<u>PATENTS EXAMINATION BOARD</u>

Subject: The Drafting of Patent Specifications - Paper ~~2~~ 1

Date: January 2022

Time: 09h00 -13h00 (although candidates requiring extra time are entitled to an additional two hours)

Examiners: L Cilliers
V Williams

Moderator: J D Whittaker

<u>Question 1</u> **[50 marks]**

Your client, an avid mountain biker, hands you the following description and drawings of her new bicycle suspension system which she aptly refers to as "the Brain".

"For many years bicycles were constructed using rigid frame designs. These conventional bicycles relied on air-pressurized tires and a small amount of flexibility in the frame and the front forks to absorb forces from bumps in a road or a trail. This level of shock absorption was generally considered acceptable for bicycles ridden primarily on flat, well-maintained roads. However, as "off-road" biking became more popular with the advent of All Terrain Bicycles ("ATBs"), improved shock absorption systems were needed to improve the smoothness of a ride over harsh terrain. As a result, a shock absorbing bicycle suspension for a rear wheel of an ATB was developed, an example of which is shown in FIG. 1 of the drawings below. As can be seen, a telescoping shock absorber 110 is rigidly attached at one end to a rear member 103 of a bicycle frame, and is pivotally attached at the other end to a lug 106 extending from a seat tube 120 of the bicycle frame.

The shock absorber 110 can either be set to "soft" (for better wheel contact and improved control when pedalling over relatively rough terrain) or to "stiff" (for maximum power and efficiency when pedalling over relatively smooth terrain). Importantly, there is no existing mechanism for automatically adjusting the shock absorber setting as the nature of the terrain and/or the pedalling conditions change. Most shock absorbers are therefore configured *somewhere between "soft" and "stiff" settings, i.e. at a static, intermediate setting, which cannot automatically adjust to provide "ideal" damping in different conditions.*

I have designed an improved suspension system for an ATB which can adjust dynamically to different terrain and/or pedalling conditions by differentiating between upward forces produced by contact of a bicycle wheel with rough terrain, and downward forces produced by movements of a rider on the bicycle.

In the drawings below, FIG. 1 shows a side view of a conventional (prior art) suspension on a rear portion of a bicycle; FIG. 3 shows a cross-sectional schematic view of a suspension system accordance to my invention; FIG. 4 shows the suspension system of FIG. 3 reacting to a rider-induced force; FIG. 5 shows the suspension system of FIG. 3 reacting to a terrain-induced force; FIG. 6 shows, in a cross-sectional schematic view, a fluid refill mechanism on the suspension system; and FIG. 8 shows an enlarged schematic view of the suspension system mounted on a bicycle.

With reference to FIG. 3 of the drawings, my suspension system is designed for attachment to a bicycle, such as the ATB illustrated in FIG. 1, and includes a primary tube 302 and a secondary tube 304 which are coupled via a connector hose 306. An upper mount 318 is designed for pivotal connection to a lug, such as the lug 106 on the ATB illustrated in FIG. 1, and a lower mount 342 is designed for fixed connection to a bicycle wheel by a frame member, such as the rear frame member 103 of the ATB illustrated in FIG. 1.

A piston 308 on a piston rod 310 divides the inside of the primary tube 302 into an upper fluid chamber 312 and a lower fluid chamber 314, and these chambers are filled with a hydraulic fluid. The piston rod 310 passes through a seal arrangement 316 in the primary tube 302 so as to extend into the chambers 312 and 314, as shown, and an upper end of the piston rod 310 is connected to the upper mount 318. Longitudinally extending passages 320 in the piston 308 provide for limited fluid communication between the upper fluid chamber 312 and the lower fluid chamber 314.

With reference also to FIGS. 4 and 5 of the drawings, an inertial valve 322 is movable within a chamber 326 of the secondary tube 304, and is biased by a coil spring 324. The coil spring 324 is shown in a fully extended condition in FIG. 4, in which it biases the inertial valve 322 into a closed position for blocking or reducing fluid flow from the primary tube 302 to the secondary tube 304 via the connector hose 306. When the coil spring 324 is in a fully compressed state, as shown in FIG. 5, the inertial valve 322 is in an open position for allowing fluid flow from the primary tube 302 to the secondary *tube 304 via the connector hose 306. The inertial valve 322 is typically formed from a relatively dense, heavy metal such as brass.*

Disposed within the body of the inertial valve 322 is a fluid return chamber 336 (see FIG. 3). A first fluid return port 337 allows for fluid flow between the return chamber 336 and the connector hose 306, and a second fluid return port 339 allows for fluid flow between the return chamber 336 and a secondary fluid chamber 332. A fluid return element 338 located within the fluid return chamber 336 is biased by a fluid return spring 340, as shown. In FIGS. 3 and 5, the fluid return spring 340 is shown in a fully extended condition in which it biases the fluid return element 338 into a closed position for blocking fluid flow between the secondary fluid chamber 332 and the connector hose 306. When the fluid return spring 340 is in a fully compressed condition, as shown in FIG. 6, the fluid return element 338 is in an open position for allowing fluid flow between the secondary fluid chamber 332 and the connector hose 306.

The secondary tube 304 includes a floating piston 328 which separates a gas chamber 330 (typically pressurized with nitrogen) from the secondary fluid chamber 332. A valve 334 at an upper end of the secondary tube 304 allows for adjustments to the pressure in the gas chamber 330.

In use, when a downward force produced by movement of a rider on the bicycle (a rider-induced force) occurs, as can be seen in FIG. 4, the piston rod 310 and the piston 308 are displaced downwardly. However, since the inertial valve 322 is in a closed position, it blocks or reduces the flow of hydraulic fluid from the lower fluid chamber 314 to the secondary fluid chamber 332 via the connector hose 306. Consequently, the piston 308 is not displaced downwardly within the primary tube 302 to reduce the volume of the lower fluid chamber 314 to any significant extent. Thus, a rider-induced force results in relatively "stiff" damping.

On the other hand, when an upward force produced by contact of the bicycle wheel with the terrain (a terrain-induced force) occurs, as can be seen in FIG. 5, the primary tube 302 and the secondary tube 304 are displaced upwards. However, since the inertial valve 322 is formed from a relatively dense, heavy metal, the inertia of this valve resists the upward displacement of the secondary tube 304, thereby causing downward displacement of the inertial valve 322 relative to the secondary tube 304. As the inertial valve 322 moves downwardly within the chamber 326 into an open position, it allows hydraulic fluid flow from the lower fluid chamber 314 into the secondary fluid chamber 332 via the connector hose 306. Then, as the piston 308 is displaced downwardly relative to the primary tube 302, the floating piston 328 is displaced upwardly relative to the secondary tube 304, thereby reducing the volume of the gas chamber 330. In this way, a terrain-induced force will result in relatively "soft" damping.

