



PDHonline Course G369 (4 PDH)

How to Legally Design Around a Competitor's Product

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2020

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Patent law has been designed to encourage innovation by providing legal rights to the inventor that prevent others from capitalizing on the inventor's ideas. Competitors are therefore given the incentive to change or improve products to give them a competitive edge. It is this distinction – knowing how a product is protected and where the product can be designed around – that makes patent law so important to understand. It is the purpose of this course to lay the foundation of how to analyze patent protection of a technology and how to legally design around a competitor's product.

“Designing around” a protected technology involves developing an alternative structure or process that has at least one or more differentiating features. It is perfectly legal, and a viable way to competitively compete in the marketplace. Some believe it is morally reprehensible, but it really is not a malfeasance at all. Let's look at it from a different perspective. You run out of an essential ingredient when you are cooking. You substitute something else that serves the same function and possibly improves the recipe altogether. Designing around is simply substituting one component or step for another. This is often done to circumvent patent rights so a costly license is unnecessary. Competitively, development of an alternative product has improved qualities over a competitor's product.

Scope of Patent Protection

In order to understand how to design around a patented product, it is imperative to understand what a patent is (and is not) and how to read a patent reference (such as a patent application or an issued patent). While this course is not geared towards the preparation and filing of a patent application, by introducing several basic concepts, the reader will be able to start deciphering the breadth of protected prior art without extensive requisite legal knowledge.

Myth: A patent gives the patent owner the right to make a product.

Fact: Patenting an invention allows the inventor to prevent others from making, using or selling his invention throughout the United States without the inventor's consent. This is distinguishable from the right of the inventor to make or use an invention. Conceivably, an inventor may obtain a valid patent and still not be free to manufacture and sell his invention without infringing on the rights of another valid patent or violating a law/regulation (FDA approval for example) or court injunction.

A patent is a right to exclude, but not necessarily a right to affirmatively do something. Many inventors are surprised to learn that it is possible to be awarded a patent and still be unable to commercialize the invention. While it is rare, a competitor's patent may preclude you from practicing your invention (i.e., no "right to use"). A competitor may hold a dominant claim that is so broad that there may be no practical way to practice your invention without infringing the

competitor's claims. At the same time, your patent may be used to prevent your competitor from practicing your improvement (i.e., "right to exclude"). So, what happens? Well, you may need to come together to exploit the inventions with cross-licensing opportunities for both parties. One party may license its rights to the other. Or, both parties may license to one another, allowing each to use the other's technology.

Exploiting Patent Rights

Most commonly, inventors benefit from patent rights by selling the patent rights, licensing the patent rights (exclusively or non-exclusively) or acting as the exclusive manufacturer of the product.

Patents are valuable business assets that may be used as collateral for financing or may be pledged as collateral to secure a debt. In some cases, patents act as a deterrent to potential competitors and as a marketing edge to provide customers and investors with a sense of "cutting edge" technology or limited monopoly on a market segment. Patents can also be used to block a competitor from introducing a new product, service or improvement.


Let's review important parts of a patent and how they reveal the chronology and other priority information.

Anatomy of a Patent Reference

First, let's look at some patent references. Patent references generally come in two forms: a published patent application and an issued patent. A patent application is a pending "request" for a patent. It is important to understand that it may never be issued, and that even if it is, the claims are likely to be issued quite

differently than what appears in the published application. An issued patent is a federal grant of rights for a specified period (usually 14-20 years).

The following snapshot is the face of a published patent application. You can glean important pieces of information from the front page.



US 20100108336A1

(19) **United States**
 (12) **Patent Application Publication**
 Thomson et al.

(10) **Pub. No.:** US 2010/0108336 A1
 (45) **Pub. Date:** May 6, 2010

(54) **RIDE CONTROL FOR MOTOR GRADERS**

(75) **Inventors:** Norval P. Thomson, Dunlap, IL (US); Steven A. Daniel, East Peoria, IL (US)

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(73) **Assignee:** Caterpillar Inc., Peoria, IL (US)

(21) **Appl. No.:** 12/262,310

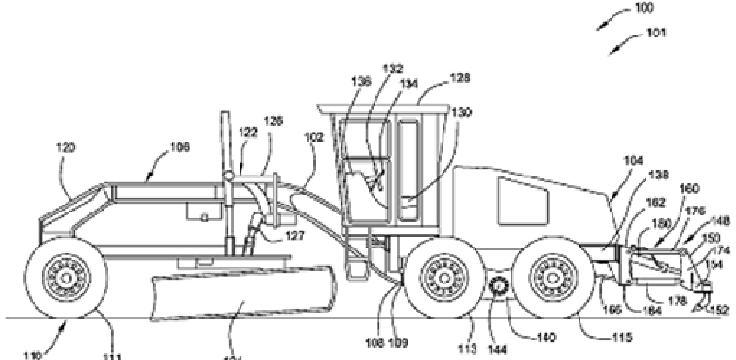
(22) **Filed:** Oct. 31, 2008

Publication Classification

(51) **Int. Cl.**
E02F 3/85 (2006.01)
E02F 9/22 (2006.01)
E02F 3/96 (2006.01)

(52) **U.S. Cl.** 172/795; 60/413; 60/327

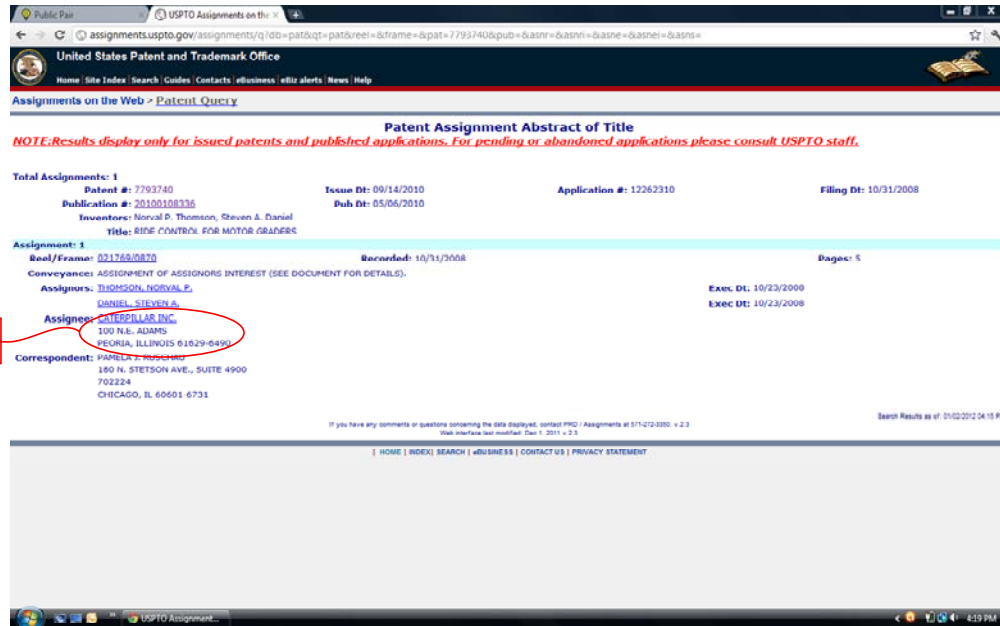
(57) **ABSTRACT**
 A ride control arrangement for a machine having a frame, a ripper, a hydraulic actuator operative to move the ripper includes at least one accumulator assembly, and a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly. A ride control arrangement for a motor grader with an implement operated by a hydraulic actuator similarly includes at least one accumulator assembly selectively fluidly connected to the hydraulic actuator by way of a valve mechanism.



In this example, publication occurs after the expiration of an 18-month period following the earliest effective filing date or priority date claimed by a non-provisional patent application. The earliest filing date is October 31, 2008. Notice that approximately 18 months has elapsed before the application is published on May 6, 2010 with a publication number of US 2010/0108336.

