Patent Owner SRAM's Demonstrative Exhibits

PTAB Hearing for
IPR2024-00492

***Inter Partes* Review of**
U.S. Patent No. 7,147,207

May 15, 2025

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

(10) **Patent No.: US 7,147,207 B2**
(45) **Date of Patent: Dec. 12, 2006**

(54) **ACTUATOR APPARATUS FOR CONTROLLING A VALVE MECHANISM OF A SUSPENSION SYSTEM**

(75) Inventors: **Brian Jordan**, Chicago, IL (US); **Kevin Wesling**, Lombard, IL (US); **Christopher Shipman**, Chicago, IL (US); **Eric Swaidner**, Colorado Springs, CO (US); **John Cheever**, Chicago, IL (US)

(73) Assignee: **SRAM Corporation**, Chicago, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/904,340**

(22) Filed: **Nov. 4, 2004**

(65) **Prior Publication Data**

US 2006/0091345 A1 May 4, 2006

(51) **Int. Cl.**
F16K 31/44 (2006.01)

(52) **U.S. Cl.** **251/263**; 267/64.18; 188/322.22

(58) **Field of Classification Search** 251/251, 251/262, 263; 267/64.15, 64.18, 293; 188/321.11, 188/322.15, 322.22
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,745,517 A 5/1956 Zook
4,036,335 A 7/1977 Thompson
4,305,486 A 12/1981 Cowan
4,488,704 A * 12/1984 Wicker 251/265
5,505,281 A 4/1996 Lee
6,279,703 B1 8/2001 Mete
6,360,857 B1 3/2002 Fox
2003/0234144 A1 12/2003 Fox

FOREIGN PATENT DOCUMENTS

GB 1415608 11/1975

OTHER PUBLICATIONS

Mountain Bike Action Suspension Special, pp. 75-78, Feb. 1991.
Ceriani Product Catalog, Circa 1991.
One set of five pages of photographs of a Ceriani Fork.
Cross-sectional schematic of a Ceriani Fork.

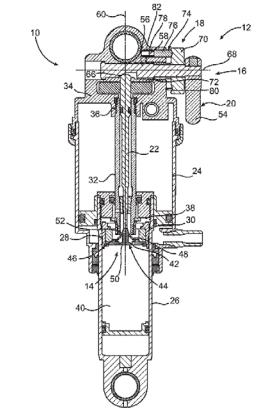
* cited by examiner

Primary Examiner—Edward K. Look
Assistant Examiner—John K. Fristoe, Jr.
(74) *Attorney, Agent, or Firm*—Milan Milosevic; Lisa Serdynski

(57) **ABSTRACT**

An actuator apparatus controls a valve mechanism of a suspension system. The apparatus includes a valve actuating assembly and an adjuster assembly. The valve actuating assembly is operatively connected to the valve mechanism and is operable between at least two rider-selectable positions to adjust the valve mechanism between various suspension settings. The adjuster assembly is operatively connected to the valve actuating assembly for adjusting the damping characteristics corresponding to at least one of the positions of the valve actuating assembly independently of the damping characteristics corresponding to another position of the valve actuating assembly.

12 Claims, 18 Drawing Sheets

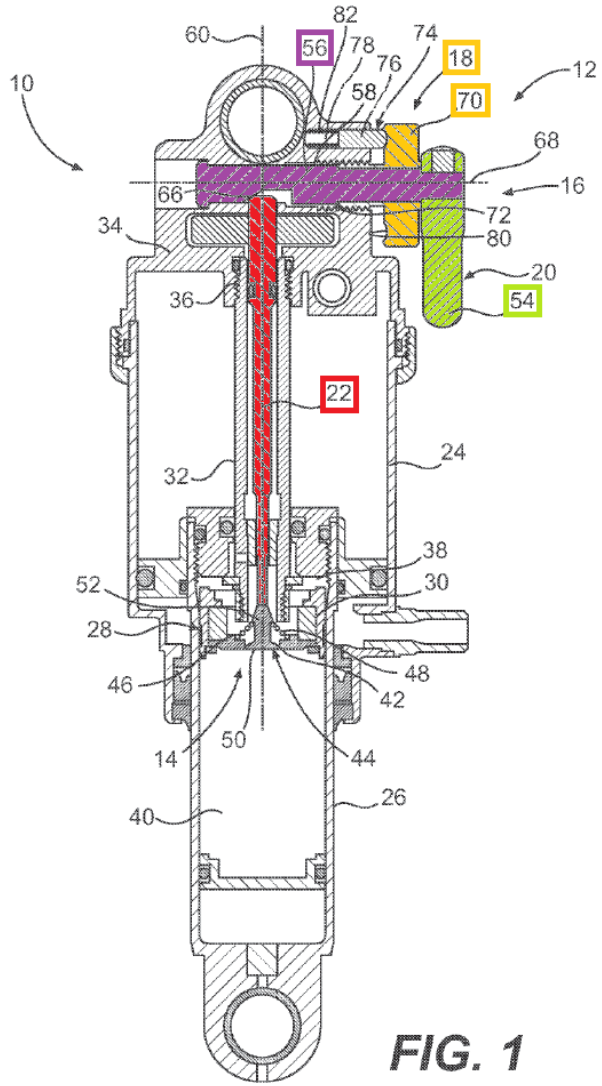


'207 Patent (Ex. 1001), cover page

Introduction

- The ‘207 Patent is a **leap forward** in convenience and customization for suspension systems
- The inventions claimed in the ‘207 Patent yield the best of both worlds in damping adjustment:
  - One lever position having preset damping characteristics, and
  - A second lever position that can have its damping characteristics adjusted without affecting the first preset option

‘207 Patent at Fig. 1

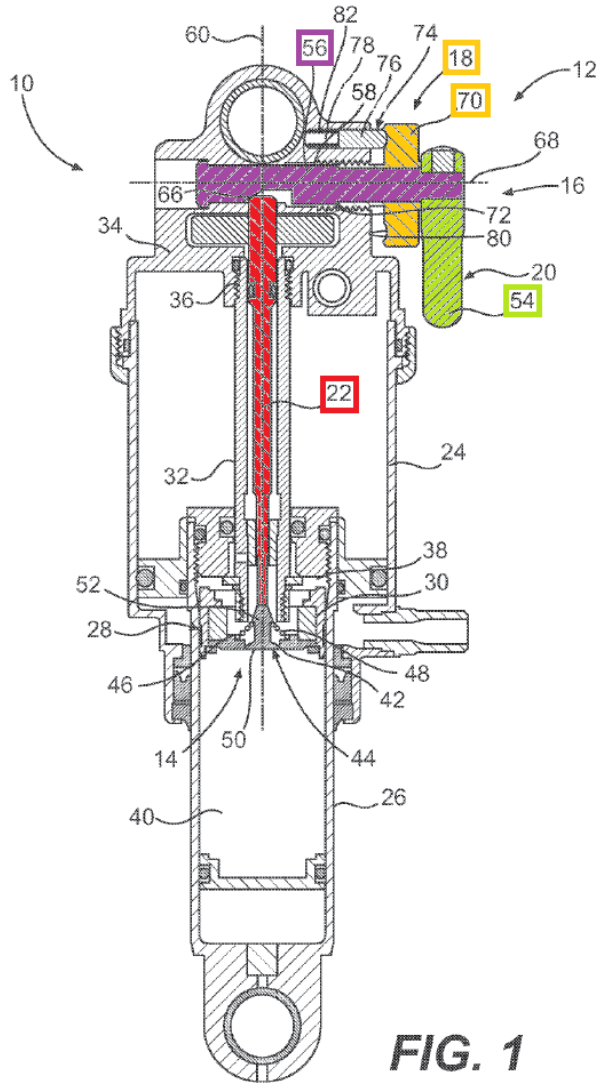


POR (Paper 16) at 1–2; ‘207 Patent (Ex. 1001) at FIG. 1

Introduction

- The Board encouraged the parties to develop the record on:
  - If a POSITA would understand Fox to disclose an adjuster assembly
  - If JP'279's damping adjustment is "finer" than other prior art's damping adjustment
- SRAM's Response (Paper 16) shows that Fox's cam-based damping system has no adjuster assembly, and JP'279 provides no "finer" adjustment than Fox or Yi
- Petitioner's Reply (Paper 18) fails to counter SRAM's clear evidence

'207 Patent at Fig. 1



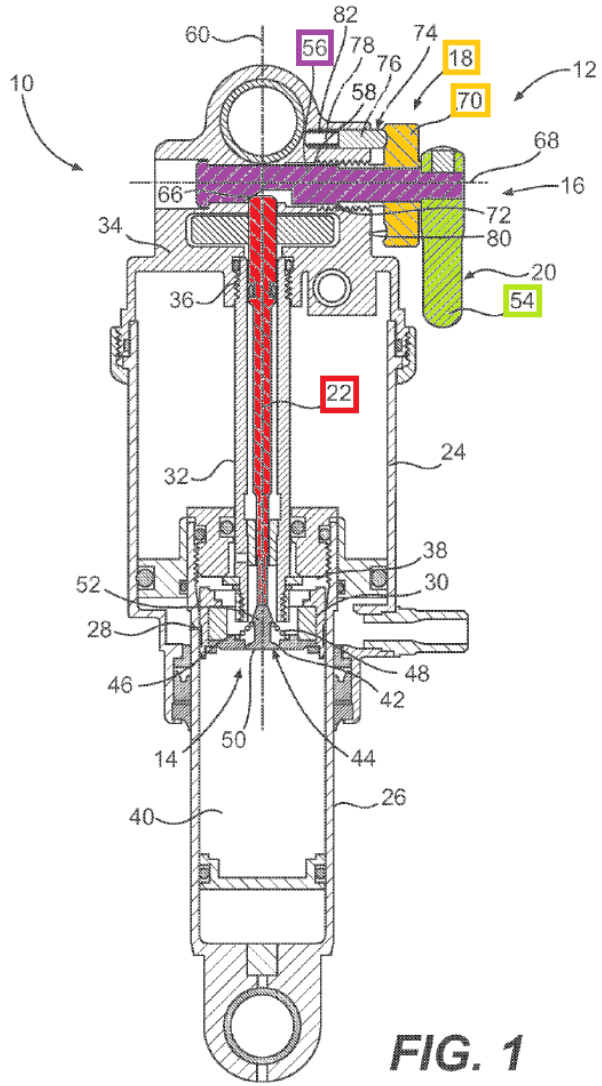
Institution Decision (Paper 11) at 19, 25–26, 31–32; POR (Paper 16) at 18–32, 36–46, 48–55; Sur-Reply (Paper 24); '207 Patent (Ex. 1001) at FIG. 1

The ‘207 Patent

- The ‘207 Patent is directed to suspension systems like those typically used with bicycles

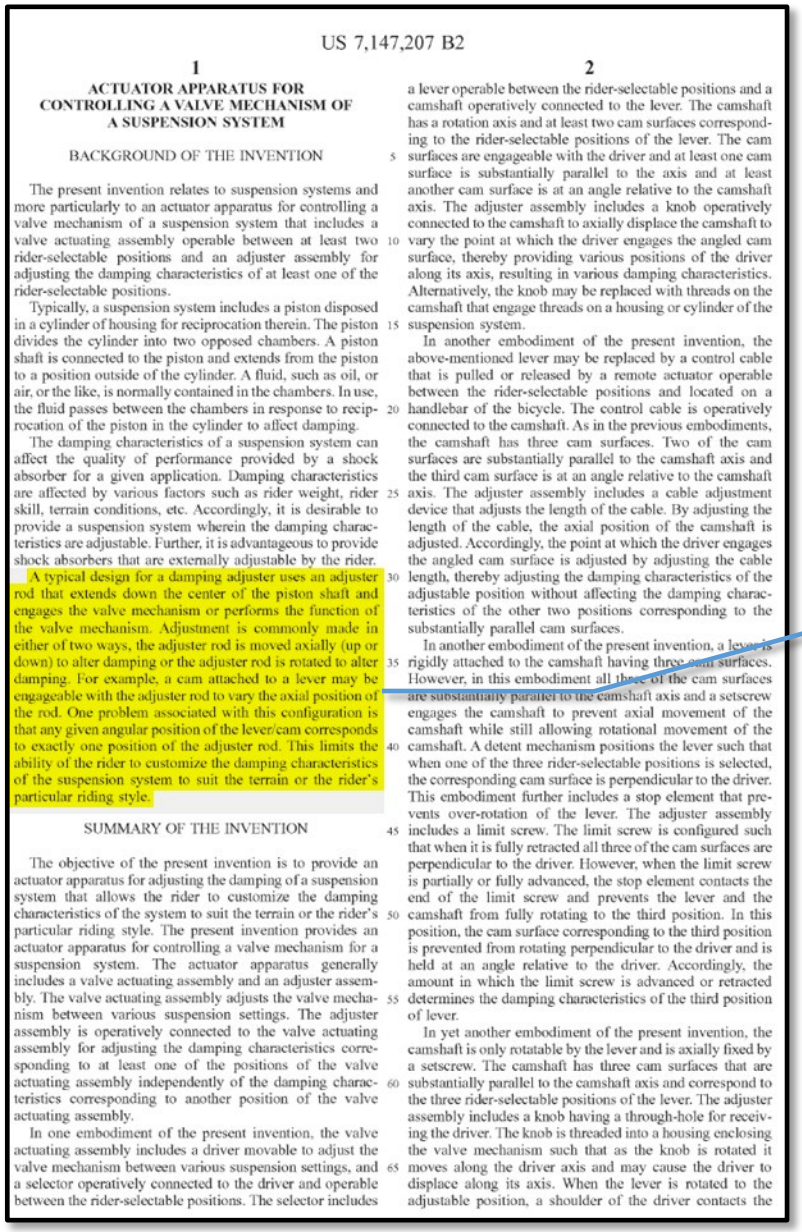


‘207 Patent at Fig. 1



POR (Paper 16) at 10; ‘207 Patent (Ex. 1001) at FIG. 1, 2:16–20, 6:10–40, 8:33–42; Ex. 2016 (Parnell) at ¶40

The '207 Patent



US 7,147,207 B2

1

ACTUATOR APPARATUS FOR CONTROLLING A VALVE MECHANISM OF A SUSPENSION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to suspension systems and more particularly to an actuator apparatus for controlling a valve mechanism of a suspension system that includes a valve actuating assembly operable between at least two rider-selectable positions and an adjuster assembly for adjusting the damping characteristics of at least one of the rider-selectable positions.

Typically, a suspension system includes a piston disposed in a cylinder of housing for reciprocation therein. The piston divides the cylinder into two opposed chambers. A piston shaft is connected to the piston and extends from the piston to a position outside of the cylinder. A fluid, such as oil, or air, or the like, is normally contained in the chambers. In use, the fluid passes between the chambers in response to reciprocation of the piston in the cylinder to affect damping.

The damping characteristics of a suspension system can affect the quality of performance provided by a shock absorber for a given application. Damping characteristics are affected by various factors such as rider weight, rider skill, terrain conditions, etc. Accordingly, it is desirable to provide a suspension system wherein the damping characteristics are adjustable. Further, it is advantageous to provide shock absorbers that are externally adjustable by the rider.

A typical design for a damping adjuster uses an adjuster rod that extends down the center of the piston shaft and engages the valve mechanism or performs the function of the valve mechanism. Adjustment is commonly made in either of two ways, the adjuster rod is moved axially (up or down) to alter damping or the adjuster rod is rotated to alter damping. For example, a cam attached to a lever may be engageable with the adjuster rod to vary the axial position of the rod. One problem associated with this configuration is that any given angular position of the lever/cam corresponds to exactly one position of the adjuster rod. This limits the ability of the rider to customize the damping characteristics of the suspension system to suit the terrain or the rider's particular riding style.

SUMMARY OF THE INVENTION

The objective of the present invention is to provide an actuator apparatus for adjusting the damping of a suspension system that allows the rider to customize the damping characteristics of the system to suit the terrain or the rider's particular riding style. The present invention provides an actuator apparatus for controlling a valve mechanism for a suspension system. The actuator apparatus generally includes a valve actuating assembly and an adjuster assembly. The valve actuating assembly adjusts the valve mechanism between various suspension settings. The adjuster assembly is operatively connected to the valve actuating assembly for adjusting the damping characteristics corresponding to at least one of the positions of the valve actuating assembly independently of the damping characteristics corresponding to another position of the valve actuating assembly.

In one embodiment of the present invention, the valve actuating assembly includes a driver movable to adjust the valve mechanism between various suspension settings, and a selector operatively connected to the driver and operable between the rider-selectable positions. The selector includes

2

a lever operable between the rider-selectable positions and a camshaft operatively connected to the lever. The camshaft has a rotation axis and at least two cam surfaces corresponding to the rider-selectable positions of the lever. The cam surfaces are engageable with the driver and at least one cam surface is substantially parallel to the axis and at least another cam surface is at an angle relative to the camshaft axis. The adjuster assembly includes a knob operatively connected to the camshaft to axially displace the camshaft to vary the point at which the driver engages the angled cam surface, thereby providing various positions of the driver along its axis, resulting in various damping characteristics. Alternatively, the knob may be replaced with threads on the camshaft that engage threads on a housing or cylinder of the suspension system.

In another embodiment of the present invention, the above-mentioned lever may be replaced by a control cable that is pulled or released by a remote actuator operable between the rider-selectable positions and located on a handlebar of the bicycle. The control cable is operatively connected to the camshaft. As in the previous embodiments, the camshaft has three cam surfaces. Two of the cam surfaces are substantially parallel to the camshaft axis and the third cam surface is at an angle relative to the camshaft axis. The adjuster assembly includes a cable adjustment device that adjusts the length of the cable. By adjusting the length of the cable, the axial position of the camshaft is adjusted. Accordingly, the point at which the driver engages the angled cam surface is adjusted by adjusting the cable length, thereby adjusting the damping characteristics of the adjustable position without affecting the damping characteristics of the other two positions corresponding to the substantially parallel cam surfaces.

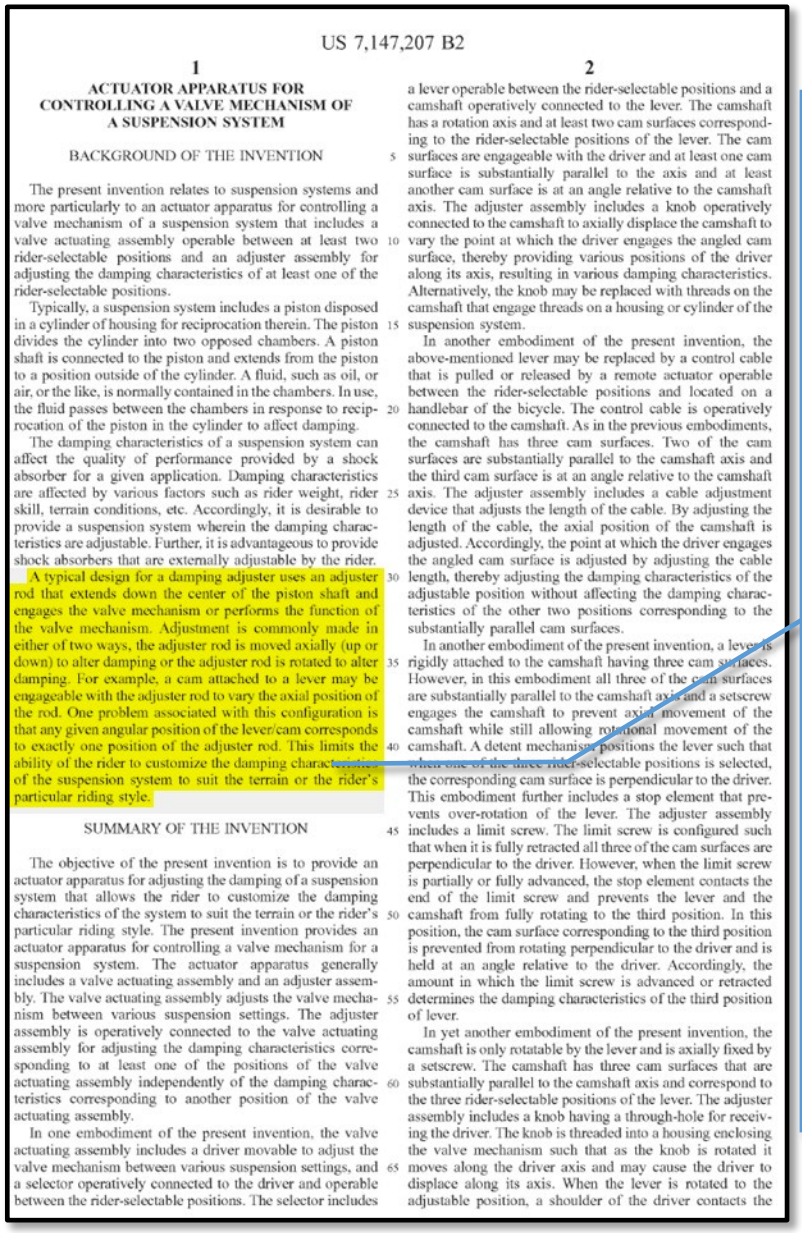
In another embodiment of the present invention, a lever is rigidly attached to the camshaft having three cam surfaces. However, in this embodiment all three of the cam surfaces are substantially parallel to the camshaft axis and a setscrew engages the camshaft to prevent axial movement of the camshaft while still allowing rotational movement of the camshaft. A detent mechanism positions the lever such that when one of the three rider-selectable positions is selected, the corresponding cam surface is perpendicular to the driver. This embodiment further includes a stop element that prevents over-rotation of the lever. The adjuster assembly includes a limit screw. The limit screw is configured such that when it is fully retracted all three of the cam surfaces are perpendicular to the driver. However, when the limit screw is partially or fully advanced, the stop element contacts the end of the limit screw and prevents the lever and the camshaft from fully rotating to the third position. In this position, the cam surface corresponding to the third position is prevented from rotating perpendicular to the driver and is held at an angle relative to the driver. Accordingly, the amount in which the limit screw is advanced or retracted determines the damping characteristics of the third position of lever.

