Career in Intellectual Property

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Canadian Conference for
Undergraduate Women in Physics
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Outline

- What is Intellectual Property?
- Why is it important?
- My path to IP
- What I like and don’t like about my job
- General Advice

What is Intellectual Property?

- Legal rights to intangible creations

  industrial, scientific, artistic, literary, musical

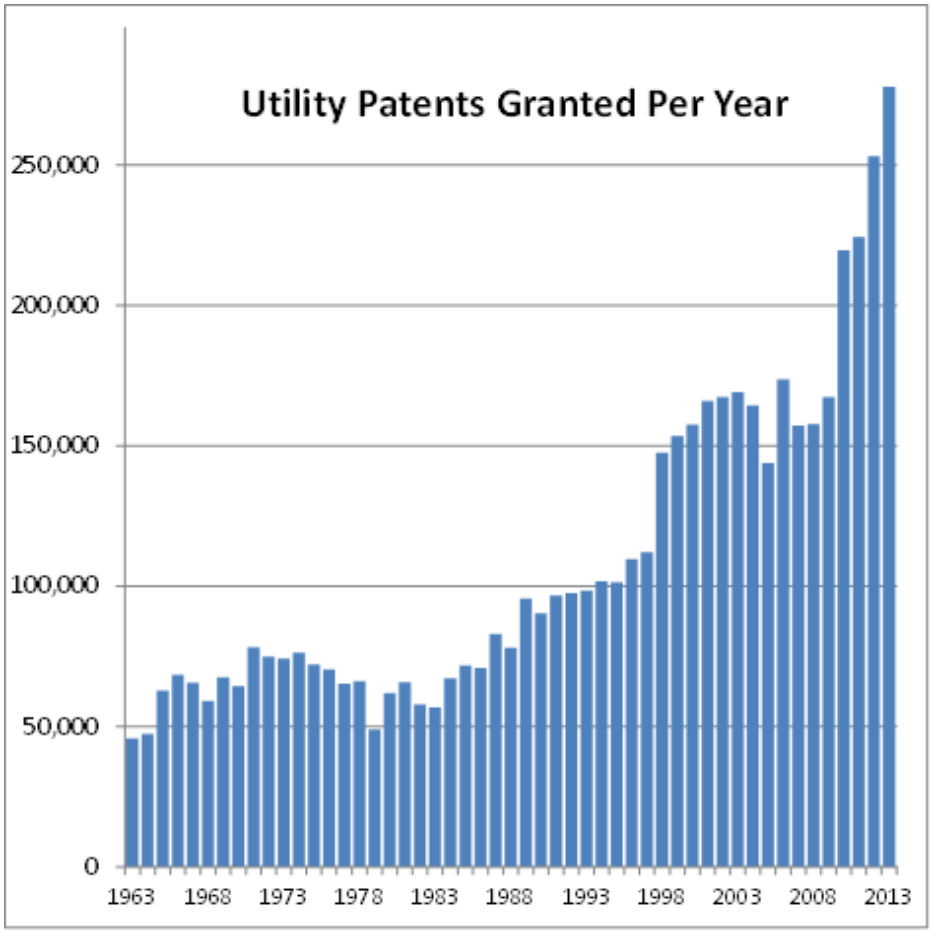
- Patents
- Designs
- Trademarks
- Copyrights
- Trade Secrets

For example, smartphone

Why should you be interested in patents?

- Cutting edge, state of the art
- Huge importance to the economy, science, technology, arts
- Recession made IP even more valuable
- Valuation of companies
- Funding of research based on number of patent applications filed
- Major policy issues

…because everybody filing patents



Companies filing the largest number of patents

- “patentDocs” blog

2012 IPO Rank	2011 IPO Rank	Company/Organization	2012 Patents	2011 Patents
1	1	International Business Machines Corp.	6,457	6,148
2	2	Samsung Electronics Co., Ltd.	5,043	4,868
3	8	Sony Corp.	3,608	2,265
4	3	Canon K.K.	3,307	2,922
5	5	Panasonic Corp.	2,829	2,689
6	4	Hitachi, Ltd.	2,723	2,857
7	7	Microsoft Corp.	2,704	2,368
8	13	LG Electronics Inc.	2,682	1,404
9	6	Toshiba Corp.	2,601	2,666
10	11	General Electric Co.	2,040	1,697
11	10	Siemens Corp.	2,000	1,698
12	9	Fujitsu Ltd.	1,923	1,762
13	19	Toyota Jidosha K.K.	1,491	1,140
14	21	Qualcomm, Inc.	1,471	1,055
15	12	Seiko Epson Corp.	1,454	1,525

Note the industries!

Monetizing Patents is a BIG industry

- Licensing patents
  - IBM ~$1 billion/yr
  - Qualcomm ~ $6 -$10 billion/yr
  - Caltech ~$30 million/yr
  - Nortel sold its patents for ~$4.5 billion
- Patent aggregating companies (eg. Intellectual Ventures, RPX)
- Patent Licensing Companies (MOSAID, WiLAN)
- Patent trolls (eg. NTP)

Who patents?