The owner or assignee of this patent is Caterpillar, Inc. The inventors are Thomson and others (“et al” means “and others”). The title of the invention is

“Ride Control for Motor Graders.” The assignee listed was the owner of the patent at the time of issuance or publication. This can change over time, so it is necessary to check the patent office assignment record to determine current ownership at USPTO's Assignments on the Web (AOTW) as follows:




A key piece of information is the filing date. At the time this course is published, the U.S. patent system has been using the “first to invent” system for over the past two centuries. Therefore, although the earliest filing date shown is October 31, 2008, any party having conceived the same invention but prior to and within a year of this date may be considered the senior party or as having priority over this invention. On September 16, 2011, President Obama signed a bill termed the “America Invents Act (AIA)” which later became law. One key change of this bill from the present patent system has been in the determination of priority. Starting March 16, 2013 (or 18 months from September 16, 2011), priority will be determined based on “first inventor to file” system. In other words, the party having filed an application first will be the senior party.

Why is the filing date of a patent application a concern? It is used to determine the senior party in enforcement should a patent application be allowed and

ultimately issues as a patent. A patent application puts the public on notice of the claimed invention. Although infringement cannot occur until a patent is actually issued, it is best to avoid practicing a substantially similar invention as claimed in a competitor's patent application.

The following snapshot is the face of the issued patent (patent number 7,793,740) based on the previously referenced application, i.e., application number 12/262,310. The patent was issued on September 14, 2010.


US007793740B2

(12) **United States Patent**
Thomson et al.

(10) **Patent No.:** **US 7,793,740 B2**
(45) **Date of Patent:** **Sep. 14, 2010**

(54) **RIDE CONTROL FOR MOTOR GRADERS** 5,733,095 A 3/1998 Palmer et al.
5,890,870 A 4/1999 Berger et al.
(75) **Inventors:** Norval P. Thomson, Dunlap, IL (US); 5,897,287 A 4/1999 Berger et al.
Steven A. Daniel, East Peoria, IL (US) 6,260,355 B1 7/2001 Rausch et al.
6,357,230 B1 3/2002 A'Hearn et al.
(73) **Assignee:** Caterpillar Inc., Peoria, IL (US) 6,634,653 B2 10/2003 Chatterjee
6,938,413 B2 9/2005 Harnischfeger
(*) **Notice:** Subject to any disclaimer, the term of this 7,165,395 B2 1/2007 Anderson et al.
patent is extended or adjusted under 35 7,194,856 B2 3/2007 Ma et al.
U.S.C. 154(b) by 60 days. 7,209,185 B2 * 4/2007 Ma et al. 91:446
7,415,822 B1 * 8/2008 Harber et al. 60:452
7,614,335 B2 * 11/2009 Girder 91:444
7,614,336 B2 * 11/2009 VerKulien et al. 91:446

(21) **Appl. No.:** 12/262,310
(22) **Filed:** Oct. 31, 2008 * cited by examiner

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Primary Examiner—Robert E Pezzuto
(74) *Attorney, Agent, or Firm*—Leydig, Voit & Mayer

(51) **Int. Cl.**
E02F 3/76 (2006.01)
F15B 13/08 (2006.01)

(52) **U.S. Cl.** 172/795; 91/446

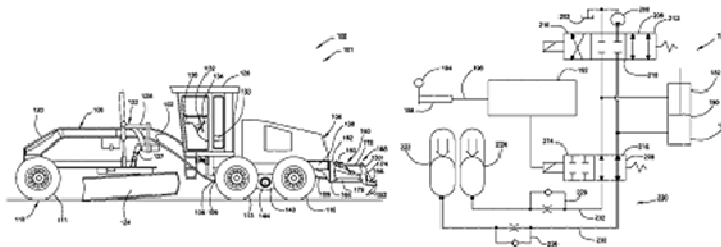
(58) **Field of Classification Search** 172/2-11,
172/795-799.5; 91/444, 448, 446, 454; 60/452,
60/413, 420, 468; 180/333
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
4,186,814 A 2/1989 Hart
5,116,188 A 5/1992 Kurohushi et al.
5,520,499 A 5/1996 Iffert et al.

(57) **ABSTRACT**
A ride control arrangement for a machine having a frame, a ripper, a hydraulic actuator operative to move the ripper includes at least one accumulator assembly, and a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly. A ride control arrangement for a motor grader with an implement operated by a hydraulic actuator similarly includes at least one accumulator assembly selectively fluidly connected to the hydraulic actuator by way of a valve mechanism.

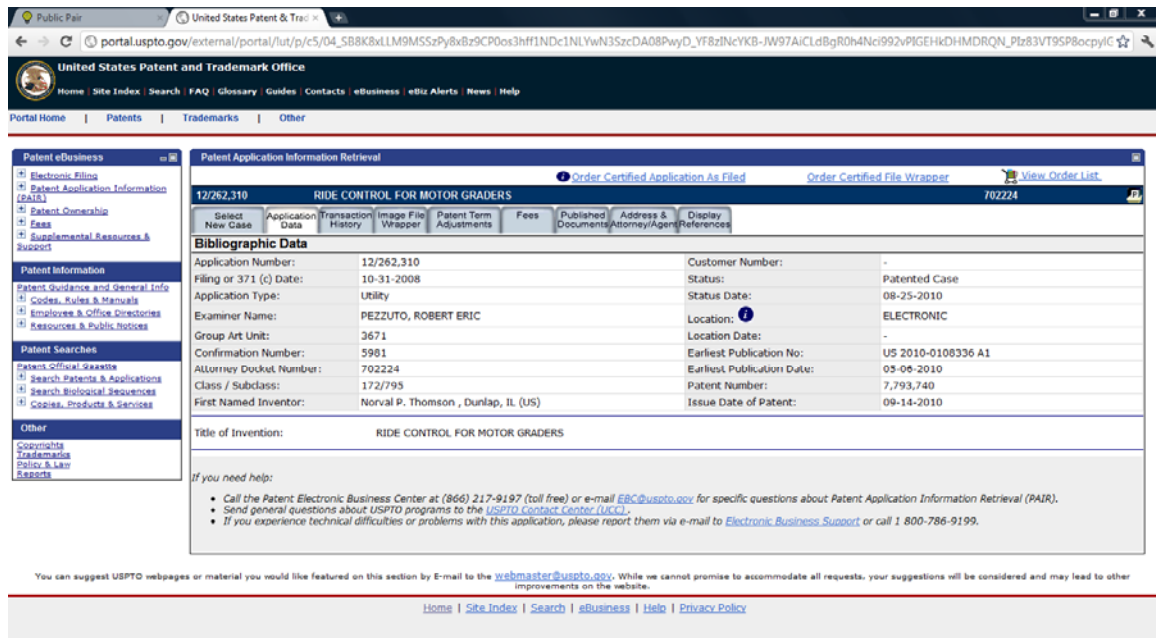
14 Claims, 4 Drawing Sheets

Patent Number
Issue Date



For patents issued as a result of applications filed on or after June 8, 1995, the longest enforceable period for a nonprovisional patent (utility, not design patent) is 20 years from the filing date of the non-provisional patent application.

