# Appendix C: Claim Chart for U.S. Patent 7,513,238

Based on information presently available, Longhorn Automotive Group LLC("Longhorn") contends that Nissan Motor Co., Ltd. ("Nissan") infringes at least claims 1-14 (the "Asserted Claims") of U.S. Patent 7,513,238 (the "238 Patent") through the Accused Products which are manufactured, sold, offered for sale, and/or used by Nissan.

For example, the Accused Products include, but are not limited to, all Nissan automotive in all configurations, which include, but are not limited to the following: Nissan Versa, Nissan Sentra, Nissan Altima, Nissan LEAF, Nissan Maxima, Nissan Z, Nissan GT-R, Nissan Rogue, Nissan Pathfinder, Nissan ARIYA, Nissan Kicks, Nissan Murano, Nissan Armada, Nissan Frontier, Nissan TITAN, Nissan TITAN XD, Nissan Juke, Nissan Tiida, Nissan X-Trail, Nissan Teana, Nissan Wingroad, Nissan Gran Livina, among other vehicles and other infringing technology sold, imported, or used by Nissan in the United States since 2018, and vehicles sold, imported, or used by Nissan in the United States since 2018 by Nissan customers ("Nissan Accused Product(s)" or "Accused Product(s)").

Nissan directly infringes each of the Asserted Claims by making, importing, using, selling, and/or offering to sell the Accused Products in violation of 35 U.S.C. § 271(a). Additionally, Nissan directly infringes the Asserted claims through its use, testing, troubleshooting, and demonstration of use of the Nissan Accused Products to its customers and end-users in the United States.

Nissan indirectly infringes the Asserted Claims in violation of 35 U.S.C. § 271(b) by inducing third parties, including Nissan customers and end-users, to directly infringe through their operation and use of the Accused Products. Nissan has knowingly and intentionally induced this direct infringement by, inter alia, (i) making, selling, importing, or otherwise providing the Accused Products to third parties with the intent that the Accused Products will operate and be used in a manner that practices the Asserted Claims; and (ii) marketing and advertising the Accused Products. Nissan's marketing and promotional materials for the Accused Products are found, for example, on Nissan's website. For example, Nissan's website offers customers downloadable User Manuals and customer support for the Accused Products that instruct customers to, among other things, set up and use the Accused Products. On information and belief, Nissan knows that its actions will result in infringement of the Asserted Claims, or subjectively believes that there is a high probability that its actions will result in infringement of the Asserted Claims but has taken deliberate actions to avoid learning these facts.

Nissan also contributorily infringed each of the Asserted Claims in violation of 35 U.S.C. § 271(c) by making, selling, importing, and offering for sale the Accused Products, which were used to directly infringe the Asserted Claims. The Accused Products constitute a material part of the Asserted Claims.

The contentions below list certain features of the Nissan Juke that Longhorn contends is representative of features of all accused Products. On information and belief, the Nissan Juke is representative of all Accused Products which include, but are not limited to, the Nissan Juke with Nissan directly injecting internal combustion engines, including the MR16DDT Engine.

Longhorn does not concede that any claims of the '238 Patent that are not listed below are not infringed by the identified Accused Products. Moreover, the citations to certain documents and other information below are intended to be exemplary only and in no way

foreclose Longhorn from citing or relying on additional documents, source code, information, and/or testimony at a later time. These contentions are preliminary in nature, and an analysis of the Accused Products, internal documentation, source code, and/or testimony from relevant witnesses may be necessary to more fully and accurately describe the infringing features of the Accused Products. Accordingly, Longhorn reserves the right to supplement, correct, modify, and/or amend these contentions once such additional information is made available to Longhorn. Furthermore, Longhorn reserves the right to supplement, correct, modify, and/or amend these contentions as discovery in this case progresses; in view of the Court's claim construction order(s); in view of any positions taken by Nissan including, but not limited to, positions on claim construction, invalidity, and/or non-infringement; and in connection with the preparation and exchange of expert reports.

The contents of every below claim cell on which another claim cell depends are expressly incorporated by reference in that dependent cell, as if set forth in their entirety therein.