After this damping, a return spring 130 surrounding the primary tube 302 (see FIG. 8), and the compressed gas in the gas chamber 330, bias the piston 308 and the piston rod 310 back into their raised positions, thereby drawing hydraulic fluid from the secondary fluid chamber 332 back into the lower fluid chamber 314. Also, the coil spring 324 biases the inertial valve 322 back into its closed position, as seen in FIG. 6. In this position of the inertial valve 322, fluid may continue flowing from the secondary fluid chamber 332 to the lower fluid chamber 314 via the fluid return ports 337 and 339. In this regard, decompression of the gas in the gas chamber 330 drives the floating piston 328 downwardly, reducing the volume of the secondary fluid chamber 332. When this occurs, the hydraulic fluid in the secondary fluid chamber 332 forces the return element 338 downwardly within the fluid return chamber 336, against the bias of the coil spring 340, as shown in FIG. 6. Once the fluid return element 338 has been displaced downwardly below the fluid return port 337, hydraulic fluid can flow from the secondary fluid chamber 332 through the fluid return port 339, through the fluid return chamber 336, through the fluid return port 337, through the connector hose 306, and into the lower fluid chamber 314. This continues until the pressure in the secondary fluid chamber 332 is low enough for the fluid return element 338 to be biased back into the closed, FIG. 5 position by the fluid return spring 340.