Assuming the earliest filing date is the filing date of a non-provisional patent application, the enforceable period of patent number 7,793,740 is then October 31, 2008 to October 31, 2028 plus the number of days adjusted under 35 U.S.C. 154(b). The Patent Office must extend the patent term of an issued patent on day by day basis for the number of days it delays a patent's processing beyond a predetermined "acceptable period" (generally 3 years). For patents in the computer or electronic arts, patents can take 5-8 years to process so patent term extension can be important and amount to months or years added onto the standard patent term (20 years from filing). Patent term adjustments can be determined by referencing the patent prosecution file wrapper (the prosecution history). This information is also printed on the face of a patent. One way to view the file wrapper of a case is by going through the Public Patent Access Information Retrieval or public PAIR. Public PAIR is available free of charge at the USPTO website: www.uspto.gov. This can be viewed by entering the USPTO's public PAIR website as follows:

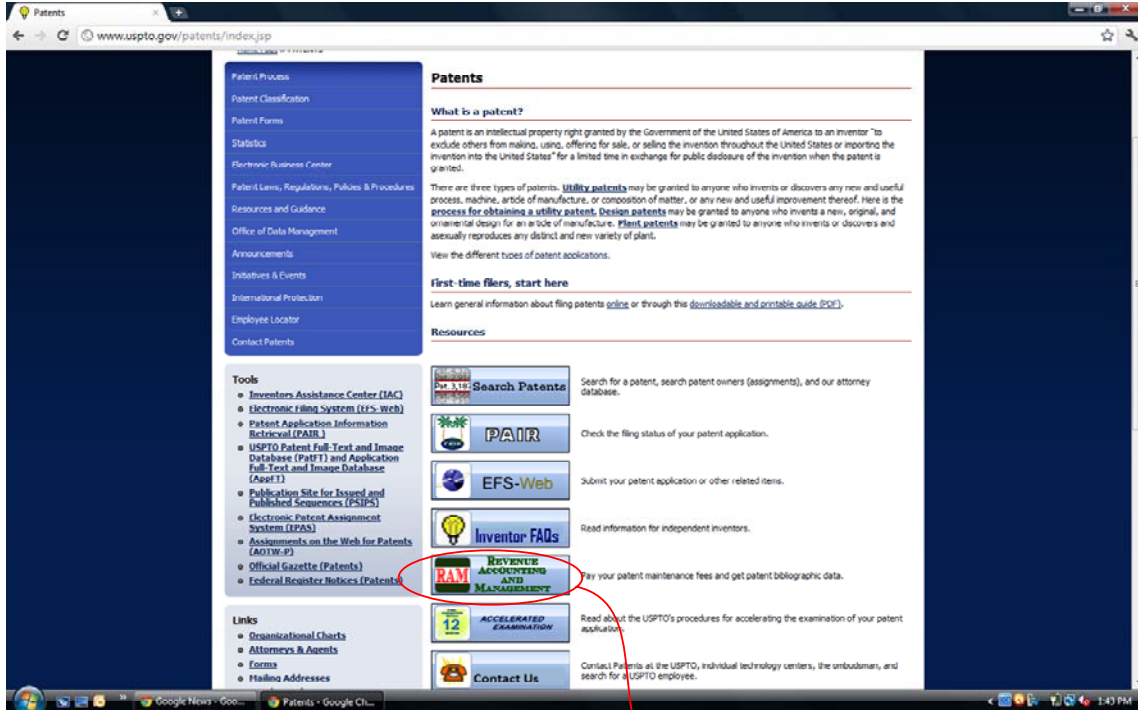


Upon clicking the "Image File Wrapper" tab, the prosecution history of patent 7,793,740 is displayed as follows:

The screenshot shows the USPTO website interface for a patent application. The main content area displays a table of available documents for the application 12/262,310. A red box labeled "File Wrapper" points to the "File Wrapper" link in the top navigation bar.

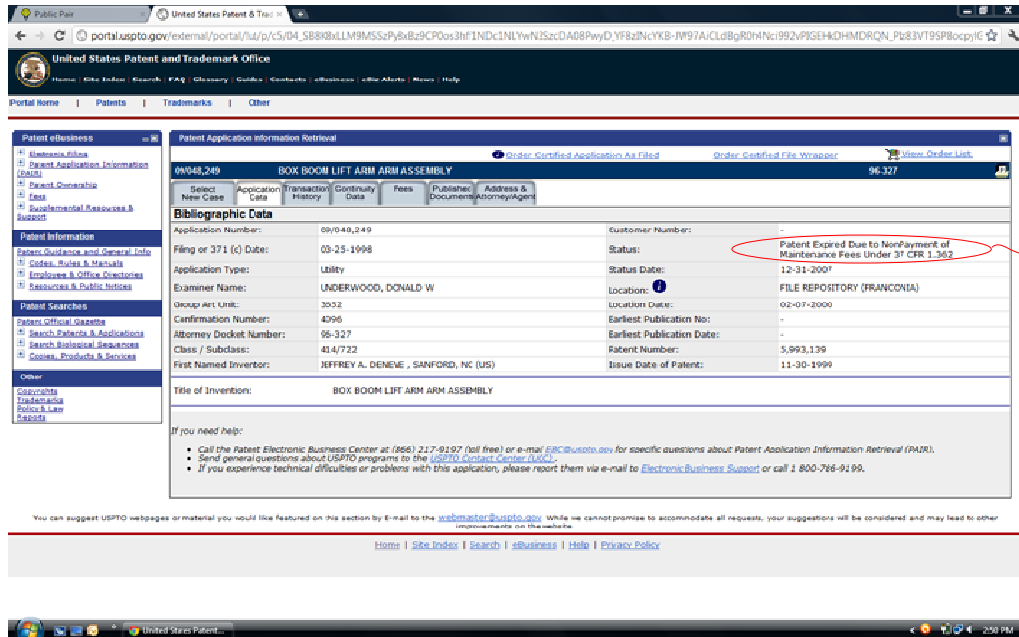
| Mail Room Date | Document Code | Document Description | Document Category | Page Count | PDF |
|----------------|---------------|---|-------------------|------------|--------------------------|
| 08-25-2010 | ISSUE NTF | Issue Notification | PROSECUTION | 1 | <input type="checkbox"/> |
| 08-09-2010 | IFEE | Issue Fee Payment (PTO-858) | PROSECUTION | 1 | <input type="checkbox"/> |
| 08-09-2010 | WFEE | Fee Worksheet (5806) | PROSECUTION | 2 | <input type="checkbox"/> |
| 08-09-2010 | N417 | IPS Acknowledgment Receipt | PROSECUTION | 2 | <input type="checkbox"/> |
| 05-07-2010 | NDA | Notice of Allowance and Fees Due (PTOL-83) | PROSECUTION | 4 | <input type="checkbox"/> |
| 05-07-2010 | SR-W | Search information including classification, databases and other search related notes | PROSECUTION | 1 | <input type="checkbox"/> |
| 05-07-2010 | IFW | Issue Information including classification, examiner, name, claim, status/issue, etc. | PROSECUTION | 1 | <input type="checkbox"/> |
| 05-07-2010 | BIB | Bibliographic Data Sheet | PROSECUTION | 1 | <input type="checkbox"/> |
| 05-06-2010 | HTC-PUB | Notice of Publication | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-19-2010 | A- | Amendment/Rea. Reconsideration After Non-Final Rejection | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-19-2010 | CLM | Claims | PROSECUTION | 8 | <input type="checkbox"/> |
| 03-19-2010 | REM | Applicant Arguments/Remarks Made in an Amendment | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-19-2010 | WFEE | Fee Worksheet (5806) | PROSECUTION | 2 | <input type="checkbox"/> |
| 03-19-2010 | N417 | IPS Acknowledgment Receipt | PROSECUTION | 2 | <input type="checkbox"/> |
| 03-19-2010 | 136A | Authorization for Extension of Time all replies | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-19-2010 | WFEE | Fee Worksheet (5806) | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-03-2010 | CTNF | Non-Final Rejection | PROSECUTION | 5 | <input type="checkbox"/> |
| 03-03-2010 | 892 | List of references cited by examiner | PRIOR ART | 1 | <input type="checkbox"/> |
| 03-03-2010 | SRPW | Search information including classification, databases and other search related notes | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-03-2010 | BIB | Bibliographic Data Sheet | PROSECUTION | 1 | <input type="checkbox"/> |
| 03-03-2010 | 1449 | List of References cited by applicant and considered by examiner | PRIOR ART | 3 | <input type="checkbox"/> |
| | | Claim Receipt | PROSECUTION | 3 | <input type="checkbox"/> |

For a patent to be enforceable for the full 20-year term (utility patent, not design patent which has a 14 year term from date of issuance), maintenance fees must be timely paid or the patent will go expired. These can also be checked on the USPTO website. You should also check the Electronic Business Center – Revenue Accounting and Management section for patent maintenance information:



Check Maintenance Fee Payment

In the example of patent 5,993,139 as follows, the patent became unenforceable as the patent expired due to non-payment of maintenance fees.



