1-5, each exit orifice 1114a and 1114b is located near the upper portion of bar 1102. Exit orifices 1114a/1114b are preferably about 4 inches to about 12 inches apart along the longitudinal length of bar 1102, more preferably about 5 inches to about 8 inches apart along the longitudinal length of bar 1102, and most preferably about 6 inches apart along the longitudinal length of bar 1102. Entry orifice 1113 is again located near the bottom of bar 1102. Also, as in the case of the embodiment shown in FIGS. 1-5, bar 1102 is held within a housing similar to that of housing 104 in the embodiment of Figs. 1-5.

[0052] Referring now to FIGs. 9, 9a, 10, and 11, yet another alternate embodiment of the present invention is show with three exit orifices 2114a, 2114b, and 2114c,. Bar 2102 is similar in configuration and structure to bar 102 and 1102 except that it includes three exit orifices 2114a, 2114b, and 2114c. Each exit orifice 2114a, 2114b, and 2114c is in fluid communication with a corresponding passageway 2110a, 2110b, or 2110c as shown in FIG. 11. Passageways 2110a, 2110b, or 2110c are each in fluid communication with manifold passageway 2128 which is in turn in fluid communication with entry orifice 2113. As in the case of the embodiments shown in FIGs. 1-5 and FIGs. 6-8, lubricant enters through entry orifice 2113 and passes through passageways 2128, 2110a, 2110b, and 2110c exiting through corresponding exit orifices 2114a, 2114b, and 2114c. In this manner, three exit orifices are provided in the event one or more passageways 2110a, 2110b, and 2110c or exit orifices 2114a, 2114b, and 2114c becomes clogged, restricted or blocked. As in the case of the embodiment shown in FIGs. 1-5 and FIGs. 6-8, each exit orifice 2114a, 2114b, and 2114c is located near the upper portion of bar 2102. Outer exit orifices 2114a and 2114c are preferably about 4 inches to about 12 inches apart along the longitudinal length of bar 2102, more preferably about 5 inches to about 8 inches apart along the longitudinal length of bar 2102, and most preferably about 6 inches apart along the longitudinal length of bar 1102. Center exit orifice 2114b is preferably located in the approximate center between outer exit orifices 2114a and 2114c as measured along the longitudinal length of bar 2102. Entry orifice 2113 is again located near the bottom of bar 2102. Also, as in the case of the embodiment shown in FIGs. 1-5 and FIGs. 6-8, bar 2102 is held within a housing similar to that of housing 104 in the embodiment of Figs. 1-5.

[0053] Based on the disclosure provides with respect to FIGs. 6-11 it will be apparent to one skilled in the art that bar 1102 or 2202 may include any number of multiple exit orifices and such is included within the scope of the present invention.

[0054] Referring now to FIGs. 8, 9a, and 11, the alternate embodiments shown therein include a prefabricated manifold 1500/2500 having entry orifices 1113/2113 and passageways 1128/2128 machined therein. In this manner, in the manufacture of bar 1102/2102 it may be molded around manifold 1500/2500 to ensure an integral and sound structure with clean open passageways 1128/2128. Also, prior to the molding of bar 1102/2102 plugs may be inserted within the mold to cast passageways 1110a/1110b and 2110a/2110b/2110c. Each such plug would extend from manifold 1500/2500 to the corresponding exit orifice of bar 1102/2201. After the molding is completed such plugs are pulled resulting in passageways 1110a/1110b and 2110a/2110b/2110c.

[0055] In one embodiment of the disclosure, the friction modifier comprises a thixotropic material that flows easily through an orifice in the applicator bar because of shear thinning. However, as a thixotropic material it then becomes more viscous when it is static on the top or the side of the rail. While the thixotropic friction modifier is being pumped through the pump, hoses and applicator bar, shear thinning lowers the viscosity and allows the friction modifier to flow more easily through the tubular passage and out of the applicator.

[0056] In at least one other embodiment, the top of rail applicator of the present disclosure is intended to be used only with friction modifying compositions that are thixotropic and thus able to be pushed upward onto the railhead even though the exit orifice is below the level of the railhead by an amount of at least 1/8th of an inch. The thixotropic nature of the friction modifier assures that when the composition leaves the exit orifice at the top surface of the applicator bar from a position below the top of the rail surface it will "climb" up (i.e. be pushed up) the railhead such that a significant amount of the friction modifier ends up on the top surface of the rail and is subsequently carried down the track.

[0057] This lower viscosity during pumping allows for a smaller pump and/or a smaller tubular passage. When the thixotropic friction modifier exits the applicator bar it immediately begins to thicken (i.e. become more viscous). This increased viscosity allows for three desirable effects. First the viscous "glob" of friction modifier is thick enough to be pushed up the side of the railhead and toward the center of the top of the railhead because of the backpressure from the pump. Second, the friction modifier in this more viscous state is less likely to run off the side of the rail onto the ground. Third, as the friction modifier material is "sheared" by the train wheel it be-

comes less viscous again and is more easily carried down the track to allow more distant spacing of applicators. Such materials enable a more consistent distribution of friction modifier down the rail of the track.

[0058] In at least one embodiment, the friction modifier composition has the following composition in weight percent (w/w%):

(a) from about 4 to about 40 w/w% water;
(b) from about 2 to about 20 w/w% rheology additive;
(c) from about 10 to about 40 w/w% water insoluble hydrocarbon;
(d) from about 10 to about 40 w/w% water soluble polyalcohol freezing point depressant;
(e) from about 1 to about 7 w/w % liquid or solid friction modifier; and
(f) from about 1 to about 40 w/w% liquid or solid lubricant.

[0059] Optionally, the composition may also contain one or more of:

(g) from 1 to 3 w/w% surfactant or wetting agent
(h) from 0.1 to 0.5 w/w% corrosion inhibitor, and/or
(i) from 0.05 to 0.2 w/w% biocide/fungicide agent.