With reference to FIG. 8 of the drawings, the sensitivity of the inertial valve 322 may be adjusted by changing the angle θ, i.e. the angle at which the secondary tube 304 is mounted relative to the direction of the terrain-induced force. The greatest sensitivity will be achieved when the secondary tube 304 is mounted as shown in sold lines in FIG. 8. With such mounting, the direction of displacement of the inertial valve 322 in the chamber 326 is parallel with respect to the direction of a terrain-induced force applied to the secondary tube 304, allowing the entire terrain-induced force vector to be applied in the exact opposite direction to that of the displacement of the inertial valve 322. However, if the secondary tube 304 is mounted at an angle θ relative to the direction of the terrain-induced force, as shown in broken lines in FIG. 8, a reduced sensitivity of the inertial valve 322 will be achieved because only a portion of the terrain-induced force vector will be applied in the exact opposite direction to that of the displacement of the inertial valve 322."

The candidate is required to identify the inventive feature(s) of the above invention, and to draft up to three claims to protect the invention.

The following figures do not include FIGS. 2 or 7. This is not an error.

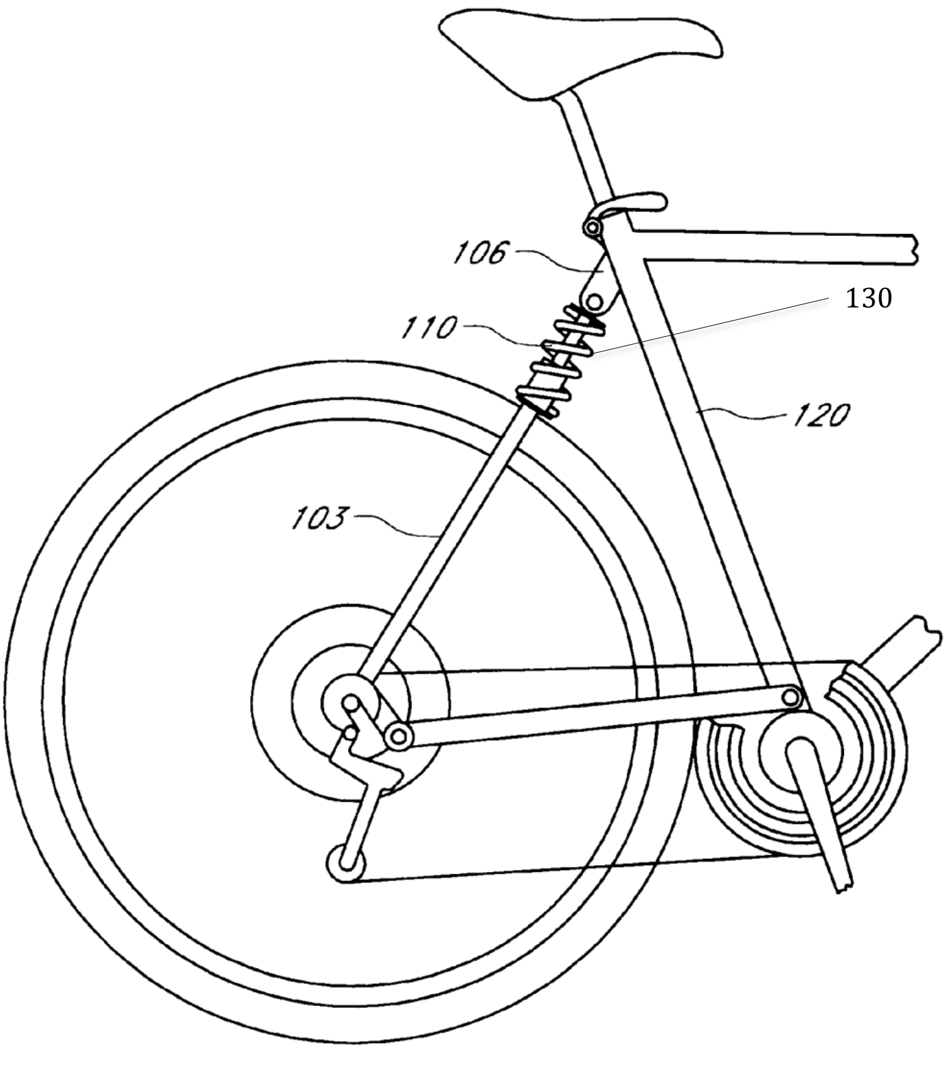
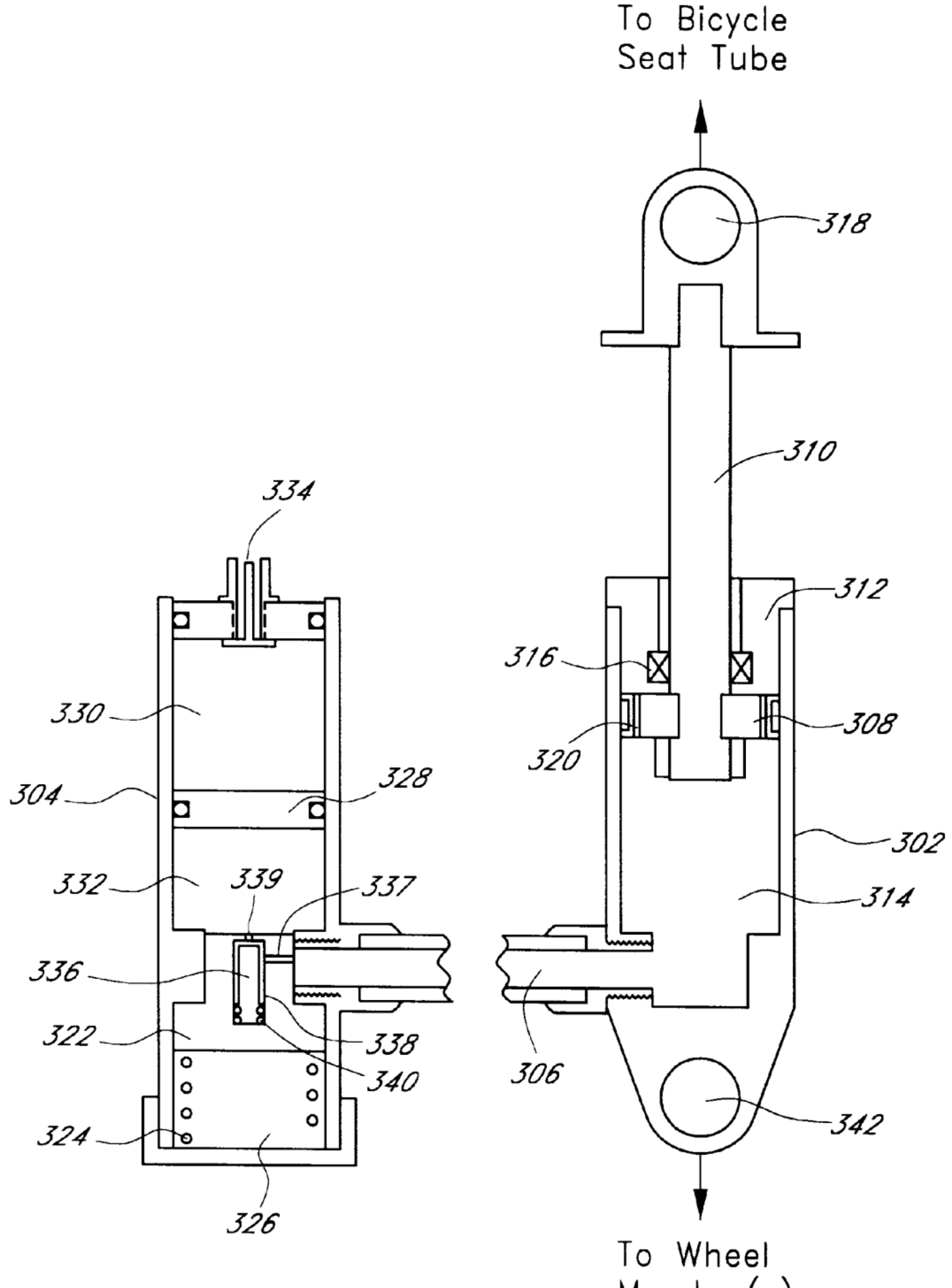