Patent Expired due to Non-Payment

The Patent Claims

Patent claims are interpreted in light of the disclosure, especially the drawings and description section of the application. In this example, the description section starts on column 3 as follows:

US 7,793,740 B2

| | |
|---|--|
| <p style="text-align: center;">3</p> <p>providing open communication between the first port of the actuator and the accumulator assembly.</p> <p style="text-align: center;">BRIEF DESCRIPTION OF THE DRAWING(S)</p> <p>FIG. 1 is a side elevational view of a motor grader according to aspects of the disclosure.</p> <p>FIG. 2 is an enlarged, fragmentary, isometric view of the rear of the motor grader of FIG. 1.</p> <p>FIG. 3-5 are enlarged, fragmentary, side elevational views of the ripper assembly of FIGS. 1 and 2, showing the ripper in various positions.</p> <p>FIG. 6 is a schematic diagram of the hydraulic system of the motor grader of FIGS. 1-5 incorporating a ride control arrangement according to the disclosure.</p> <p style="text-align: center;">DETAILED DESCRIPTION</p> <p>This disclosure relates to a ride control arrangement for a machine 100 such as a motor grader 101 illustrated in FIG. 1. While the arrangement is illustrated in connection with a motor grader 101, the arrangement disclosed herein has universal applicability in various other types of machines 100 as well. The term "machine" may refer to any machine that performs some type of operation associated with an industry such as mining, construction, farming, transportation, or any other industry known in the art. For example, the machine may be an earth-moving machine, such as a tractor, wheel loader, excavator, dump truck, backhoe, motor grader, material handler or the like. Moreover, one or more implements may be connected to the machine 100. Such implements may be utilized for a variety of tasks, including, for example, brushing, compacting, grading, lifting, loading, plowing, ripping, and include, for example, augers, blades, breakers/hammers, brushes, buckets, compactors, cutters, forked lifting devices, grader bits and end bits, grapples, moldboards, rippers, scarifiers, shears, snow plows, snow wings, and others.</p> <p>The motor grader 101 includes a mainframe 102. Although the mainframe 102 may be a single structure, in the illustrated embodiment, the mainframe 102 includes a rear frame portion 104 and a front frame portion 106. The rear and front frame portions 104, 106 may optionally be articulated at an articulated joint 108, which includes a hinge 109. The mainframe 102 is supported on a plurality of ground engaging members 110. In the illustrated embodiment, the ground engaging members 110 include a pair of front wheels 111, which are spaced from a plurality of rear wheels 113, 114, 115, 116, which are disposed pairs along opposite sides of the rear frame portion 104. It will be appreciated, however, that the ground engaging members 110 may include alternate arrangements, such as, for example, a pair of front wheels 111 and a single pair of rear wheels, or the rear wheels 113, 114, 115, 116 may alternately be track assemblies, as are known in the art.</p> <p>The front frame portion 106 includes a front frame section 120 supported between the hinge 109 and forward ground engaging members 110, here, the illustrated pair of front wheels 111. A blade assembly 122 is mounted along the front frame section 120 and may be utilized for grading. The blade assembly 122 includes a blade 124 and a linkage assembly 126 that may include a hydraulic actuator 127 that allows the blade 124 to be moved to a variety of different positions relative to the motor grader 101.</p> <p>An operator cab 128 may be supported along the front frame section 120. The cab 128 may include, for example, a seat 130, a steering mechanism 132, a speed-throttle or control lever 134, and a console 136. An operator occupying the</p> | <p style="text-align: center;">4</p> <p>cab 128 can control the various functions and motion of the motor grader 101, for example, by using the steering mechanism 132 to set a direction of travel for the motor grader 101 or by using the control lever 134 to set the travel speed of the machine. As can be appreciated, the representations of the various control mechanisms presented herein are generic and are meant to encompass all possible mechanisms or devices used to convey an operator's commands to a machine, including, for example, so-called joystick operation. While an operator cab 128 is shown in the illustrated embodiments, the inclusion of such a cab and associated seat, control mechanisms and console are optional in that the machine could alternately be autonomous, that is, the machine may be controlled by a control system that does not require operation by an on-board human operator.</p> <p>The rear frame portion 104 includes a rear frame section 138 that is supported on the plurality of ground engaging members 110 along either side of the machine 100. In the illustrated embodiment, the ground engaging members 110 supporting the rear frame section 138 include two pairs of rear wheels 113, 115 and 114, 116. Although the ground engaging members 110 may alternately be coupled directly to the rear frame portion 104, in the illustrated embodiment, the pairs of rear wheels 113, 115, 114, 116 are rotatably mounted on tandem supports 140 that are themselves pivotably mounted along either side of the rear frame section 138 at pivot shafts 144. Thus, each of the rear wheels 113, 114, 115, 116 rotates and the tandem supports 140 pivot about respective axes. It will be understood by those of skill in the art that the ground engaging members 110 may include alternate or additional structure, such as, for example, belts (not shown) disposed about the pairs of rear wheels 113, 115, 114, 116.</p> <p>For the purposes of this disclosure, the terms rear and front frame portions 104, 106 as used herein will likewise be utilized to refer generally to the forward and rearward portions of the mainframe 102 in embodiments wherein the mainframe 102 is not articulated and does not include separate rear and front frame portions 104, 106. Similarly, the terms rear and front frame sections 138, 120 as used herein will likewise be utilized to refer generally to the forward and rearward sections of the mainframe 102 in embodiments wherein the mainframe 102 is not articulated and does not include separate rear and front frame sections 138, 120.</p> <p>The machine 100 may additionally include ripper assembly 148, which includes a ripper 150, which is mounted to the rear frame section 138 by an appropriate structure. The illustrated ripper 150 includes a plurality of fingers 152 that extend from a crossbeam 154. In this way, the fingers 152 may tear into relatively hard terrain in order to prepare the terrain to be moved by the blade assembly 122. The ripper 150 may be coupled to the rear frame section 138 of the rear frame portion 104 by any appropriate mounting arrangement. In the illustrated embodiment, the ripper 150 is coupled to the rear frame section 138 by a selectively operable arm assembly 160 and a mounting assembly 162. The mounting assembly 162 includes a mounting bracket 164 that mounts directly to the rear frame section 138 and that is further supported at its lower edge by a pair of supports 166, which are coupled to the mounting bracket 164 at one end 167, and to the rear frame section 138 at the other end 168.</p> <p>The arm assembly 160 couples the ripper 150 to the mounting assembly 162 and permits the ripper 150 to be lowered to a terrain engaging position, or raised to an unengaged position when its use is not desired. While the arm assembly 160 may be of any appropriate design, in the illustrated embodiment, the arm assembly 160 is of a parallelogram arrangement that includes a pair of parallelograms 170, 172 extend-</p> |
|---|--|

Description

DETAILED DESCRIPTION

Under some circumstances, claims may be expressed as “means plus functions”. In mean plus function claims, the detailed structure is often not included in the claims, which makes the description section particularly useful for claim interpretation. Analyses of such claims must then include careful analyses of the description section. In some instances, detailed description may also be included in other sections, such as the summary, background or abstract. Therefore, it is advisable to examine the entire disclosure. If an issued patent exists, it should be examined instead of its published application.

The meaning of terms in the patent claims is also affected by legal positions taken during the prosecution (or arguing) stage of the patent process. If a patentee argues “around” prior art, he has narrowed or limited the breadth or scope of his claims. He cannot later expand the meaning of the terms in an infringement action. Therefore, the entire prosecution history of an application should be examined. For example, if the Examiner cited a reference against the applicant and the applicant argues that his invention is different than the reference because his component has a particular feature, the patentee cannot later argue that a component without that particular feature is infringing.

The legal positions taken in related patents in the same family (such as continuation applications) may also be used to narrow the breadth of patent claims. It is therefore useful to review the entire patent family. This can be viewed by examining the “Related U.S. Application Data” section of a published application or a patent:



US 20090176890A1

(19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2009/0176890 A1**
McPARTLAND (43) **Pub. Date: Jul. 9, 2009**

(54) **EDIBLE PLANT EXTRACT BASED INSECTICIDAL COMPOSITION**

1998, now abandoned, which is a continuation-in-part of application No. 08/846,351, filed on Apr. 30, 1997, now abandoned.