[0060] The water insoluble hydrocarbon may be an isoparaffins, vegetable oil, bio-based triglyceride, a fatty oil or a mixture thereof.

[0061] In another embodiment, the friction control composition of the friction control composition comprises:

(a) from 15 to 29 w/w% water
(b) from 4 to 13 w/w% rheology additive
(c) from 11 to 28 w/w% water insoluble hydrocarbon (e.g. isoparaffins, vegetable oils, bio-based triglycerides or fatty oils).
(d) from 22 to 40 w/w% freezing point depressant
(e) from 9 to 24 w/w % liquid or solid friction modifier
(f) from 1 to 6 w/w% liquid or solid lubricant.

[0062] As noted above, the composition may also optionally contain one or more of:

(g) from 1 to 3 w/w% surfactant or wetting agent
(h) from 0.1 to 0.5 w/w% corrosion inhibitor, and/or
(i) from 0.05 to 0.2 w/w% biocide/fungicide agent

[0063] It has been found that adding a water insoluble hydrocarbon to the composition (e.g. an isoparaffin such as SOTROL 220) helps depress the freezing point and also helps stabilize or even improve the rheology of the formulation. This is especially true when the water insoluble hydrocarbon is compared with other freezing point depressants such as glycerin. Other water insoluble hydrocarbons that have environmental advantages over isoparaffins are vegetable oils, bio-based triglycerides and fatty oils such as canola oil. The oils do not have the same freezing point advantages as isoparaffins but they are environmentally friendly.

[0064] The addition of the water insoluble hydrocarbon (either isoparaffins or oils) in the partially water based friction control composition is counterintuitive because one would have guessed that it would not mix well with the water and would in all likelihood separate. However, we believe that the clay has receptor sites that allow the water insoluble hydrocarbon to bind onto the clay and keep the final product homogenous. The result is a composition that may contain lower amounts of water and in the case of isoparaffins lower amounts of soluble polyalcohol freezing point depressants such as glycerine. As pointed out above, water based friction control compositions have problem with maintenance and typical freezing point depressants can cause negative rheology effects on the composition.

[0065] An example of a thixotropic friction modifier material usable in the current is "TOR Armor" from Whitmores of Rock Wall, Texas. Thixotropic materials allow for pumps, hoses and applicators with optimum sizes. In at least one embodiment, the replaceable applicator bar is made of a polyurethane insert. This assures that the bar flexes if it is hit by a train wheel to help prevent damage. However, the bar is also tough enough to keep its rough profile even after such an impact.

[0066] Embodiments of the invention can be described with reference to the following numbered clauses, with preferred features laid out in the dependent clauses:

1. An applicator for delivering a friction control composition to a railhead, the applicator comprising:

(a) a housing;
(b) a bar positioned in the housing;
(c) A manifold member embedded within the bar and having a friction control composition entry orifice, and
(c) At least two friction control composition exit orifices on the upper portion surface of the bar along the longitudinal length of the bar, said exit orifices in fluid communication with said manifold member,

wherein the outer exit orifices located along the longitudinal length of the bar are between about 4 inches and about 12 inches apart.

2. The applicator of clause 1, wherein the outer exit orifices located along the longitudinal length of the bar are between about 5 inches and about 8 inches apart.

3. The applicator of clause 2, wherein the outer exit orifices located along the longitudinal length of the bar are about 6 inches apart.

4. The applicator of any preceding clause, wherein the upper portion surface of the bar slopes has a downward slope from the railhead.

5. The applicator of any preceding clause, wherein

the slope is from about 8 to about 10 degrees off the horizontal plane defined by the railhead.

6. The applicator of any preceding clause, wherein the bar is composed of a polyurethane.

7. The applicator of clause 6, wherein the polyurethane has a hardness of between 50 Shore A and 75 Shore A.

Claims

1. An applicator for delivering a friction control composition to a railhead, the applicator comprising:

   (a) a housing;
   (b) a bar positioned in the housing; and
   (c) at least two friction control composition exit orifices on the upper surface of the bar,

   wherein when the applicator is affixed to the railhead, the upper surface of the bar slopes has a downward slope from the railhead.

2. The applicator of claim 1, further comprising a friction control composition entry orifice located on the lower portion of the slope.

3. The applicator of claim 1, further comprising a passageway from the friction control composition entry orifice to the friction control composition exit orifice for transporting the friction control composition.

4. The applicator of claim 3, wherein the passageway is tubular and has a diameter between from about 0.5 to about 0.75 inches.

5. The applicator of a preceding claim further comprising a manifold member embedded within the bar and having a friction control composition entry orifice, said exit orifices in fluid communication with said manifold member, wherein the outer exit orifices located along the longitudinal length of the bar are between about 4 inches and about 12 inches apart.

6. The applicator of claim 5, wherein the outer exit orifices located along the longitudinal length of the bar are between about 5 inches and about 8 inches apart.

7. The applicator of claim 6, wherein the outer exit orifices located along the longitudinal length of the bar are about 6 inches apart.

8. The applicator of any preceding claim, wherein the slope is from about 5 to about 15 degrees off the horizontal plane defined by the railhead.

9. The applicator of claim 8, wherein the slope is from about 8 to about 10 degrees off the horizontal plane defined by the railhead.

10. The applicator of a preceding claim wherein the bar is an elastomeric bar.

11. The applicator of claim 10, wherein the elastomer of the elastomeric bar is a polyurethane.

12. The applicator of claim 11, wherein the polyurethane has a hardness of between 50 Shore A and 75 Shore A.

13. The applicator of any preceding claim, wherein the housing has a side wall, a front wall and a back wall and further comprising a sealant adjacent to the front wall.

14. The applicator of any preceding claim, further comprising a platform onto which the bottom of the housing rests.

15. An applicator assembly comprising the applicator of claim 14 and a clamp for coupling the platform onto the railhead.