To the extent these contentions include references to entities or persons outside the Accused Products, or to the extent Nissan contends that any element of the Accused Products is attributable to a third party, Longhorn contends that they are attributable to Nissan such that they constitute direct infringement by Nissan under 271(a). Further, Longhorn contends that Nissan is also liable under 271(b) for inducing the acts of third parties.

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| CLAIM | SUPPORT |
|---|---|
| **1[Pre].** A directly injecting internal combustion engine, comprising at least one cylinder which has a combustion space | The Nissan Accused Products infringe directly and/or indirectly by providing a system comprising: A directly injecting internal combustion engine, comprising at least one cylinder which has a combustion space.<br><br>This is a non-limiting preamble.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke is equipped with the MR16DDT Engine, which is an internal combustion engine. The internal combustion engine comprises at least one cylinder (e.g., the MR16DDT Engine comprises four cylinders). Moreover, a direct injecting system (e.g., Gasoline Direct Injection (GDI)) injects fuel directly into the combustion chamber. This fuel injection provides a more controlled and efficient combustion process within the combustion space (e.g., combustion chamber).<br><br>The MR6DDT is an engine with superb performance and an environmentally conscious design. It employs a turbocharger and utilizes various controls to combine engine performance equivalent to a 2.5L engine while being 1.6L class, and also excellent fuel efficiency.<br><br>Source: https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/ |

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| CLAIM | SUPPORT |
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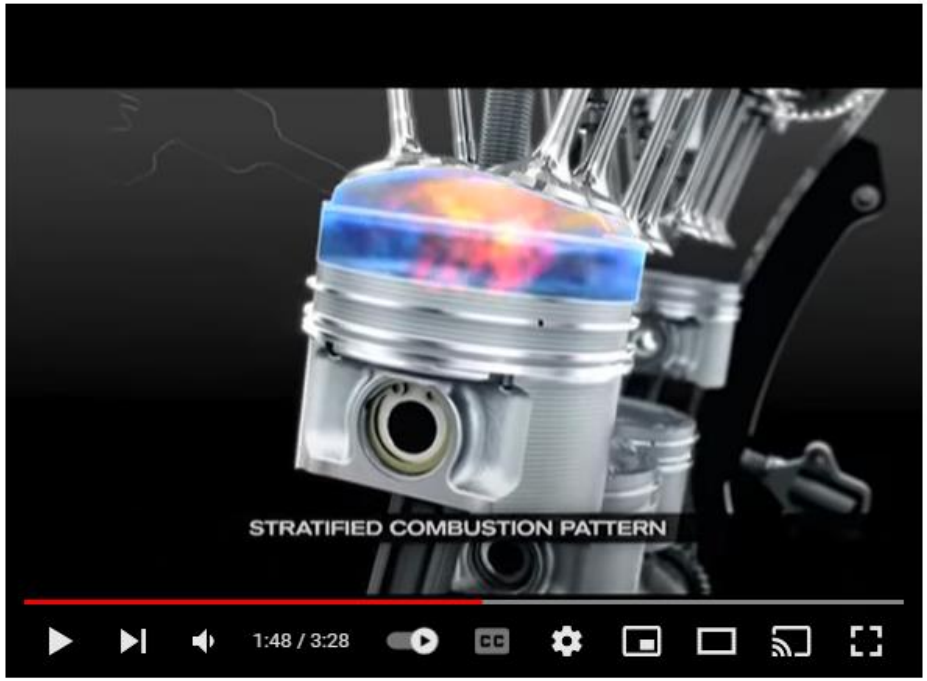
| |  <br>Source: https://www.youtube.com/watch?v=Rz9t1u5F6Uo |