FIG. 1
(PRIOR ART)


To Bicycle Seat Tube
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312
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To Wheel Member(s)

FIG. 3

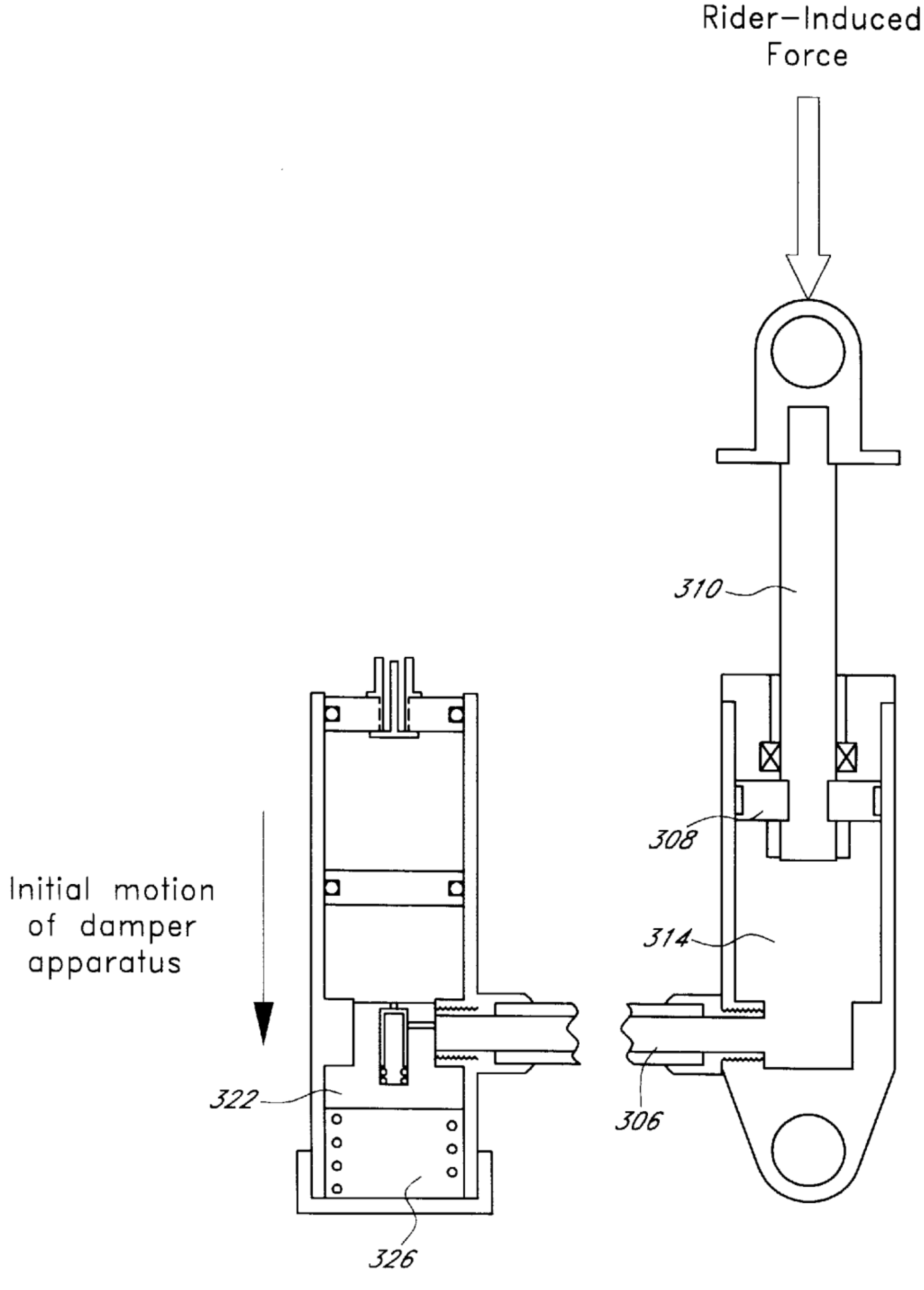
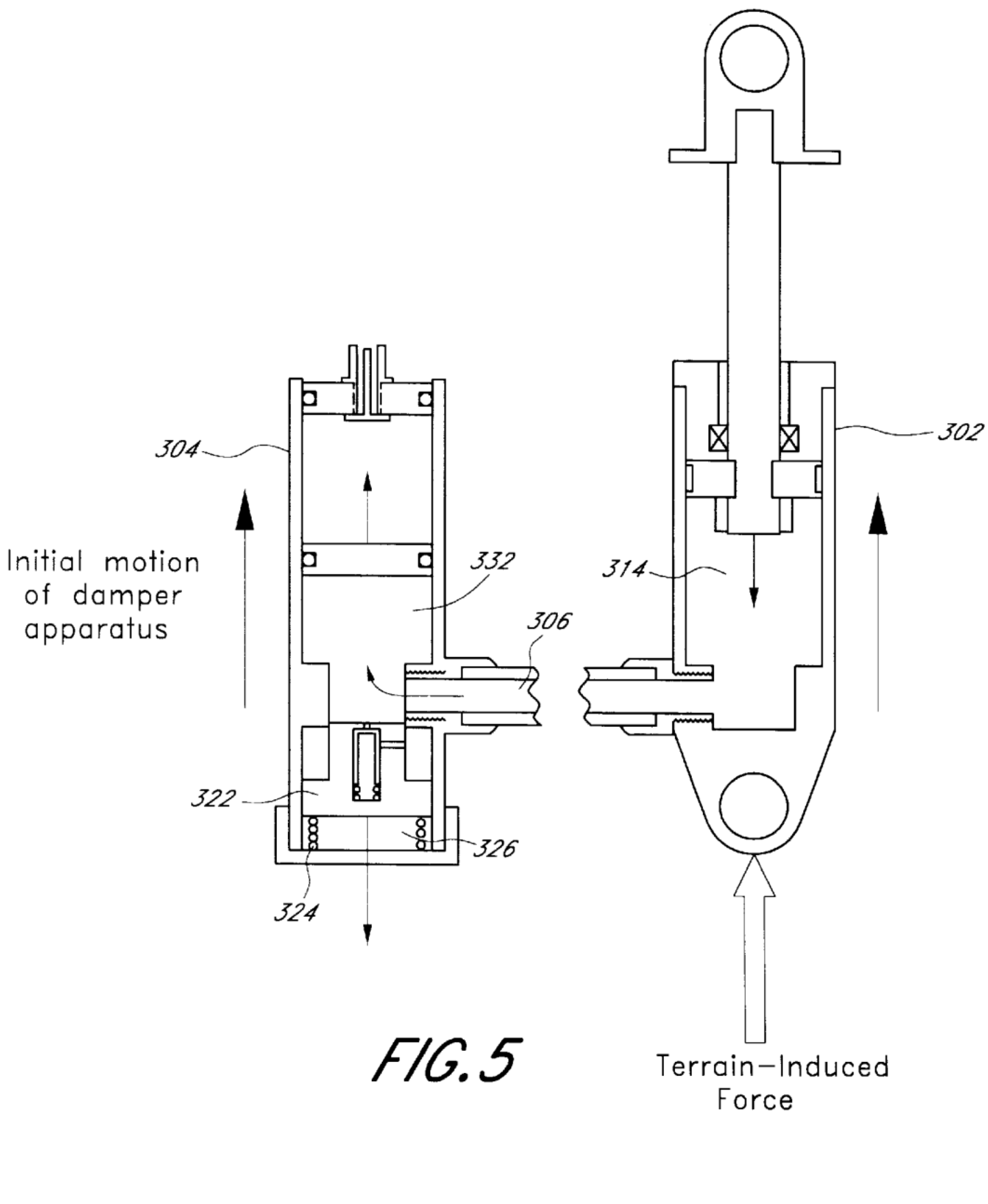

Rider-Induced
Force
310
308
Initial motion
of damper
apparatus
314
322
306
326

FIG. 4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302
Initial motion
of damper
apparatus
332
314
306
322
326
324
Terrain–Induced
Force