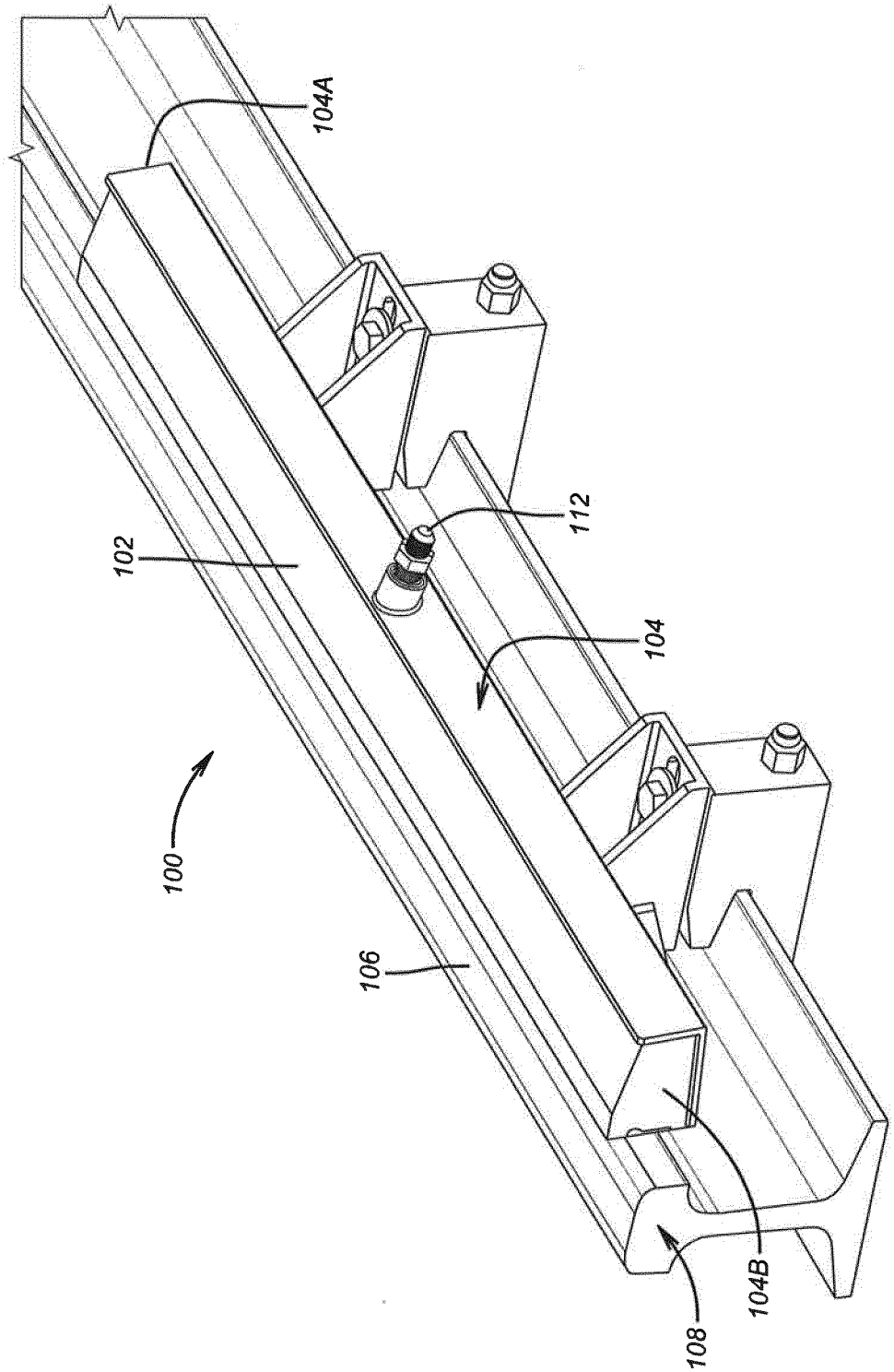
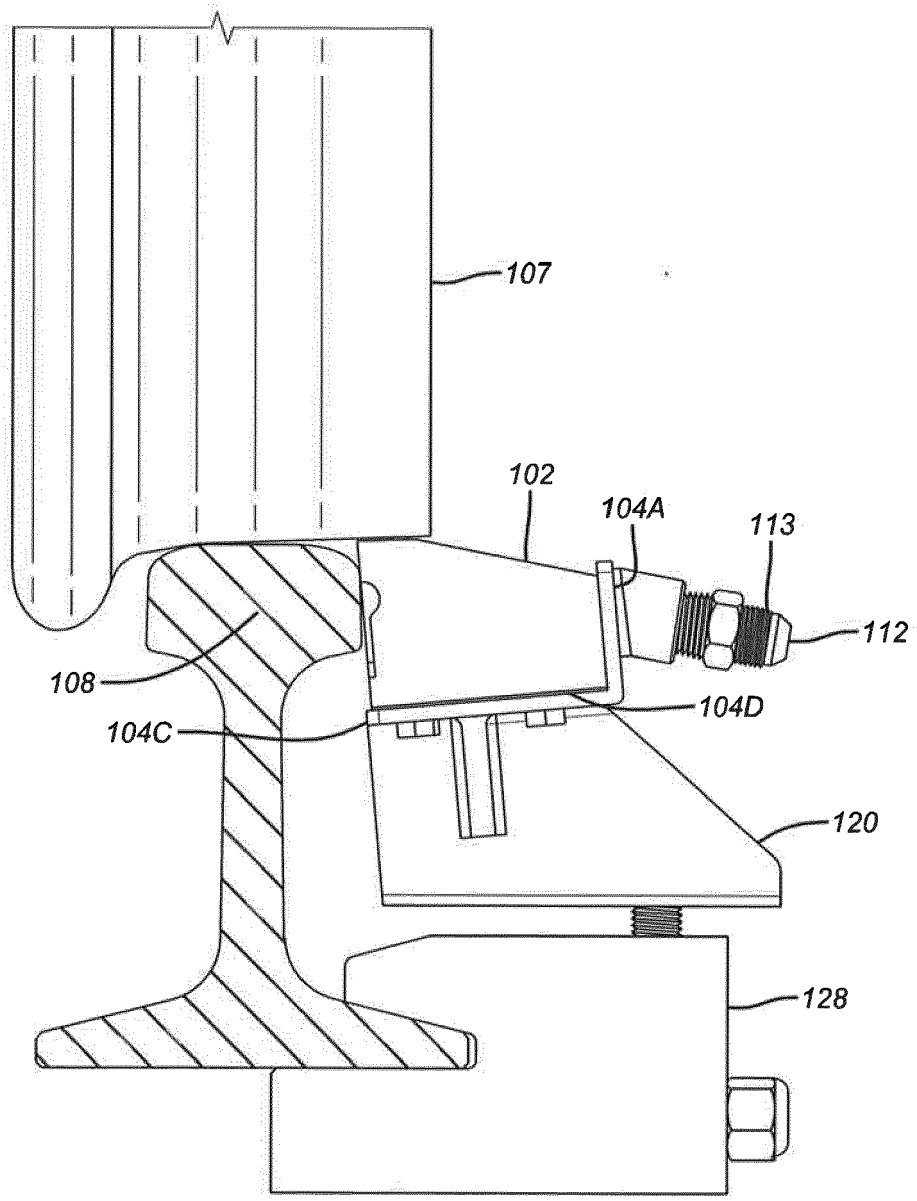