(76) Inventor: **TOR McPARTLAND**, Carmel Valley, CA (US)

Publication Classification

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(51) **Int. Cl.**
A01N 27/00 (2006.01)
(52) **U.S. Cl.** **514/763**

(21) Appl. No.: **12/394,537**

(57) **ABSTRACT**

Related Application

(22) Filed: **Feb. 27, 2009**

Related U.S. Application Data

(63) Continuation of application No. 10/235,450, filed on Sep. 4, 2002, now abandoned, which is a continuation-in-part of application No. 09/706,158, filed on Nov. 3, 2000, now Pat. No. 6,784,211, which is a continuation-in-part of application No. 09/218,732, filed on Dec. 22,

A food-grade insecticidal composition allowed for use in organic production which is effective in controlling insects, such as ants, aphids, mealy bugs, white flies, spider mites, leaf hoppers, cabbage loopers, leaf eating beetles and caterpillars, cockroaches, flies, wasps, mosquitoes, wood boring and eating insects, and body and head lice but which is non-toxic to humans, household animals, and farm animals includes an effective insect-controlling amount of D-limonene, a non-toxic emulsifying agent, and a non-toxic hydrophilic solvent.

Claims are what define the scope of a patent’s protection. They define the metes and bounds of what is claimed as the invention. In a U.S. patent, the claims can be found under section titled “Claims,” “We Claim,” “I claim,” etc. Let’s now turn our attention to the claim section of patent number 7,793,740, which starts in column 7 of the patent as follows:

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and check valve arrangements 226, 228 operate in a conventional manner to permit free flow of fluid in the conduit 230, 232 from the associated accumulator 222, 224 to the actuator 180, and to choke flow from the piston end 182 and/or cylinder end 186 through the associated conduit 232, 230 to the

respective accumulator 224, 222, which may minimize possible sudden jarring as the operator switches to ride control mode. Although two accumulators 222, 222 are provided in the illustrated embodiment, an alternate arrangement may include, for example, a single accumulator wherein the loaded end of the actuator 180 is selectively connectible with the accumulator. Similarly, the check valve and choke arrangements may be eliminated, and/or the flow arrangement supplemented with additional flow controls or the like, including, by way of example only, bleeder valves or the like. Moreover, alternate valve and connection arrangements may be provided within the spirit and scope of this disclosure.

INDUSTRIAL APPLICABILITY

The present disclosure is applicable to machines 100 including a ripper arrangement 148 and to motor graders including an implement, such as, for example, a ripper, blade, scarifier, or snowplow.

During normal operation, the operator has normal control of the implement. When it is desirable to travel for a distance, however, the operator may activate the ride control by way of switch 194 to fluidly connect one or more accumulators 222, 224 with the actuator(s) 180 to provide an arrangement wherein the normal movements of the implement are dampened. In this way, the ride control arrangement 190 may minimize bounce or loping of the machine 100 as it travels across a terrain.

Claim Section

We claim:

- 1. A machine comprising
 - a frame,
 - a ripper coupled to the frame,
 - a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, the hydraulic actuator being operative to move the ripper,
 - at least one accumulator assembly,
 - a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly,
 - a controller connected to the valve mechanism, the controller being selectively operative to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly,
 - a ride control input device adapted to produce a ride control signal, the controller being adapted to receive the ride control signal and cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly.
- 2. A machine comprising
 - a frame,
 - a ripper coupled to the frame,
 - a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, a directional control valve, a reservoir, and a source of pressurized fluid, the directional control valve being fluidly coupled to the hydraulic actuator and the reservoir, the hydraulic actuator being operative to raise and lower the ripper relative to the frame in response to pressurized

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fluid being selectively directed to and from the hydraulic actuator from the directional control valve,

at least one accumulator assembly, a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly.

3. A machine comprising a frame, a ripper coupled to the frame, a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, a source of pressurized fluid, wherein the hydraulic actuator includes first and second chambers, and first and second ports opening into the first and second chambers, respectively, the first and second chambers selectively filled with and drained of the pressurized fluid to move the ripper,

at least one accumulator assembly, and a valve mechanism selectively operatively disposed between the accumulator assembly and the first port of the hydraulic actuator, the valve mechanism being moveable between a first position in which communication is blocked between the first port of the hydraulic actuator and the accumulator assembly and a second position in which open communication is permitted between the first port of the hydraulic actuator and the accumulator assembly, pressure being substantially equalized between the first chamber and the accumulator assembly when the valve mechanism is disposed in the second position.

4. The machine of claim 3 further including a directional control valve, a reservoir, a source of pressurized fluid, a ride control input device adapted to produce a ride control signal, and a controller connected to the valve mechanism, the controller being adapted to receive the ride control signal and selectively operative to cause the valve mechanism to move between the first and second positions, the directional control valve being fluidly coupled to the hydraulic actuator and the reservoir, the hydraulic actuator being operative to raise and lower the ripper relative to the frame in response to pressurized fluid being selectively directed to and from the hydraulic actuator from the directional control valve.

5. A method of controlling a ride of a machine on a terrain, the machine having a frame, the method comprising the steps of:

- coupling a ripper to the frame,
- coupling a hydraulic actuator to the frame and to the ripper, the hydraulic actuator being operative to move the ripper relative to the frame,
- selectively fluidly coupling at least one accumulator assembly to the hydraulic actuator,
- operatively disposing a valve mechanism between the accumulator assembly and the hydraulic actuator, causing a ride control input device to produce a ride control signal,
- providing the ride control signal to a controller,
- selectively operating the controller to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly.

6. A method of controlling a ride of a machine on a terrain, the machine having a frame, the method comprising the steps of:

The claim section is typically the last section in an issued patent. In this case, the claim section starts in column 7. There are fourteen allowed claims. Although not universally true for all cases, the claim section starts with the broadest claim. In this example, there are eleven claim sets. Each claim set starts with an independent claim. An independent claim is self-standing and does not reference any other claim. Independent claims for this case are claim 1, 2, 3, 5, 6, 7, 8, 9, 11, 12 and 13.

Dependent claims can be easily identified because they reference a preceding claim and further detail the independent claim upon which they rely. There are two dependent claims in this example. Claim 4 depends from claim 3 while claim 10 depends from claim 9.

There are two distinct types of claims, i.e., apparatus and process claims in this example. Apparatus claims protect a structure while process claims protect a method or a series of steps. Apparatus claims include claims 1-4 and 9-14 while claims 5-8 are process claims. For completeness, the reader is encouraged to peruse each independent claim in each claim analysis.

Designing Around the Claimed Subject Matter

Suppose the reader is interested in practicing a technology similar to the disclosure of this Caterpillar patent or is interested in pursuing a patent strategy in view of this patent or prior art. For convenience purposes, let's call Caterpillar the senior party as it holds priority over the reader, who is considered the junior party. Let's consider a scenario where the junior party attempts to either make and use a product similar to the senior party's patent and/or considers applying for a patent claiming similar subject matter.

Generally speaking, terms in the patent claims are given their plain meaning in the given art or technology area. To determine the precise meaning of a term,

you would look to what a person of ordinary skill in the art or technology would understand the term to mean. Additionally, an inventor can specifically define a given term for his purposes in the patent. In this case where the inventor has chosen to be his own lexicographer and give a term a special meaning, one must examine the specification for a definition (explicit or implicitly understood).

Claim language can also be cast in what is called "means plus function" form permitted under 35 U.S.C. 112, sixth paragraph, which provides that

"An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

Patent law allows any element in a claim to be expressed as a means or step for performing a specified function. For example, "a means for fastening the wheel to the axle." However, the scope of such a claim is not limitless, but is confined to structures expressly disclosed in the specification and corresponding equivalents. If the patent disclosure only discusses two ways to fasten them, then only those two means are what define this claim element. "Means" language cannot be used to cover every conceivable and unknown combination. Therefore, the statutory provision prevents an overly broad claim construction by requiring reference to the specification, and at the same time precludes an overly narrow construction that would restrict coverage solely to those means expressly disclosed in the specification.