FIG. 5

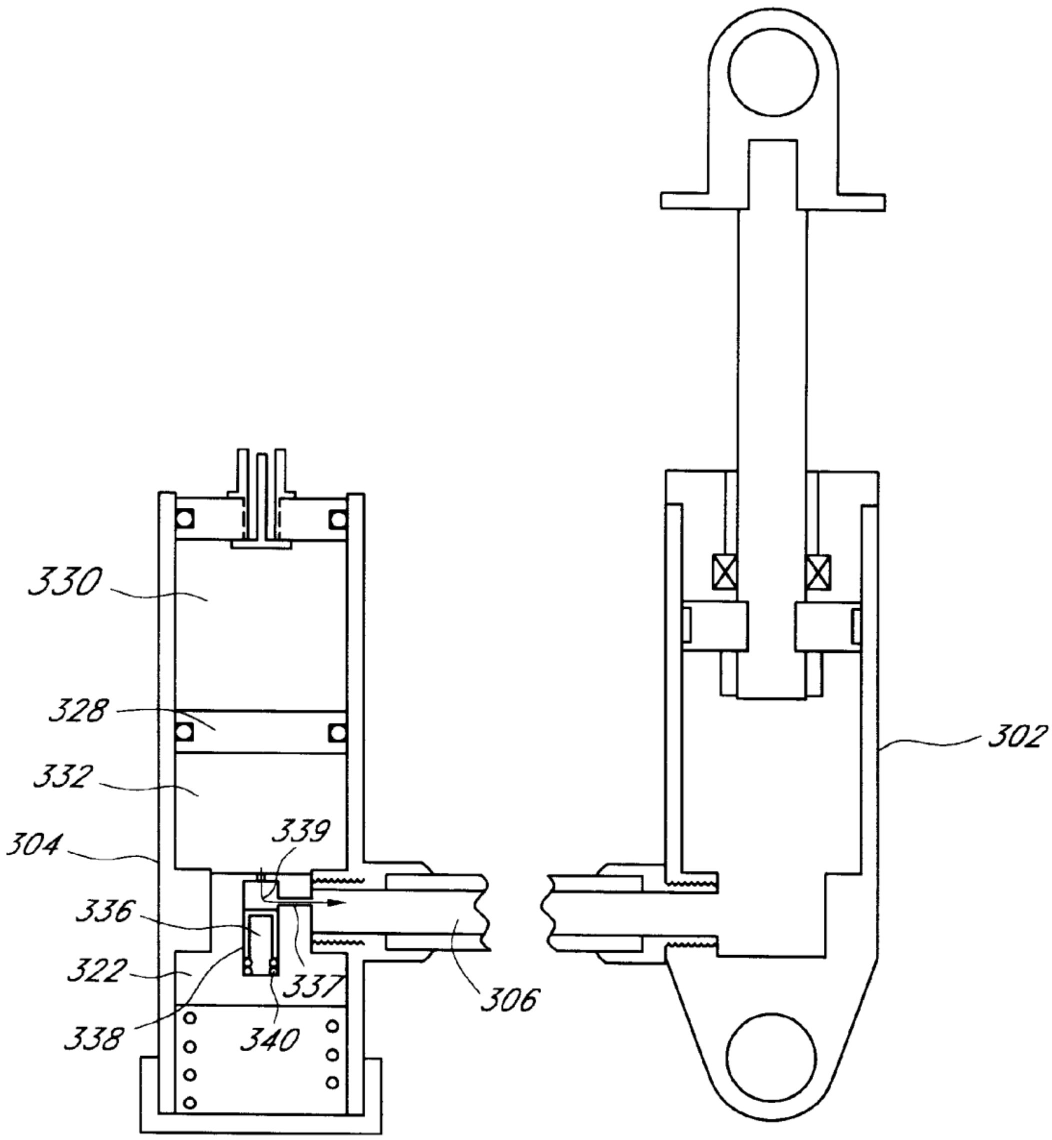

FIG. 6

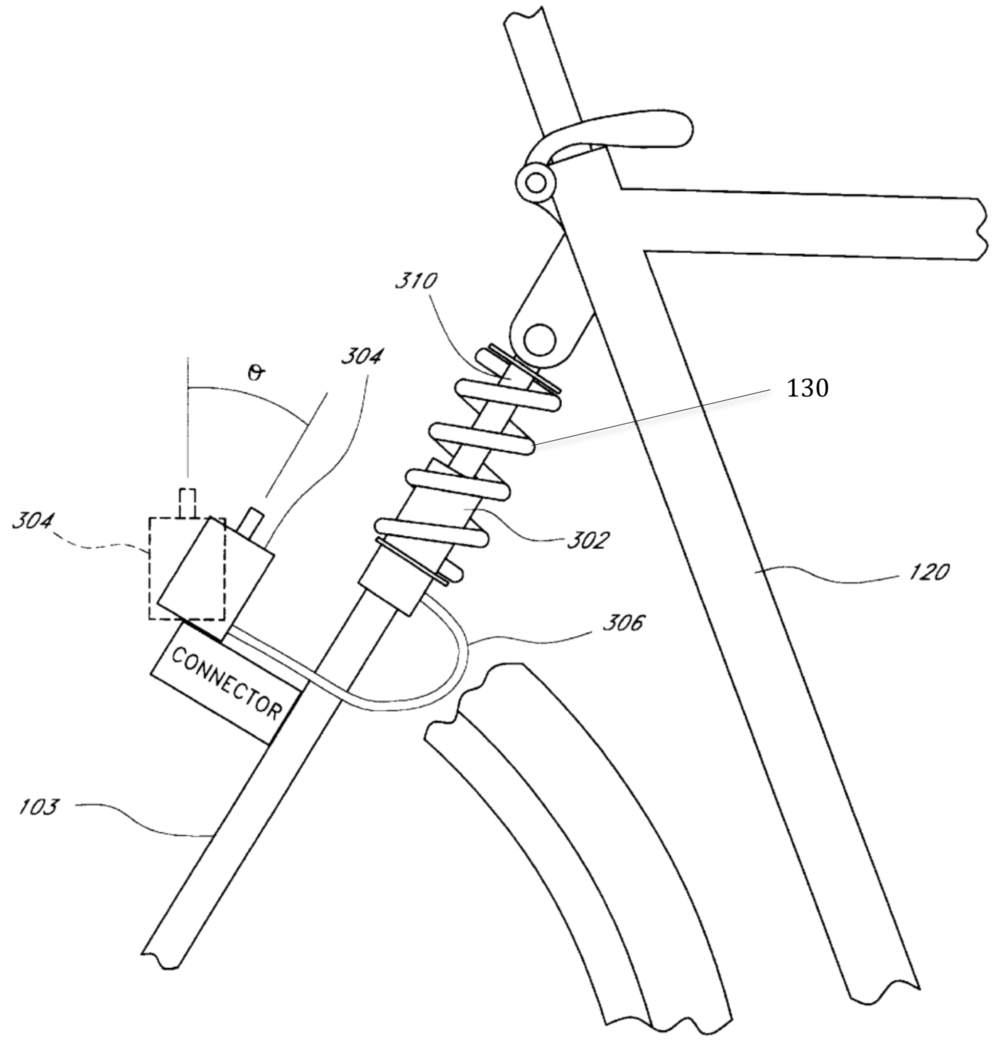

FIG. 8

Question 2 **[50 marks]**

Your client hands you the following description, drawings and rough sketches of an embodiment of his latest invention.

"*Dissolvable sanitizing substances for toilets are usually compressed into blocks commonly known as toilet blocks. Typically, these blocks are used to sanitize, clean, disinfect, sterilize, colour, scent and/or deodorize toilets upon flushing. In some cases, solid blocks of soluble substances are located in a porous holder which may be mounted to a rim of a toilet bowl. When the toilet is flushed, water passes through the holder and dissolves a portion of the block into the flushing water, and this water then sanitizes surfaces of the toilet bowl as it passes through the bowl. In other cases, solid blocks of sanitizing substances are placed directly into a cistern of a toilet. These blocks, also referred to as "in-cistern" blocks, slowly dissolve into the water in the cistern and, upon flushing, the water and sanitizing substances dissolved therein sanitizes surfaces of the toilet bowl as it passes through the bowl. A disadvantage with "in-cistern" blocks is that there is no way of controlling the concentration of the sanitizer dispensed with each flush.*

I have designed a new dispenser which is illustrated in the drawings and sketches below. FIG. 1 shows a perspective view of a dispenser according to my invention; FIG. 2 shows a partially sectioned perspective view of the dispenser of FIG. 1; FIG. 3 shows a cross-sectional view of the dispenser of FIGS. 1 and 2 in a cistern prior to flushing, FIG. 4 shows a cross-sectional view of the dispenser and cistern illustrated in FIG. 3 in a flushing condition; and FIG. 5 shows a cross-sectional view of the dispenser and cistern illustrated in FIG. 3 in a flushed condition.