In yet another embodiment of the present invention, the camshaft is only rotatable by the lever and is axially fixed by a setscrew. The camshaft has three cam surfaces that are substantially parallel to the camshaft axis and correspond to the three rider-selectable positions of the lever. The adjuster assembly includes a knob having a through-hole for receiving the driver. The knob is threaded into a housing enclosing the valve mechanism such that as the knob is rotated it moves along the driver axis and may cause the driver to displace along its axis. When the lever is rotated to the adjustable position, a shoulder of the driver contacts the

A typical design for a damping adjuster uses an adjuster rod that extends down the center of the piston shaft and engages the valve mechanism or performs the function of the valve mechanism. Adjustment is commonly made in either of two ways, the adjuster rod is moved axially (up or down) to alter damping or the adjuster rod is rotated to alter damping. For example, a cam attached to a lever may be engageable with the adjuster rod to vary the axial position of the rod. One problem associated with this configuration is that any given angular position of the lever/cam corresponds to exactly one position of the adjuster rod. This limits the ability of the rider to customize the damping characteristics of the suspension system to suit the terrain or the rider's particular riding style.

'207 Patent (Ex. 1001) at 1:30–43; POR (Paper 16) at 4–5, 22–23

The '207 Patent



US 7,147,207 B2

1

ACTUATOR APPARATUS FOR CONTROLLING A VALVE MECHANISM OF A SUSPENSION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to suspension systems and more particularly to an actuator apparatus for controlling a valve mechanism of a suspension system that includes a valve actuating assembly operable between at least two rider-selectable positions and an adjuster assembly for adjusting the damping characteristics of at least one of the rider-selectable positions.

Typically, a suspension system includes a piston disposed in a cylinder of housing for reciprocation therein. The piston divides the cylinder into two opposed chambers. A piston shaft is connected to the piston and extends from the piston to a position outside of the cylinder. A fluid, such as oil, or air, or the like, is normally contained in the chambers. In use, the fluid passes between the chambers in response to reciprocation of the piston in the cylinder to affect damping.

The damping characteristics of a suspension system can affect the quality of performance provided by a shock absorber for a given application. Damping characteristics are affected by various factors such as rider weight, rider skill, terrain conditions, etc. Accordingly, it is desirable to provide a suspension system wherein the damping characteristics are adjustable. Further, it is advantageous to provide shock absorbers that are externally adjustable by the rider.

A typical design for a damping adjuster uses an adjuster rod that extends down the center of the piston shaft and engages the valve mechanism or performs the function of the valve mechanism. Adjustment is commonly made in either of two ways, the adjuster rod is moved axially (up or down) to alter damping or the adjuster rod is rotated to alter damping. For example, a cam attached to a lever may be engageable with the adjuster rod to vary the axial position of the rod. One problem associated with this configuration is that any given angular position of the lever/cam corresponds to exactly one position of the adjuster rod. This limits the ability of the rider to customize the damping characteristics of the suspension system to suit the terrain or the rider's particular riding style.

SUMMARY OF THE INVENTION

The objective of the present invention is to provide an actuator apparatus for adjusting the damping of a suspension system that allows the rider to customize the damping characteristics of the system to suit the terrain or the rider's particular riding style. The present invention provides an actuator apparatus for controlling a valve mechanism for a suspension system. The actuator apparatus generally includes a valve actuating assembly and an adjuster assembly. The valve actuating assembly adjusts the valve mechanism between various suspension settings. The adjuster assembly is operatively connected to the valve actuating assembly for adjusting the damping characteristics corresponding to at least one of the positions of the valve actuating assembly independently of the damping characteristics corresponding to another position of the valve actuating assembly.

In one embodiment of the present invention, the valve actuating assembly includes a driver movable to adjust the valve mechanism between various suspension settings, and a selector operatively connected to the driver and operable between the rider-selectable positions. The selector includes

2

a lever operable between the rider-selectable positions and a camshaft operatively connected to the lever. The camshaft has a rotation axis and at least two cam surfaces corresponding to the rider-selectable positions of the lever. The cam surfaces are engageable with the driver and at least one cam surface is substantially parallel to the axis and at least another cam surface is at an angle relative to the camshaft axis. The adjuster assembly includes a knob operatively connected to the camshaft to axially displace the camshaft to vary the point at which the driver engages the angled cam surface, thereby providing various positions of the driver along its axis, resulting in various damping characteristics. Alternatively, the knob may be replaced with threads on the camshaft that engage threads on a housing or cylinder of the suspension system.

In another embodiment of the present invention, the above-mentioned lever may be replaced by a control cable that is pulled or released by a remote actuator operable between the rider-selectable positions and located on a handlebar of the bicycle. The control cable is operatively connected to the camshaft. As in the previous embodiments, the camshaft has three cam surfaces. Two of the cam surfaces are substantially parallel to the camshaft axis and the third cam surface is at an angle relative to the camshaft axis. The adjuster assembly includes a cable adjustment device that adjusts the length of the cable. By adjusting the length of the cable, the axial position of the camshaft is adjusted. Accordingly, the point at which the driver engages the angled cam surface is adjusted by adjusting the cable length, thereby adjusting the damping characteristics of the adjustable position without affecting the damping characteristics of the other two positions corresponding to the substantially parallel cam surfaces.

In another embodiment of the present invention, a lever is rigidly attached to the camshaft having three cam surfaces. However, in this embodiment all three of the cam surfaces are substantially parallel to the camshaft axis and a setscrew engages the camshaft to prevent axial movement of the camshaft while still allowing rotational movement of the camshaft. A detent mechanism positions the lever such that when one of the three rider-selectable positions is selected, the corresponding cam surface is perpendicular to the driver. This embodiment further includes a stop element that prevents over-rotation of the lever. The adjuster assembly includes a limit screw. The limit screw is configured such that when it is fully retracted all three of the cam surfaces are perpendicular to the driver. However, when the limit screw is partially or fully advanced, the stop element contacts the end of the limit screw and prevents the lever and the camshaft from fully rotating to the third position. In this position, the cam surface corresponding to the third position is prevented from rotating perpendicular to the driver and is held at an angle relative to the driver. Accordingly, the amount in which the limit screw is advanced or retracted determines the damping characteristics of the third position of lever.

In yet another embodiment of the present invention, the camshaft is only rotatable by the lever and is axially fixed by a setscrew. The camshaft has three cam surfaces that are substantially parallel to the camshaft axis and correspond to the three rider-selectable positions of the lever. The adjuster assembly includes a knob having a through-hole for receiving the driver. The knob is threaded into a housing enclosing the valve mechanism such that as the knob is rotated it moves along the driver axis and may cause the driver to displace along its axis. When the lever is rotated to the adjustable position, a shoulder of the driver contacts the

In other words, the '207 Patent disparages:

- A cam (camshaft) attached to a lever and engageable with an axially moving adjuster rod

BECAUSE:

- Any given angular position of the lever/cam corresponds to only one position of the adjuster rod

WHICH RESULTS IN:

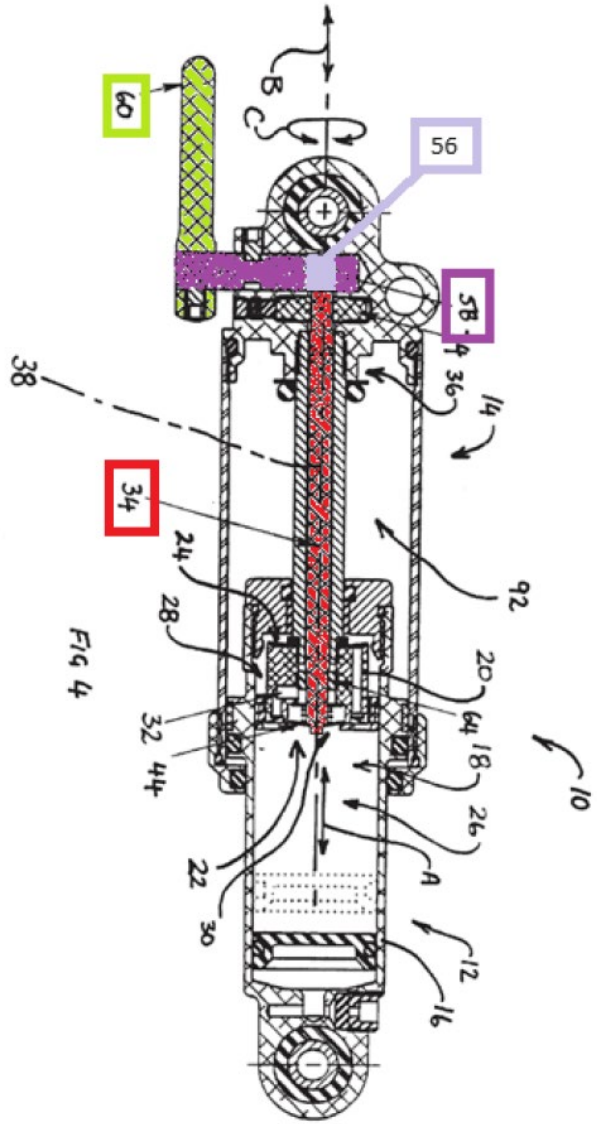
- The position of the adjuster rod dictating the damping characteristics

'207 Patent (Ex. 1001) at 1:30–43; POR (Paper 16) at 4–5, 22–23

Fox (Ex. 1005) is disparaged prior art

- Fox shows such a disparaged damping adjuster with:
  - a lever **60** (green),
  - a camshaft **58** (purple) having a cam **56** (light purple), and
  - an adjuster rod **34** (red)
- For any given angular position of Fox's lever **60** (green), there is only one suspension setting and damping characteristic

Fox (Ex. 1005) at Fig. 4

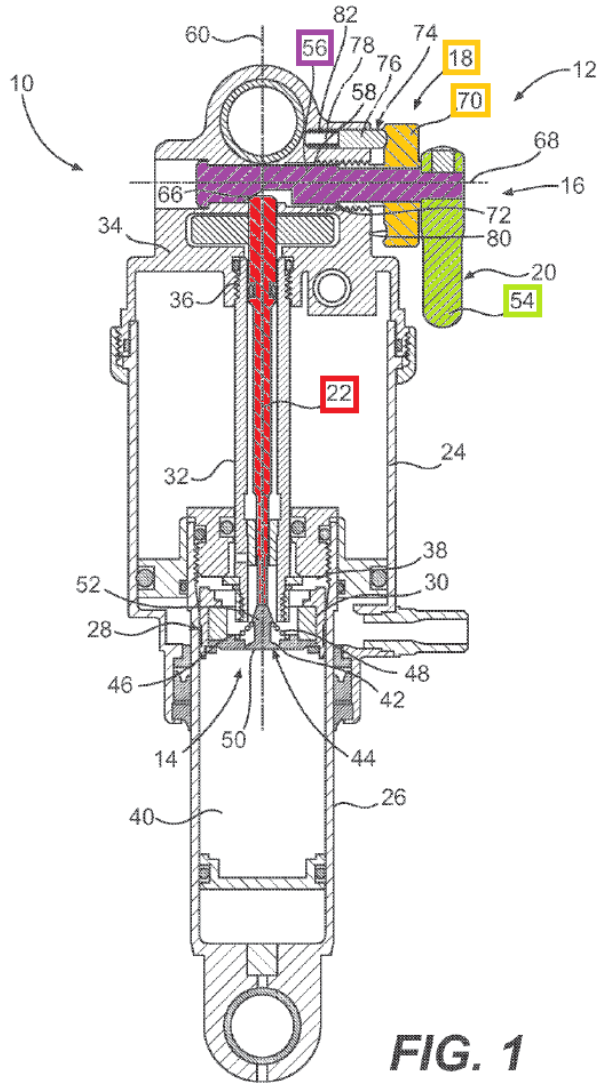


POR (Paper 16) at 6–7; Ex. 2016 (Parnell) at ¶¶32–34

The ‘207 Patent Invention

- The ‘207 Patent improves upon the disparaged prior art by adding a novel adjuster assembly (shown in yellow)
- The adjuster assembly (**18/70**) permits:
  - at least one lever position with the same damping characteristic in all cases, and
  - at least one lever position that can have its damping characteristics adjusted via the adjuster assembly without affecting the first lever position damping characteristics

‘207 Patent at Fig. 1



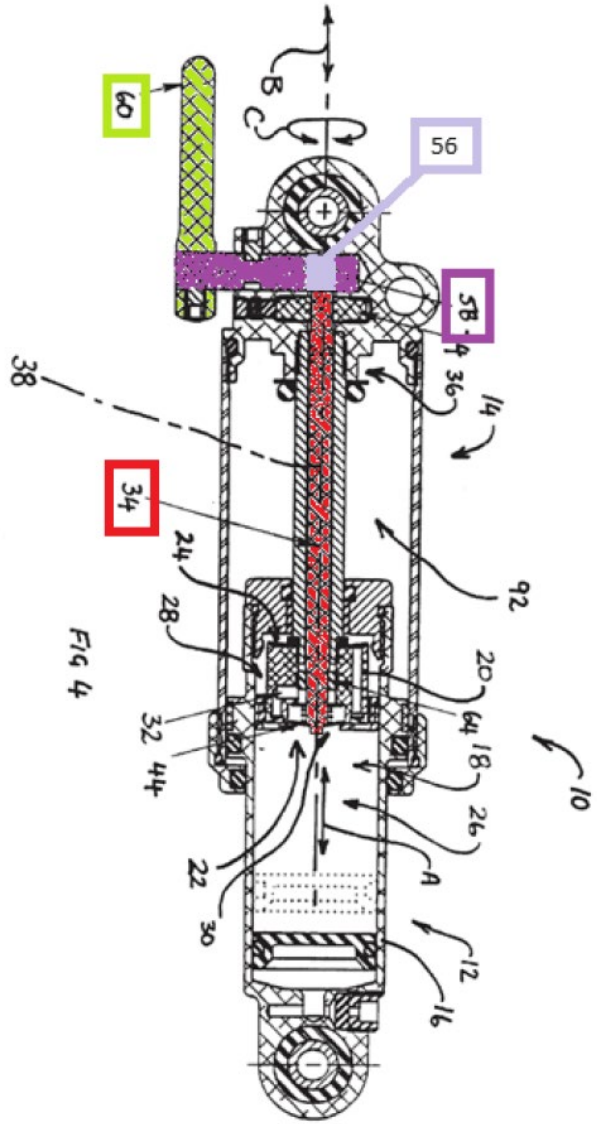
POR (Paper 16) at 6–7; Ex. 2016 (Parnell) at ¶¶32–34; ‘207 Patent (Ex. 1001) at FIG. 1

Ground 1: Fox (Ex. 1005) Does Not Anticipate the Challenged Claims of the '207 Patent

Ground 1 (Fox) Fails

- Fox discloses the same damping adjuster disparaged in the '207 Patent
  - For any given angular position of Fox's lever **60** (green), there is only one position of the adjuster rod/driver and associated damping characteristics
- The Challenged Claims of the '207 Patent are inventive over disparaged prior art like Fox

Fox (Ex. 1005) at Fig. 4



POR (Paper 16) at 6–7; Sur-Reply (Paper 23) at 3–6; Ex. 2016 (Parnell) at ¶¶32–34

Ground 1 (Fox) Fails

- Fox's cam **56** (light purple) is exactly what is described in the '207 Patent's Background Section as a "cam attached to a lever"

- Fox was specifically considered by the Examiner during prosecution of the '207 Patent:

US Patent Documents

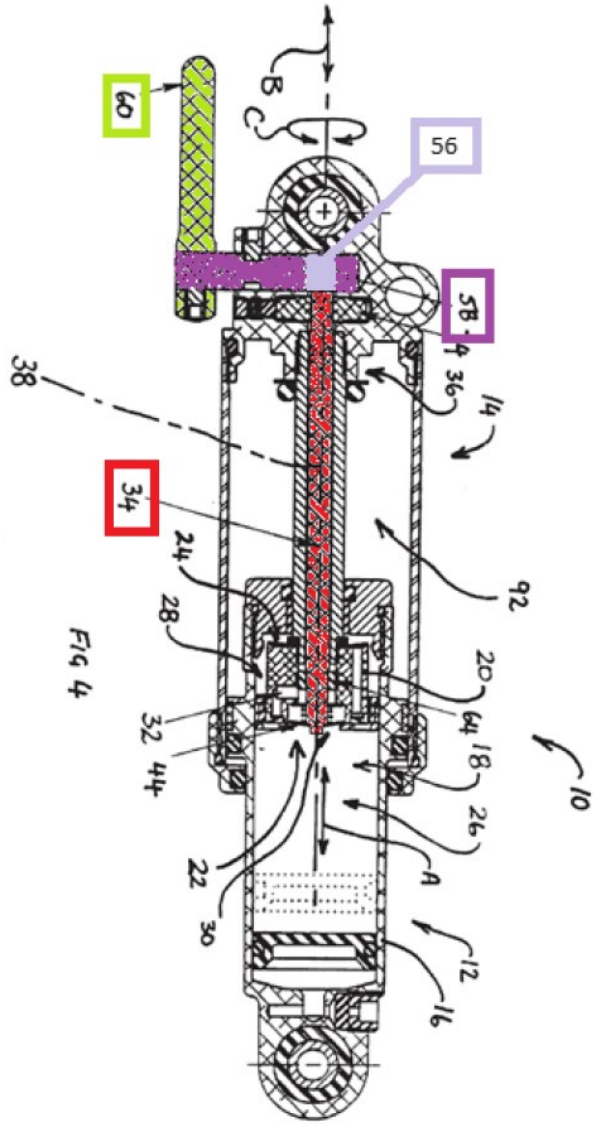
Note: Applicant is not required to submit a paper copy of cited US Patent Documents

init	Cite.No.	Patent No.	Date	Patentee	Kind	Class	Subclass
	1	6360857	2002-03-26	Fox			
	2	6279703	2001-08-28	Mete			
	3	4305483	1981-12-15	Cowan			
	4	2745517	1953-04-20	Zook			

Signature

Examiner Name	Date

Fox (Ex. 1005) at Fig. 4



POR (Paper 16) at 6–7; Sur-Reply (Paper 24) at 3–6, 14–18; Ex. 2016 (Parnell) at ¶¶26, 32–34

Ground 1 (Fox) Fails

- The separately recited "valve actuating assembly" and "adjuster assembly" are presumed to be separate structures "operatively connected" to each other
- Every embodiment in the '207 Patent discloses an "adjuster assembly" with structure separate from the "valve actuating assembly" and specifically for <u>adjusting</u> the damping characteristics of <u>at least one position</u> of the valve actuating assembly
- Petitioner's proposed Ground 1 does not describe any structure for the adjuster assembly that is separate from the valve actuating assembly

'207 Patent at FIGs. 7b & 7c

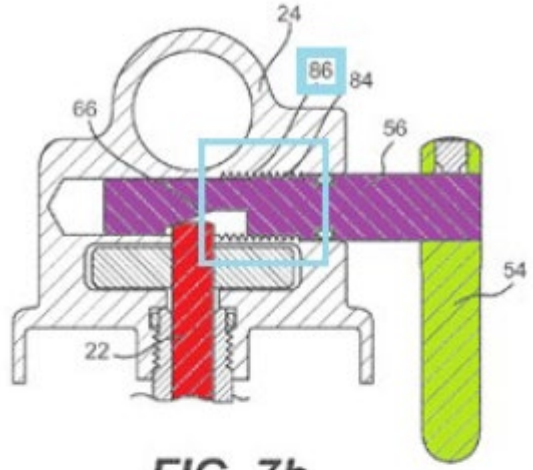


FIG. 7b

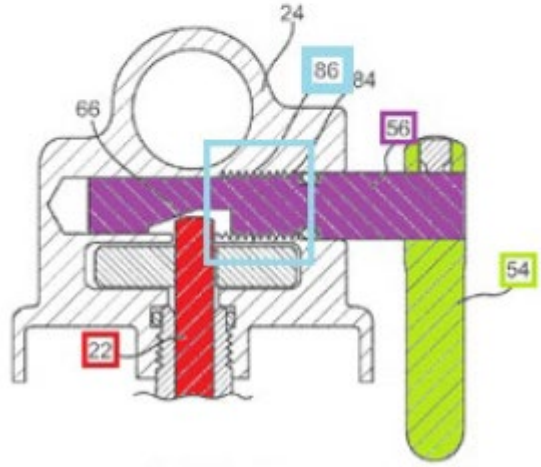


FIG. 7c

POR (Paper 16) at 3–16, 19–23; Sur-Reply (Paper 24) at 6–10; Ex. 2016 (Parnell) at ¶¶30–31, 40–47, 54–58

Ground 1 (Fox) Fails

- Petitioner's proposed reinterpretation of the term "adjuster assembly" to be nothing more than a subset of the "valve actuating assembly" components is contrary to every teaching of the '207 Patent

- The plain meaning of "adjuster assembly operatively connected to the valve actuating assembly" requires the adjuster assembly to have structure separate from the valve actuating assembly