In other words, a "literal" construction of such a limitation may encompass only the disclosed structure and its equivalents. This differs from common English

usage of the words, or their "plain meaning" which would include everything under the sun that is a means for attaching the wheel to the axle. Patent law does not allow such broad claims that exceed the applicant's actual invention at the time and therefore requires that interpretation of claim must resort to limiting features contained in the specification, the prosecution history, and a factual inquiry into equivalents to prevent an erroneously broad scope of protection.

Similarly, although a patentee may be his own lexicographer (create his own definitions for certain terms), the patent specification must support his asserted definition. Furthermore, terms of a claim must be interpreted with regard to the other claims, the specification, and the prosecution history. It is also important to note that the Federal Circuit has been consistent and uniform in its application of the law in this area, and has evidenced a liberal, pro-patent point of view.

Potential Infringement

The definition of "patent infringement" can be found in 35 U.S.C. 271(a) which defines direct infringement simply as the making, using or selling of a patented invention in the U.S. without authority from the patent owner. In addition, 35 U.S.C. 271(b) extends liability for infringement to those who "actively induce" another to infringe a patent, and 35 U.S.C. 271(c) extends liability to contributory infringers as follows:

"whoever sells a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce

suitable for substantial non-infringing use, shall be liable as a contributory infringer."

Any person or entity that is found liable for patent infringement is subject to the imposition of damages and an injunction. The damages to which a patent owner is entitled are the patent owner's lost profits as a result of the infringement, but not less than a reasonable royalty. In addition, if infringement is determined to have been willful, the court may award up to 300% the actual damages and attorneys' fees (which tend to be \$500,000-\$1,500,000 in a typical patent infringement case).

Claims are interpreted in light of the claim language itself. In other words, each and every element recited in a claim has identical correspondence in the accused infringing device or process. However, even if literal infringement does not exist, a claim may be infringed under the doctrine of equivalents if some other element of the accused device or process performs substantially the same function, in substantially the same way, to achieve substantially the same result. An infringement analysis determines whether a claim in a patent literally "reads on" an alleged infringer's device or process.

Applicable Legal Principles For Infringement

A. Claim Interpretation

To determine whether a product infringes a U.S. patent, the court looks to the patent's claims. For each claim, there is a two-step inquiry. First, the court construes or interprets the claim. That is, the court resolves any disputes as to the meaning of the particular claim technology. Second, the properly constructed claim is compared to the accused product to determine whether this is literal infringement or infringement under the doctrine of equivalents.

Patent claims should be construed as they would be by those skilled in the art. To ascertain the true meaning of the claims, it is appropriate to consider the claim language, the patent specification, and the prosecution history. In addition, in the event this matter proceeds to litigation, the court may be educated by expert testimony, although such testimony should only be considered “an aid to the court in coming to a correct conclusion as to the true meaning of the language employed in the patent.”

By statute, so-called means-plus-function phrases in claims are limited to the corresponding structure described in the specification and equivalents thereof. In particular, the interpretation of claim language drafted in means-plus-function form, e.g., “means for...,” is governed by 35 U.S.C. 112, sixth paragraph, which reads as follows (emphasis added): “An element in a claim...may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and *such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.*”

The U.S. Court of Appeals for the Federal Circuit explained the proper way to construe means-plus-function claim as follows: “Under 35 U.S.C. 112, sixth paragraph, to satisfy a means-plus-function limitation literally, the accused device must perform the identical function required by the limitation and must incorporate the structure disclosed in the specification, or its substantial structural equivalent, as means for performing that function.”

B. Literal Infringement

To determine literal infringement, the relevant inquiry is whether *all* the elements contained in the claim appear in the product under consideration. A product that has all of the claimed elements is said to be literal infringement. For open-ended claims, with the word “comprising” in the preamble, it typically does not matter

that the product has elements in addition to the ones specified in the claim. The product is said to infringe literally when it has everything mentioned in the claim. On the other hand, a product that does not have each and every element recited in the claim should not be considered a literal infringement.

C. The Doctrine of Equivalents

A product that does not literally infringe a patent claim may still infringe under the doctrine of equivalents. The touchstone under the doctrine of equivalents is whether the differences between the accused product and the claimed invention are insubstantial. Where the differences are substantial, there should be no infringement under the doctrine of equivalents. In making a determination under the doctrine of equivalents, the court may consider whether the accused product performs substantially the same function, in substantially the same way, to obtain substantially the same result as the claimed invention.

An amendment made during the prosecution that narrows the scope of a claim to satisfy a requirement of the Patent Act may give rise to prosecution history estoppels. An estoppel is an equitable bar from asserting a claim based on fairness. In this case, the patent law will not allow you to rely on something to get your patent and to minimize its importance when accusing someone of infringement. Either it is important or not, you cannot have it both ways! When the patentee is unable to explain the reason for the amendment, prosecution history estoppels bars the application of the doctrine of equivalents as to the amended element even where an explanation for the amendment can be established, the patentee's decision to narrow the claims may be presumed to be a general disclaimer of the territory between the original claim and the amended claim, and the burden should be on the patentee to show that the amendment did not surrender the subject matter in question.

As indicated above, the essence of prosecution history estoppel is that a patentee should not be able to obtain, through the doctrine of equivalents, coverage of subject matter that was relinquished during prosecution to procure issuance of the patent. Further, the legal standard for determining what subject matter was relinquished is an objective one, measured from the vantage point of what a competitor was reasonably entitled to conclude from the prosecution history that the applicant gave up to procure issuance of the patent. Additionally, a patentee should not be able to obtain, under the doctrine of equivalents, coverage which he could not lawfully have obtained from the USPTO by literal claims.

"... all express representations made by or on behalf of the applicant to the examiner to induce a patent grant... Such representations include amendments to the claims and arguments made to convince the examiner that the claimed invention meets the statutory requirement of novelty, utility, and non-obviousness. Thus, the prosecution history (or file wrapper) limits the interpretation of claims as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance."

In addition, the prosecution history of a parent case, and the construction of a term contained therein, is relevant to an understanding of that term as it is used in a continuation case.

The doctrine of equivalents is an equitable doctrine which effectively expands the scope of the claims beyond their literal language to the true scope of the inventor's contribution to the art. However, there are limits on the scope of equivalents to which the patent owner is entitled.

- (a) Prosecution history estoppels - In order to determine the scope of equivalents to which the patent owner is entitled, the doctrine of prosecution history estoppel must be considered. Prosecution history estoppel limits the scope under the doctrine of equivalents by preventing a patent owner from recapturing during litigation that which was given up during prosecution of the patent to avoid prior art and obtain a patent. This portion of the analysis is performed by obtaining and studying the patent application file.
- (b) Effect of prior art - The scope of equivalents to which the patent owner is entitled is limited by the prior art. The patent owner cannot expand the claims for purposes of finding infringement if the scope of equivalency sought would ensnare the prior art. Therefore, if infringement under the doctrine of equivalents is found, a prior art search should be performed to determine if the scope of equivalency ensnares the prior art. The fundamental purpose of all such evaluations must be to prevent the patentee from obtaining, under the doctrine of equivalents, coverage which the patentee could not have obtained from the USPTO by literal claims.

D. Dependent Claims

Dependent claims contain every limitation of the claims from which they depend. As a matter of law, if an accused product does not infringe an independent claim, then it does not infringe any claim that depends from that claim.

The following steps are sample steps taken to analyze whether a device or process is literally infringed:

- (a) Construe the scope of the "literal" language of the claims.
- (b) Compare the claims with the accused device or process to determine whether there is literal infringement.
- (c) If literal infringement does not exist, construe the scope of the claims under the doctrine of equivalents.