With reference to FIGS. 1 and 2 of the drawings, a dispenser 10 according to my invention includes a container 12 having a base 14, a pair of spaced-apart side walls 16, and a pair of arcuate-shaped end walls 18 and 18.1, which form a reservoir 20 for receiving a dissolvable sanitizer block 22. The container 12 defines an inlet rim 24, and a dispensing outlet in the form of a substantially U-shaped cut-away 26 in the end wall 18.1. In order to support the container 12 in an upright condition, in use, the base 14 has stabilising feet 30 extending therefrom. The base 14 could also be weighted to stabilise to the container 12, in use.

A curved retaining formation 32 is provided on the inner surface of each side wall 16 for retaining the sanitizer block 22 in position in the reservoir 20 (see, for example, FIG. 2). These retaining formations 32 are spaced from the base 14, and are also spaced from one another to define a central gap (not visible) between them. The central gap between the retaining formations 32 *allows dissolved sanitizer to be concentrated in an operatively lower region of the reservoir 20, between the retaining formations 32 and the base 14.*

With reference also to FIGS. 3 to 5, a separator 34 divides the reservoir 20 into an inlet portion 36 and an outlet portion in the form of a passage 38 which leads to the dispensing outlet 26. The separator 34 is spaced from the base 14, as shown, thereby providing a flow path from the inlet portion 36 to the dispensing outlet 26, via the passage 38, when the toilet is flushed. A pair of grooves 42 (see FIG. 1) in the sidewalls 16 receive opposing longitudinal edges of the separator 34 in a complementary fashion. The grooves 42 are specifically sized to allow for sliding adjustments of the separator 34 within the container 12, thereby to change the size of an adjustable gap at the entrance to the passage 38, between a bottom edge of the separator 34 and the base 14. In this way, the concentration of the dissolved sanitizer 27 dispensed with each flush may be decreased by decreasing the size of the adjustable gap (i.e. sliding the separator 34 towards the base 14 in the direction of the arrow 44 in FIGS. 1 and 2). Similarly, the concentration of the dissolved sanitizer 27 dispensed with each flush may be increased by increasing the size of the adjustable gap (i.e. sliding the separator 34 away from the base 14 in the direction of the arrow 46 in FIGS. 1 and 2).

The concentration of dissolved sanitizer 27 dispensed from the dispenser 10 with each flush is also dependent upon the volume of water in the inlet portion 36 above the level of the lowest edge of the dispensing outlet 26. Accordingly, by raising or lowering the lowest edge of the outlet 26 (for example with a slidable closure (not shown)), the concentration of the sanitizer 27 dispensed from the dispenser 10 with each flush may be adjusted.

Also, at a given level of the lowest edge of the dispensing outlet 26, the flow rate of the dissolved sanitizer 27 out of the dispenser 10 may be adjusted by increasing or decreasing the lateral dimension of the dispensing outlet 26.

In a pre-flushing condition with a cistern 28 full of water, as shown in FIG. 3, the concentration of the dissolved sanitizer 27 in the dispenser 10 is highest near the base 14.

When the toilet is flushed, the dissolved sanitizer 27 in the water 40 flows through the passage 38, out of the dispensing opening 26, and out of the cistern 28, via an opening 48, in the direction of the arrow 46 in FIG. 4.

Immediately after flushing, the level of the water 40 in the reservoir 20 corresponds with the level of the lowest edge of the dispensing outlet 26, as shown in FIG. 5.

My dispenser 10 is advantageous in that it allows for the adjustment of the dosage, the concentration and the flow rate of a dissolved sanitizer 27 dispensed from the dispenser for sanitising a toilet bowl."

The candidate is required to identify the inventive feature(s) of the above invention, and to draft up to three claims to protect the invention.