- Large and medium sized corporations
  - Pfizer, Bombardier, RIM, CAE, Proctor & Gamble
- Universities
- Hospitals
- Start-Ups
- Inventors working in their basements

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(12) **Patent Application Publication**

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(43) **Pub. Date: Oct. 17, 2013**

(54) **SNOWMOBILE SUSPENSION LOAD ADJUSTING MECHANISM**

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(73) Assignee: **BOMBARDIER RECREATIONAL PRODUCTS INC.**, Valcourt, QC (CA)

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(2), (4) Date: **Apr. 24, 2013**

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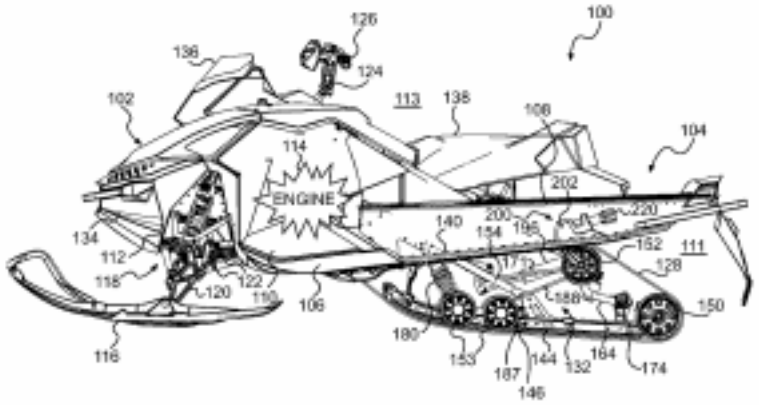
B62M 27/02 (2006.01)

(52) **U.S. Cl.**
CPC ***B62M 27/02*** (2013.01)
USPC **180/193**

(57) **ABSTRACT**

A snowmobile has a tunnel and a rear suspension assembly. The rear suspension assembly includes at least one rail for engagement with the endless drive track and at least one suspension arm. At least one torsion spring is coupled to the at least second suspension arm. The at least one torsion spring has a first end contacting the rail and a second end. A torsion spring adjuster is fixedly connected to the at least one suspension arm. The torsion spring adjuster receives the second end of the at least one torsion spring. An actuator is operatively connected to the torsion spring adjuster. The actuator is located at least partially outside the tunnel. The actuator operates the torsion spring adjuster to move the second end of the at least one torsion spring relative to the first end of the at least one torsion spring.



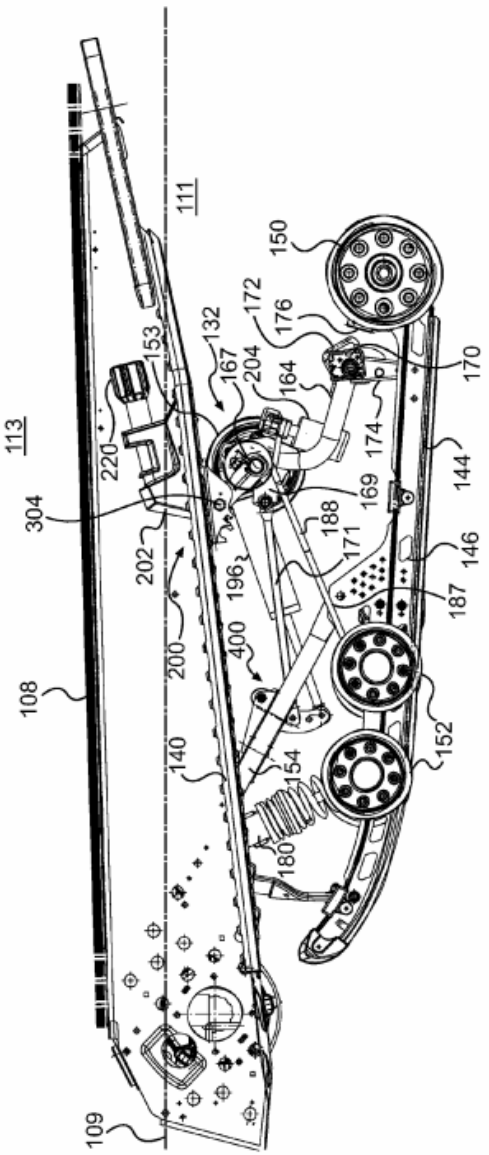

111
150
172
176
132
153
167
204
164
170
113
220
174
144
304
169
188
171
146
202
196
187
200
400
108
140
154
152
180
109