FIG. 1



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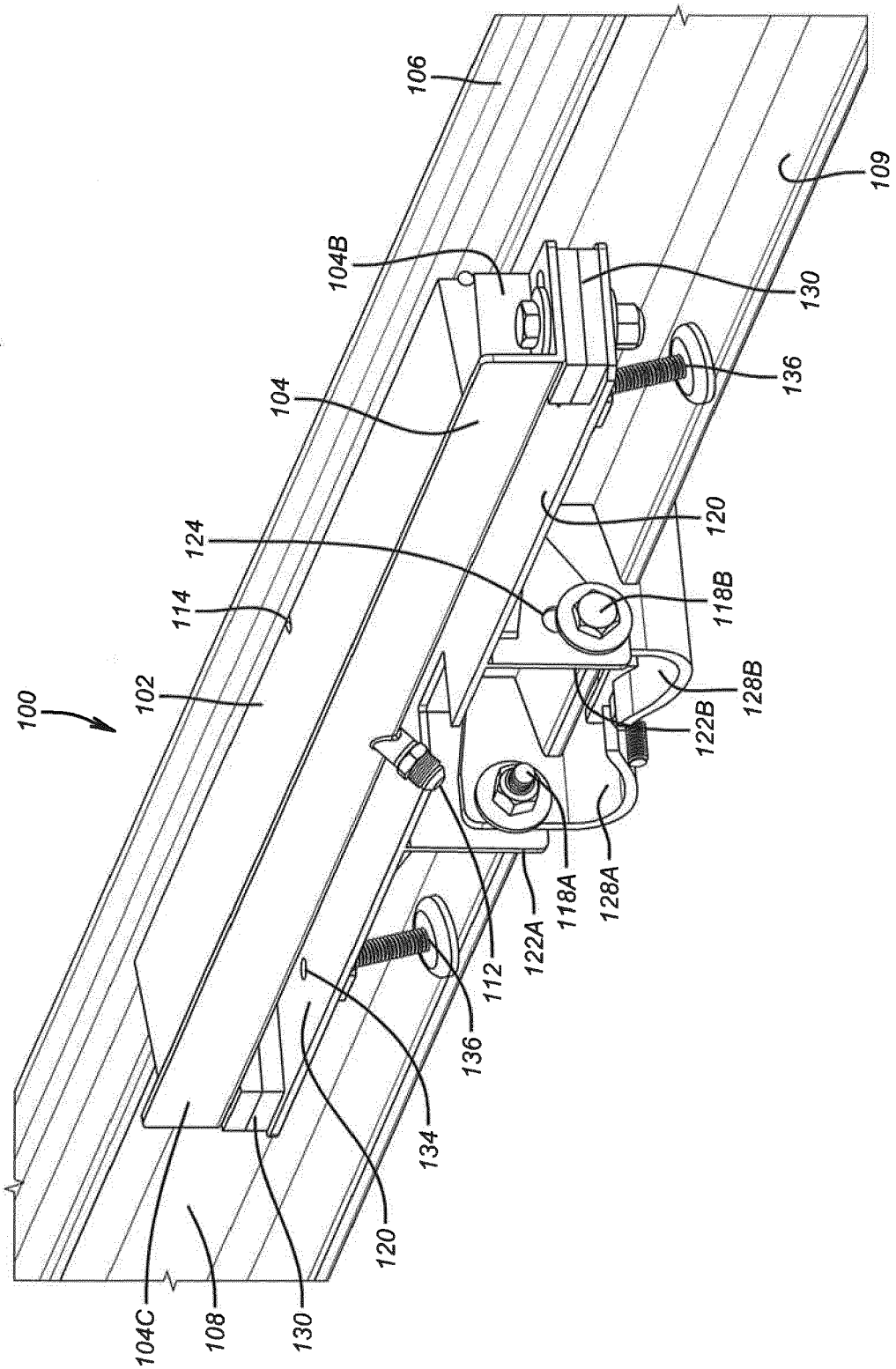
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FIG. 3

