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(71) Applicant: **T3 MICRO, INC.** [US/US]; 228 Main Street, Suite 12, Venice, CA 90291 (US).

(72) Inventors: **YU, Kent**; c/o T3 Micro, Inc., 228 Main Street, Suite 12, Venice, CA 90291 (US). **POFCHER, Paul**; c/o T3 Micro, Inc., 228 Main Street, Suite 12, Venice, CA 90291 (US). **ROCHA, Michael**; c/o T3 Micro, Inc., 228 Main Street, Suite 12, Venice, CA 90291 (US).

(74) Agent: **DELJUIDICE, Louis, J.**; Trouman Sanders LLP, 875 Third Avenue, New York, NY 10022 (US).

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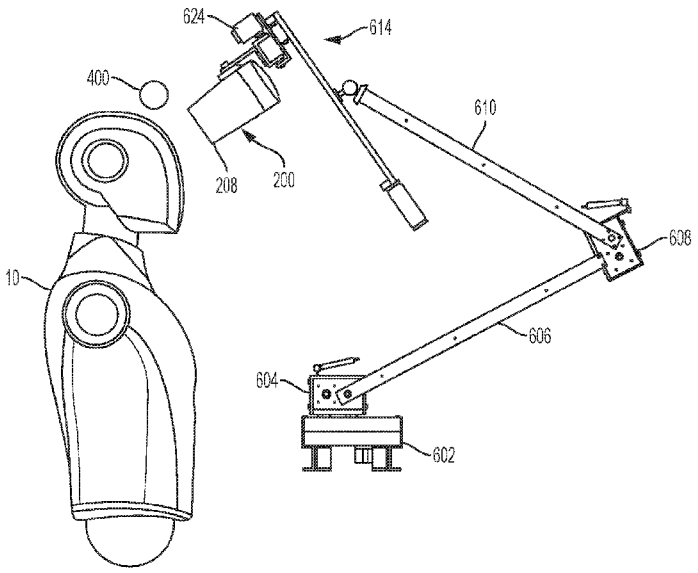

Figure 9

(57) Abstract: A motion sensing hair dryer system can include a hair dryer, a controller, and a tracker. The dryer can have the standard features of a hair dryer and can also include a tracking element and a movable base. The tracking element can be used to track the user in different ways. The movable base can move the dryer in at least four to six degrees of freedom. The base can be motorized and powered. The tracker can allow the dryer to track the motions of the user to determine where to direct the air flow. The tracker can be wearable on the user or mounted on the tracker.

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MOTION SENSING HAIR DRYER

Cross-Reference to Related Applications

This application claims priority to U.S. Provisional Application Serial No. 62/360,069 filed July 8, 2016. This application is incorporated herein by reference in its entirety.

Technical Field

The present invention relates to an apparatus of a hair drying unit with a motion sensing tracker to free a user's hands for convenience or artistic styling of the hair.

Background

Among conventional hair treatment apparatuses for blowing warm and hot air are a hand dryer which is held by hand and blows hot air to a desired portion of the head. However, using a hand held dryer requires strength and good hand-eye coordination, especially for women with long hair. Maneuvering a hairbrush the way needed to get that sleek salon style while holding hair dryer at the same time makes things harder and more complicated for the user at home. Numerous attempts to solve this problem have been made.

U.S. Patent No. 8,082,679 to Arnim describes a device and method for directing heated air from a hair dryer onto the hair while brushing or combing the hair. The hair dryer is fitted with a pivoting nozzle that follows a brush or combing device. The position of the nozzle relative to the brush is preferably controlled through magnetic attraction. However, this is not a hands free device. Figure 1 clearly shows a user holding the dryer. Nor does the user have control over any of the dryer's functions. The diffuser simply follows the brush. Also, as can be seen, the range of motion is limited.

U.S. Patent Publication No. 2004/0168337 to Curtin describes a hands-free dryer which can move over a wide range of angles in order to dry the surface of a person's hair or body. The position of the dryer is controlled by a preprogrammed or programmable control unit. Her control means may comprise an infrared or radio frequency transceiver for detecting the presence or absence of a user. That is whether a user remains close enough to the dryer so that the dryer remains on. However, the angles of the dryer are controlled by the control means. The dryer does not track the movements of the user while she is styling, the user must manually position the direction of the air flow.