FIG. 2

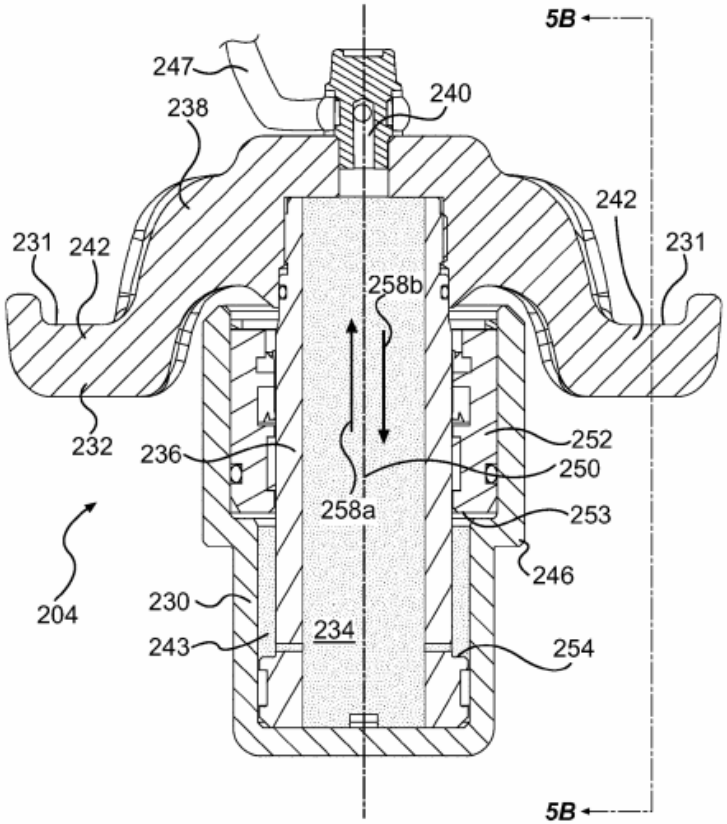
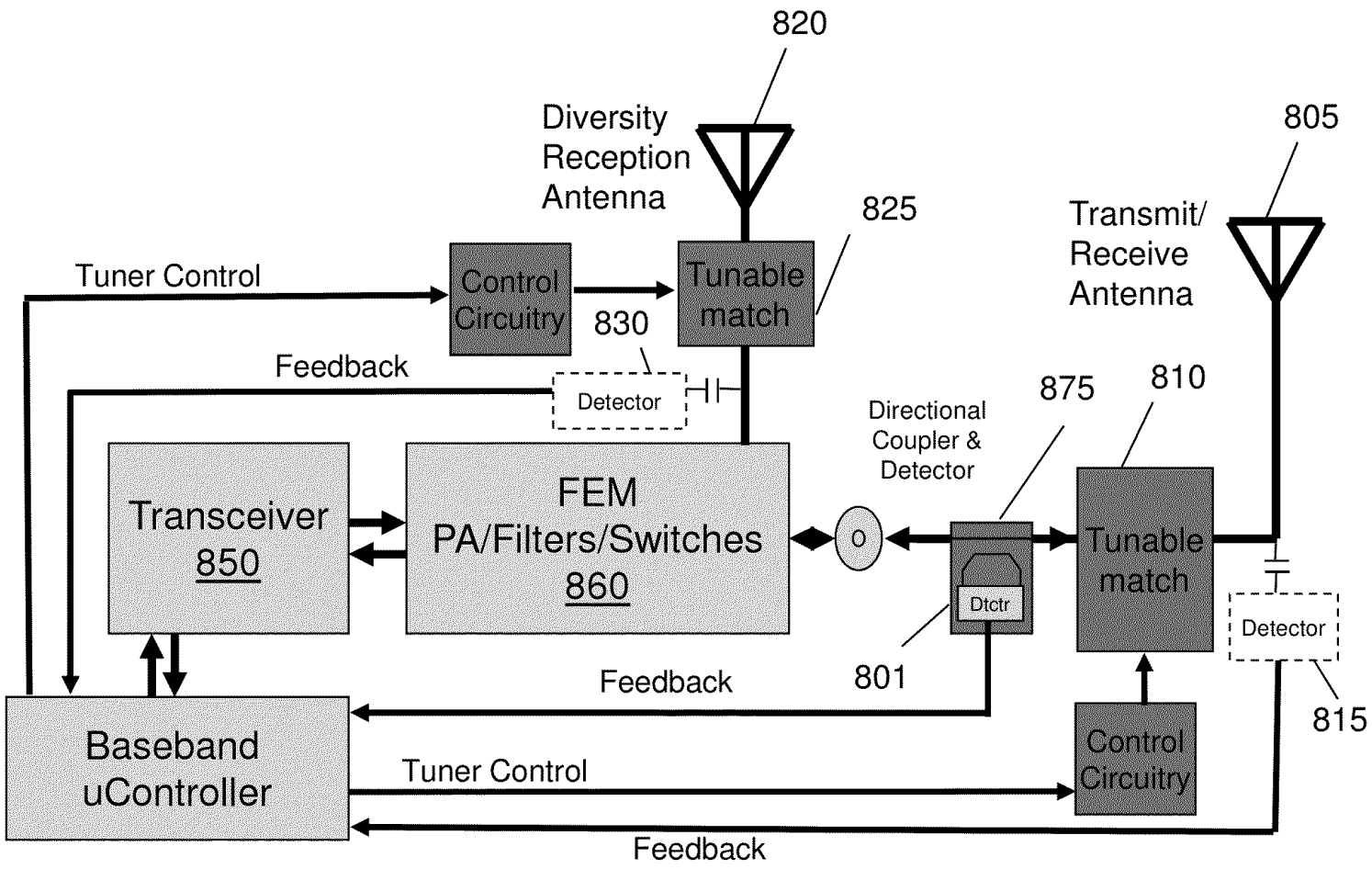

5B
247
240
238
242
231
242
231
258b
232
236
252
250
258a
253
246
204
230
234
243
254
5B

FIG. 5A


820
Diversity
Reception
Antenna
805
Transmit/
Receive
Antenna
825
Tuner Control
Control
Circuitry
Tunable
match
830
Feedback
Detector
875
810
Directional
Coupler &
Detector
Transceiver
850
FEM
PA/Filters/Switches
860
Tunable
match
Dtctr
Detector
801
Feedback
815
Baseband
uController
Control
Circuitry
Tuner Control
Feedback