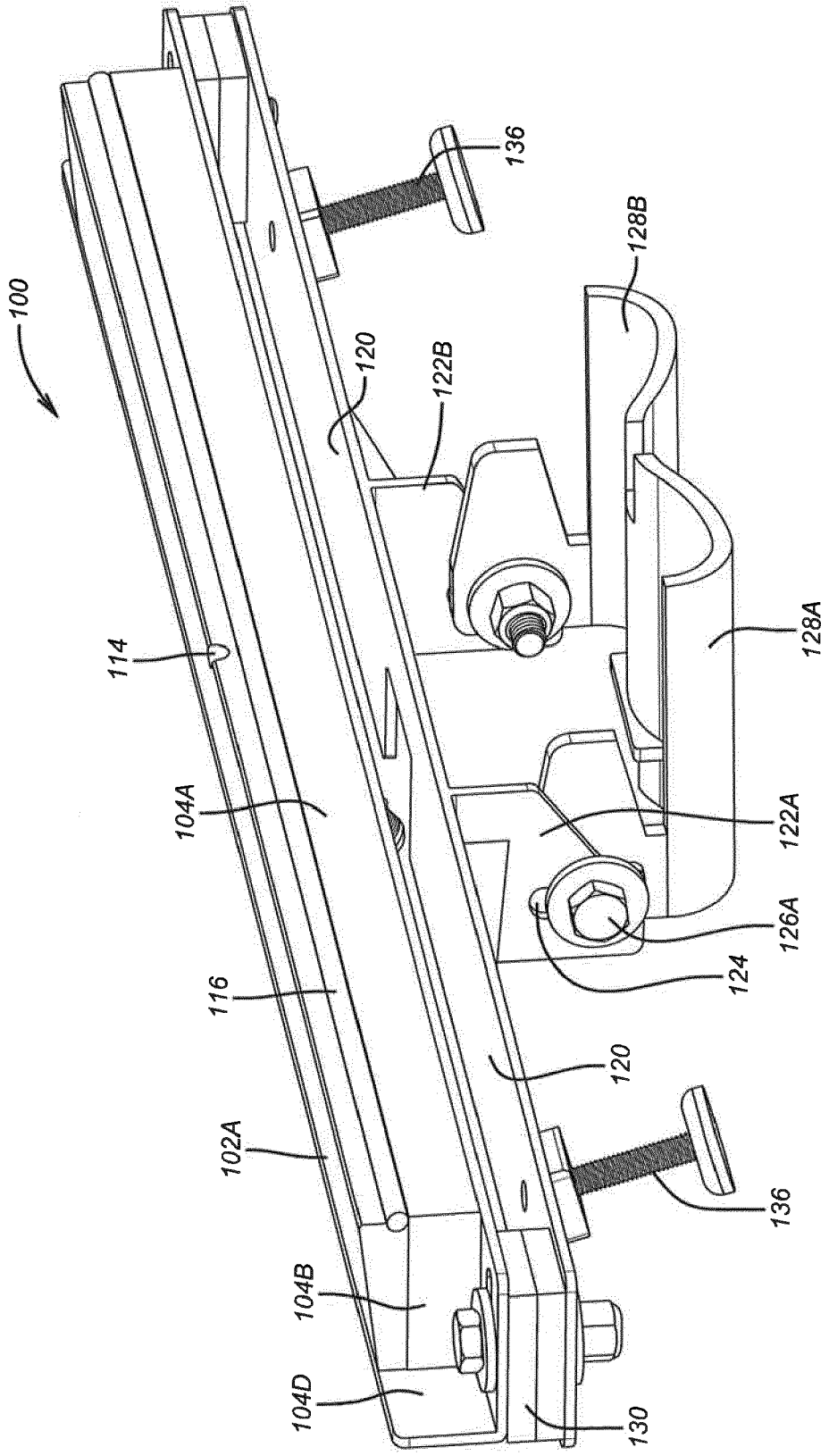
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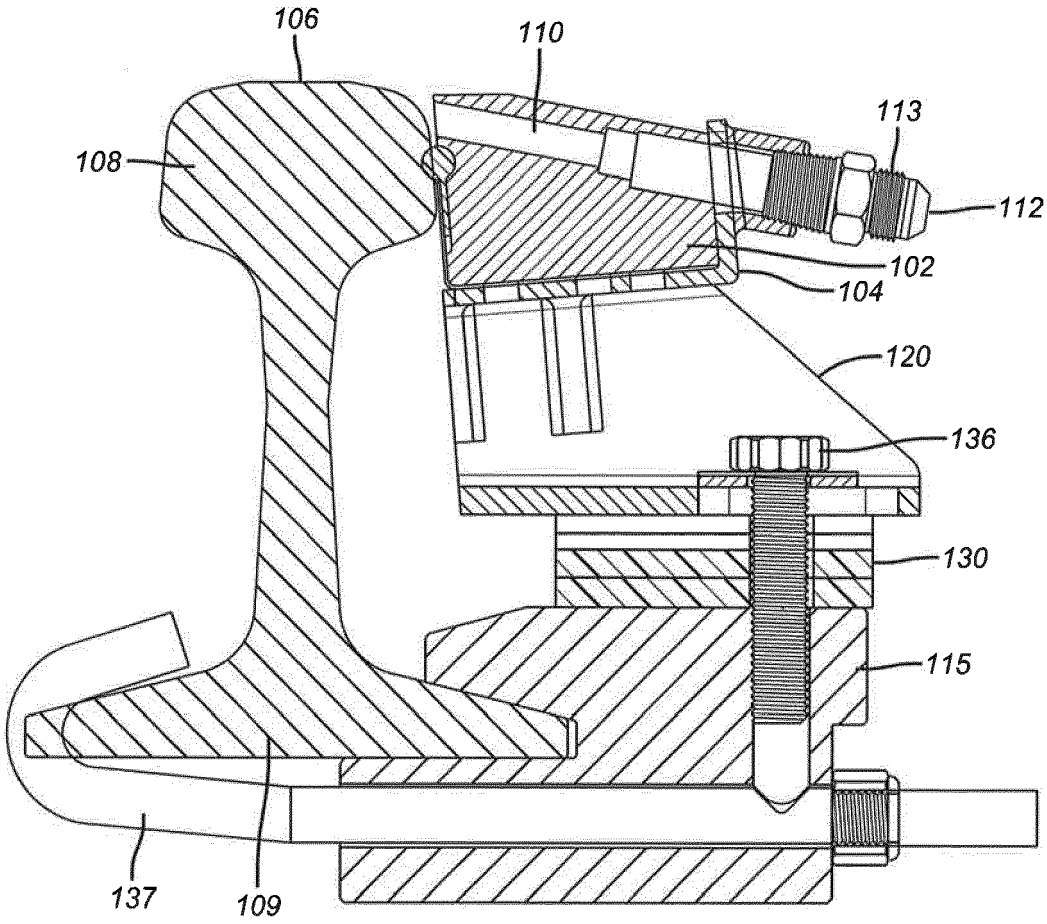
FIG. 4