'207 Patent at Figs. 7b & 7c

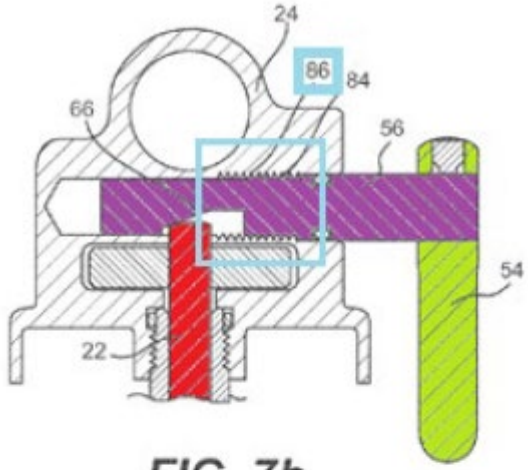


FIG. 7b

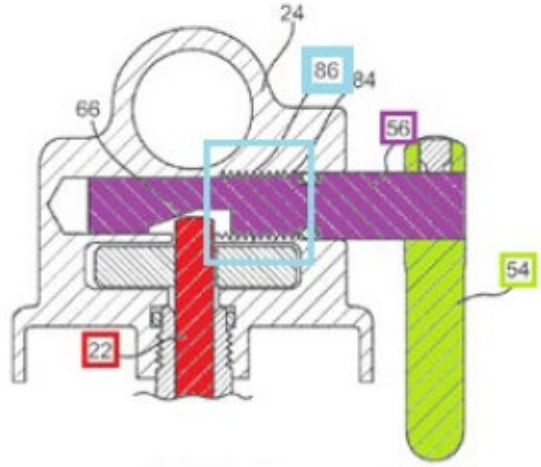


FIG. 7c

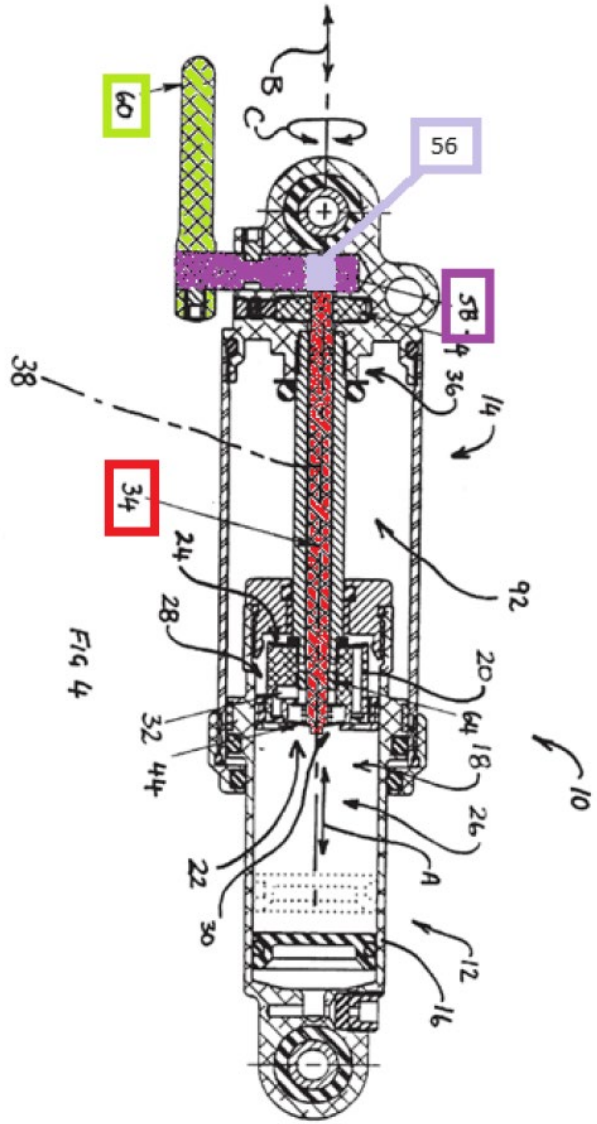
POR (Paper 16) at 18–23; Sur-Reply (Paper 24) at 6–10; Ex. 2016 (Parnell) at ¶¶40–47, 52–58

Ground 2: Fox (Ex. 1005) in view of JP'279 (Ex. 1007) and Nagai (Ex. 1008) Does Not Render the Challenged Claims of the '207 Patent Obvious

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Petitioner's proposed combination of Fox with JP'279 and Nagai fails to disclose the claimed adjuster assembly
- No valid motivation to combine Fox with JP'279, only improper hindsight

Fox (Ex. 1005) at Fig. 4

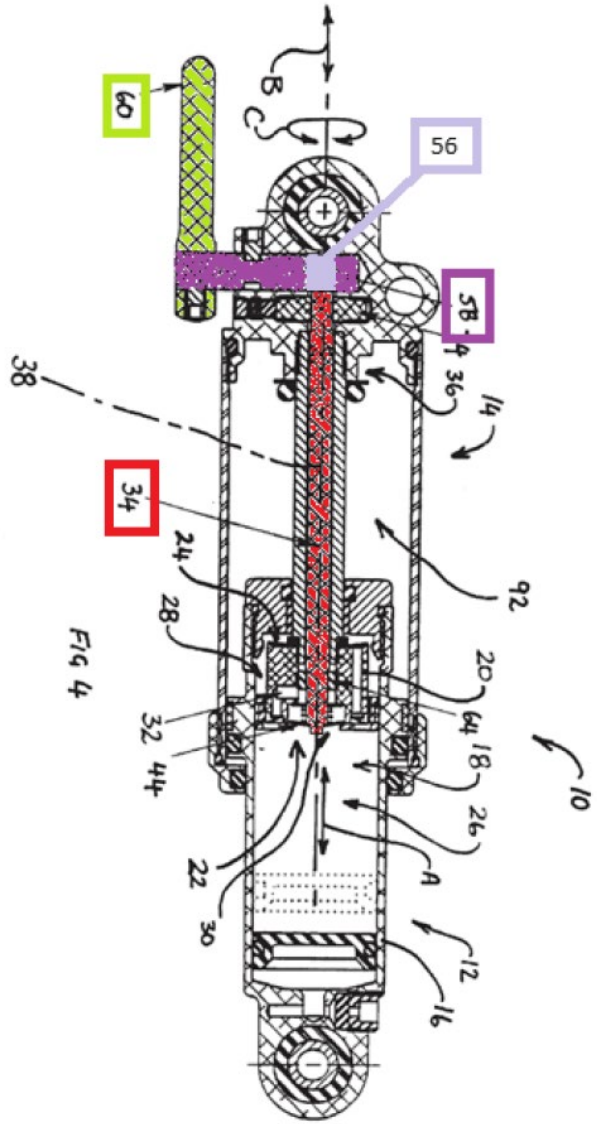


POR (Paper 16) at 6–7, 18–23, 32–46; Ex. 2016 (Parnell) at ¶¶32–35, 75–99

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Petitioner's proposed combination of Fox with JP'279 and Nagai fails to disclose <u>any</u> adjuster assembly
- Both Fox and JP'279 disclose damping adjusters that have one degree of freedom
- Forming a tapered surface over Fox's cam surface would result in a device with no positions of the lever that would be unaffected by the adjuster assembly

Fox (Ex. 1005) at Fig. 4



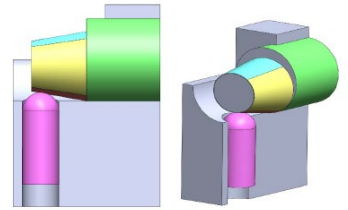
POR (Paper 16) at 6–7, 18–23, 32–36; Ex. 2016 (Parnell) at ¶¶32–34, 75–79

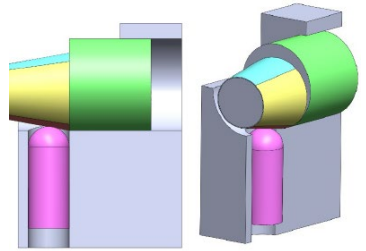
Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Dr. Slocum imagines "solid models" to show the purported combination of Fox and JP'279:

94. Below, I have created solid models illustrating in 3D such an exemplary arrangement, where tapered surfaces are added to a cam for fine adjustment of cam action. On the left is a simple eccentric cylinder cam and on the right is a set of tangent arcs to create three different cam radii regions for finer adjustment of cam action.

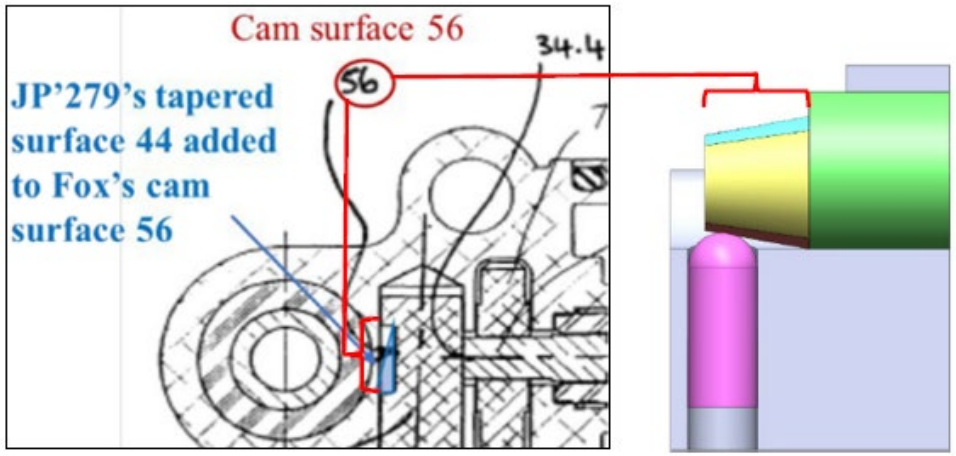
Slocum Declaration (Ex. 1003) at p. 67





Sur-Reply (Paper 23) at p. 15

- Dr. Slocum's figures clearly show the tapering across the entire cam surface
- This tapering would result in adjustment of all positions whenever the purported "adjuster assembly" is used

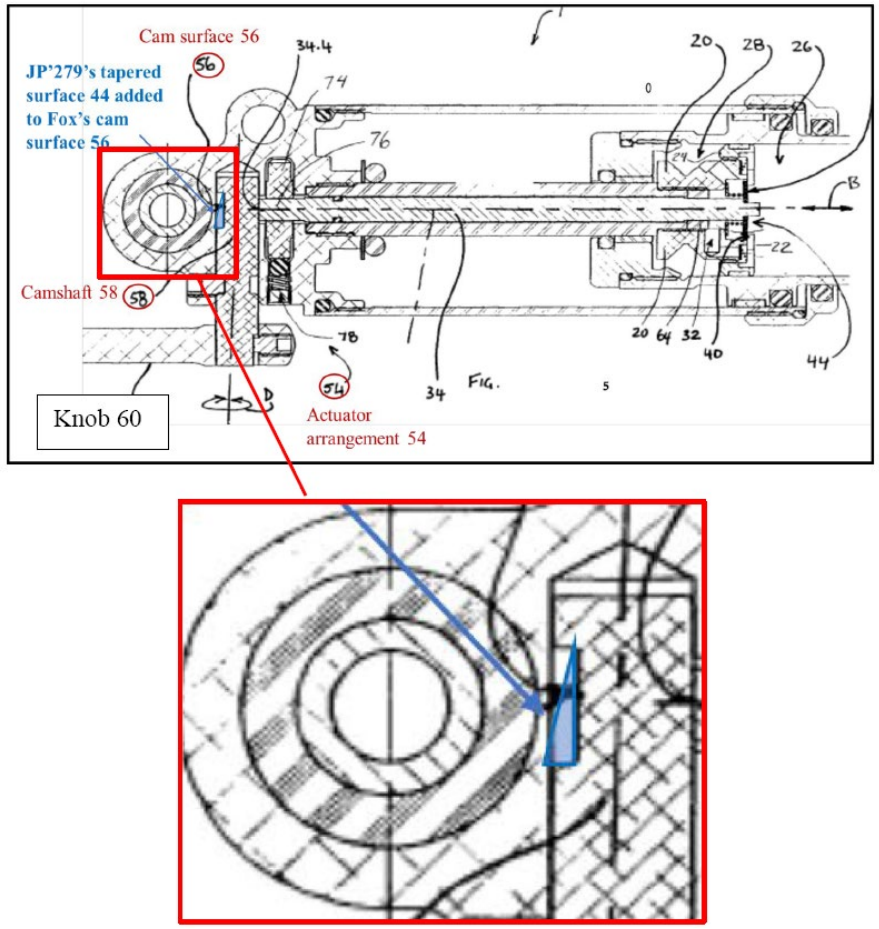


POR (Paper 16) at 33–36; Ex. 1003 (Slocum) at pp. 65–68, ¶¶93–96; Ex. 2016 (Parnell) at ¶78

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- The Petition cites the figure annotated on the right as representing the combination of Fox and JP'279 and states only that the "tapered surface 44 [of JP'279]" is "add[ed]" to Fox's "suspension system"
- No evidence connecting JP'279's gear **49** or axle **50** to Petitioner's annotated figure
- No evidence as to how a POSITA would incorporate JP'279's gear **49** or axle **50**
- No evidence as to how a POSITA would incorporate Nagai's stopper bolt **141**

Petition (Paper 1) at p. 50 (annotated)

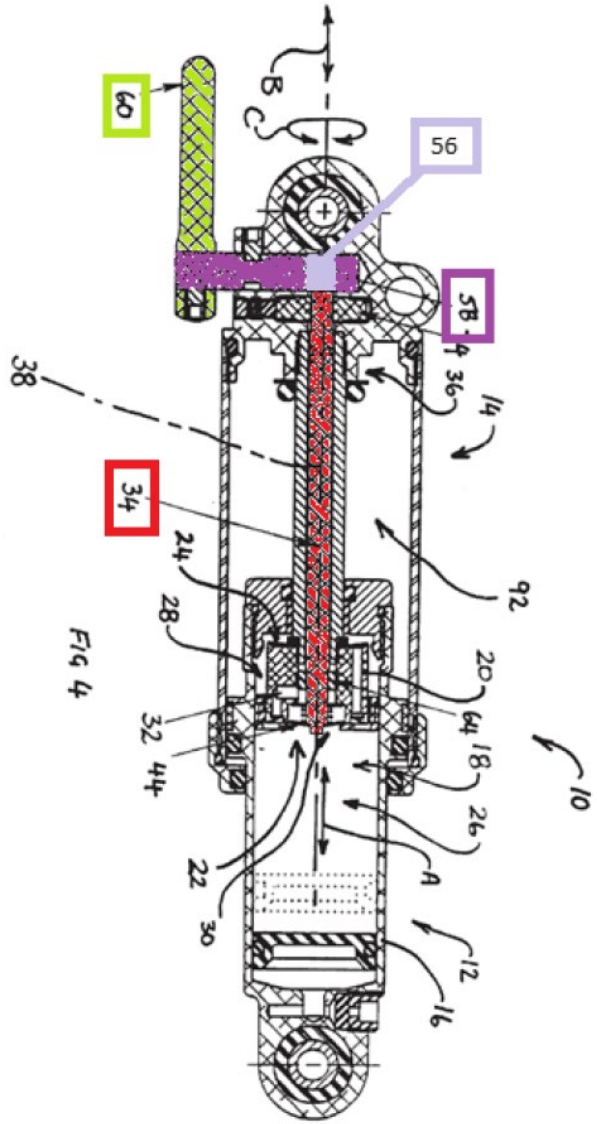


Petition (Paper 1) at 49–50; POR (Paper 16) at 33–36; Sur-Reply (Paper 24) at 10–14; Ex. 1003 (Slocum) at pp. 64–70, ¶¶93–98; Ex. 2016 (Parnell) at ¶77–78

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Petitioner's arguments about "fine-tuning" are meritless
- Fox is already capable of providing <u>any</u> damping characteristics between closed and fully-open
- JP'279's damping adjuster is not "finer" or superior to Fox's damping adjuster
- Fox and JP'279 each provide a full range of suspension settings and damping characteristics

Fox (Ex. 1005) at Fig. 4



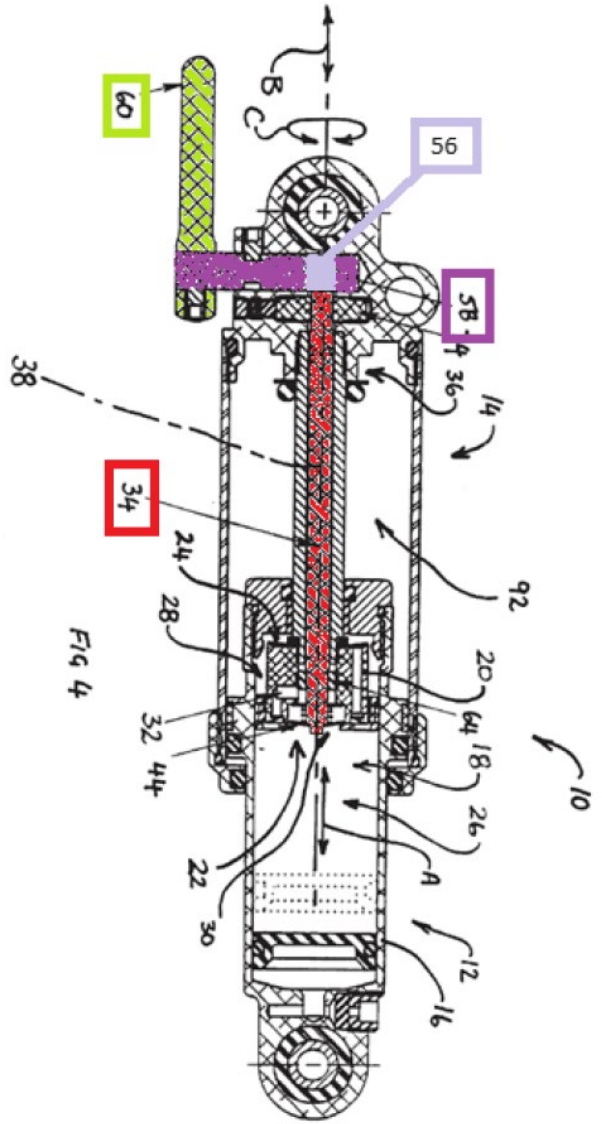
POR (Paper 16) at 6–7, 37–41; Sur-Reply (Paper 24) at 14–21; Ex. 2016 (Parnell) at ¶¶32–34

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Petitioner falsely claims that "JP'279 would allow fine-tuning of the damping characteristics beyond that possible with Fox's actuator arrangement because JP'279's 'adjuster assembly' allows fine adjustments"

- JP'279 provides the same level of "fineness" as Fox, depending on the size and shaping of JP'279's slider **43** and Fox's cam **56**

Fox (Ex. 1005) at Fig. 4

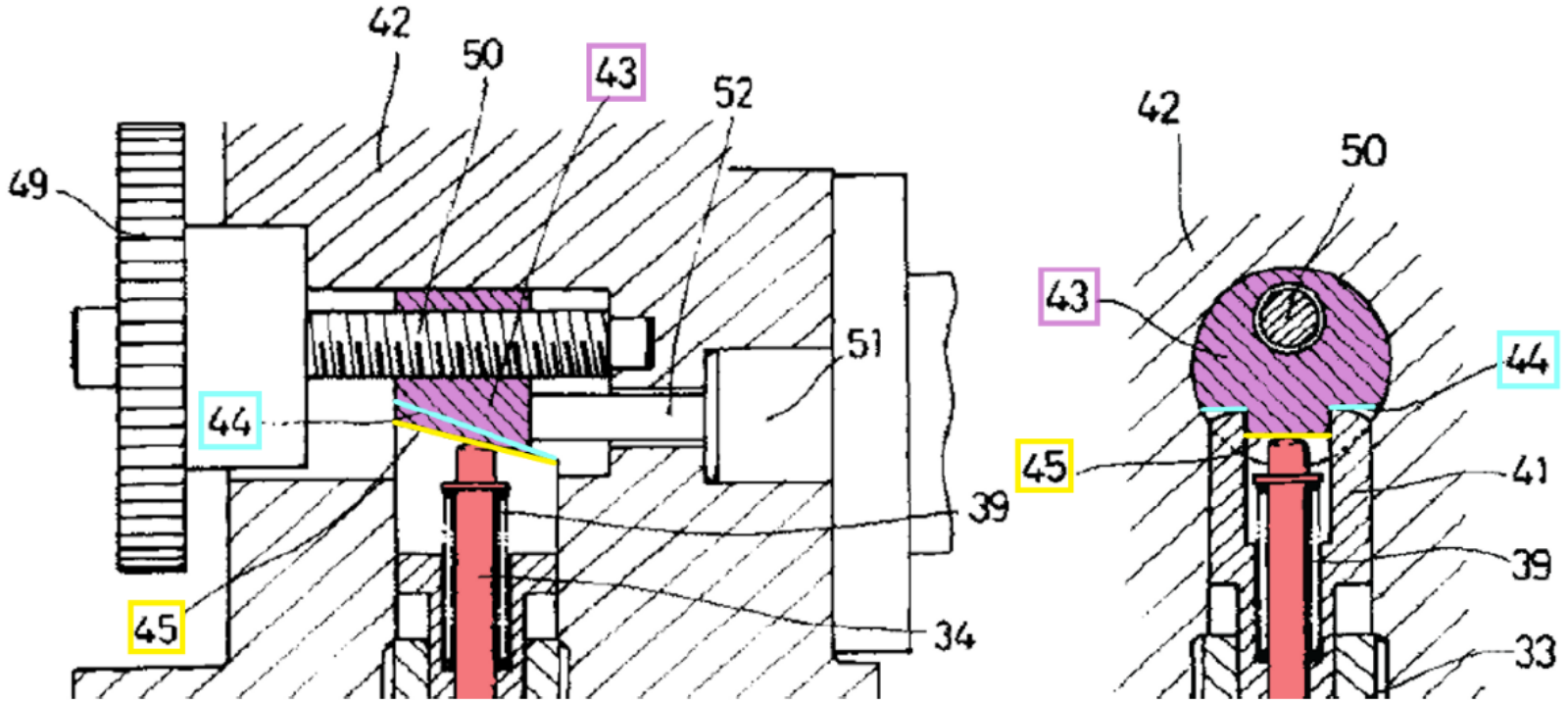


POR (Paper 16) at 37–41; Sur-Reply (Paper 24) at 14–21; Ex. 2016 (Parnell) at ¶¶32–34, 81–88