800

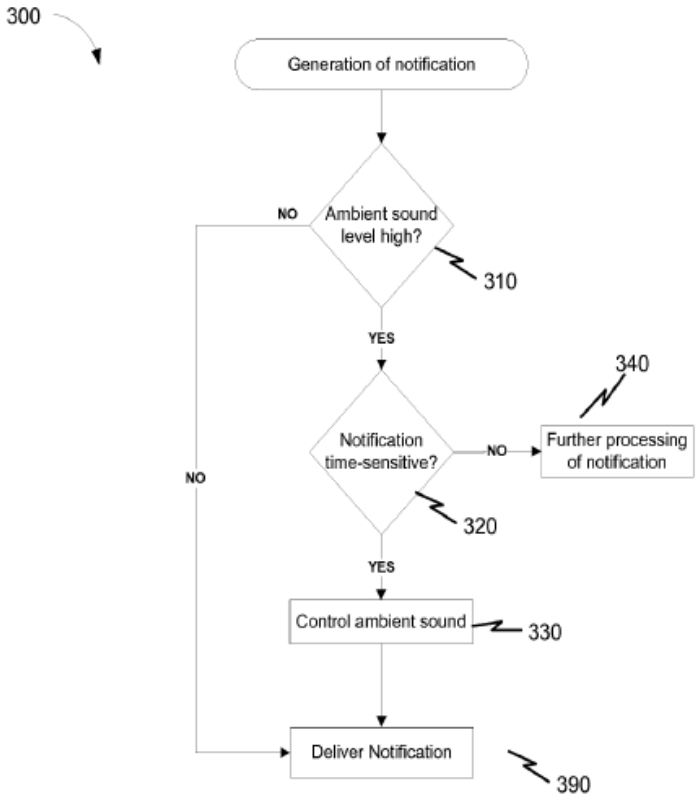

300
Generation of notification
Ambient sound level high?
NO
310
YES
340
Notification time-sensitive?
NO
Further processing of notification
NO
320
YES
Control ambient sound
330
Deliver Notification
390

FIG. 3

SNOWMOBILE SUSPENSION LOAD ADJUSTING MECHANISM

TECHNICAL FIELD

[0001] The present invention relates to load adjusting mechanisms of suspension assemblies for tracked vehicles, and more particularly to load adjusting mechanisms of rear suspension assemblies for snowmobiles.

BACKGROUND

[0002] Some snowmobile rear suspensions have been enhanced with adjustable features for adapting the rear suspension to individual needs of riders. Commonly, the snowmobile rear suspensions have adjustable shock absorbers which alter the compression and rebound damping of the shock absorbers of the snowmobile rear suspension. Additionally, snowmobile rear suspensions have adjustments which are linked to the amount of tension within the coil and torsion springs of the snowmobile rear suspension. Such adjustments are done manually by the user. By adjusting the load (or preload) of the (one or more) torsion springs, the user can change the suspension characteristics to meet his/her desired characteristics.

[0003] The torsion springs are used to expand the rear suspension after it has been compressed so that it is ready to absorb a subsequent impact. The torsion springs are disposed around a transverse rod of the rear suspension arm(s) of the rear suspension. The first end of each torsion spring is in contact with the slide rails and the second end is in contact with the rear suspension arm. The torsion springs apply a bias force to rotate the rear suspension arm with respect to the slide rails so as to raise the tunnel away from the ground. Sometimes, only one torsion spring is used.

[0004] In one system, the short end of the torsions springs, i.e. the second end in contact with the rear suspension arm, is received on a rotatable block. The block has one or more sides which are non-equally distanced from the rotation axis of the block, such that the preload of the torsion springs can be altered by rotating the block. The preload of the torsion springs is determined by the side of the block in contact with the second ends of the torsion springs. The rotation of the block is done manually using a tool such as a wrench, by applying a torque to the block so as to rotate it.

[0005] In order to rotate the block, the user may have to kneel on the ground and extend his/her arm under the tunnel into the rear suspension system when accessing the block. As can be easily understood, such position can be cumbersome to apply sufficient force to rotate the block. In some cases, the user can dirty his clothing if contact is made with some of the snowmobile rear suspension components while making the adjustment.

[0006] Therefore, there is a need for a mechanism to adjust the load (or preload) on a torsion spring of a rear suspension assembly that is easily accessible to for the user.

SUMMARY

[0007] It is an object of the present invention to ameliorate at least some of the inconveniences present in the prior art.

[0008] A snowmobile is provided which has a load adjuster for a rear suspension located at least partially on an outside of a tunnel of the snowmobile.