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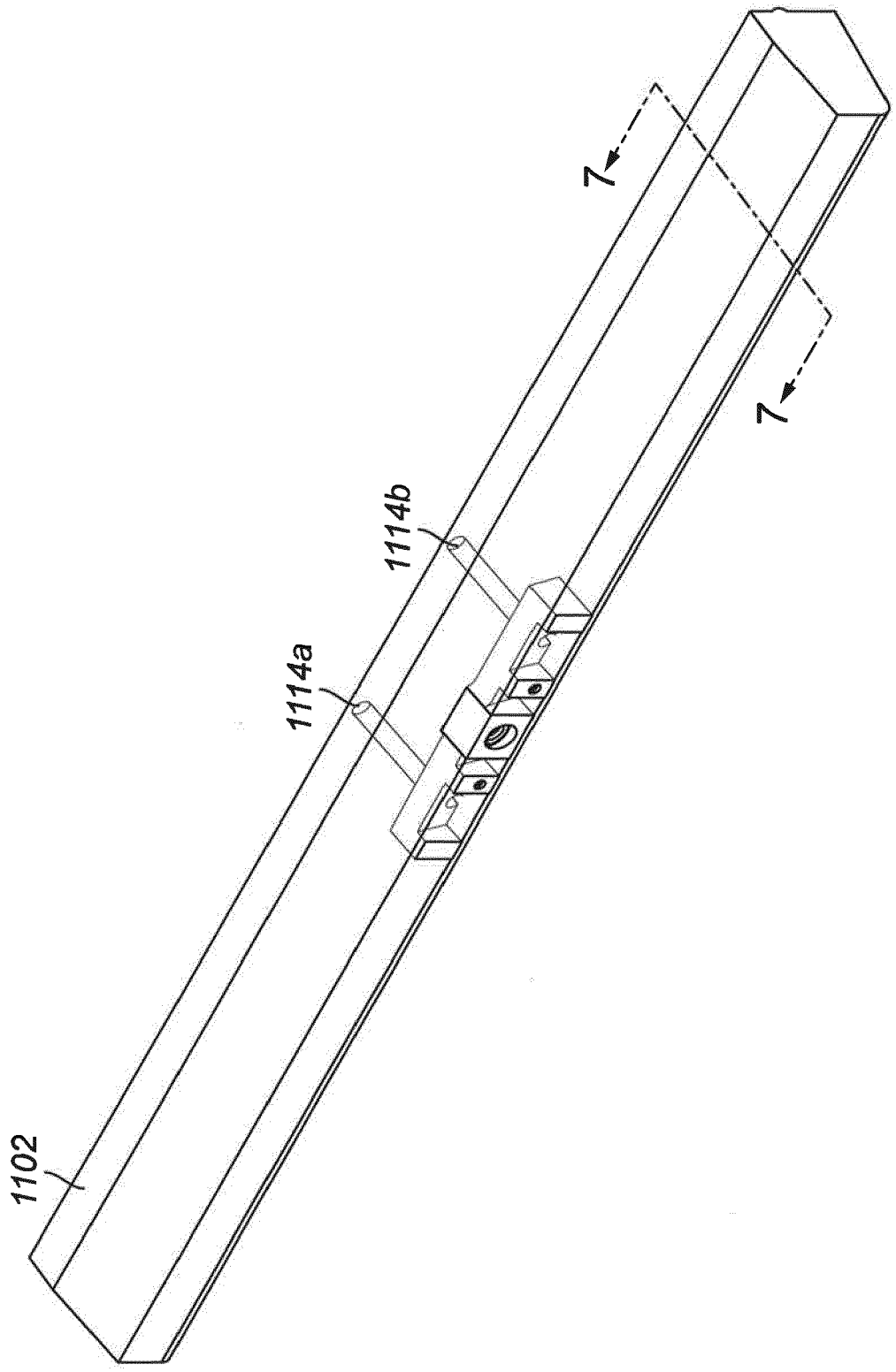

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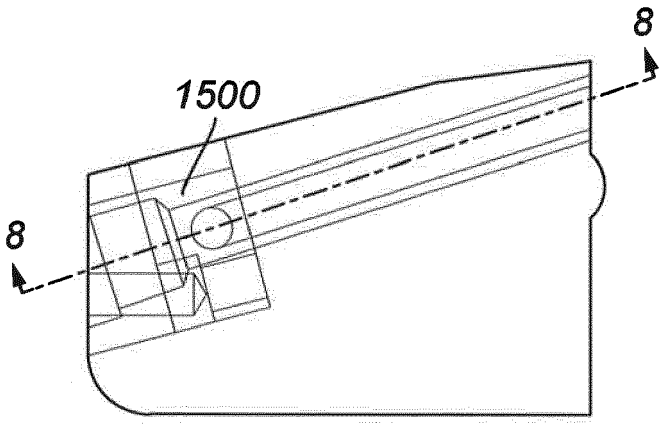