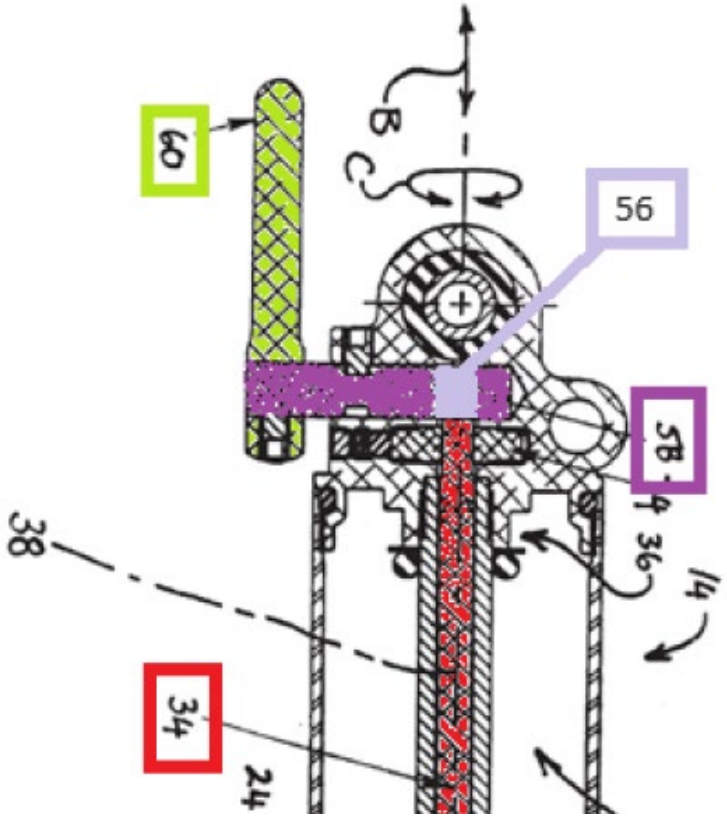
Ground 2 (Fox in view of JP'279 and Nagai) Fails

- JP'279's slider **44** (blue) is not inherently finer than Fox's cam **56** (light purple), and each have the same adjustment range

JP'279 (Ex. 1007) at FIGs. 4&5



Fox (Ex. 1005) at Fig. 4

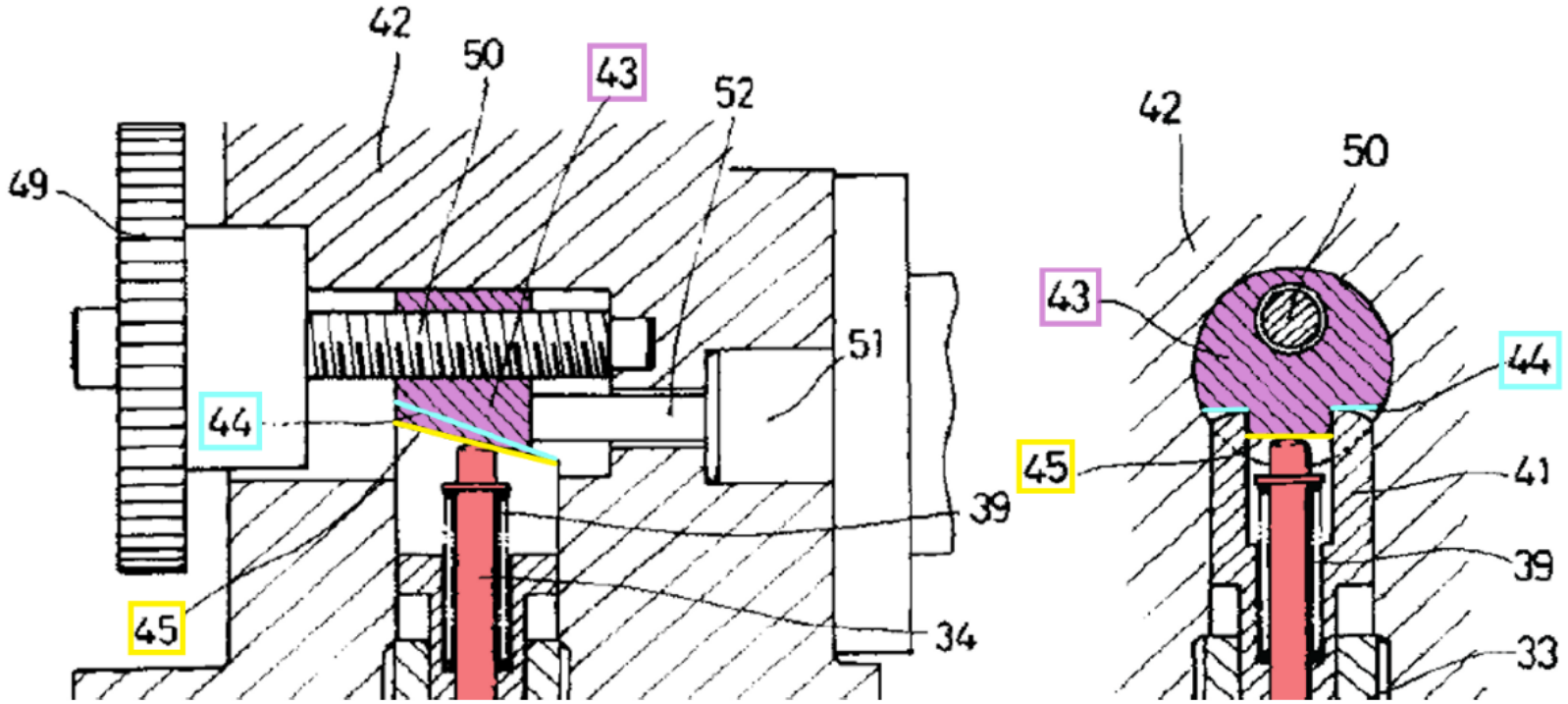


POR (Paper 16) at 38–41; Sur-Reply (Paper 24) at 14–18; Ex. 2016 (Parnell) at ¶¶32–34, 84–88

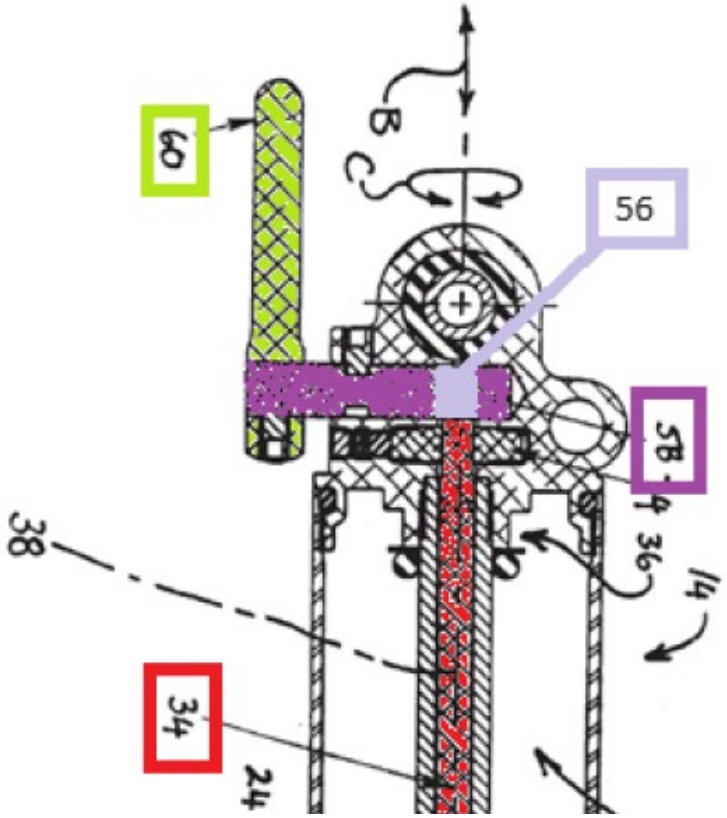
Ground 2 (Fox in view of JP'279 and Nagai) Fails

- Moving JP'279's slider **44** (blue) right or left moves JP'279's adjuster rod/driver 34 up or down
- Rotating Fox's cam **56** (light purple) moves Fox's adjuster rod/driver 34 up or down

JP'279 (Ex. 1007) at Figs. 4&5



Fox (Ex. 1005) at Fig. 4



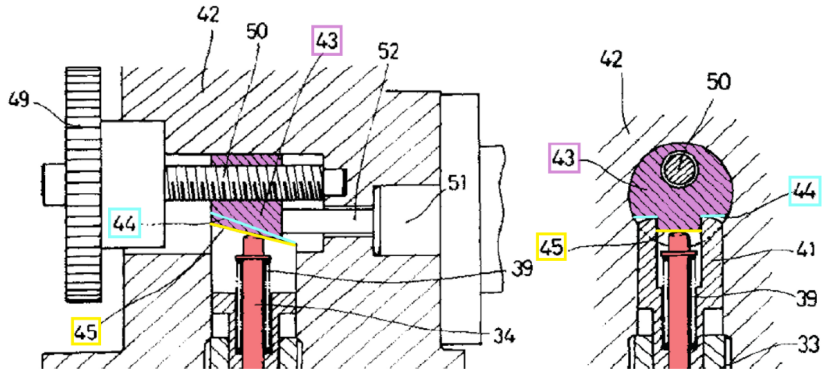
POR (Paper 16) at 38–41; Sur-Reply (Paper 24) at 14–18; Ex. 2016 (Parnell) at ¶¶32–34, 84–88

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- JP'279 simply states that one of its two angled surfaces **44**, **45** is finer than the other:

> The hydraulic shock absorber damping force adjustment mechanism of Claim 2 uses one adjustment rod to adjust the bypass oil passage opening surface area of a hollow rod at the needle portion provided at the tip [thereof], and uses the other adjustment rod to adjust the blow[out] load of a pressure-side valve disposed in an oil passage inside a piston at the tip portion [thereof]; the back end of one of the adjustment rods is made to contact the more gently sloped surface of the two sloped surfaces of the slider relative to the back end of the other adjustment rod, therefore the adjustment range at the needle portion can be made smaller than the adjustment range of the pressure-side valve blow[out] load, and fine adjustment amounts can be achieved at the needle portion.

JP'279 (Ex. 1007) at Fig. 4



- The surface **45** (yellow) allows for smaller adjustments due to having a lesser slope

- This does not suggest a general level of "fineness" above any other damper adjuster

POR (Paper 16) at 37–41; Ex. 1007 (JP'279) at 6, Fig. 4; Ex. 2016 (Parnell) at ¶84

Ground 2 (Fox in view of JP'279 and Nagai) Fails

Petitioner's motivation to combine is false and unsupported:

No evidence of record shows that JP'279's slider 43 provides a finer level of adjustment than Fox's cam 56

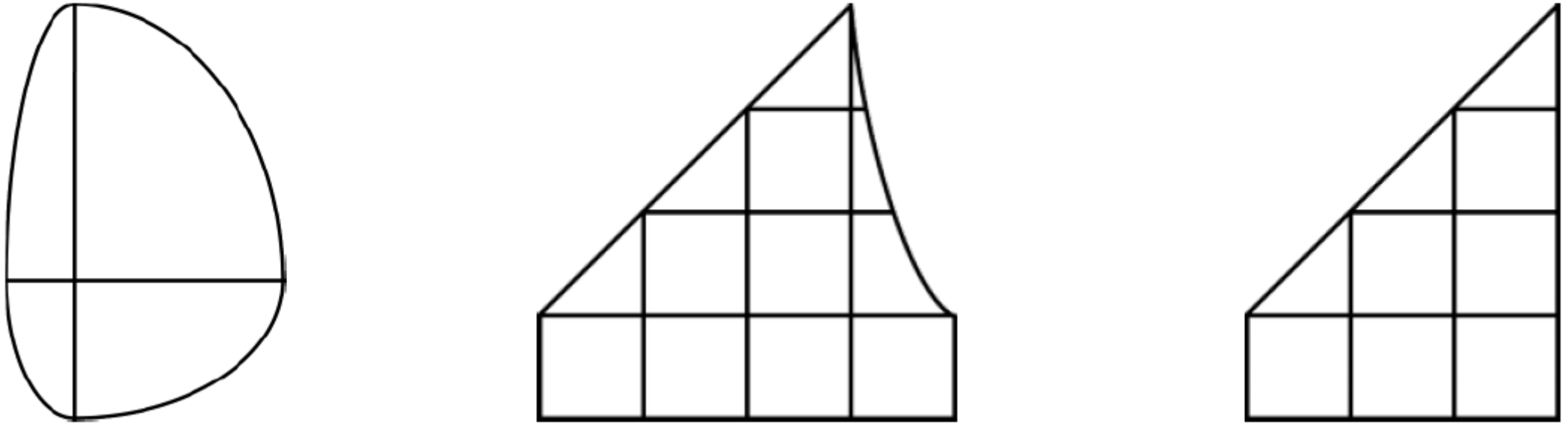
A tapered surface is not superior to a cam

POR (Paper 16) at 37–41; Sur-Reply (Paper 24) at 14–21; Ex. 2016 (Parnell) at ¶¶32–34, 81–88

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- In fact, a cam can provide the exact same output as a tapered surface:

Cam Shape **Cam Output at Adjuster Rod** **Inclined Plane Output**



- Petitioner and Dr. Slocum fail to give any details or evidence on the size and shaping of JP'279's slider **43** and Fox's cam **56**

- Without these details, it is unknown which is "finer"

POR (Paper 16) at 39–41; Sur-Reply (Paper 24) at 14–21, Ex. 2016 (Parnell) at ¶¶84–88

Ground 2 (Fox in view of JP'279 and Nagai) Fails

- What was unknown at the time of the invention of the '207 Patent?

Use of an inclined plane on a camshaft?	**UNKNOWN**
Use of an inclined plane on only a portion of a camshaft?	**UNKNOWN**
Arranging an inclined plane and camshaft at perpendicular angles?	**UNKNOWN**
Using two different damper adjusters together?	**UNKNOWN**
Moving a camshaft axially in a damper adjuster?	**UNKNOWN**
A damper adjuster with two degrees of freedom?	**UNKNOWN**

- Petitioner's proposed combination can only fill in the gaps with improper hindsight

POR (Paper 16) at 41–46; Ex. 2016 (Parnell) at ¶¶89–99

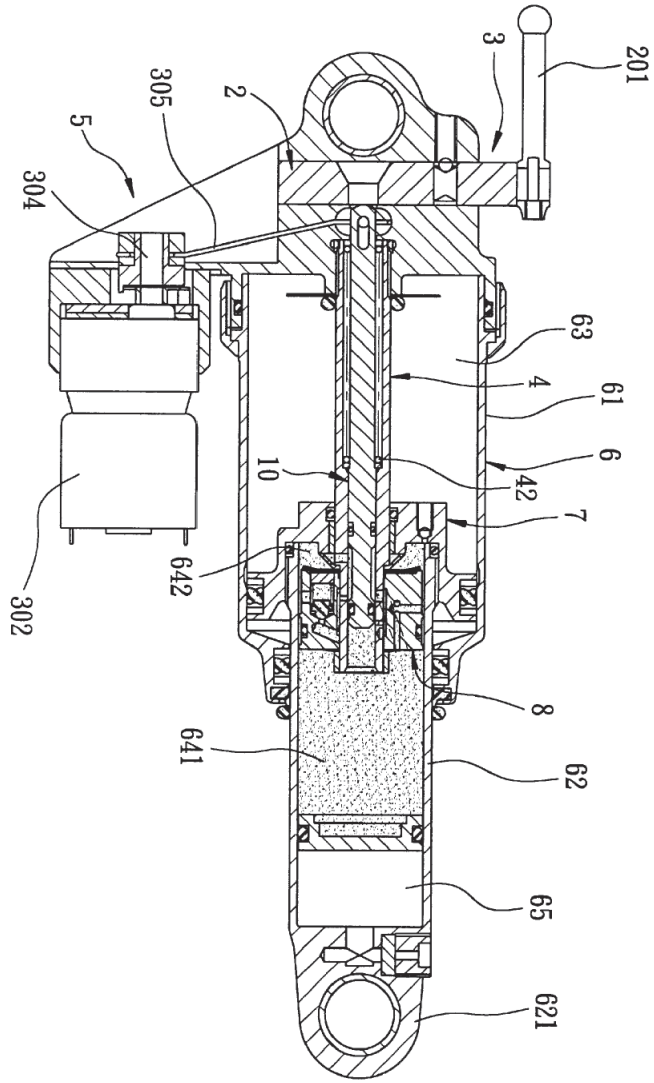
Ground 3: Yi (Ex. 1006) in view of JP'279 (Ex. 1007) and Nagai (Ex. 1008) Does Not Render the Challenged Claims of the '207 Patent Obvious

Ground 3 (Yi in view of JP'279 and Nagai) Fails

- Petitioner's proposed combination of Yi with JP'279 and Nagai similarly fails to disclose the claimed adjuster assembly

- No valid motivation to combine Yi with JP'279, only improper hindsight

Yi (Ex. 1006) at Fig. 12



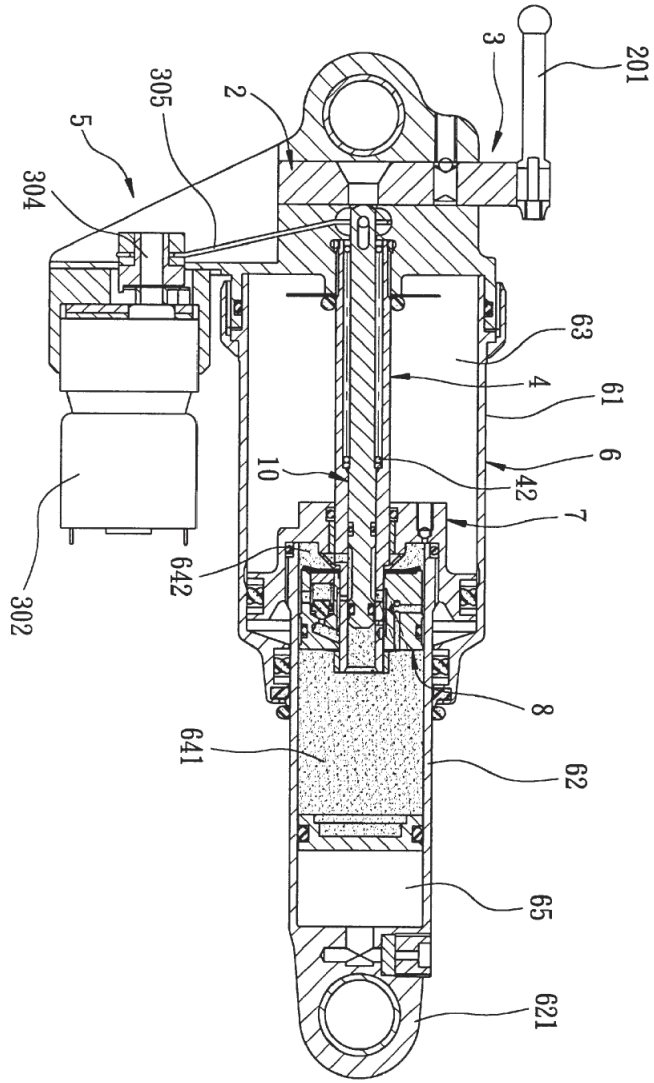
POR (Paper 16) at 46–55; Sur-Reply (Paper 24) at 21–26; Ex. 2016 (Parnell) at ¶¶100–117

Ground 3 (Yi in view of JP'279 and Nagai) Fails

Same Issues as Ground 2:

- Petitioner's proposed combination of Yi with JP'279 and Nagai fails to disclose <u>any</u> adjuster assembly
- Both Yi and JP'279 discloses damping adjusters that have one degree of freedom
- Forming a tapered surface over Yi's cam surface would result in a device with no positions of the lever that would be unaffected by the adjuster assembly