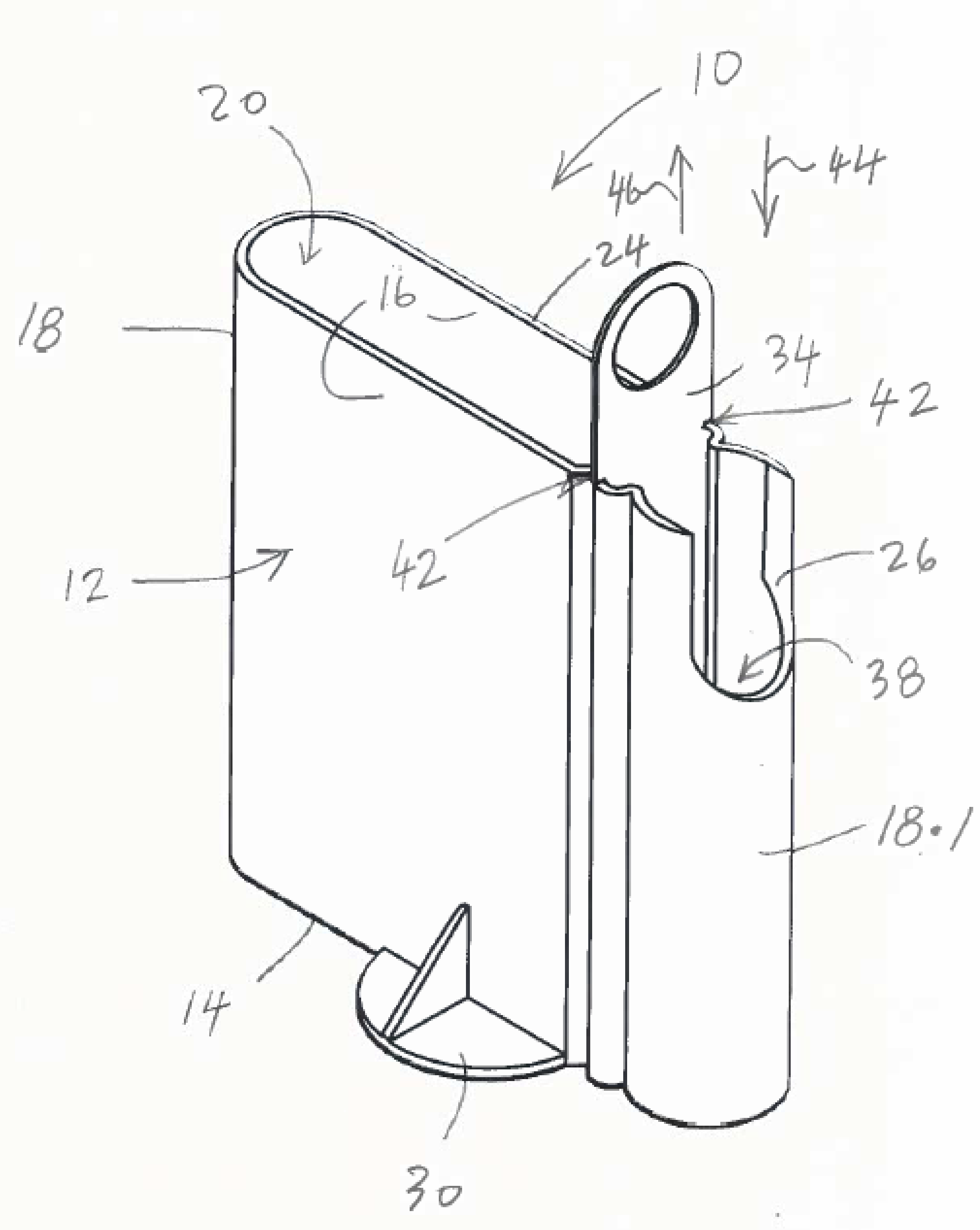

FIG. 1

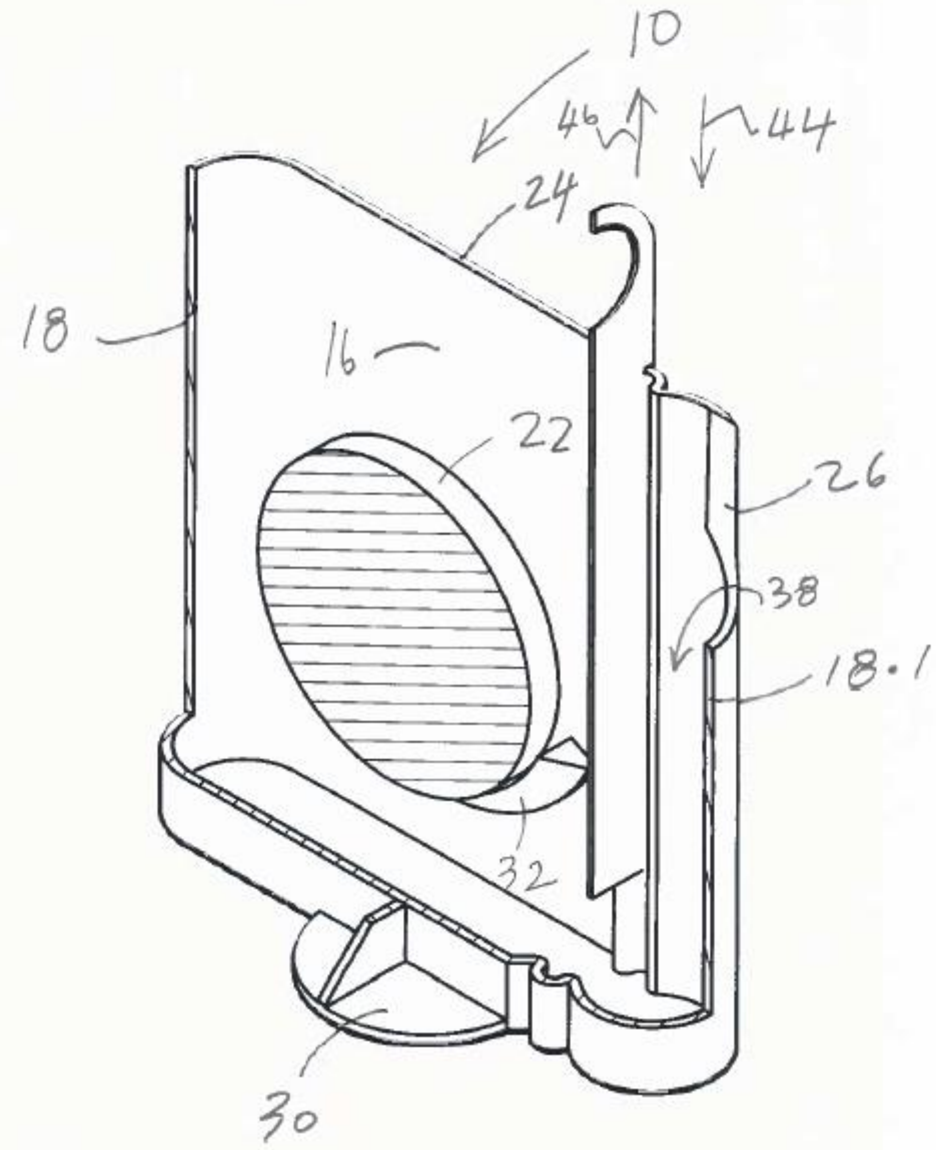

FIG. 2

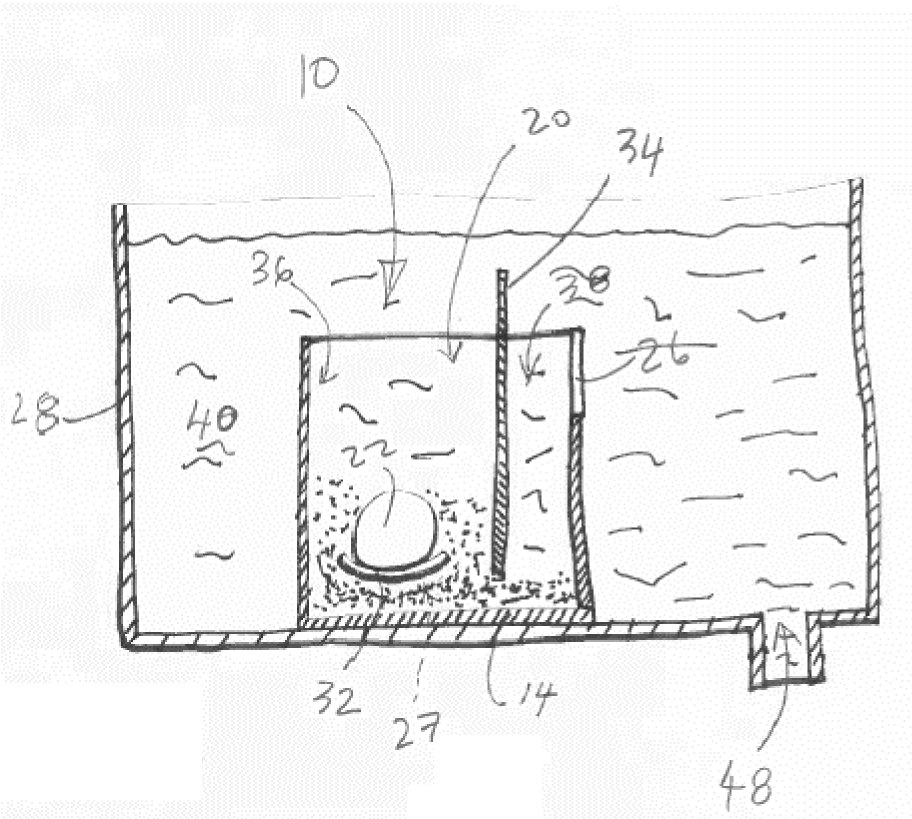
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FIG. 3