[0009] In one aspect, a snowmobile has a chassis including a tunnel. The tunnel has a longitudinal axis. An engine is disposed on the chassis. An endless drive track is disposed at least in part inside the tunnel and operatively connected to the engine for propulsion of the snowmobile. At least one ski is disposed on the frame via a front suspension. A straddle seat is disposed on the tunnel above the endless drive track. The straddle seat is disposed rearward of the engine. A rear suspension assembly is supporting and tensioning the endless drive track. The rear suspension assembly includes at least one rail for engagement with the endless drive track. At least one suspension arm has an upper end pivotally connected to the tunnel and a lower end pivotally connected to the at least one rail. At least one torsion spring is coupled to the at least one suspension arm via a transverse rod. The at least one torsion spring has a first end and a second end. The first end applies a force the at least one rail. A torsion spring adjuster is connected to the at least one suspension arm. The torsion spring adjuster receives the second end of the at least one torsion spring. An actuator is operatively connected to the torsion spring adjuster. The actuator is located at least partially outside the tunnel. The actuator operates the torsion spring adjuster to move the second end of the at least one torsion spring relative to the first end of the at least one torsion spring.

[0010] In a further aspect, the torsion spring adjuster is hydraulically operated by the actuator.

[0011] In an additional aspect, the actuator includes a first volume of hydraulic fluid. The torsion spring adjuster includes a second volume of the hydraulic fluid. The first volume is in fluid communication with the second volume.

[0012] In a further aspect, the actuator includes a controller. When the controller is in a first position, at least a portion of the first volume of hydraulic fluid is transferred to the second volume of hydraulic fluid. When the controller is in a second position, at least a portion of the second volume of hydraulic fluid is transferred to the first volume of hydraulic fluid.

[0013] In an additional aspect, when at least the portion of the first volume of hydraulic fluid is transferred to the second volume of hydraulic fluid, a load on the at least one torsion spring is increased. When at least the portion of the second volume of hydraulic fluid is transferred to the first volume of hydraulic fluid, the load on the at least one torsion spring is decreased.

[0014] In a further aspect, increasing the load on the at least one torsion spring is achieved by moving the second end of the at least one torsion spring away from the first end of the at least one torsion spring. Decreasing the load on the at least one torsion spring is achieved by moving the second end of the at least one torsion spring toward the first end of the at least one torsion spring.

[0015] In an additional aspect, the controller is a hand-actuable knob.

[0016] In a further aspect, the actuator includes a piston, and the controller is operatively connected to the piston for transferring at least the portion of the first volume of hydraulic fluid to and from the second volume of hydraulic fluid.

[0017] In an additional aspect, the controller is a hand-actuable knob, and the controller is operatively connected to the piston via a threaded rod.

[0018] In a further aspect, the torsion spring adjuster includes a fixed portion fixedly connected to the at least second suspension arm. The torsion spring adjuster includes a movable portion receiving the second end of the at least one torsion spring.

pension arm **154** and the rear suspension arm **164**, as it will be described in greater details below. It is contemplated that the coupling could be ensured differently.

[0062] A front shock absorber assembly **180** disposed between the front suspension arm **154** and the slide frame assembly **144** extends rearwardly and downwardly from the front portion of the front suspension arm **154**. A lower end of the front shock absorber assembly **180** is disposed forwardly of the lower ends of the front suspension arm **154**. The front shock absorber assembly **180** is a damping unit which usually includes a hydraulic damper and a coil spring for absorbing the impact energy when impact forces are applied to the opposite ends of the damping unit. The coil spring biases the damping unit toward an extended position so that the hydraulic damper is in the best position to absorb the impact energies. Shock absorber assemblies of the type of the shock absorber assembly **180** are well known in the art and will not be further described herein.

[0063] The rear shock absorber **196** extends forwardly and downwardly from the rear suspension arm **164**, and is disposed at least in part rearwardly of the front suspension arm **154**. The rear shock absorber **196**, similar to the hydraulic damper of front shock absorber assembly **180**, is well known in the art, and therefore will not be described in detail. The rear shock absorber **196** is pivotally connected at its upper end to brackets **192**, **193** to the rear suspension arm **164**. The rear shock absorber **196** is connected at a lower end to the front suspension arms **154** via a pivot connection to left and right bracket arms and links **400**.

[0064] Left and right tie rods **171** (only the left one being shown) are disposed on each side of the rear shock absorber **196**. A lower end of each of the left and right tie rods **171** is pivotally connected to a corresponding one of the left and right links **400**. An upper end of each of the left and right tie rods **171** is pivotally connected to a bracket **169** fixed to rear suspension arm **164**.

[0065] Upon motion of the rear suspension arm **164**, the rear shock absorber **196** gets actuated thereby moving the left and right tie rods **171**. The shock absorber **196**, the tie rods **171** and the links **400** form an assembly through which the pivot movement of the rear suspension arm **164** about pivot point **304** and relative to the tunnel **108** of the chassis **106** forces the left and right bracket arms **400** to act on the front suspension arms **154**, thereby applying a force to the front portion of the tunnel **108**, and actuating the front shock absorber assembly **180**.

[0066] Left and right torsion springs **188** (only the left one being shown in FIG. **1**, both being shown in FIG. **3**A) are provided in order to push the slide frame assembly **144** apart from the tunnel **108** of the chassis **106**, and to maintain the front and rear shock absorber assemblies **180**, **196** substantially in an extended condition when no substantial loads are applied thereon. The left and right torsion springs **188** surround the transverse shaft **167** and are positioned at each end thereof. A first end **187** of each torsion spring **188** abuts the slide frame assembly **144** and applies a force thereto. It is contemplated that the first end **187** could abut the front suspension arm **154** and apply a force to the slide frame assembly **144**. A second end **189** of each torsion spring **188** abuts a torsion spring adjuster **204**. It is contemplated that the snowmobile **100** could have only one torsion spring **188**.