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| CLAIM | SUPPORT |
|---|---|
| | The MR16DDT is a direct injection engine that injects fuel directly into the cylinders. Injecting the liquid gasoline into the cylinder generates vaporized heat and the internal temperature of the cylinder goes down. This makes it more difficult for knocking to arise, thus improving combustion efficiency and realizing improved fuel efficiency. Direct injection engines also have the advantage that they are able to reduce fuel consumption by precisely controlling the amount of fuel burned. Through the direct injection engine's fine control of fuel, immediately after initiating the engine can form a dense air-fuel mixture around the spark plug and have it combust in a stratified charge. Doing this increases the exhaust temperature and the catalyst activates quickly, making the catalyst work quickly. After warming up, it forms a highly homogenous air-fuel mixture, raising fuel combustion efficiency.<br><br>Source: https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/<br><br>  <br><br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28<br>https://www.youtube.com/watch?v=L7uLUs8jO28&t=1354s |

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| CLAIM | SUPPORT |
|---|---|
| **1[a].** in which a piston executes an oscillating movement, and an injection nozzle for injection of fuel into the combustion space, | Each Nissan Accused Product comprises a directly injecting internal combustion engine in which a piston executes an oscillating movement, and an injection nozzle for injection of fuel into the combustion space.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, Nissan Juke is equipped with the MR16DDT Engine. The Nissan MR16DDT Engine employs an internal combustion engine design, where the piston's oscillating movement generates power from the combustion process. The inclusion of an injection nozzle indicates a fuel injection system that injects the fuel into the combustion space.<br><br>  <br>Source: https://www.youtube.com/watch?v=Rz9t1u5F6Uo |

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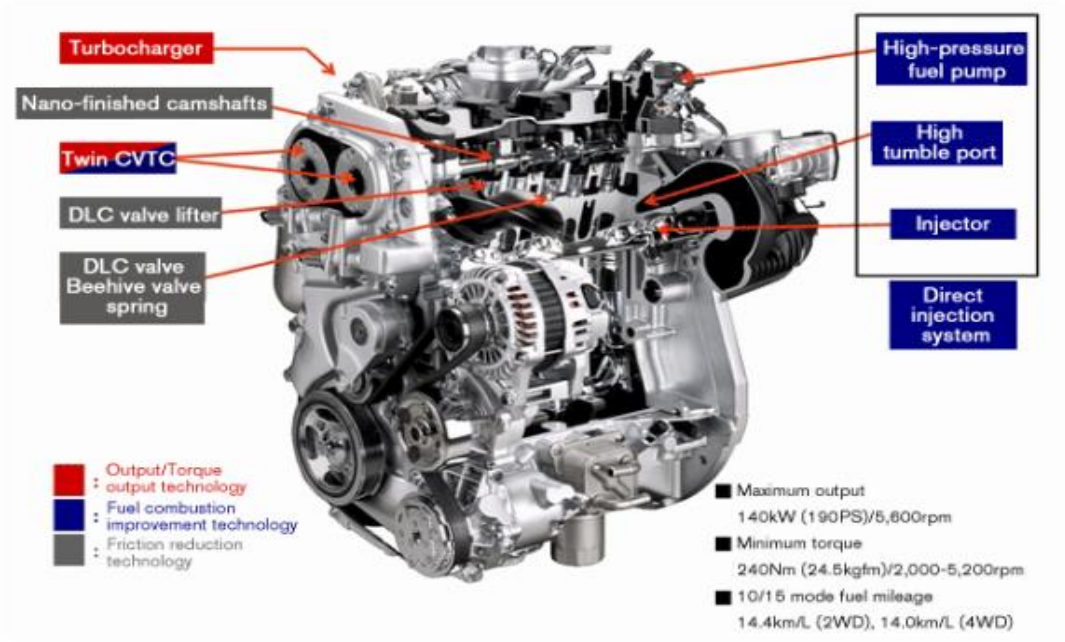
| CLAIM | SUPPORT |
|---|---|
| |  <br>  <br>Source: https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/ |