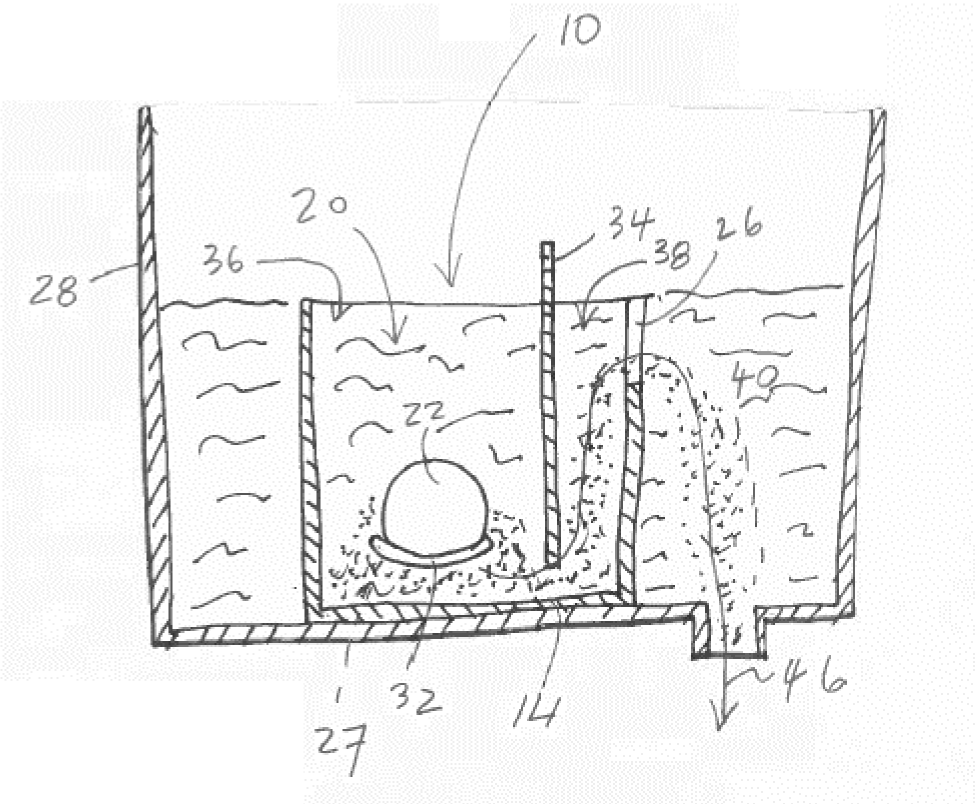
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FIG. 4

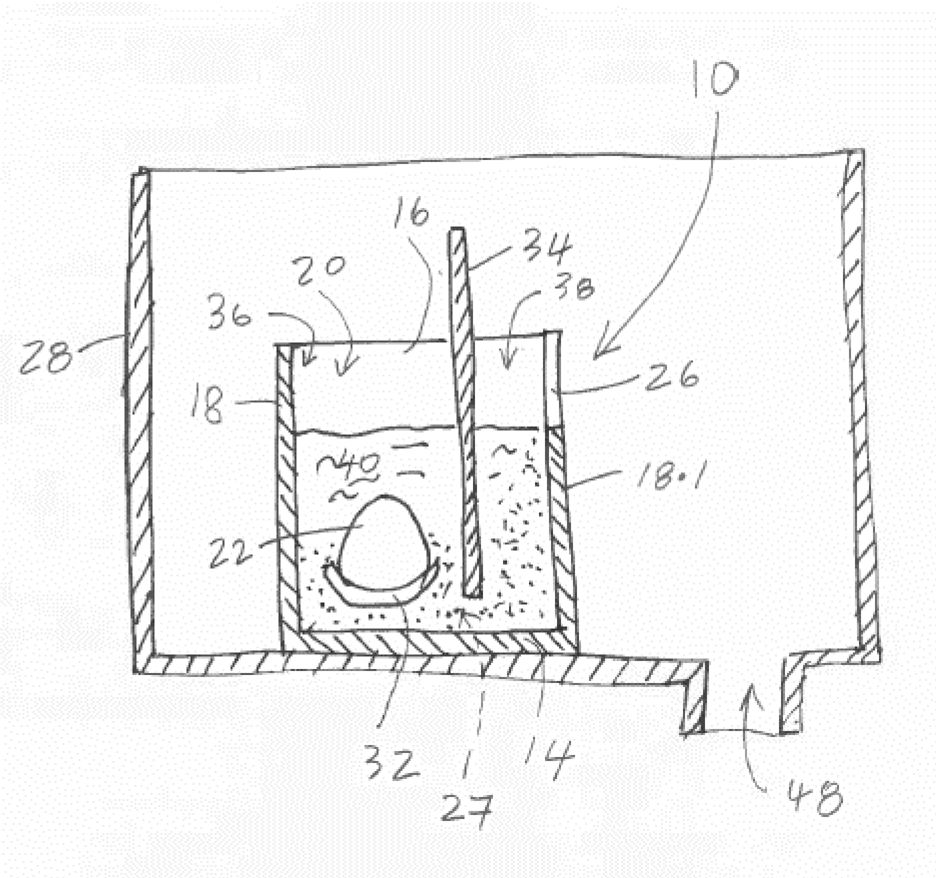

FIG. 5