FIG. 7

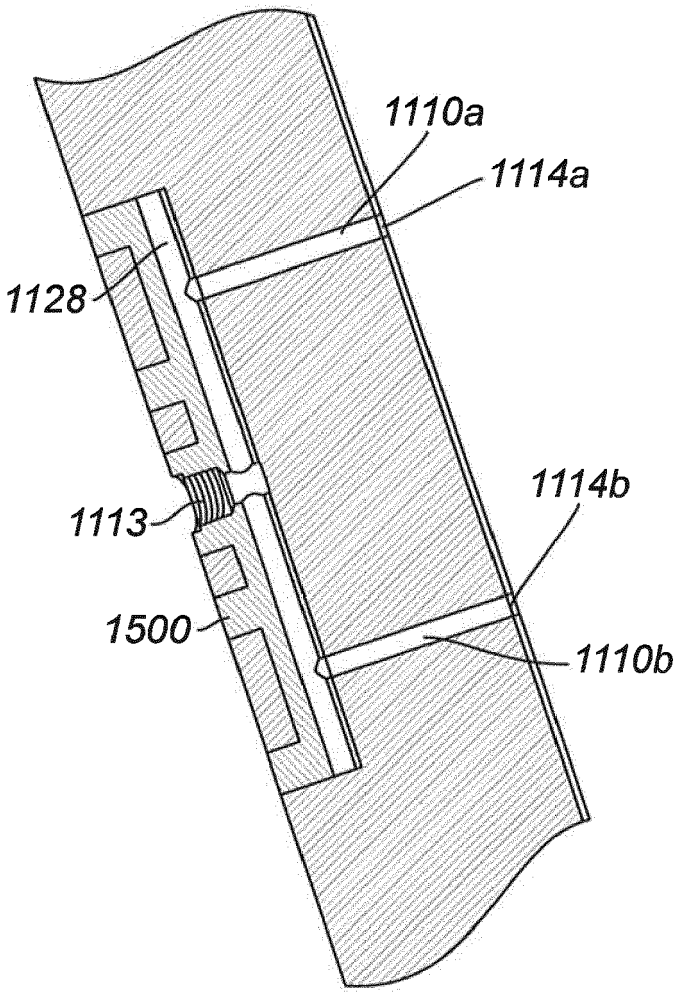

FIG. 8

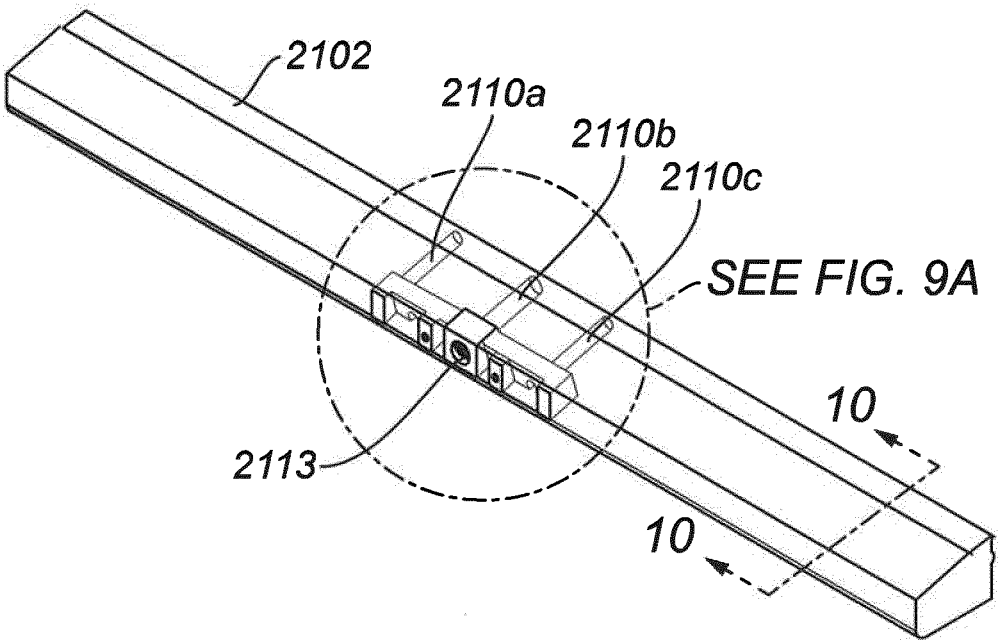
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FIG. 9

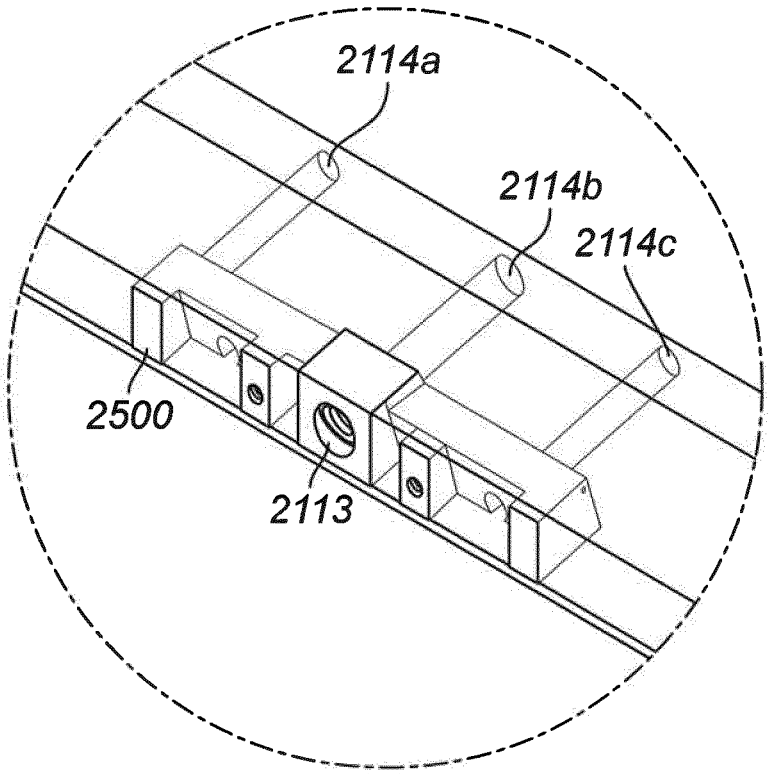
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FIG. 9A