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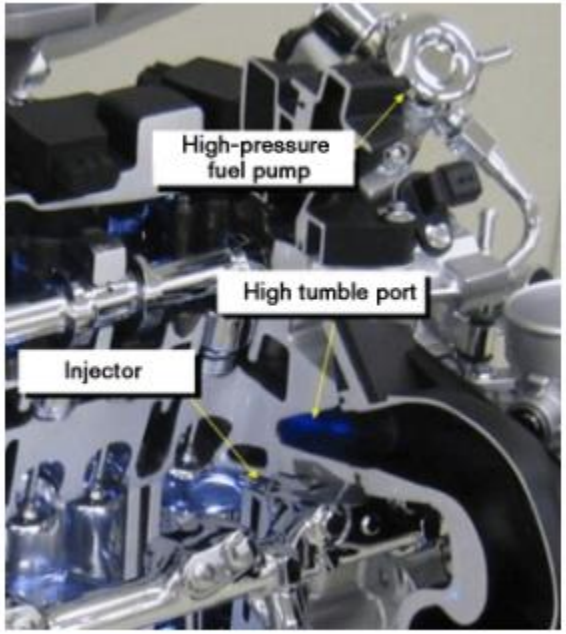
| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/<br><br>**Primary and Secondary Fuel Injection.** Two levels of fuel injection give you the perfect one-two punch. By spraying fuel directly into the combustion chamber twice before ignition, the combustion pattern is optimized. Meaning greater efficiency, torque and power. Now, that's a knockout.<br><br>Source: https://pictures.dealer.com/bramptonnorthnissantc/fffc3db70a0d02b700f007ad2e59944f.pdf |

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| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.youtube.com/watch?v=Rz9t1u5F6Uo |
| **1[b].** wherein the piston has a piston recess, which, in a central region thereof, has an elevation extending in a cylinder head direction, and a surface of the piston recess adjoining the elevation in a recess edge direction is connected to the elevation via a radius | Each Nissan Accused Product comprises a piston executing an oscillating movement wherein the piston has a piston recess, which, in a central region thereof, has an elevation extending in a cylinder head direction, and a surface of the piston recess adjoining the elevation in a recess edge direction is connected to the elevation via a radius.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, a slight depression, or a cavity on its surface. This recess is crucial for the fuel injection process. Inside the piston recess, there's a raised portion or elevation in the central region. This elevation extends toward the cylinder head (e.g., the top part of the cylinder). |

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| CLAIM | SUPPORT |
|---|---|
| | The surface of the piston recess around the raised elevation is smoothly connected to the elevation itself. This connection is made using a curved shape called a radius. This design allows for the proper distribution of the injected fuel.<br><br>  <br><br><br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **1[c].** so that an injection jet impinging the surface and injected as early as possible is distributed both in a elevation direction and in | Each Nissan Accused Product comprises an engine in which the injection jet impinging the surface and injected as early as possible is distributed both in an elevation direction and in the recess edge direction, and the surface is substantially planar and has an ascending gradient in the recess edge direction such that an injection jet injected as late as possible impinges onto the surface, the last-mentioned injection jet being distributed both in the elevation direction and in the recess edge direction. |

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| CLAIM | SUPPORT |
|---|---|
| the recess edge direction, and the surface is substantially planar and has an ascending gradient in the recess edge direction such that an injection jet injected as late as possible impinges onto the surface, the last-mentioned injection jet being distributed both in the elevation direction and in the recess edge direction. | This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke is equipped with the MR16DDT Engine. The MR16DDT engine utilizes Gasoline Direct Injection (GDI), where fuel is injected directly into the combustion chamber before the piston reaches the top of its compression stroke as early as possible. Direct injection involves injecting fuel into the combustion chamber during the compression stroke, just before the spark ignition, which contributes to efficient combustion.<br><br>For example, as shown below, in the Nissan's MR16DDT Engine, when an injection jet injects as early as possible or as late as possible, the fuel is distributed both in the elevation direction and in the recess edge direction.<br>  |

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| CLAIM | SUPPORT |
|---|---|
| | Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **2.** The directly injecting internal combustion engine as claimed in claim 1, wherein a surface connected to the recess edge adjoins the surface of the piston recess. | Each Nissan Accused Product comprises a surface connected to the recess edge adjoins the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, as shown below, the Nissan Juke inlcudes the MR16DDT Engine which comprises of cylinders, and the piston inside the cylinder has a recess [10], adjoined by the surface [13] connected to the recess edge [12].<br><br>  |