[0067] Turning now to FIGS. **3**B to **6**, the load adjusting mechanism **200** will now be described.

[0068] As mentioned above, the load adjusting mechanism **200** comprises the torsion spring adjuster **204** and the actuator **202**, which are disposed remotely from each other.

[0069] The actuator **202** is located on a rear portion of the left foot rest **140**, which is a location easily accessible to the user. It is contemplated that the actuator **202** could be disposed elsewhere on the outside **113** of the tunnel **108**. For example, the actuator **202** could be located on a different part of the left foot rest **140**, or on the right foot rest **140**, or elsewhere else on or above an upper surface of the tunnel **108**. It is also contemplated that only a portion of the actuator **202** could be located on the foot rests **140** or elsewhere on the outside **113** of the tunnel **108**. As will be described below, the actuator **202** includes a hydraulic mechanism for actuating the torsion spring adjuster **204**. It is contemplated that the hydraulic mechanism could be remote from the actuator **202**. For example, the hydraulic mechanism could be located on the inside **111** of the tunnel **108** while the actuator **202** could be located on the outside **113** of the tunnel **108**. It is also contemplated that the hydraulic mechanism could be part of the torsion spring adjuster **204** itself, while the actuator **202** could be a switch. Examples of switches include a button on the handlebar **126** or a pedal, disposed remotely from the hydraulic actuator. It is contemplated that the actuator **202** could be a pump activated by an electric motor or a solenoid. The motor could be actuated by a switch as described above.

[0070] As best seen in FIG. **3**B, the torsion spring adjuster **204** is disposed in between and is connected to the rear suspension arm **164**, about the bend of the L shape of the rear suspension arm **164**. It is contemplated that the torsion spring adjuster **204** could be located somewhere else on the rear suspension arm **164**. It is also contemplated that the torsion spring adjuster **204** could be located elsewhere on the rear suspension assembly **132**. A connection of the torsion spring adjuster **204** to the rear suspension arm **164** will be described in greater detail below.

[0071] Referring to FIG. **4**, the actuator **202** comprises a fixed portion **210**, and a movable portion **212**. The movable portion **212** includes a piston **216** mounted to one end of a threaded shaft **218**. A first volume **214** of hydraulic fluid (shown in shading) is defined by inner walls of the fixed portion **210** and the piston **216**. Another end of the threaded shaft **218** has a hand-actuable knob **220** fixedly attached thereto. As indicated by arrows **222***a* and **222***b*, the user can turn the knob **220** in two directions. When the user turns the knob **220** in any one of the directions **222***a*, **222***b*, the threaded shaft **218** transform this rotational motion into a translational motion (illustrated by arrows **224***a*, **224***b* respectively) via a threaded end cap **226**. The translational motion increases or decreases the first volume **214** of hydraulic fluid due to the displacement of the piston **216**. An exit **239** in the fixed portion **210** disposed opposite to the piston **216** allows the hydraulic fluid to enter or exit the actuator **202**. It is contemplated that the exit **239** could be disposed on sides of the fixed portion **210**. It is also contemplated that the knob **220** could be replaced by a hand actuated lever or dial or by one or more finger actuated buttons or one or more pedals. It is also contemplated that the knob **220** and/or the actuator **202** could be replaced by an automatic command of the torsion spring adjuster **204**.

[0072] Referring to FIGS. **5**A and **5**B, the torsion spring adjuster **204** comprises a fixed portion **230** and a movable portion **232**. The fixed portion **230** has a general hollow cylindrical shape. The movable portion **232** comprises a

Vehicles

Honda

Bombardier

Airbus

Consumer products

Smartphone devices, applications

Interactive crowd game technology

Augmented reality, virtual shopping

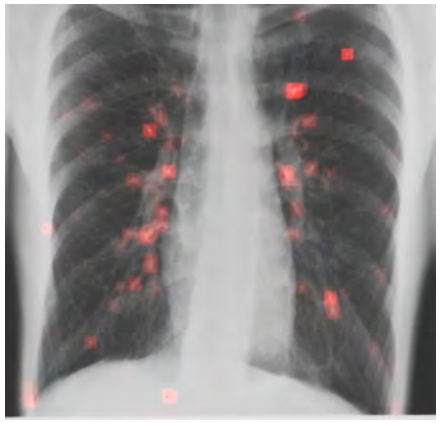
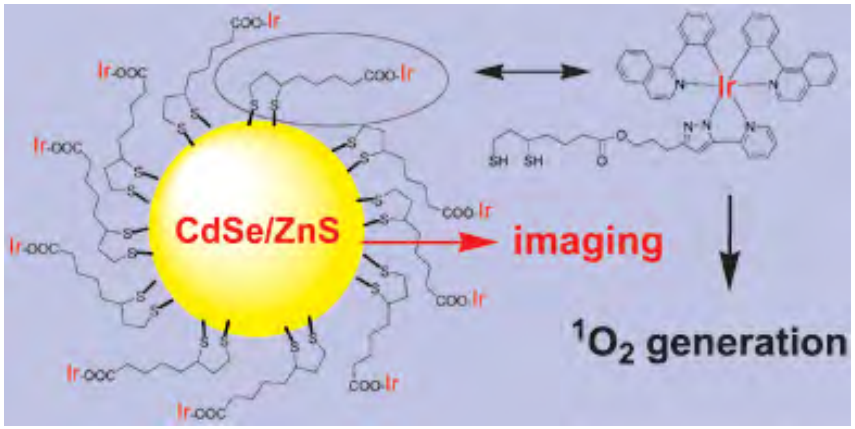