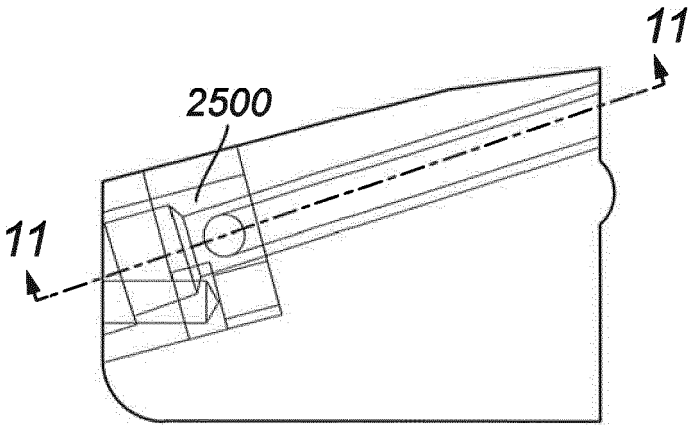

FIG. 10

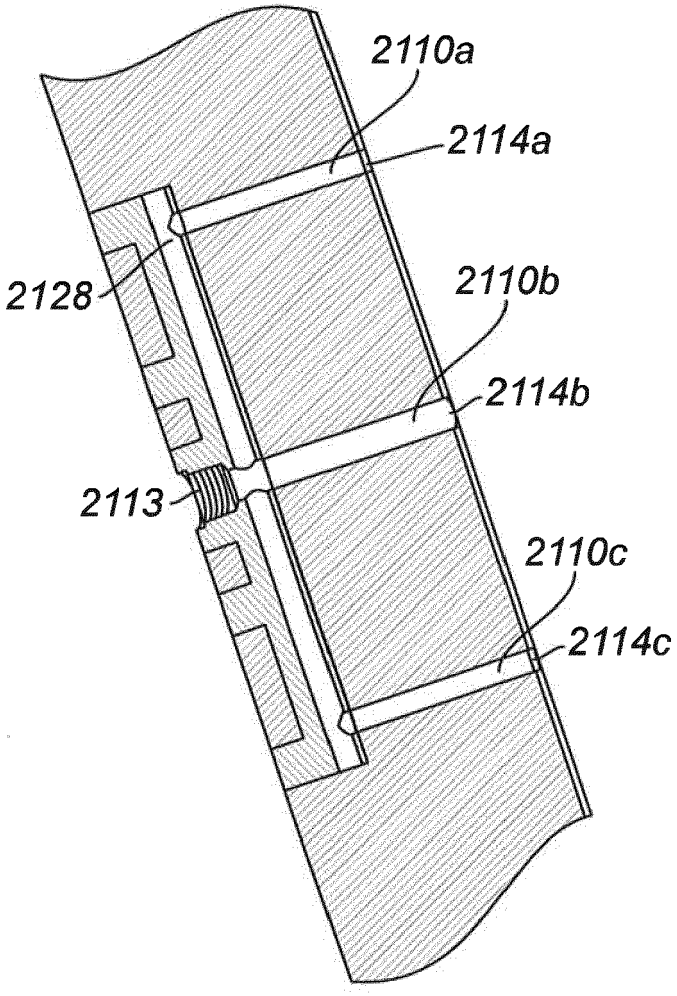

FIG. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 19 21 0449

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2016/094883 A1 (WHITMORE MFG COMPANY [US]) 16 June 2016 (2016-06-16) * figures 1-5 * * page 11, paragraph 00039 * * page 12, paragraph 00042 * * page 14, paragraph 00043 *	1-15	INV. B61K3/00 B61C15/10
A	WO 2010/138819 A2 (PORTEC RAIL PRODUCTS INC [US]; SINGLETON STEVEN D [US] ET AL.) 2 December 2010 (2010-12-02) * the whole document *	1-15	
A	WO 2014/029028 A1 (L B FOSTER RAIL TECHNOLOGIES INC [CA]) 27 February 2014 (2014-02-27) * the whole document *	1-15	
A	US 2009/000869 A1 (HOLLAND CHRISTOPHER D [US]) 1 January 2009 (2009-01-01) * the whole document *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B61C
B61K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 April 2020	Crama, Yves

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 21 0449

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-04-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016094883 A1	16-06-2016	CA 2970188 A1	16-06-2016
		CN 107743464 A	27-02-2018
		EP 3230149 A1	18-10-2017
		WO 2016094883 A1	16-06-2016
WO 2010138819 A2	02-12-2010	AU 2010253819 A1	08-12-2011
		BR PI1014926 A2	19-04-2016
		CA 2763205 A1	02-12-2010
		CN 102458956 A	16-05-2012
		EP 2435284 A2	04-04-2012
		US 2010300810 A1	02-12-2010
		US 2015158509 A1	11-06-2015
		WO 2010138819 A2	02-12-2010
WO 2014029028 A1	27-02-2014	AU 2013305452 A1	05-03-2015
		BR 112015003525 A2	04-07-2017
		CA 2881786 A1	27-02-2014
		GB 2519709 A	29-04-2015
		US 2014054113 A1	27-02-2014
		WO 2014029028 A1	27-02-2014
US 2009000869 A1	01-01-2009	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82