Yi (Ex. 1006) at Fig. 12



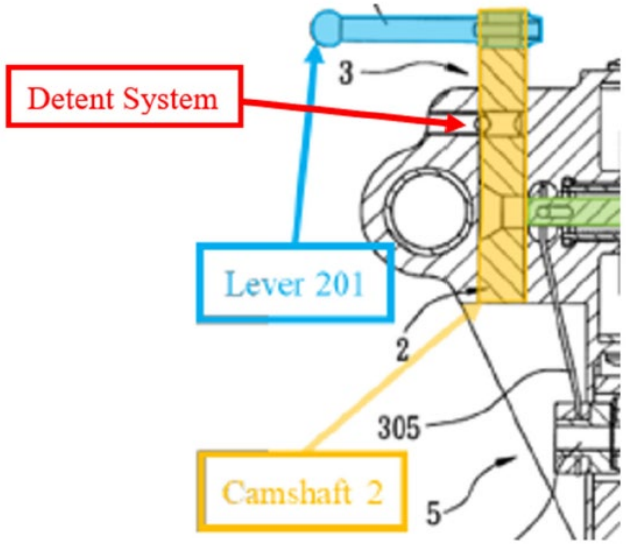
POR (Paper 16) at 46–48; Sur-Reply (Paper 24) at 21–22; Ex. 2016 (Parnell) at ¶¶100–106

Ground 3 (Yi in view of JP'279 and Nagai) Fails

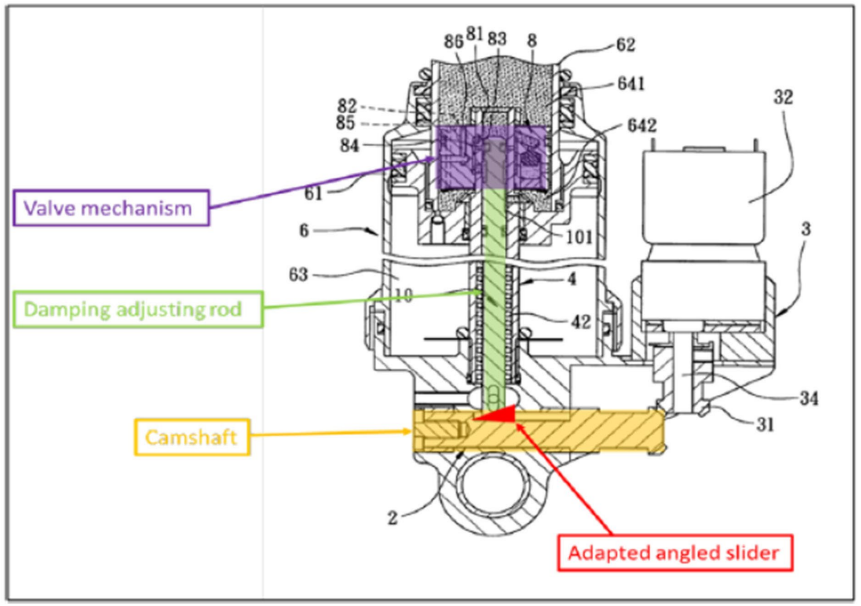
- Petitioner's proposed combination of Yi with JP'279 and Nagai would be inoperable because Yi's camshaft 2 (yellow) cannot be moved axially (left or right) in the figure on right as Petitioner posits, given the fixed location of Yi's driving unit **32** and associated geared coupler **31**

- Similarly, it is not clear how Yi's detent system would operate if Yi's camshaft **2** (yellow) is axially displaced

Yi (Ex. 1006) at Fig. 12



Yi (Ex. 1006) at Fig. 6, Reply at p. 22



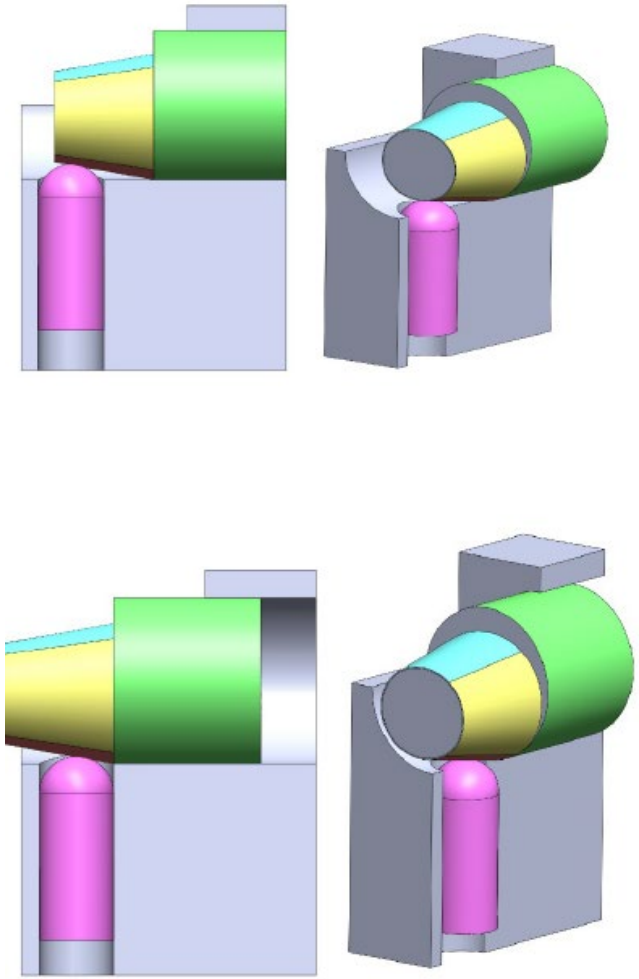
POR (Paper 16) at 46–48; Ex. 1006 (Yi) at FIGs. 6, 12; Reply (Paper 18) at 22; Ex. 2016 (Parnell) at ¶¶100–106

Ground 3 (Yi in view of JP'279 and Nagai) Fails

- Dr. Slocum imagines "solid models" to show the purported combination of Yi and JP'279:

> 119. It would have been obvious to a POSITA to combine Yi's "valve actuating assembly" and elements of JP'279's "adjuster assembly," which comprises a slider 43 with a tapered surface 44, to allow the damping characteristics corresponding to at least one of the compression damping setting of Yi's "valve actuating assembly" to be finely adjusted independently of the damping characteristics corresponding to another position of the "valve actuating assembly." This is because a POSITA in November 2004 would have recognized that modification of Yi in view of JP'279 would provide an additional range of damping adjustments, specifically the "fine adjustment" offered by JP'279's slider mechanism. Ex. 1007, 6. The solid model images I created above of tapered cylindrical surface cams illustrate how a POSITA would implement this combination to achieve finely tunable cam action.

Slocum Declaration (Ex. 1003) at p. 67



- This tapering would result in adjustment of <u>all</u> positions whenever the purported "adjuster assembly" is used

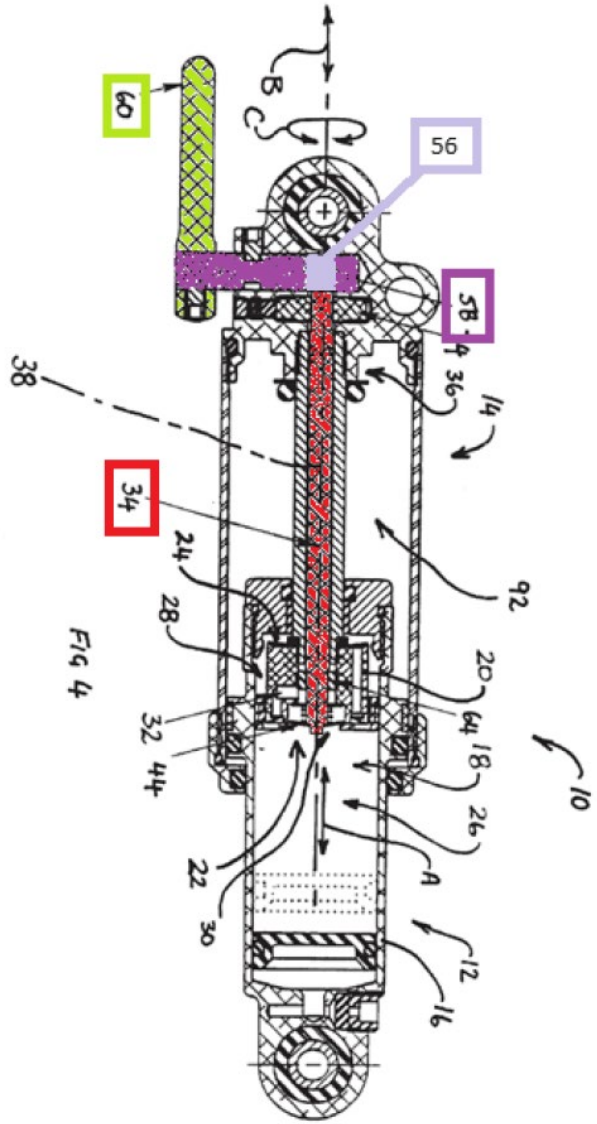
POR (Paper 16) at 46–48; Ex. 1003 (Slocum) at pp. 66–67, 88, ¶¶96, 119; Ex. 2016 (Parnell) at ¶102

Ground 3 (Yi in view of JP'279 and Nagai) Fails

- Petitioner falsely claims that "an 'adjuster assembly' as taught by JP'279 would allow fine-tuning of the damping characteristics beyond that possible in Yi's shock absorber"

- Like Ground 2, JP'279 provides the same level of "fineness" as Yi, depending on the size and shaping of JP'279's slider **43** and Yi's camshaft **2**

Fox (Ex. 1005) at Fig. 4



POR (Paper 16) at 46–48; Ex. 2016 (Parnell) at ¶¶100–106

Ground 3 (Yi in view of JP'279 and Nagai) Fails

Petitioner's motivation to combine is false and unsupported:

No evidence of record shows that JP'279's slider 43 provides a finer level of adjustment than Fox's cam 56

A tapered surface is not superior to a cam

POR (Paper 16) at 37–41, 46–48; Ex. 1007 (JP'279) at 6, Fig. 4; Ex. 2016 (Parnell) at ¶¶84, 100–106

Ground 3 (Yi in view of JP'279 and Nagai) Fails

- Again, what was unknown at the time of the invention of the '207 Patent?

Use of an inclined plane on a camshaft?	**UNKNOWN**
Use of an inclined plane on only a portion of a camshaft?	**UNKNOWN**
Arranging an inclined plane and camshaft at perpendicular angles?	**UNKNOWN**
Using two different damper adjusters together?	**UNKNOWN**
Moving a camshaft axially in a damper adjuster?	**UNKNOWN**
A damper adjuster with two degrees of freedom?	**UNKNOWN**

- Petitioner's proposed combination can only fill in the gaps with improper hindsight

POR (Paper 16) at 51–55; Ex. 2016 (Parnell) at ¶¶108–117

What Has Patent Owner Shown?

The recited adjuster assembly requires additional structure beyond that provided by the valve actuating assembly	✓
Fox does not disclose an adjuster assembly	✓
A slider or tapered surface is not superior to a cam or camshaft	✓
A slider or tapered surface does not provide a finer level of adjustment when compared to a cam or camshaft	✓
No motivation to combine Fox or Yi with JP'279 and Nagai	✓
No evidence of any damping adjuster with two-degree of freedom	✓
Only improper hindsight proffered for Petitioner's combinations	✓

POR (Paper 16) at 3–16, 18–23, 32–55; Sur-Reply (Paper 24) at 3–10, 14–26; Ex. 1003 (Slocum) at pp. 64–70, 88, ¶¶93–98, 119; Ex. 2016 (Parnell) at ¶¶30–35, 40–47, 52–58, 75–117

Conclusion

SRAM respectfully requests that the Board issue a final written decision confirming the patentability of the Challenged Claims of the '207 Patent