U.S. Patent No. 5,640,781 to Carson describes a ceiling or wall mounted hair styling unit that supplies a user controlled volume of hot and cold air through an extendable, hollow-armed delivery tube to an adjustable nozzle leaving the user's hands free to manipulate hair styling tools. The user controls the amount of heat and volume of air with a wireless, remote control contained in the handle of a hair brush or within a foot operated, wireless signaling device, leaving both hands free. However, the actual movement of the nozzle is done manually and then set in position. The remote is only for air flow and temperature.

Other attempts to solve the “hands-free” problem include a bonnet dryer, worn over the hair like a hood or cap. While leaving the hands free, it is slow to dry the hair and leaves no room underneath for styling. Other solutions are stands, either telescoping or articulated, that just hold a hair dryer in a fixed position allowing the user to keep both hands free for styling. However, the user either needs to move her head or the stand as she styles.

Thus, there is a need for a truly “hands-free” dryer that the user can both move and control without touching the dryer.

Summary

The present invention solves the problem of a truly hands-free dryer. The user can remotely control all or most of the features of the air flow and temperature while the dryer automatically tracks the user’s movements.

A hand-free motion sensing hair dryer system can have a dryer comprising a fan and heating element to generate a heated air flow and a tracking element linked to the dryer. Further, it can have a dryer base engaging the dryer and moving the dryer in at least one direction. The dryer base includes a first motor rotatable around the base, a lower arm attached to and rotatable around the first motor, a second motor attached to an opposite end of the lower arm, and an upper arm attached to and rotatable around the second motor. Also there can be included a dryer movement system attached to an opposite end of the second arm and mounting the dryer where the dryer base moves the dryer in response to the tracking of the tracking element.

Other examples have the tracking element using at least one of RFID, GPS, magnets, color tracking, infrared (IR), visual recognition and radio frequency. The tracking element can be configured to track at least one of a user face, a tracking device, and a hair styling tool. A tracker can be linked to, and separate from, the tracking element. The tracker can be wearable on the

user or incorporated into a hair styling tool. The hands-free motion sensing hair dryer system can also have a controller communicating with the dryer and controlling the functions of the dryer.

Other example can have the dryer movement system with a dryer slide and carriage permitting linear movement of the dryer; and a dryer pan element permitting pivoting movement of the dryer. Also, the tracking element is mounted to the dryer movement system, the first motor can rotate 360° about the dryer base. The lower and upper arms can rotate about 160° about the first motor, the dryer movement system can pivot about 100° about the second arm, and the pan element can pivot about 100°.

In a separate example, a motion sensing hair dryer system includes a dryer with a fan and heating element to generate a heated air flow, a tracking element linked to the dryer, and a dryer base engaging the dryer and moving the dryer in at least one direction. The tracking element can be configured to track at least one of a user face, a tracking device, and a hair styling tool, and the dryer base moves the dryer in response to the tracking of the tracking element.

Brief Description of the Drawings

The following Detailed Description is better understood when read in conjunction with the appended drawings. For the purposes of illustration, there is shown in the drawings exemplary embodiments, but the subject matter is not limited to the specific elements and instrumentalities disclosed.

Figure 1 illustrates an example of motion sensing hair dryer system of the present invention;

Figure 2 illustrates an example of the range of motion of the dryer and base;

Figure 3A illustrates an example of a brush style controller;

Figure 3B illustrates an example of other hair styling tools that can be tracked;

Figures 4A-4C illustrate different examples of wearable trackers;

Figures 5A and 5B illustrate examples of a single component tracker;

Figures 6A and 6B illustrate examples of a concentrator;

Figure 7 is an example of a drone hands-free dryer;

Figure 8A is a front view of another example of motion sensing hair dryer system of the present invention;

Figure 8B is a side view of Figure 8A;

Figures 9-12 are various views of the other example of the motion sensing hair dryer system of the present invention in motion about a user;

Figures 13A, 13B and 13C are side, front and top views, respectively, of the dryer movement system; and

Figure 14 is a top side profile view of the arm and motor axes of the present example.

Detailed Description

To facilitate an understanding of the principles and features of the various embodiments of the present invention, various illustrative embodiments are explained below. Although exemplary embodiments of the present invention are explained in detail, it is to be understood that other embodiments are contemplated. Accordingly, it is not intended that the present invention is limited in its scope to the details of construction and arrangement of components set forth in the following description or examples. The present invention is capable of other embodiments and of being practiced or carried out in various ways. Also, in describing the exemplary embodiments, specific terminology will be resorted to for the sake of clarity.