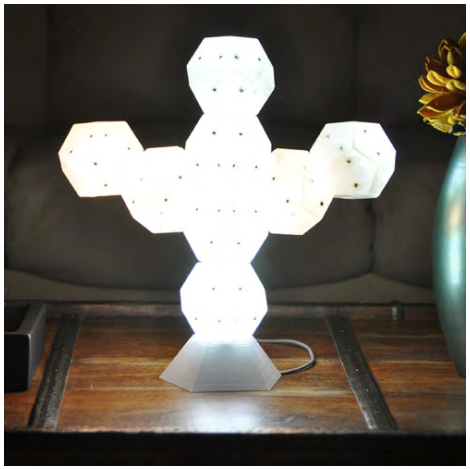
Image processing

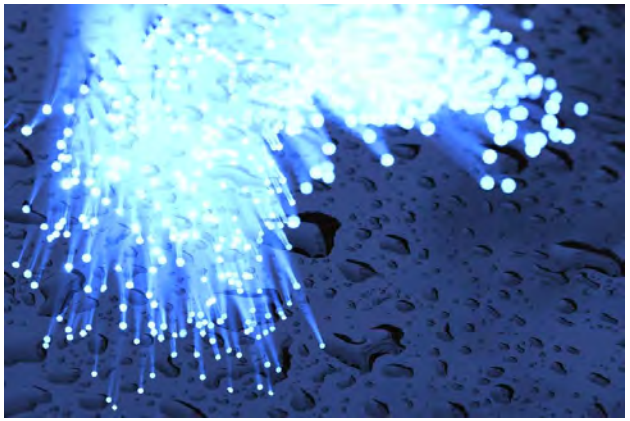


Quantum dot manufacturing process

Medical devices

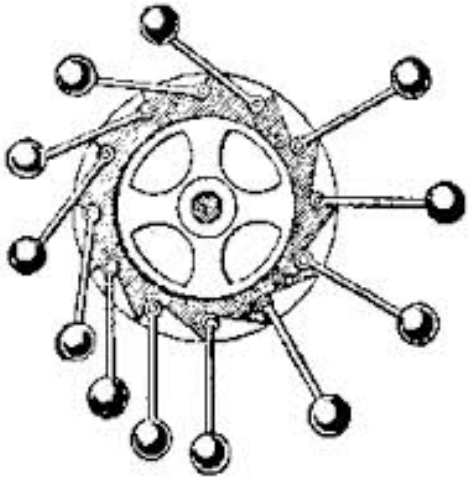
LED fixtures, optical fibers





Waste management

Trading methods



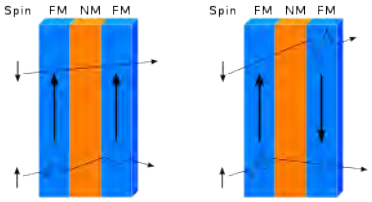
Crazy machines

Bathroom fixtures

My Path from Physics to Patents

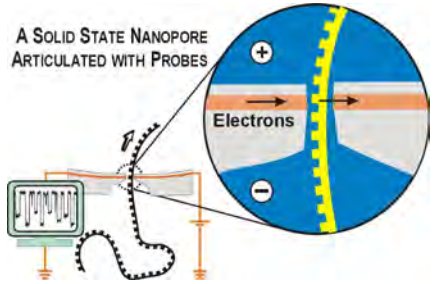
- Undergraduate studies (Applied Physics)

- Graduate studies (MS, PhD, Applied Physics, Minor in Materials Science)