POR (Paper 16) at 55; Sur-Reply (Paper 24) at 26

Figures of the ‘207 Patent

‘207 Patent – Figure 1

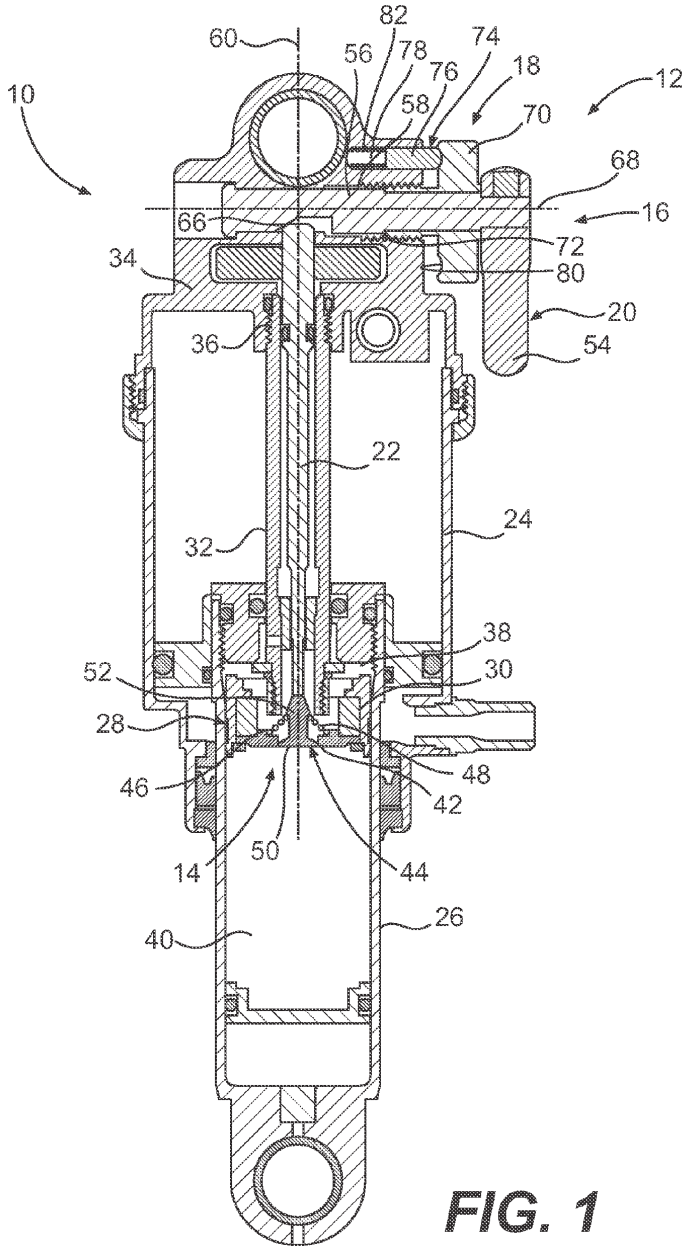


FIG. 1

‘207 Patent (Ex. 1001), FIG. 1

‘207 Patent – Figures 2 and 3

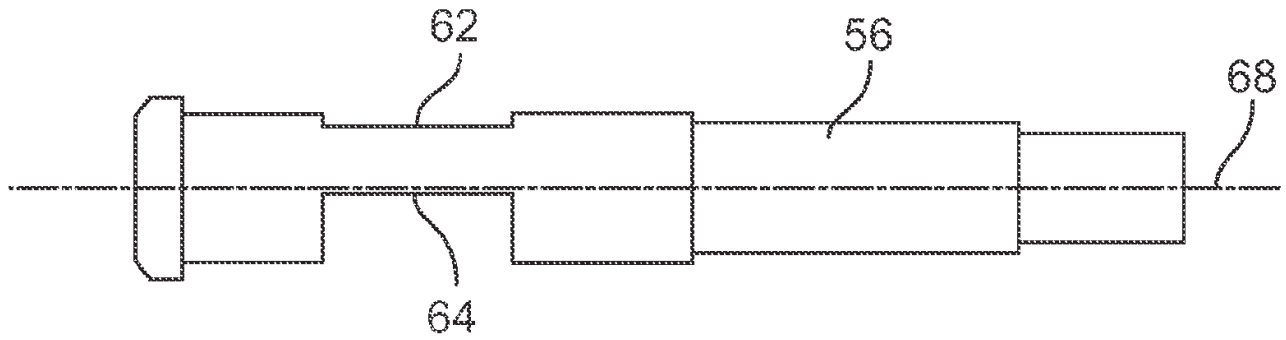


FIG. 2

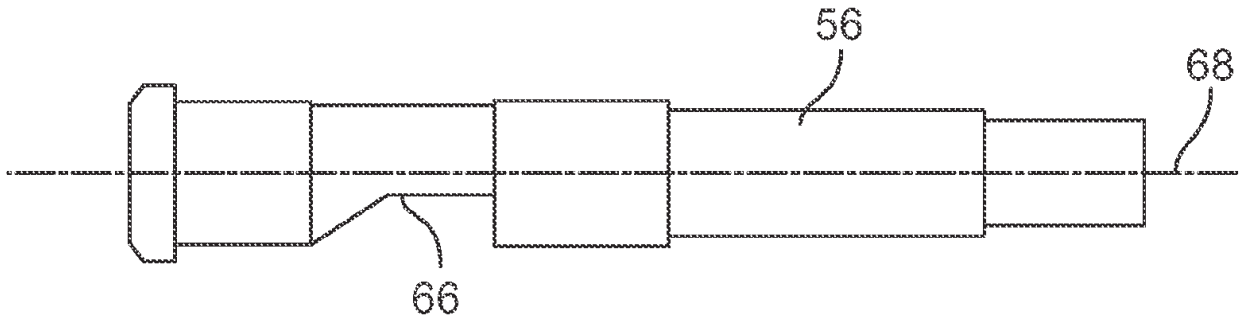


FIG. 3

‘207 Patent (Ex. 1001), FIGs. 2, 3

‘207 Patent – Figure 4a

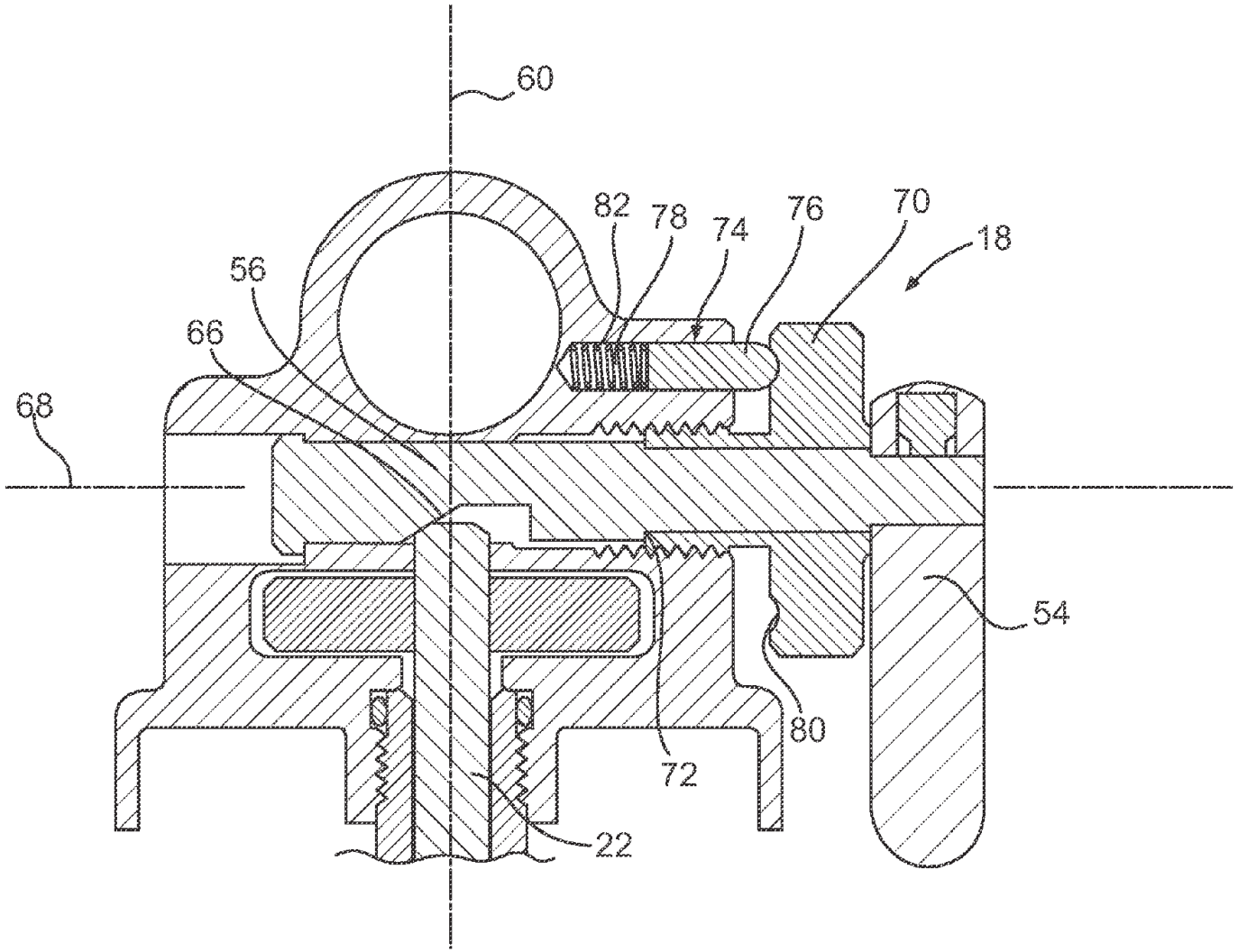


FIG. 4a

‘207 Patent (Ex. 1001), FIG. 4a

‘207 Patent – Figure 4b

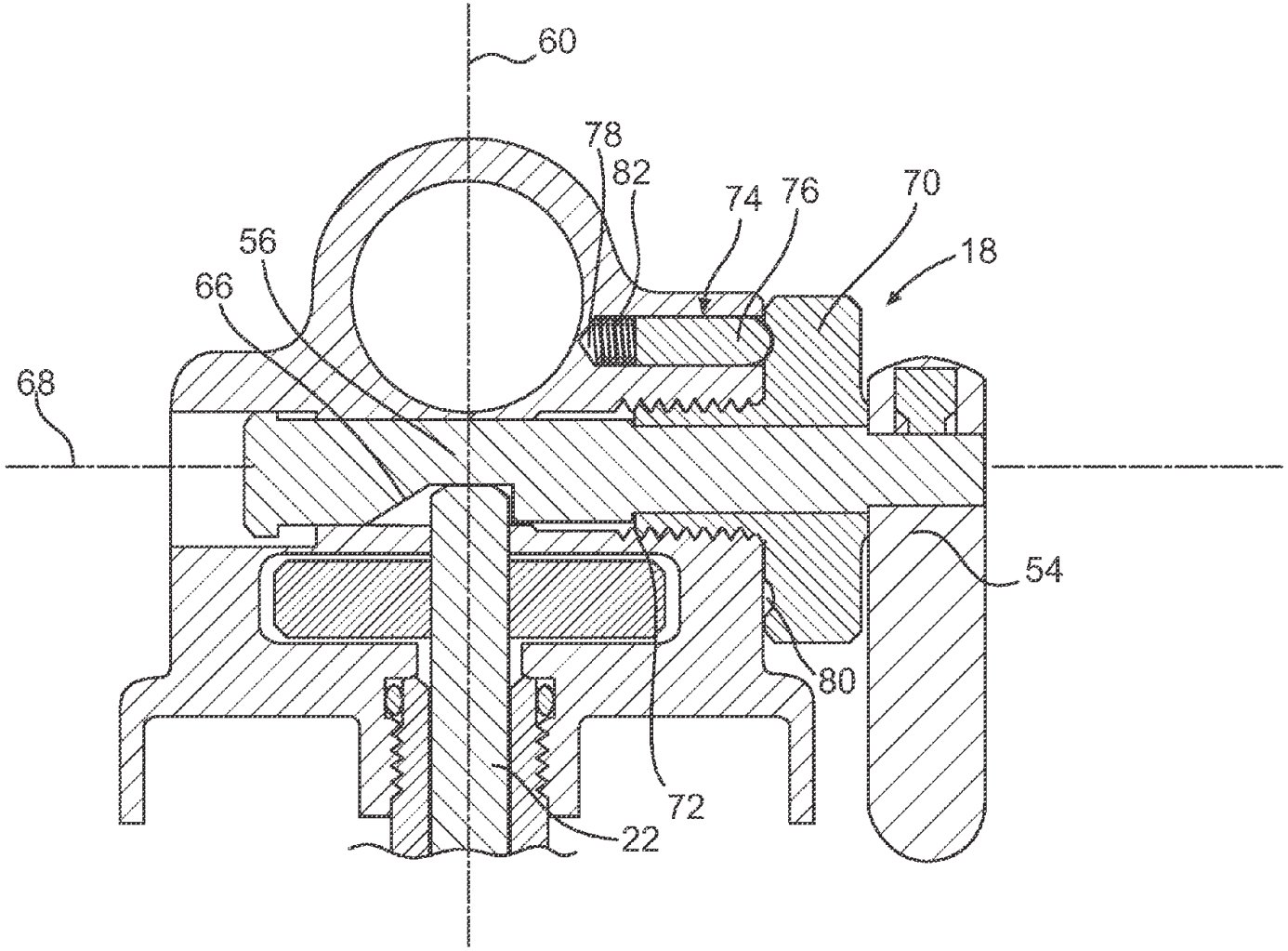


FIG. 4b

‘207 Patent (Ex. 1001), FIG. 4b

‘207 Patent – Figures 5a, 5b, and 5c

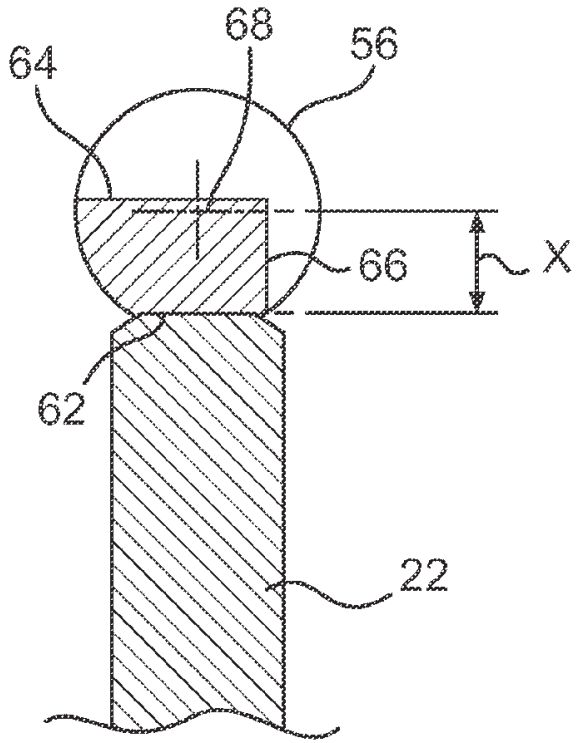


FIG. 5a

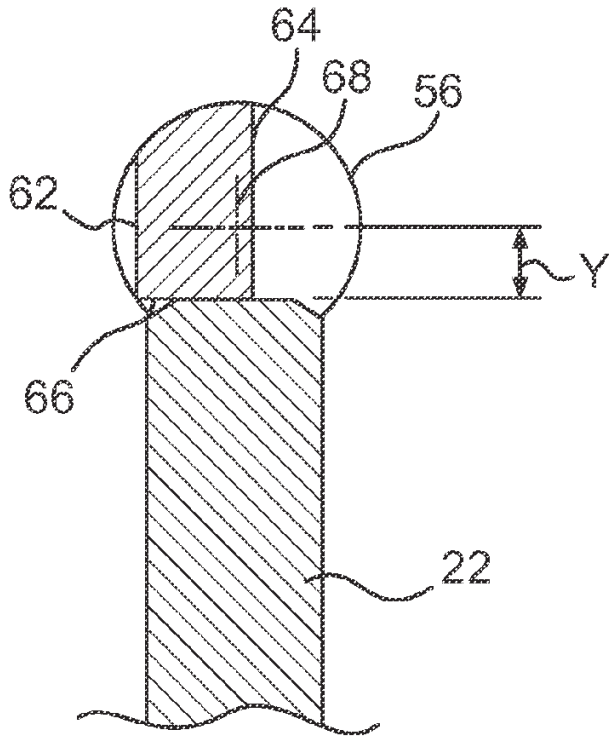


FIG. 5b

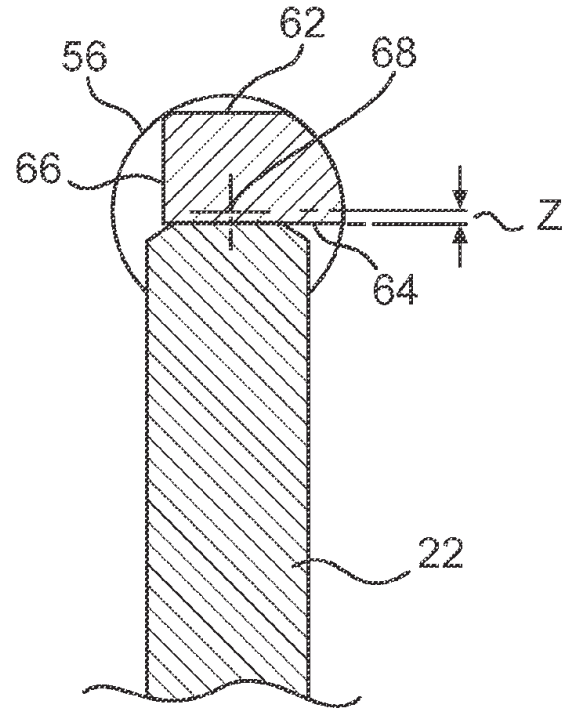


FIG. 5c

’207 Patent (Ex. 1001), FIG. 5a, 5b, 5c

‘207 Patent – Figures 6a, 6b and 6c

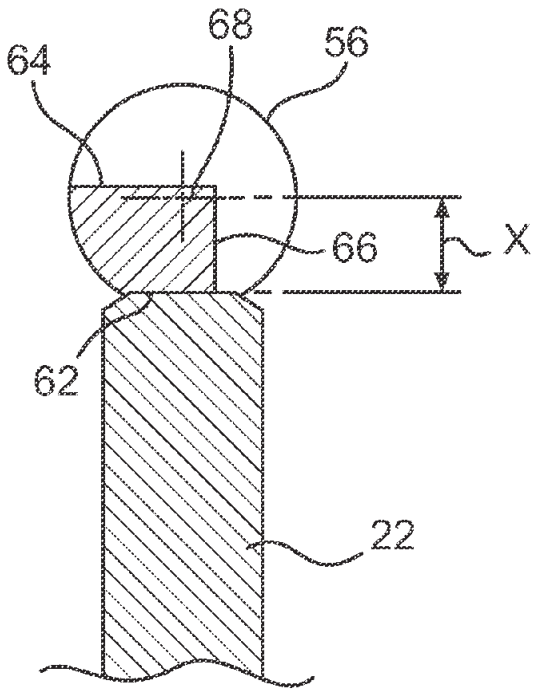


FIG. 6a

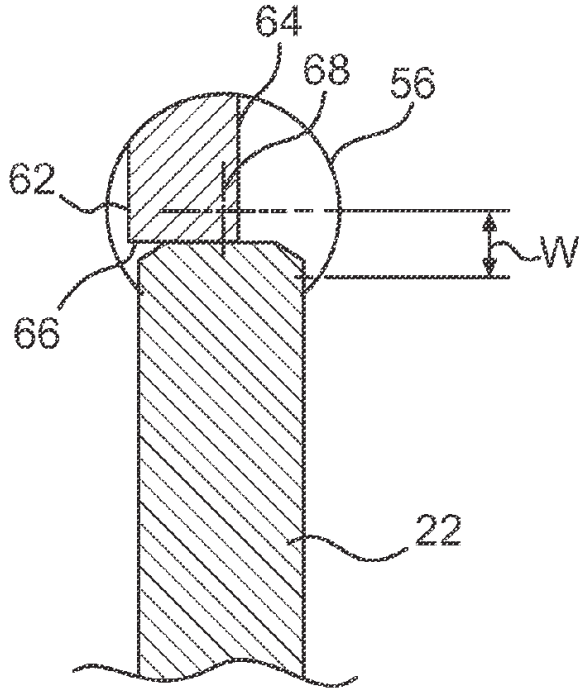


FIG. 6b

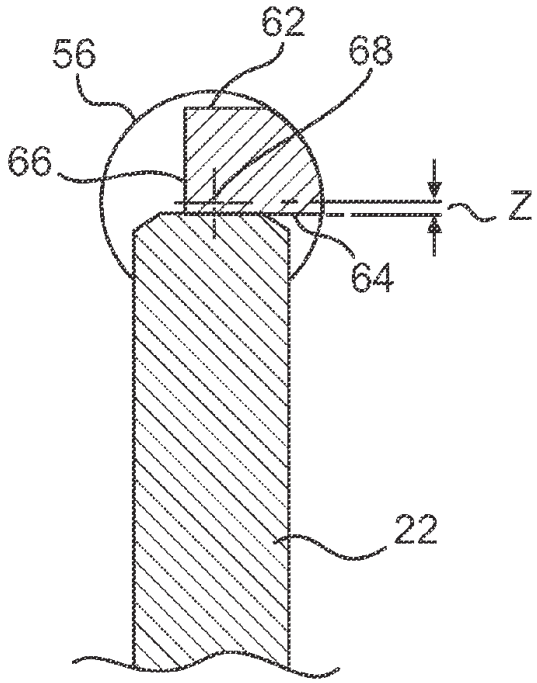


FIG. 6c

‘207 Patent (Ex. 1001), FIGs. 6a, 6b, 6c

‘207 Patent – Figure 7a

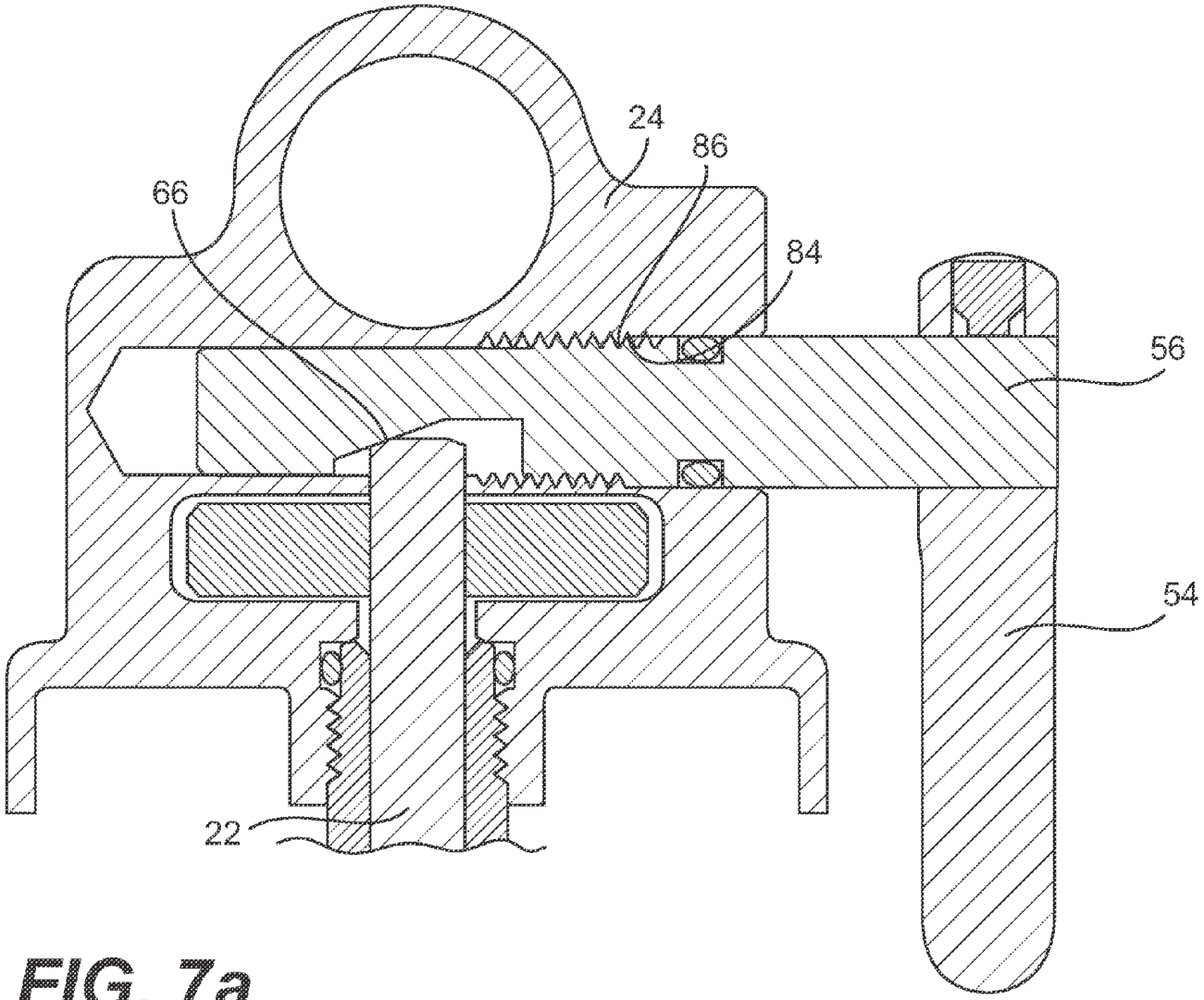


FIG. 7a

‘207 Patent (Ex. 1001), FIG. 7a

‘207 Patent – Figures 7b and 7c

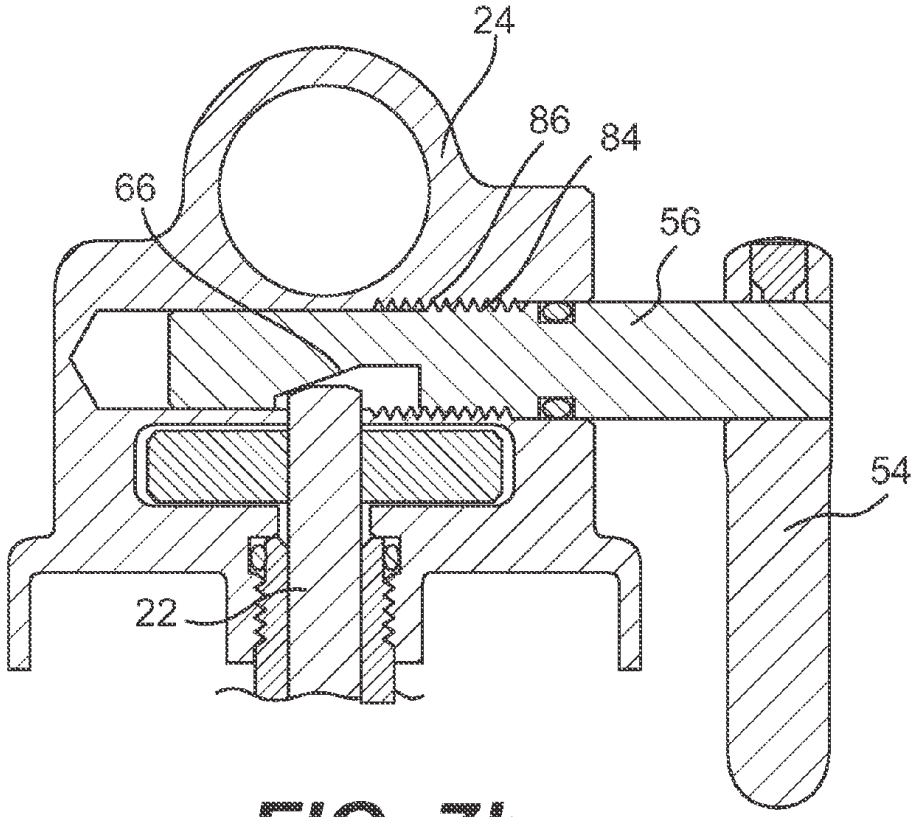


FIG. 7b

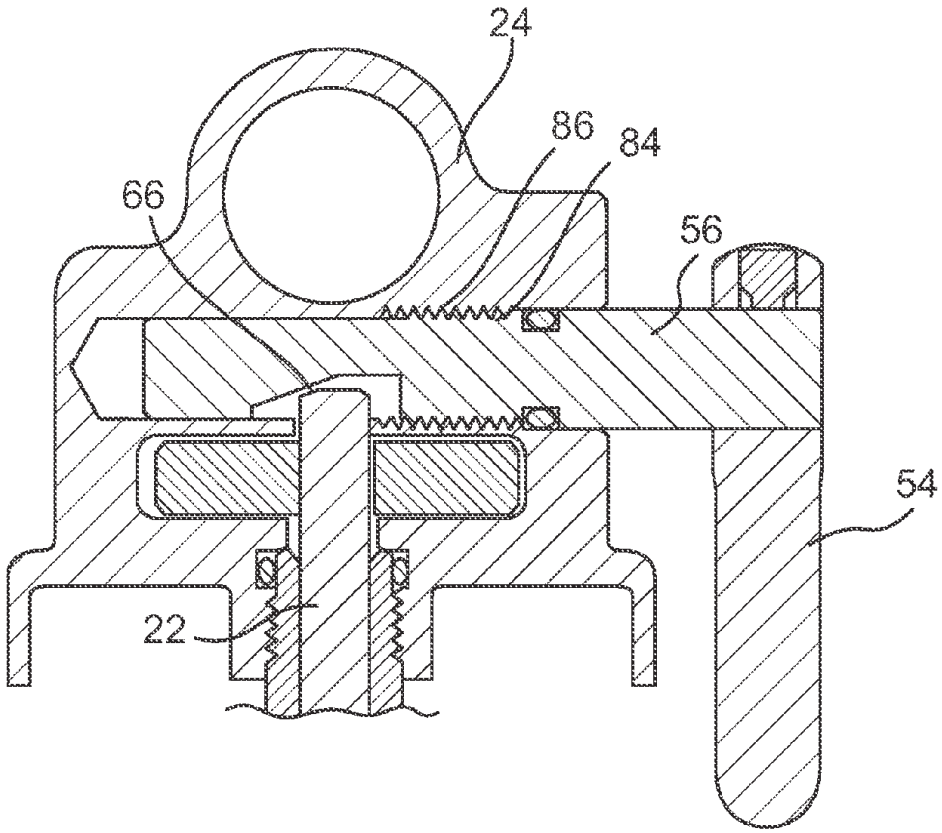


FIG. 7c

‘207 Patent (Ex. 1001), FIGs. 7b, 7c

‘207 Patent – Figure 8a

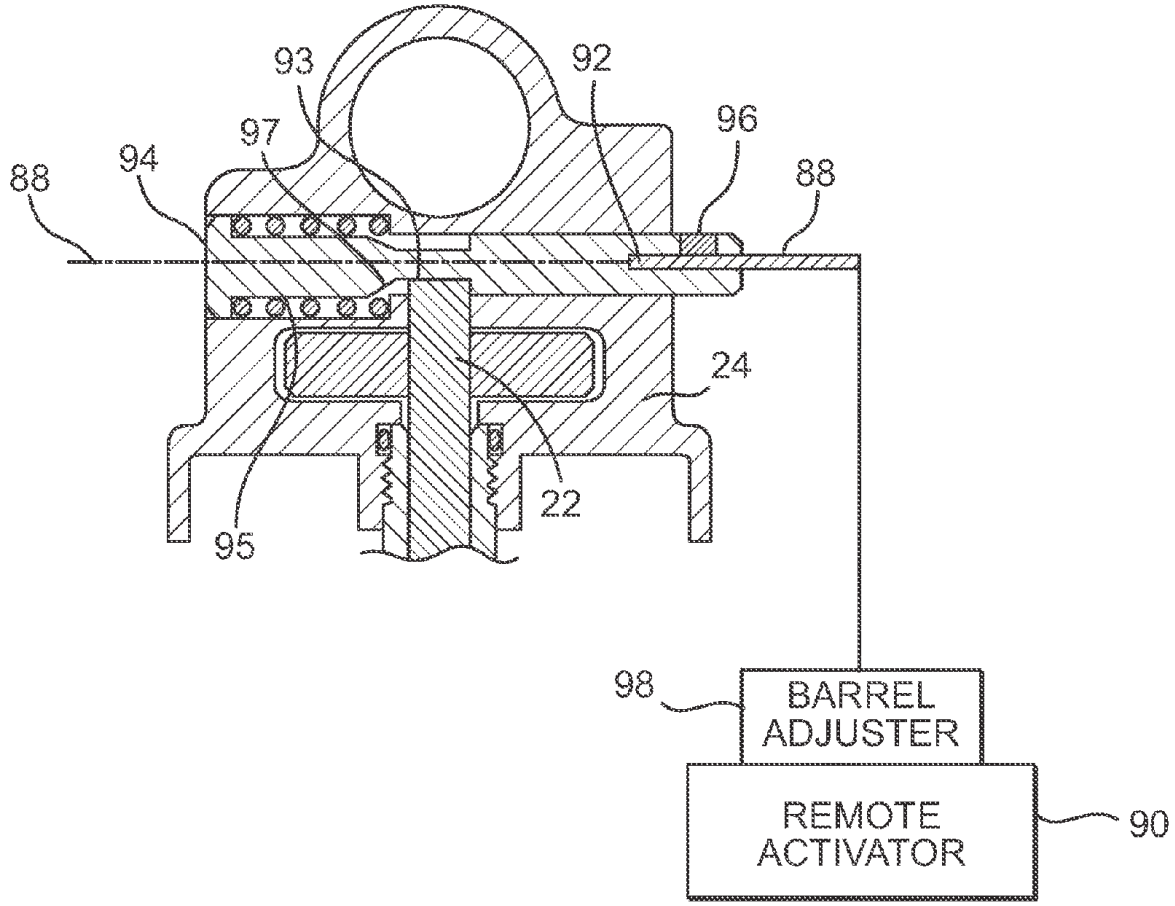


FIG. 8a

‘207 Patent (Ex. 1001), FIG. 8a

‘207 Patent – Figures 8b and 8c

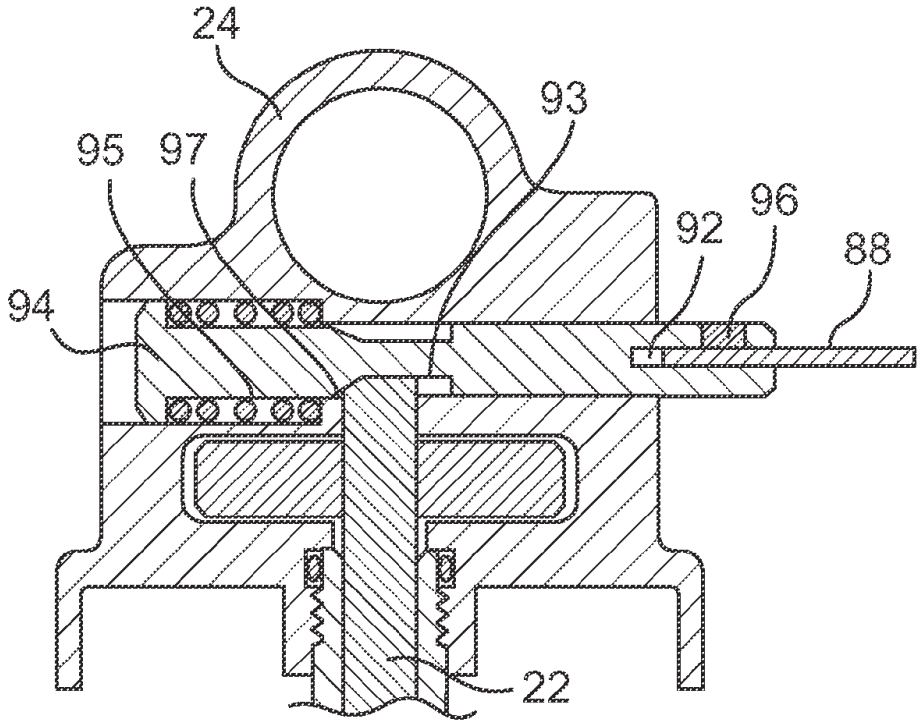


FIG. 8b

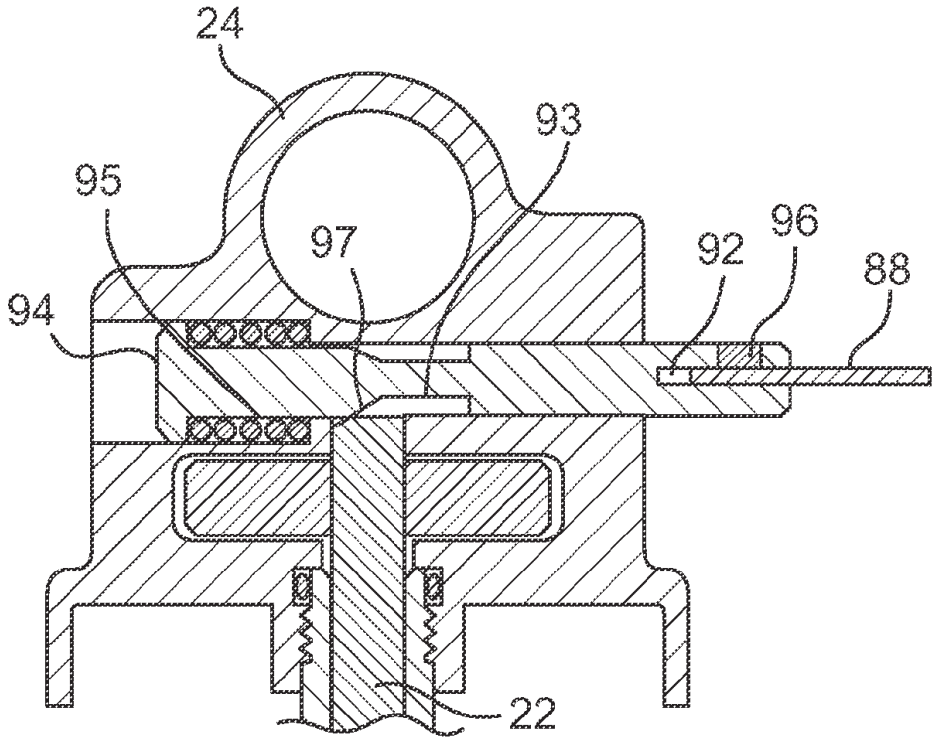


FIG. 8c

‘207 Patent (Ex. 1001), FIGs. 8b, 8c

‘207 Patent – Figures 9a and 9b

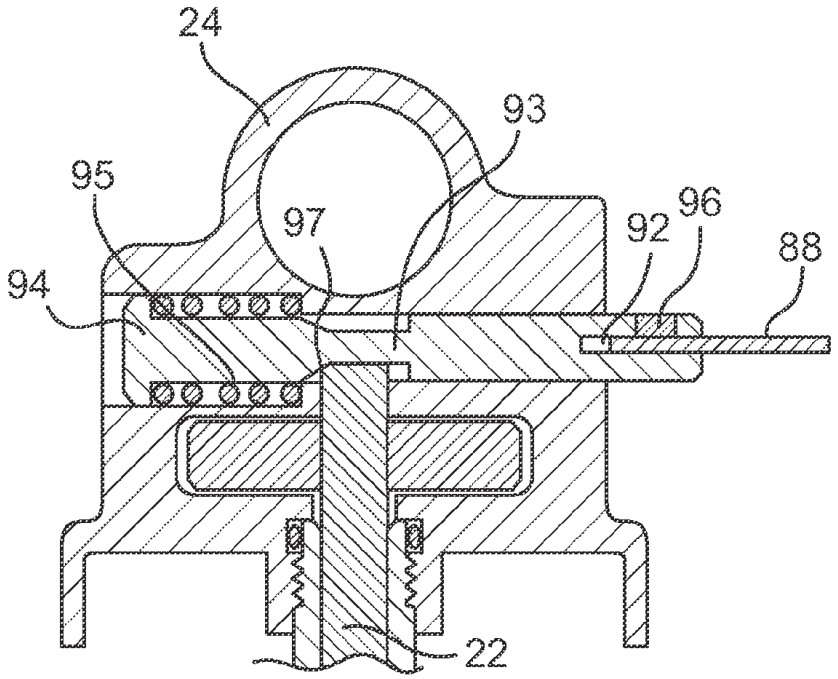


FIG. 9a

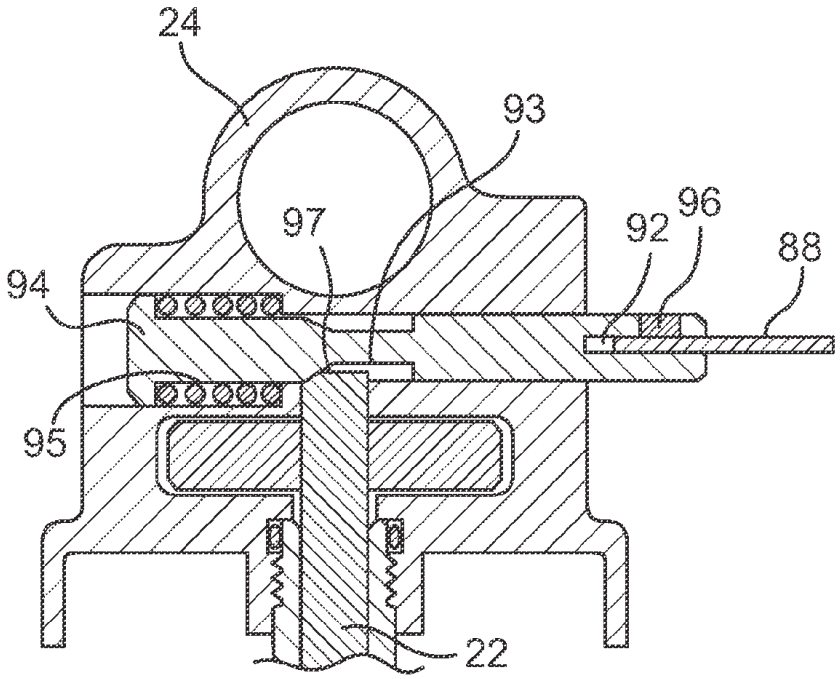


FIG. 9b

‘207 Patent (Ex. 1001), FIGs. 9a, 9b

‘207 Patent – Figures 9c and 10a

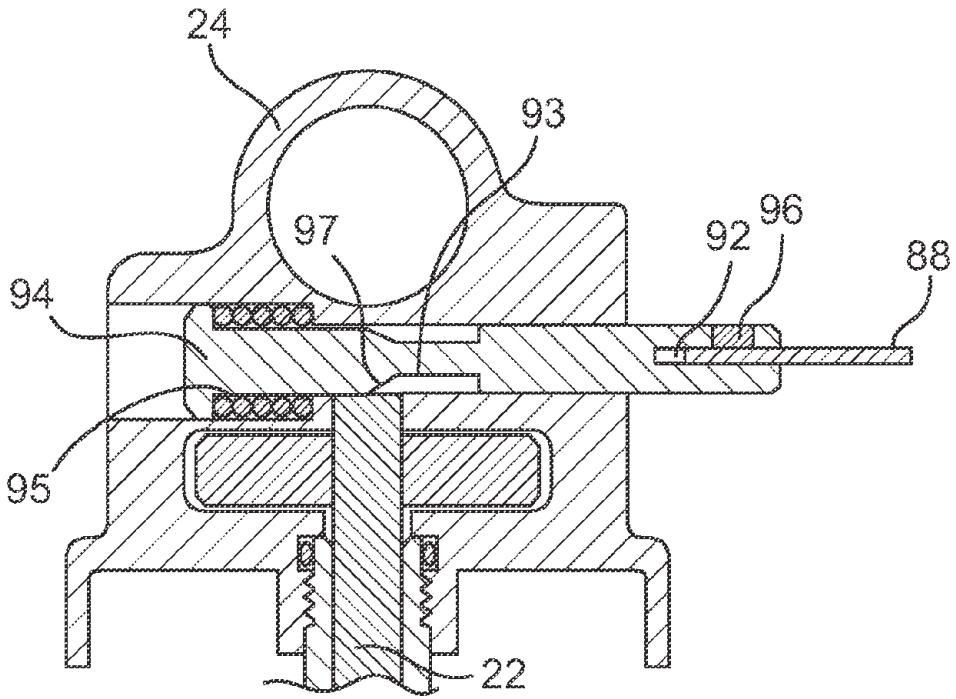


FIG. 9c

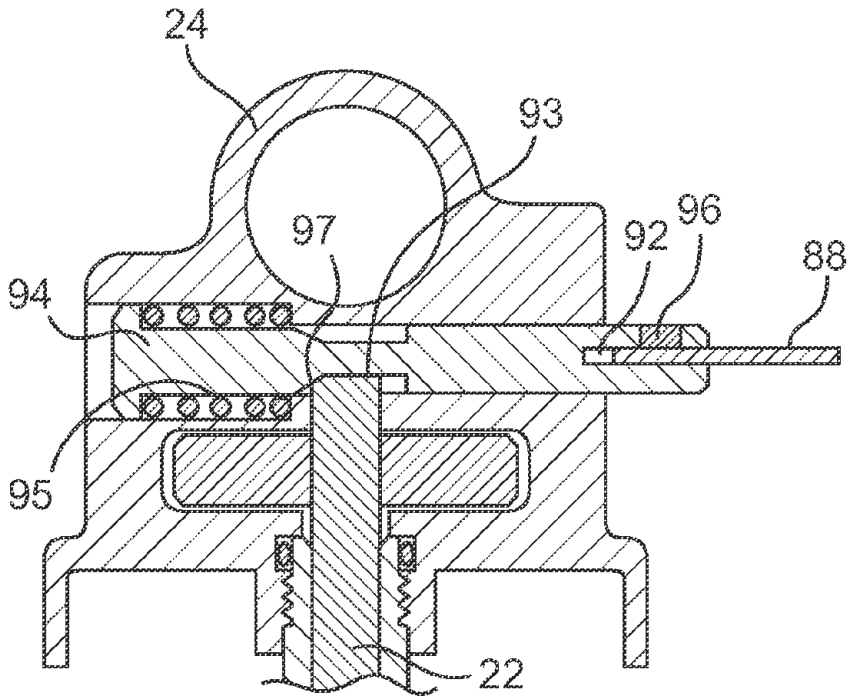


FIG. 10a

‘207 Patent (Ex. 1001), FIGs. 9c, 10a

‘207 Patent – Figures 10b and 10c

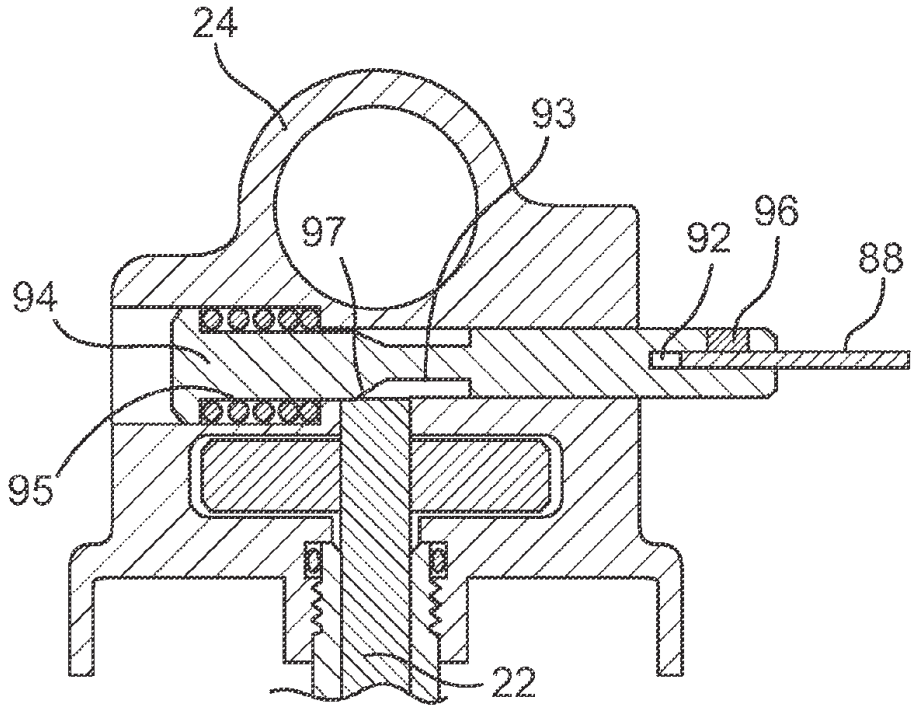


FIG. 10b

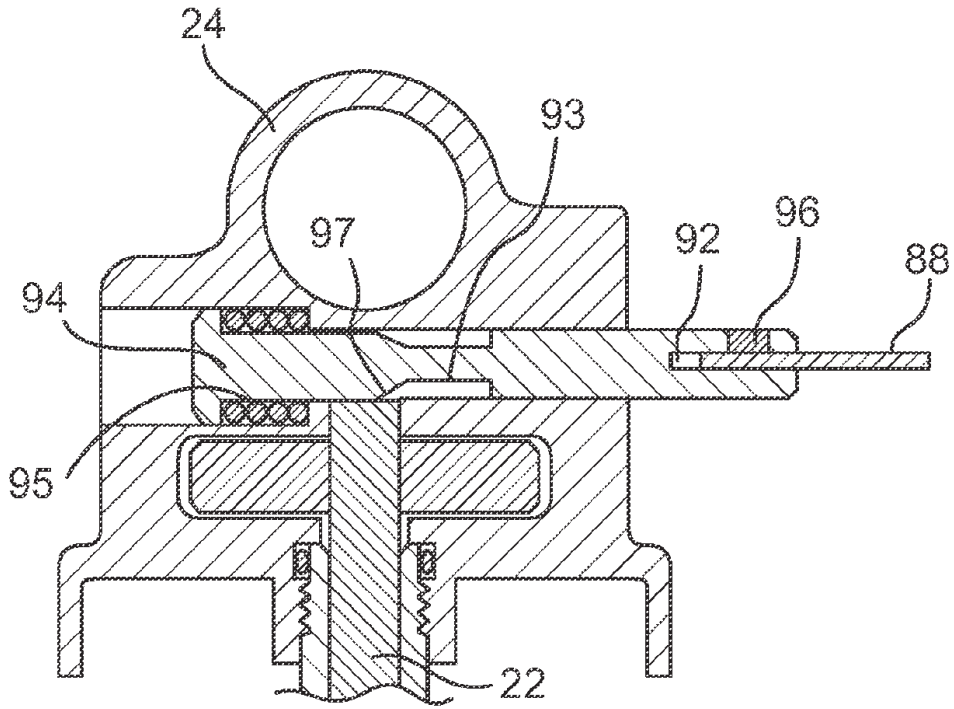


FIG. 10c

‘207 Patent (Ex. 1001), FIGs. 10b, 10c

‘207 Patent – Figure 11a

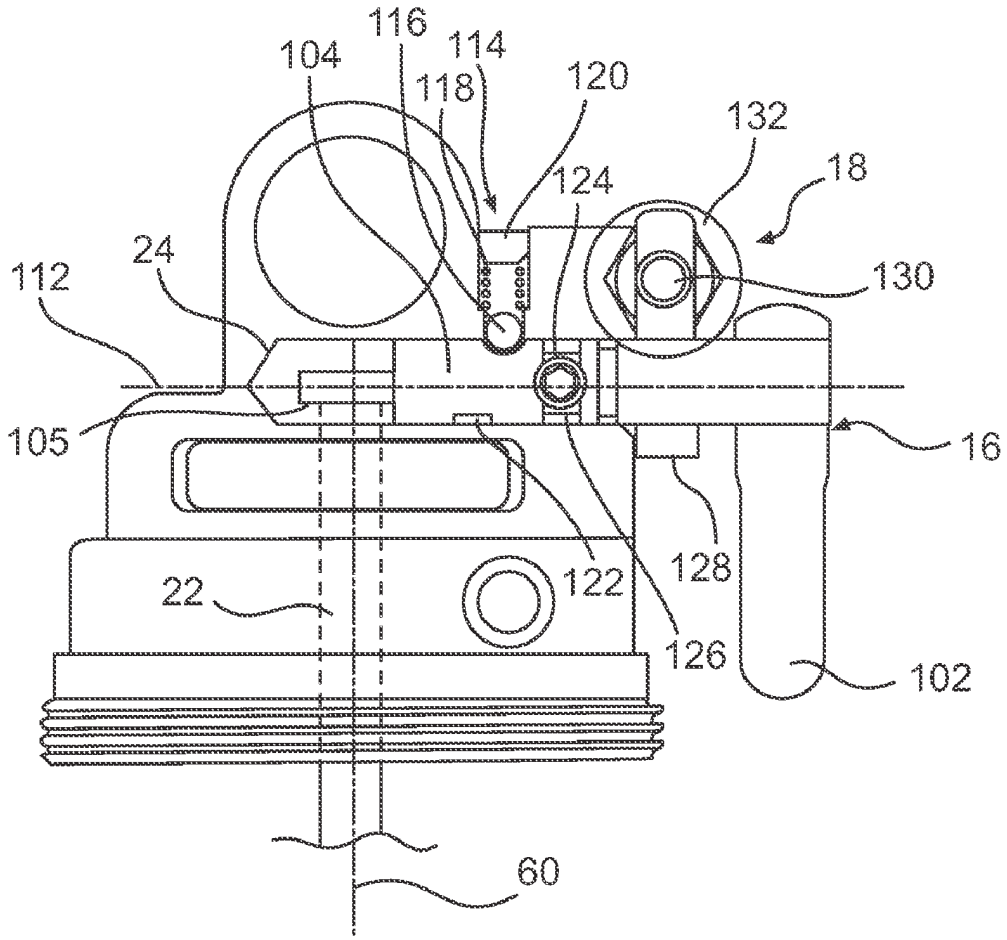


FIG. 11a

‘207 Patent (Ex. 1001), FIG. 11a

‘207 Patent – Figures 11b and 11c

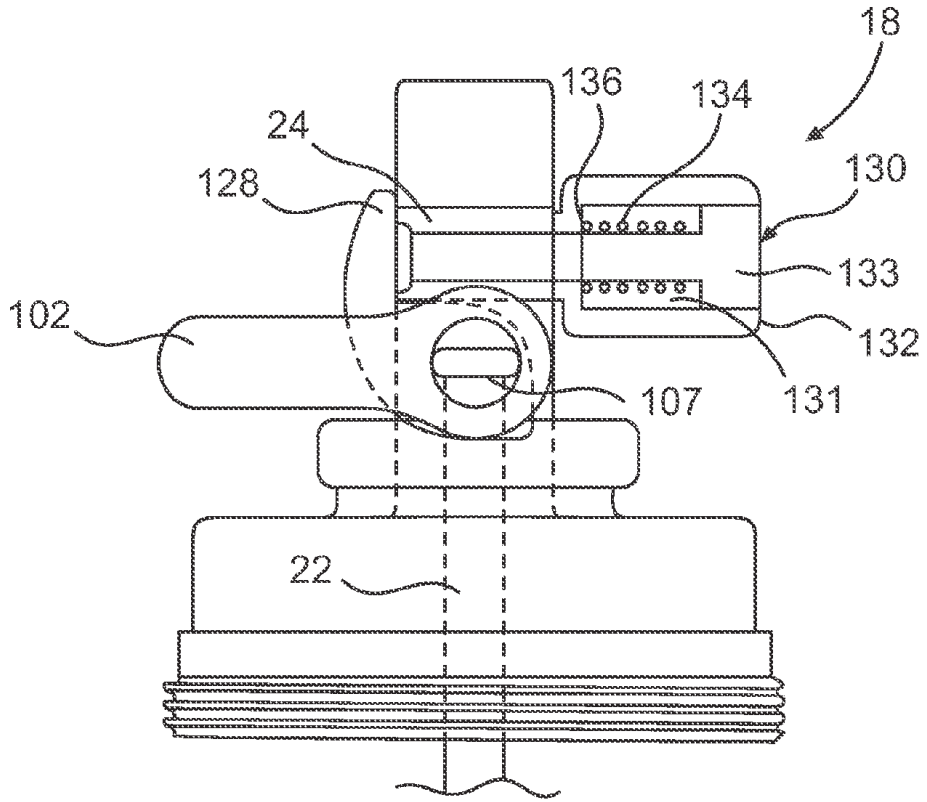


FIG. 11b

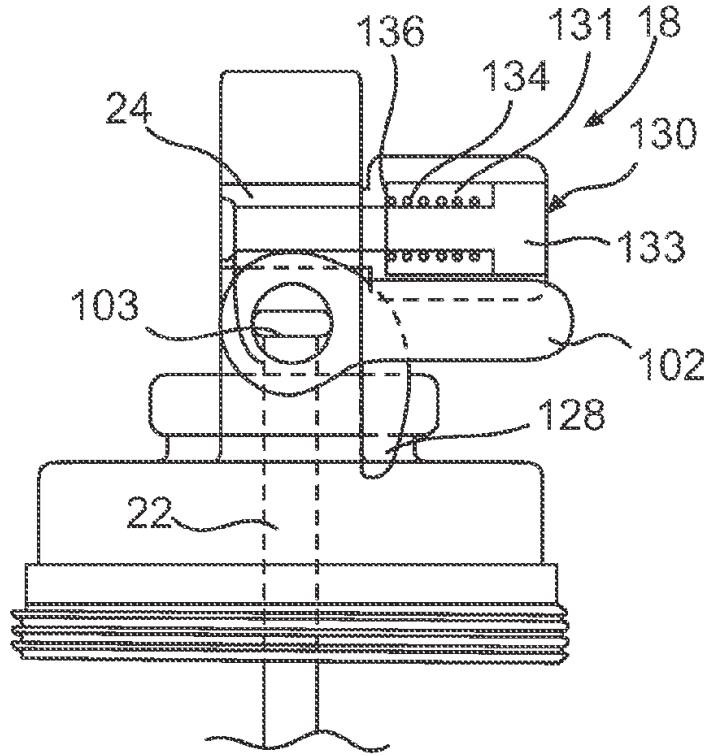


FIG. 11c

‘207 Patent (Ex. 1001), FIGs. 11b, 11c