It must also be noted that, as used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural references unless the context clearly dictates otherwise. For example, reference to a component is intended also to include composition of a plurality of components. References to a composition containing “a” constituent is intended to include other constituents in addition to the one named.

Also, in describing the exemplary embodiments, terminology will be resorted to for the sake of clarity. It is intended that each term contemplates its broadest meaning as understood by those skilled in the art and includes all technical equivalents that operate in a similar manner to accomplish a similar purpose.

By “comprising” or “containing” or “including” is meant that at least the named compound, element, particle, or method step is present in the composition or article or method, but does not exclude the presence of other compounds, materials, particles, method steps, even if the other such compounds, material, particles, method steps have the same function as what is named.

It is also to be understood that the mention of one or more method steps does not preclude the presence of additional method steps or intervening method steps between those steps expressly identified. Similarly, it is also to be understood that the mention of one or more components in a composition does not preclude the presence of additional components than those expressly identified. Such other components or steps not described herein can include, but are not limited to, for example, similar components or steps that are developed after development of the disclosed technology.

Figure 1 illustrates an example of a motion sensing hair dryer system 100 of the present invention. An example of the system 100 can include a hair dryer 200, a controller 300, and a tracker 400. While the elements are discussed separately below, different combinations of the dryer 200, controller 300, and tracker 400 are also discussed and contemplated.

The dryer 200 can have the standard features of a hair dryer, including a handle 202, a fan 204, heating coil 206 and a nozzle 208. In addition, the dryer 200 of the present invention can also include a tracking element 210, a wireless communicator 212, and data storage and/or processor 214. This is all then connected to a movable base 216.

The fan 204, heating coil 206 and nozzle 208 are as known to those of skill in the art. The fan 204 generates an air flow, which is heated by the heating coil 206 and directed out the nozzle 208 and to the user. Examples can place the fan 204 and the heating coil 206 in differing places within the dryer 200. Some examples can place both the fan 204 and heating coil 206 in the nozzle 208 section, other examples place both the fan 204 and the heating coil 206 in the movable base 216 and "duct" the air flow to the nozzle 208. A further example can move the fan 204 into the base 216 and the heating coil 206 in the nozzle 208.

The tracking element 210 can be used to track the user 10 in different ways, as discussed further below. The wireless communicator 212 can be used to wirelessly communicate with the controller 300 using any known wireless protocols, including WiFi and Bluetooth®.

The movable base 216 can move the dryer 200 in at least four to six degrees of freedom. This includes, relative to the user, up-down, left-right, forward-away, and rotation about an axis. The gross initial direction can be set by the user 10 prior to use, e.g. set the height of the base 216 relative to the user's hair, and then the base 216 can vary the height in an arc from the top of the user's head to her neck. The movement of the dryer 200 on the base 216 can be pivotal, rotational, or linear, and all of these can be initially set as well. The base 216 can be motorized

and powered by any typical source, including batteries and domestic AC. The power for the base 216 can be the same as or separate from the power for the dryer 200 itself.

Also included in examples of the system 100 is the controller 300. The controller 300 has a communication interface 302 (e.g. an antenna) to wirelessly communicate with the dryer's wireless communicator 212 using the same protocols as above. The controller 300 can also have a control interface 304 to control the features of the dryer 200, including on, off, fan speeds (low, medium, and high) and temperature (hot, warm, and cold shot). The control interface 304 can be intuitive and operated single handedly. In an example, the controller 300 can be an application on a wireless device, such as a smartphone, and linked to the dryer 200.

Another element can be the tracker 400 which allows the dryer 200 to track the motions of the user 10 to determine where to direct the air flow. The tracker 400 can take many forms. In one example, the tracker 400 is a wearable tracker 402. The wearable tracker 402 can be worn about the user's 10 head or neck region 12 to properly position the air flow. The wearable tracker 402 can take the form of one or more earrings, bracelets, gloves, or necklaces. In another example, the tracker 400 can be a built in tracker 404 which is integral or removably integral with the controller 300. In a further example, the tracker 400 can be a dryer mounted tracker 406. This tracker 406 can rely on facial recognition or other technologies that allow the dryer 200 to track the user's head or neck region 12 or just her hair.

The system 100 allows the user 10 to activate the dryer 200 and have the nozzle 208 direct air flow hands-free. The dryer 200 can be activated directly or through the controller 300. The dryer 200 then tracks the location of the tracker 400 and the base 216 moves the dryer 200 accordingly. This allows the user 10 to use both hands to style her hair, as the dryer 200 positions itself.