Let's now turn our attention to Caterpillar's claim 1:

1. A machine comprising

*a frame,
a ripper coupled to the frame,
a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, the hydraulic actuator being operative to move the ripper,
at least one accumulator assembly,
a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly,
a controller connected to the valve mechanism, the controller being selectively operative to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly,
a ride control input device adapted to produce a ride control signal, the controller being adapted to*

receive the ride control signal and cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly.

Without specifying a particular type of machine (notice mere “a machine”), this apparatus claim claims any machine comprising the seven components as specified below:

Component 1: a frame

Component 2: a ripper coupled to the frame

Component 3: a hydraulic arrangement

Component 4: at least one accumulator

Component 5: a valve mechanism

Component 6: a controller connected to the valve mechanism

Component 7: a ride control input device

Attempt to Design Around Prior Art by Adding Claim Element

Suppose the reader has a machine having an improved ripper height control device. Would this get around the Caterpillar machine? Let’s analyze this situation. A sample claim describing our improved machine might look like this:

A machine comprising

a frame,

a ripper coupled to the frame,

a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper,

the hydraulic actuator being operative to move the ripper,

at least one accumulator assembly,

a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly,

a controller connected to the valve mechanism, the controller being selectively operative to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly,

a ride control input device adapted to produce a ride control signal, the controller being adapted to receive the ride control signal and cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly,

a ripper height control device adapted to produce an height output signal to positioning the ripper, wherein the height output signal is inversely proportional to a change of the ride control signal over time and cause the ripper to be driven to a height corresponding to the height output signal.

There are two distinct concepts to understand. The first is patentability. The second is infringement.

Looking at patentability first, it is possible this improved combination might be able to receive a patent. It turns on whether the improvement (bolded and underlined above) are both novel and nonobvious when taking into account the state of the art of the Caterpillar machine that existed at the time of the invention. Is the improvement something that would have been anticipated by the earlier invention? Is this an inevitable improvement that would have been made by those of ordinary skill in the art seeking to continually improve the apparatus? If it satisfies those tests, it may be eligible for patent protection.

Now let's turn to the second inquiry: Is the improved device infringing Caterpillar's claim 1? Yes, the above claim literally infringes Caterpillar's first claim. Why? Each and every component is recited in Caterpillar's first claim. Even though the above claim has an additional element which is critical to the correct operation of the machine, it does not matter! Any component containing those elements is infringing. The term "comprising" means including but not limited to the recited components 1-7. There may be "additional" components that allow for patentability but do not protect from infringement. Therefore, manufacturing a machine described above may infringe upon Caterpillar's claim 1. Thus, adding additional elements is generally not a viable design around technique, even when it may lead to patentable inventions.

Successful design around techniques include:

- (a) Substitution of Component - Substitute a component of Caterpillar's claim 1 with a critical component which is not claimed or taught in Caterpillar's claim 1.
- (b) Removal of Component - Remove at least one component from Caterpillar's claim 1.

In each of these cases, one would not produce the result of a machine that has all of the claimed components in the patent combination. Therefore, one would not be literally infringing on the patented apparatus.

Attempt to Design Around Prior Art by Substituting Claim Element

It is tempting to simply replace a component from Caterpillar's claim 1 with just about any component which differentiates the machine from the combination claimed in Caterpillar's claim 1.

A machine comprising

a frame,

~~*—a ripper coupled to the frame,*~~

a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, the hydraulic actuator being operative to move the ripper,

at least one accumulator assembly,

a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly,

a controller connected to the valve mechanism, the controller being selectively operative to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly,

a ride control input device adapted to produce a ride control signal, the controller being adapted to receive the ride control signal and cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly, and

a ripper height control device adapted to produce an height output signal for positioning a ripper, wherein the height output signal is inversely proportional to a change of the ride control signal over time and cause the ripper to be driven to a height corresponding to the height output signal.

The component “a ripper coupled to the frame” has been replaced with a ripper height control device. Is this a successful design around? At least one claim element or component, i.e., “a ripper coupled to the frame,” has been removed from the new machine. A ripper height control device is included instead. Since it does not contain each and every element of the claimed combination, it is potentially a successful design around. The next step is to look at whether there is a doctrine of equivalents issue. Assuming that the height control device is not a functional equivalent to a ripper coupled to a frame, it would be a successful design around.

Attempt to Design Around Prior Art by Removing Claim Element

Let’s consider another example claim. Suppose the reader discovered that by removing the ride control input device from the motor grader, the motor grader performs equally well or better.

A machine comprising

a frame,

a ripper coupled to the frame,

a hydraulic arrangement including at least one hydraulic actuator coupled to the frame and the ripper, the hydraulic actuator being operative to move the ripper,

at least one accumulator assembly,

a valve mechanism operatively disposed between the accumulator assembly and the hydraulic actuator, the valve mechanism being operative to either block or allow fluid communication between the hydraulic actuator and the accumulator assembly,

a controller connected to the valve mechanism, the controller being selectively operative to cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly;

~~*a ride control input device adapted to produce a ride control signal, the controller being adapted to receive the ride control signal and cause the valve mechanism to either block or allow communication between the hydraulic actuator and the accumulator assembly.*~~

Based upon the above analysis, we can conclude that the elimination of the ride control input device would eliminate the possibility of literal infringement and would be a successful design around (assuming there is no functional equivalent that satisfies the doctrine of equivalents).

But, is this new combination potentially patentable? It might be. As we mentioned earlier, there are two rules governing patentability. First, the rule governing novelty, 35 U.S.C. 102 (b) states:

*A person shall be entitled to a patent unless –
the invention was patented or described in a printed
publication in this or foreign country or in public use or
on sale in this country, more than one year prior to the
date of application for patent in the United States.*

In today's patent environment, there is an increased likelihood that the USPTO will find such broadened claim subject matter not novel. It is fairly likely the examiner would be able to locate a single reference showing a prior art machine having the (reduced number of) components. If the Examiner is unable to find a single reference with all of the components of the new improved machine, he may be able to find several references that, when taken in combination, would have rendered the new combination obvious to a person of ordinary skill in the art.

The rule governing obviousness, 35 U.S.C. 103(a)

*A patent may not be obtained though the invention is
not identically disclosed or described as set forth in
section 102 of this title, if the differences between the
subject matter sought to be patented and the prior art
are such that the subject matter as a whole would
have been obvious at the time the invention was
made to a person having ordinary skill in the art to
which said subject matter pertains. Patentability shall
not be negated by the manner in which the invention
was made.*

For another example, an obvious combination might be adding paint to outer surfaces of the frame to prevent corrosion.

After the KSR case several years ago, obviousness has been more challenging to argue. The Examiner is allowed to make a finding of fact that something is obvious based on his own experience and opinion. The objective obviousness standard thus takes on a subjective quality. For this reason, it is recommended to have more than one differentiating feature to rely on, in case your arguments for one are not successfully argued to the Examiner.

Avoid Infringement Under the Doctrine of Equivalents

As mentioned earlier, one of the principal concerns with relying on the literal language of the claims in a patent is that, even though you avoid literal infringement, you may still infringe the patent under the "doctrine of equivalents." The "doctrine of equivalents" is a judicially created doctrine having a three part "function/way/result" substantial identity test embodying the following steps:

(a) Determine whether the accused device or process achieves substantially the same result as the claimed invention. If it does not, the infringement inquiry ends.

(b) Determine whether the accused device or process performs substantially the same function as the claimed invention. If it does not, the infringement inquiry ends.

(c) Determine whether the accused device or process operates in substantially the same way as the claimed invention. If it does not, the infringement inquiry ends.

In applying this test, each element of the claim must also be compared with the accused device or process to determine whether the accused device or process contains each element or its substantial equivalent.

A substantial equivalent of an element is one that causes the accused device or process to operate in substantially the same way as the claimed invention, considering the nature, purpose and quality of the element and its corresponding structure in the accused device or process.

Another way of looking at this test is to determine if the differences between the claimed invention and the accused device are so insubstantial that a fraud on the patent would result. This occurs when, for example, changes are made solely to avoid the literal language of the claim, and the changes reflect little or no advantage.