‘207 Patent – Figures 11d and 11e

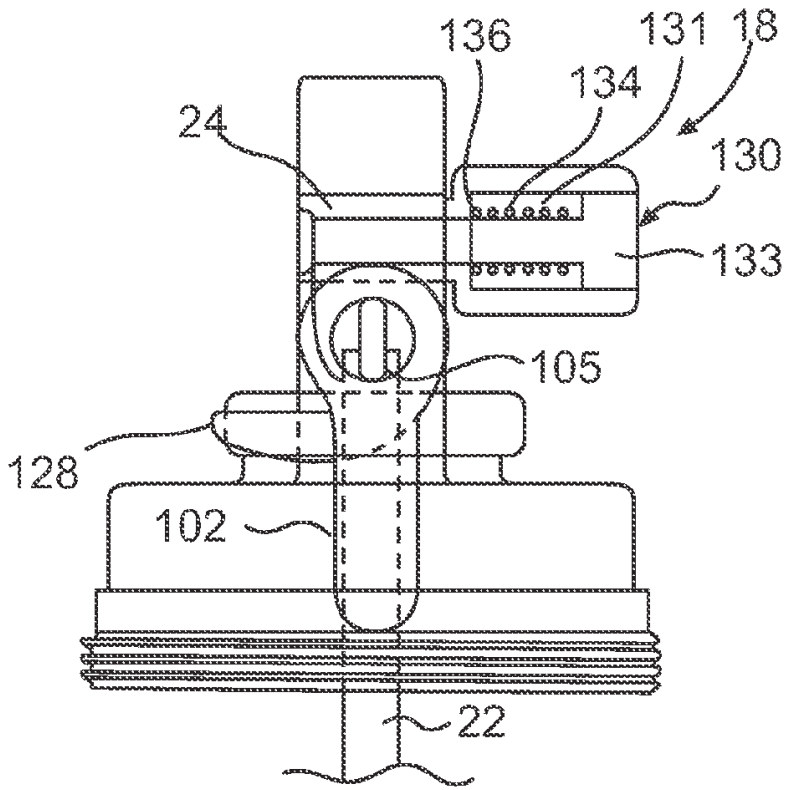


FIG. 11d

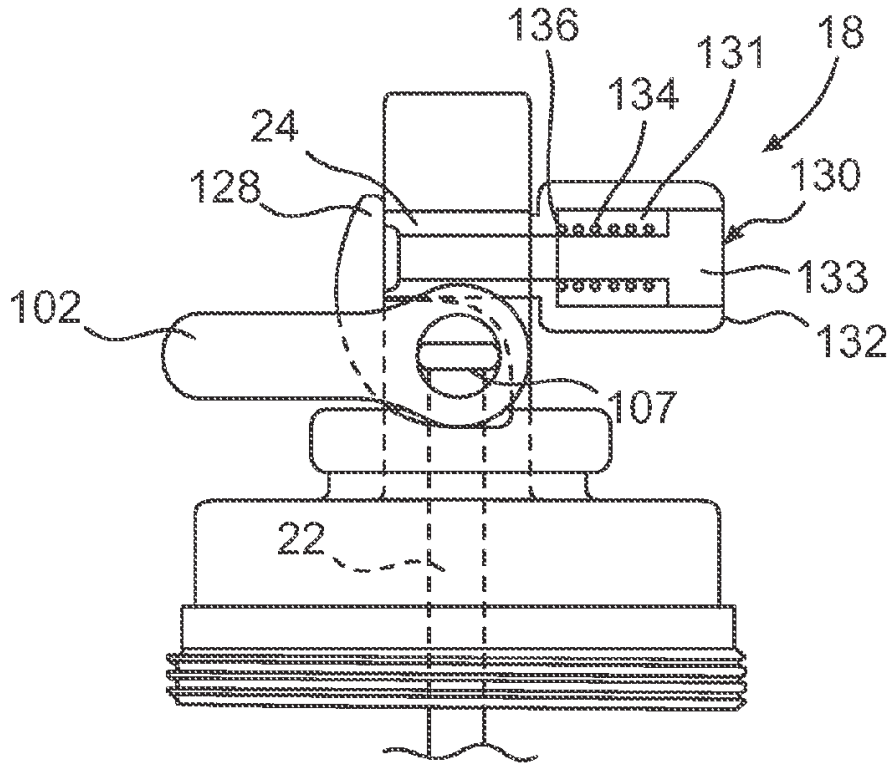


FIG. 11e

‘207 Patent (Ex. 1001), FIGs. 11d, 11e

‘207 Patent – Figures 11f and 11g

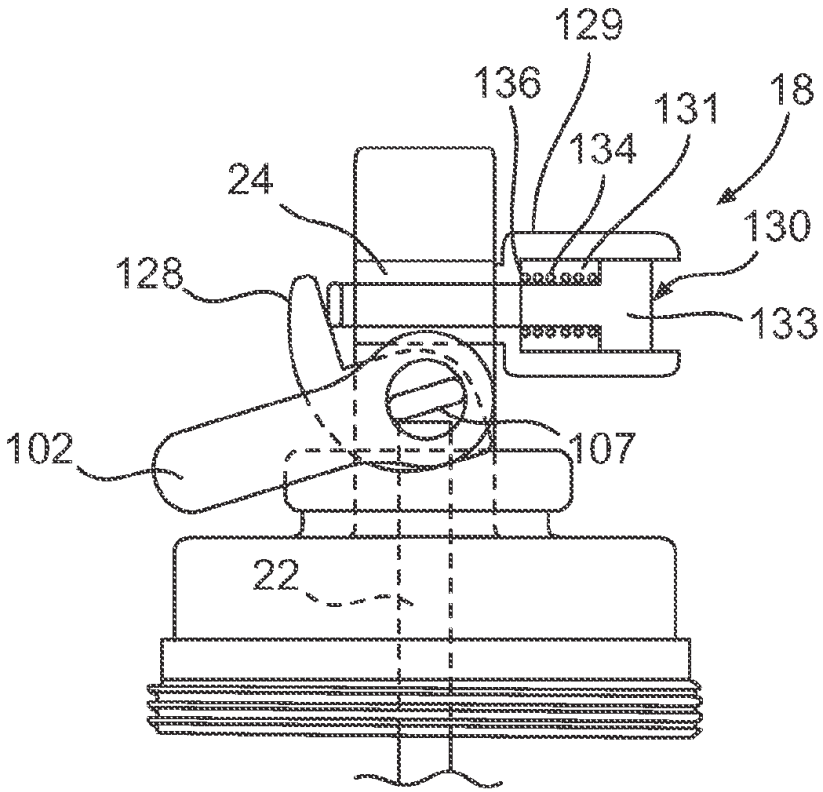


FIG. 11f

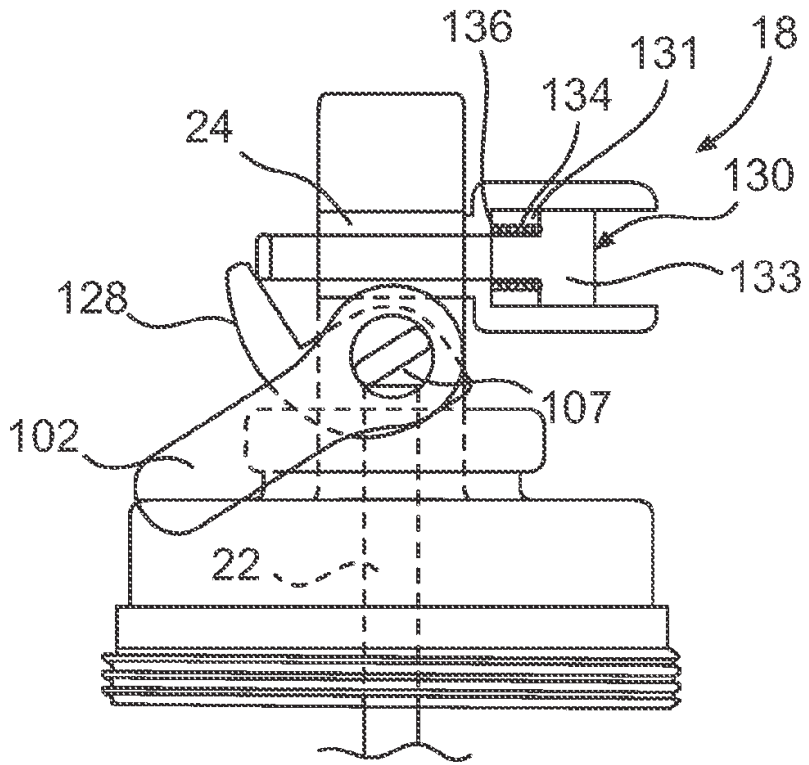


FIG. 11g

‘207 Patent (Ex. 1001), FIGs. 11f, 11g

‘207 Patent – Figure 12

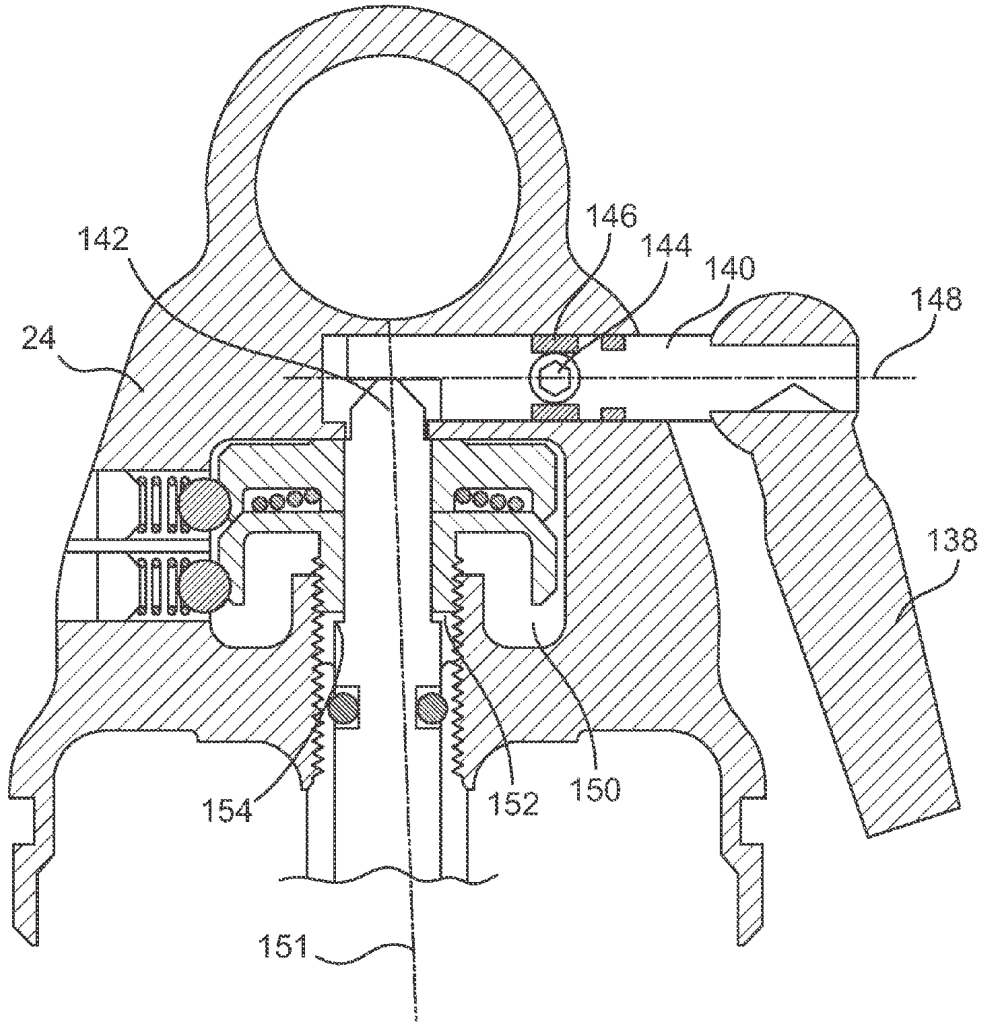


FIG. 12

‘207 Patent (Ex. 1001), FIG. 12

Claims of the ‘207 Patent

Independent Claim 1 – Challenged

1. An actuator apparatus for controlling a valve mechanism of a suspension system, the actuator apparatus comprising:

a valve actuating assembly operatively connected to the valve mechanism, the valve actuating assembly including a camshaft rotatable between at least two positions to adjust the valve mechanism between various suspension settings; and

an adjuster assembly operatively connected to the valve actuating assembly for adjusting the damping characteristics corresponding to at least one of the positions of the valve actuating assembly independently of the damping characteristics corresponding to another position of the valve actuating assembly.

'207 Patent (Ex. 1001), 8:45–58

Dependent Claim 2 – Challenged

2. The actuator apparatus of claim **1** wherein the valve actuating assembly comprises:

a driver movable to adjust the valve mechanism between various suspension settings; and

a selector operatively connected to the driver and rotatable between the positions.

'207 Patent (Ex. 1001), 8:59–64

Dependent Claim 3 – Challenged

3. The actuator apparatus of claim **2** wherein the selector comprises:

a lever operable between the positions; and

the camshaft operatively connected to the lever, and at least two cam surfaces corresponding to the positions of the lever, the cam surfaces configured to be engage-able with the driver.

'207 Patent (Ex. 1001), 8:65–9:4

Dependent Claim 4 – Unchallenged

4. The actuator apparatus of claim **3** wherein at least one of the cam surfaces is disposed substantially parallel to the camshaft axis and at least another of the cam surfaces is disposed at an angle relative to the camshaft axis.

'207 Patent (Ex. 1001), 9:5–8

Dependent Claim 5 – Unchallenged

5. The actuator apparatus of claim **4** wherein the adjuster assembly comprises a knob operatively connected to the camshaft to axially displace the camshaft to vary the engagement point of the driver along the angled cam surface.