Turning to more detailed examples, Figure 2 illustrates that in one example, the movable base 216 can move the dryer 200 left and right in an arc A and tilt the dryer 200 up and down over an arc B. Additionally, the tracking element 210 can be operable and reliable over a distance C. The air flow generated from the fan 204 should also be effective over at least the distance C as well. The ranges for arc A can range from 0°-180°. Arc B can be similar for the up/down range. These ranges can be set based on limitations in the hardware or can be user constrained.

Figure 3A illustrates an example where the controller 300 can have hair brush bristles 306. This allows the user 10 to control the dryer 200 with the same hand she is styling with. The handle of the brush can have the control interface 304 while the body of the brush can house the communication interface 302.

Tracking the user's 10 movements can be done using any technology known to those of skill in the art. Tracking can be accomplished with single component or paired component trackers.

Paired component trackers put a tracker 400 away from the dryer 200 and the tracking element 210 on the dryer 200 is paired to follow the tracker's movements. Paired components can use RFID, GPS, magnets, color tracking, infrared (IR), and/or radio frequency. These technologies require the tracker 400 to be placed on or near the user 10 and the tracking element 210 is designed to follow the tracker 400. As the tracker 400 is moved, the tracking element 210 communicates that to the base 216 to move the base 216 accordingly.

One type of paired tracker is the wearable tracker 402. As noted above, it can be a form of jewelry or clothing. As an example, Figure 4A illustrates one or more earrings, these trackers can frame one boundary (left-right) of the user's face and can also be used as a gauge for a vertical displacement (up-down). That is to say a user's ears are typically at a particular height in relation to other features on a user's face and/or head and neck region 12. The use of two earring trackers 402 can also allow for using two tracking points. This can transmit information regarding the orientation of the user's head depending on the distance and orientation of each wearable tracker 402 in relation to both the dryer 200 and the other wearable tracker 402. Figure 4B is a necklace wearable tracker 402, tracking the neck line of the user 10. Other wearable trackers 402 proximate the user's head and neck 12 can be in headbands, hair ties, or hair clips.

Figure 4C illustrates a bracelet wearable tracker 402. This can track the user's hands 14, and in particular the one holding the hair brush. Gloves can also be used as trackers 402. Tracking the user's hands can allow the user 10 to apply hair product and have the dryer 200 still heat the area where the hands 14 are running through the hair.

Figures 3A and 3B also illustrate an example of an integral tracker 404. In Figure 3A, the tracker 404 is attached to the brush 306 variant of the controller 300. The tracking element 210 can track to the movement of the brush 306. In this example, it is presupposed that air flow should be directed at the brush 306 location. This is similar to the bracelet wearable tracker 402,

but is now more refined to direct the air flow at the brush 306 itself. In addition, the integral tracker 404 can be added to a user's existing brush so any brush can be used. Multiple trackers 404 can be used for multiple brushes, so additional users can share the same dryer 200.

Figure 3B illustrates the use of other hair styling items, in this example, rollers 308. Here, the tracking element 210 is designed to follow either the rollers themselves 308, or the integral trackers 404 built in. Examples can have just one of the rollers with the tracker 404, or any to all can have them as well. In an example, each roller 308 can have the tracker 404, but the tracker is not activated until the roller 308 is removed from a heating platform 310. The tracking element 210 can track only the most recently activated, so it tracks to each new roller 308 as it is applied. Alternately, the tracking element 210 can read multiple trackers 404 and track a calculated approximate center 312 of the rollers 308.

Turning to Figures 5A and 5B, a single component tracker is illustrated. In these examples the tracking element 210 performs the tracking without the tracker 400. Examples can use or optical or audio reflection tracking (e.g., laser or ultrasound)(Figure 5A) and/or image recognition, which can be a camera based solution (e.g., facial recognition)(Figure 5B). The data storage and/or processor 214 can be utilized to store users' individual facial profiles and other personalized user settings.

Examples can use both single and paired component tracking to maximize user flexibility. The single component tracking can be used for general hands-free drying. This can make sure that the dryer remains pointed at the hair. This can allow for drying while the user is performing other tasks. The user can then activate paired component tracking for detailed styling. For example, as the user is trying to straighten or curl her hair, the dryer 200 needs to be directed at the particular spot where she is brushing. Activating the tracker 400 can now allow a greater focus on particular areas of the user's hair.