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| CLAIM | SUPPORT |
|---|---|
| | Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **3.** The directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess. | Each Nissan Accused Product comprises the directly injected internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke includes the MR16DDT Engine, and the surface connected to the recess edge is connected via a radius to the surface of the piston recess. |

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| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **4.** The directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge merges in a radius into an upper surface of the piston. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge merges in a radius into an upper surface of the piston.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke incudes the MR16DDT Engine wherein the surface connected to the recess edge merges in a radius into an upper surface of the piston. |

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| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **5.** The directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge forms an acute angle with an upper surface of the piston. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge forms an acute angle with an upper surface of the piston.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke includes the MR16DDT Engine, wherein the surface connected to the recess edge forms an acute angle with an upper surface of the piston. |

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| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **6.** The directly injecting internal combustion engine as claimed in claim 5, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 5, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [3].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. |

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| CLAIM | SUPPORT |
|---|---|
| | The surface of the piston recess around the raised elevation is smoothly connected to the elevation itself. This connection is made using a curved shape called a radius. |
| **7.** The directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge forms an obtuse angle with an upper surface of the piston. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 2, wherein the surface connected to the recess edge forms and obtuse angle with an upper surface of the piston.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [5].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine, wherein the surface connected to the recess edge forms and obtuse angle with an upper surface of the piston. |

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| CLAIM | SUPPORT |
|---|---|
| |  <br>Source: https://www.youtube.com/watch?v=L7uLUs8jO28 |
| **8.** The directly injecting internal combustion engine as claimed in claim 7, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 7, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [3].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. |

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| CLAIM | SUPPORT |
|---|---|
| | The surface of the piston recess around the raised elevation is smoothly connected to the elevation itself. This connection is made using a curved shape called a radius. |
| **9.** The directly injecting internal combustion engine as claimed in claim 1, wherein an injection angle of the injection nozzle is between 50° and 120°. | The Accused Nissan Products comprises the directly injecting internal combustion engine as claimed in claim 1, wherein an injection angle of the injection nozzle is between 50° and 120°.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>For example, the Nissan Juke includes the MR16DDT Engine, wherein an injection angle of the injection nozzle is between 50° and 120°.<br><br>  <br><br>Source: https://www.youtube.com/watch?v=Rz9t1u5F6Uo |

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| CLAIM | SUPPORT |
|---|---|
| **10.** The directly injecting internal combustion engine as claimed in claim 9, wherein a surface connected to the recess edge adjoins the surface of the piston recess. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 9, wherein a surface connected to the recess edge adjoins the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [2].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which comprises of cylinders, and the piston inside the cylinder has a recess, adjoined by the surface connected to the recess edge. |
| **11.** The directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge is connected via a radius to the surface of the piston recess.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [3].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. The surface of the piston recess around the raised elevation is smoothly connected to the elevation itself. This connection is made using a curved shape called a radius. |
| **12.** The directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge forms an acute angle with an upper surface of the piston. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge forms an acute angle with an upper surface of the piston.<br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [5].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. |

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| CLAIM | SUPPORT |
|---|---|
| | The surface of the piston recess around the recess edge forms an acute angle with the upper surface of the piston. |
| **13.** The directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge forms an obtuse angle with an upper surface of the piston. | Each Nissan Accused Product the directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge forms an obtuse angle with an upper surface of the piston.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [7].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. The surface of the piston recess around the recess edge forms an obtuse angle with the upper surface of the piston. |
| **14.** The directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge merges in a radius into an upper surface of the piston. | Each Nissan Accused Product comprises the directly injecting internal combustion engine as claimed in claim 10, wherein the surface connected to the recess edge merges in a radius into an upper surface of the piston.<br><br>This element is infringed literally, or in the alternative, under the doctrine of equivalents.<br><br>*See supporting evidence for claim [4].*<br><br>For example, the Nissan Juke includes the MR16DDT Engine which is comprised of several cylinders, and the piston inside each cylinder has a recess, adjoined by the surface connected to the recess edge. The surface of the piston recess around the raised elevation is smoothly connected to the elevation itself. This connection is made using a curved shape called a radius. |