'207 Patent (Ex. 1001), 9:9–12

Dependent Claim 6 – Unchallenged

6. The actuator apparatus of claim **4** wherein the adjuster assembly is formed integrally with the selector of the valve actuating assembly, the camshaft threadably coupled to a housing of the suspension system to axially displace the camshaft along the housing to vary the engagement point of the driver along the angled cam surface.

'207 Patent (Ex. 1001), 9:13–18

Dependent Claim 7 – Challenged

7. The actuator apparatus of claim 2 wherein the selector comprises:

a lever operable between the positions;

the camshaft having at least two cam surfaces corresponding to the positions of the lever, the camshaft operatively connected to the lever; and

a stop element rotatable with the selector and configured to abut against the adjuster assembly to prevent over-rotation of the lever.

'207 Patent (Ex. 1001), 9:19–27

Dependent Claim 8 – Challenged

8. The actuator apparatus of claim **7** wherein the cam surfaces are disposed substantially parallel to the camshaft axis.

'207 Patent (Ex. 1001), 10:1–3

Dependent Claim 9 – Unchallenged

9. The actuator apparatus of claim **8** wherein the adjuster assembly comprises a limit screw threadably coupled to a housing of the suspension system and configured to be engageable with the stop element to prevent over-rotation of the lever.

'207 Patent (Ex. 1001), 10:4–8

Dependent Claim 10 – Challenged

10. The actuator apparatus of claim **2** wherein the selector comprises:

a lever operable between the positions;

the camshaft having a plurality of cam surfaces, at least one of said cam surfaces configured to be engageable with the driver, the cam surfaces corresponding to the positions of the lever, the cam surfaces disposed substantially parallel to the axis of the camshaft, the camshaft operatively connected to the lever.

'207 Patent (Ex. 1001), 10:10–18

Dependent Claim 11 – Challenged

11. The actuator apparatus of claim **10** wherein the adjuster assembly is operatively connected to the driver to position the driver relative to camshaft of the selector.

'207 Patent (Ex. 1001), 10:19–21

Dependent Claim 12 – Challenged

12. The actuator apparatus of claim **1** wherein the positions of the valve actuating assembly are rider-selectable positions.

'207 Patent (Ex. 1001), 10:22–24