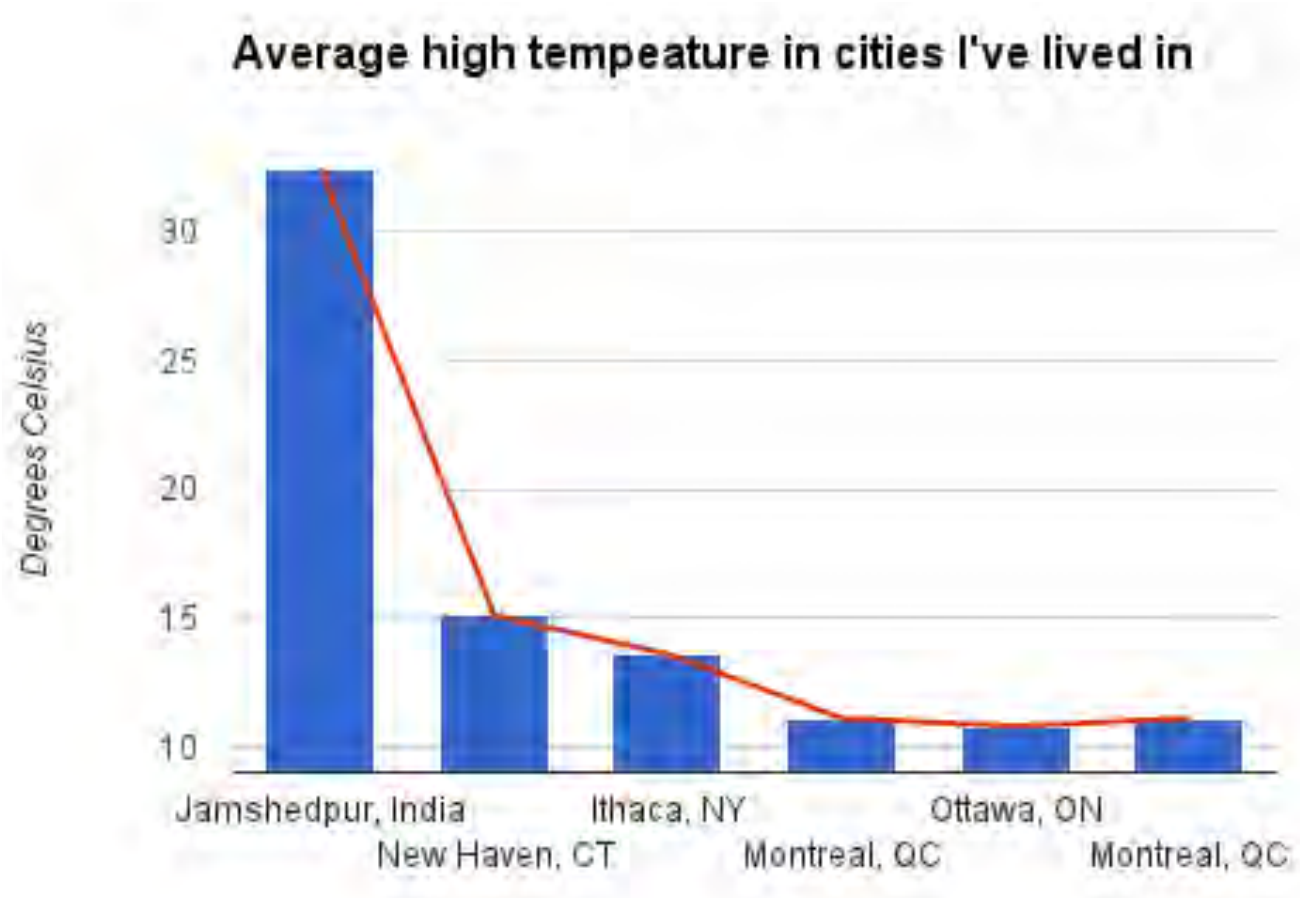
- Postdoctoral Research

- Teaching



- Patent Law firm

Should I really be giving advice to anyone?



What does a Patent Specialist do?

- Write
- Read
- Research (web-based)
- Communicate with clients – scientists, engineers, lawyers, business people, other patent professionals…

What Exactly?

- Patentability Search
- Draft patent applications
- Prosecution – argue with the patent office
- Analysis & Opinions
  - Patentability
  - Freedom to Operate
  - Infringement
  - Validity
- Advise regarding strategy, costs, timeline

How does my physics background help in my career as a patent specialist?

- Science
  - mechanics, E&M, chemistry, circuits, optics
- Technical skills
  - fabrication, programming, image processing
- Other relevant skills
  - Reading dense papers
  - quickly skimming papers
  - Performing searches
  - staying abreast of new developments in the field(s)
  - Interacting with a wide range of personalities

Useful/Desirable Skills

- Ability to write precisely and clearly
- Ability to synthesize large amounts of material
- Ability to work under time constraints
- Organization
- Attention to detail
- Breadth of knowledge

Work Environment/Lifestyle

- At a desk/computer in an office
- Mostly work alone
- Flexible hours but also need to work in the evenings, weekends, holidays etc. when necessary
- Deadlines
- Need to keep track of time spent on various tasks
- Colleagues not that different from a lab environment, really varies depending on the company

Where does a Patent Specialist Work?

- Legal firm
- Patent Office
- In-House
  - Large companies (IBM, Bombardier, Ericsson,…)
  - Universities
  - Government (NRC, Health Canada, …)
  - “Centers” (private/provincial/federal, MaRS Center, hospitals, incubators,…)
- Solo/Independent practice

General aspects of the profession

- Generally in larger cities

- Can work as an solo practitioner

- Constantly changing, need to stay abreast of developments

Things I like about my job

- Variety
- Get into the nitty-gritty details how things work but also keep the big picture in mind
- Dealing with technological, commercial, legal challenges
- Work is influenced by, and in turn influences, many different areas (policy, laws, international treaties, market, competitors)
- International aspect
- Clear targets for advancement (billable hrs/year)

Things I like less

- Difficult exams
- Subjective unlike physics - often there is no RIGHT or WRONG answer
- Lots of details
  - Forms, rules, deadlines
- "Service Industry"
  - Sometimes you are not part of the decision making process, you do what the client tells you to do, even if you disagree.
- At the end of the day, it's a business
  - People get fired, laid off, people get hired, products get shelved, clients business goes bankrupt
- Surrounded by lawyers!

If you want to work in IP

- Get a strong and broad background in science/technology
- Gain experience working in the science/tech
- Maybe get a law degree (not necessary)
- Contact people in the industry, keep an eye out for openings
- Get your foot in the door
- Take the Patent Agent Exams

Questions?