In short, in order to find infringement under the doctrine of equivalents, an element-by-element comparison and not a "claim as a whole analysis", must be made between the claimed invention and the accused device. In determining if a "substantial equivalent" exists for a claimed element or limitation, the three-prong test can be used. However, even if a "substantial equivalent" can be found, there still can be no infringement if the asserted scope of equivalency would encompass the prior art or be barred by the prosecution history of the patent.

Returning to our earlier example, does the ripper height control device result in a device substantially the same as Caterpillar's ripper? If the reader's device substantially improves upon Caterpillar's ripper due to its provision for height control, the infringement inquiry ends. If the provision of height control results in

insignificant improvement in height control of the ripper, the inquiry continues on to determine whether the reader's device performs the same function as Caterpillar's device. If the reader's device performs substantially the same function, i.e., to break the ground behind a motor grader, then the inquiry continues on to determine whether the reader's device operates the same way as Caterpillar's ripper. In this example, the answer is clear, the reader's device operates in a substantially different way than Caterpillar's ripper as Caterpillar's ripper is simply a bang-bang device, i.e., the ripper is either deployed or retracted, without the ability to control the ripper to a particular height. Therefore, there may not be infringement under the Doctrine of Equivalents.

Avoiding Infringement of Means plus Function Claims

As indicated above, infringement of a claim requires that the accused device meet every limitation of the claim, either literally or under the doctrine of equivalents. In the case of literal infringement, if a claimed element is missing, then literal infringement is avoided. In other words, a "literal" construction of such a limitation may encompass only the disclosed structure and its equivalents.

However, claim language can be cast in what is called "means plus function", ,

"An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

In the case of a claim with a "means plus function" element, the element is met literally when (i) an accused device performs the same function recited in the

element, and (ii) the accused device embodies the corresponding structure, material, or acts described by the specification or an equivalent thereof. 35 U.S.C. 112, sixth paragraph provides that claim limitations "expressed as means ... for performing a specified function without the recital of structure ... in support thereof, ... shall be construed to cover corresponding structure ... described in the specification and equivalents thereof." In this paragraph (6) Congress sought to provide instruction on the interpretation of "means" claims, which otherwise might be held to be indefinite. Therefore, Paragraph 6 operates to cut back on the type of means which could literally satisfy the claim language. More specifically, where a claim sets forth a means for performing a specific function, without reciting any specific structure for performing that function, the structure disclosed in the specification must be considered, and the patent claim construed to cover both the disclosed structure and equivalents thereof.

Let's look at another example, i.e., a claim from patent 5,574,643 as follows. This claim contains three clauses of means plus function language:

Means for determining said ground speed of said machine;

Means for calculating percent slip of said wheels;

Means for controlling operation of said differential lock and said throttle control.....;

For example, the means for calculating percent slip may be interpreted in light of the description in column 3 of the patent. In this case, the slip is determined using wheel speed and ground speed and it is defined as the sum of wheel speed minus the ground speed divided by wheel speed as represented by the formula, where WS is wheel speed and GS is ground speed:

$$\%SLIP=(WS-GS)/WS$$

Therefore in designing around a means plus function claim element, one must consider the meaning of the means plus function claim element in light of the description.

5,574,643

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blade 38 of the motor grader is located between the front and rear wheels.

Various operator controls are located in an operator's compartment 40. These controls include the transmission shift lever 22 and inching pedal 42. The controller 26 may be conveniently located under the operator's seat 48. The controller 26 is a microprocessor based electronic module that receives information from the shift lever 22, the inching pedal 42, the transmission output speed sensor 28 and the radar unit 24. The controller 26 actuates appropriate ones of the solenoids 30A-30H for shifting the transmission 16 to the desired gear. The controller 26 also controls the engine throttle control 14 and locks and unlocks the differential 18.

Referring to FIG. 4, the differential gear assembly 18 is locked and unlocked by a differential lock 50 under the control of the transmission controller 26. In the unlocked position, the differential gear assembly 18 operates normally to allow one wheel to spin faster than another. In the locked position, the differential gear assembly 18 forces all drive wheels to turn at the same speed. The throttle control 14 is also under the control of the controller 26 and is operable between an active and an inactive condition. In the inactive condition, engine speed is responsive to the accelerator pedal of the machine. In the active condition, the throttle control 14 determines engine speed.

Referring to FIG. 5, information regarding engine speed, gear ratio, and ground speed are input to the controller 26 which calculates wheel speed. Wheel speed is the product of engine speed, gear ratio and a constant. The constant is primarily a function of the final drive reduction ratio taking into the effect of tires and other less significant variables. While the present invention uses radar for sensing ground speed, other means of determining ground speed may also be used. Radar is preferred because radar is believed to be the most accurate. Alternatively, front wheel speed could be used to determine machine speed.

Slip is determined using wheel speed and ground speed. Slip is defined as the sum of wheel speed minus the ground speed divided by wheel speed as represented by the formula

$$\%SLIP=(WS-GS)/WS.$$

In the slip formula, GS is ground speed, WS is wheel speed, and

$$WS=(ES)(GR)(C).$$

In the wheel speed formula ES is engine speed, GR is gear ratio, and C is a constant representing final drive ratio.

The present invention provides better traction control by automatically locking up the differential and limiting engine speed under certain conditions of slip. At slip less than 10%, the differential lock would not be activated by the controller nor would the throttle control be activated by the controller. Ten percent would then be considered the minimum slip, and at the opposite end of the slip range, 25% would be considered maximum slip. Above 25% slip, the throttle control would be activated and the differential lock would also be activated by the controller. Between the conditions of minimum slip and maximum slip, the throttle control would not be activated but the differential lock would be activated to control traction.

While the traction control has been described with reference to a rear wheel drive machine, it is equally applicable to an all wheel drive machine. At minimum slip, there would

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be no need to effect operation of the front drive wheels. Above minimum slip, the controller could also control pump pressure in the front drive wheels to control the traction.

INDUSTRIAL APPLICABILITY

Operation of the present invention is believed to be apparent from the foregoing description and drawings, but a few words will be added for emphasis. The traction control operates automatically without operator intervention to controllably respond to slip by controlling the engine and therefore transmission speed or by locking the differential to limit differential gearing thereby forcing the wheels to turn at the same speed or both depending on the amount of slip.

As is evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the examples illustrated, and it is therefore contemplated that other modifications and applications will occur to those skilled in the art. While the invention has been described with reference to a motor grader, it is apparent that the traction control is easily adapted to other machines that are subject to slip. It is also apparent that the minimum and maximum slip values may be adjusted for varying footing conditions. It is accordingly intended that the claims shall cover all such modifications and applications as do not depart from the hue spirit and scope of the invention.

What is claimed is:

1. A machine, comprising:

- a frame;
- wheels mounted on said frame, said wheels experiencing wheel slip under certain conditions;
- an engine mounted on said frame and operable at an engine speed;
- an engine throttle control operable between an off condition at which engine speed is unaffected and an on condition at which engine speed is controlled;
- a transmission mounted on said frame and coupled to said engine and operable at a gear ratio;
- a transmission control for controlling operation of said transmission and effecting said gear ratio;
- a differential gear assembly coupled to said transmission for turning said wheels and propelling said machine at a ground speed, said differential gear assembly having a lock operable between an off condition at which wheel turning is unaffected so that wheels turn differentially and an on condition at which wheel turning is affected so that all drive wheels turn at same speed;

means for determining said ground speed of said machine;

means for calculating percent slip for said wheels; and

means for controlling operation said differential lock and said throttle control and turning said differential lock off when percent slip is less than a slip minimum value, turning said differential lock on and said throttle control off when percent slip is equal to or greater than said slip minimum value and equal to or less than a slip maximum value, and turning said differential lock on and said throttle control on when percent slip is greater than said slip maximum value.

2. A machine, as set forth in claim 1, wherein said slip minimum value is 10%.

3. A machine, as set forth in claim 1, wherein said slip maximum value is 25%.

4. A machine, as set forth in claim 1, wherein percent slip is determined by the formula

Description of %slip calculating means

Means Plus Function