Other examples of the invention are just the base 216 and tracking element 210. The user can then mount their own hair dryer on the base 216. The tracker 400 can be included if paired tracking is used by the tracking element 210. This more basic version of the invention does not have a wireless controller 300 but still permits hands-free drying.

On/off control can also be facilitated using tracking. Once the tracking element 210 has recognized either a tracker 400 or user 10 within a certain range, the dryer can start automatically, and turn off if the outside the range. Proximity tracking can also be used for a

temperature failsafe. If tracking element 210 determines that the user is too close or remains too long in the hot air flow, the speed or temperature can be lowered, the dryer can be turned off, or the nozzle 208 can be moved away from the user.

Figures 6A and 6B illustrate an example of a concentrator 220 attached to the end of the nozzle 208 which can also be hands-free. The concentrator 220 can have an elongated opening 222 through which the air flow is restricted and directed. The concentrator 220 can move through at least three directions, up-down, left-right, and rotate about a center axis 218 of the nozzle 208. Further, the concentrator 220 can vary the opening 222 becoming narrower or wider. In this way, the opening 222 can be the size of the nozzle 208 or reduced to minimal flow. Also, the concentrator 220 can be the only part of the dryer 200 that moves in response to the motion tracking of the tracking element 210.

In another example, the concentrator 220 can move in addition to the movement of the dryer 200 and nozzle 208 above. Here, the movement of concentrator 220 can be "fine tuning" of the coarser movements of the dryer 200 on the base 216. In this example, the base 216 can move the nozzle 208 within proximity of the user 10 and then the concentrator 220 moves to track the user's 10 fine movements. For example, when the user 10 is styling long hair, she separates the hair and styles small sections at a time. The nozzle 208 can remain generally still as the concentrator 220 moves up and down following the tracker 400 or brush 306. Further, the controller 300 can have a control interface 304 for positioning the concentrator 200. One control example can be a touch pad 314 that tracks the positioning of the concentrator 200 with the user's finger motions.

Figure 7 illustrates another example of hands-free drying. Here a small drone 500 has the ability of flight and can hover around the user 10. Typical elements of a drone are known to those of ordinary skill in the drone arts and can include a power supply, motor, rotary engine, rotating blades, gyroscopic elements, and/or wireless communications. The drone 500 can also have a nozzle 508 along with a concentrator 520/522, and a tracking element 510, all similar to the ones described above. This example gives the user extra flexibility as she can travel outside of a small prescribed range usually associated with typical hair dryers based on the length of the power cord. Now a user can travel from room to room and still dry her hair. The drone 500 can be programmed to maintain a certain distance from the tracker 400 or user 10 under all or certain

circumstances. The drone 500 can have a drone base 516 that allows the drone 500 to dock and charge between uses.

Another drone 500 example can be a “fly-by” or “back image” feature. The drone 500, in addition to having hair drying capabilities, can also have imaging features. Here, the drone 500 can have an imaging unit 502, e.g. a still or motion camera. The imaging unit 502 can be part of the tracking element 510 or separate therefrom. The user 10 can request that the drone 500 image all or a section of the user’s hair so the user 10 can see parts of her hair that are difficult to see or get the overall look of her style.

In an example, the base 516 can include a monitor 504 that receives the image information from the imaging unit 502. The images can be fixed in time (i.e. a snapshot) or in real time (i.e. video). This can allow the user 10 to see the back and sides of her head normally difficult or impossible to see. In addition, this can eliminate the need for a mirror, giving the user even more flexibility where she styles her hair. Examples can have the monitor 504 separate from the base 516, can be mounted to the drone 500 itself, or the images transmitted to a smartphone. Alternately, the drone 500 can have a projector to project the image onto any surface.

Figures 8-14 illustrate yet another example of a hand-free motion sensing hair dryer system 600 of the present invention. An example of the system 600 can include a hair dryer 200, a controller 300, and a tracker 400. Figures 8A and 8B illustrate a front and side view of the system 600. The system 600 includes a base 602 which can be placed on or mounted to any generally flat surface. This includes a countertop, ceiling, or wall. Attached to the base 602 is a first motor 604. The first motor 604 can rotate on the base 602. Attached to the first motor 604 is lower arm 606. In one example, there can be more than one lower arm, 606a, 606b. The lower arm can 606 can pivot or rotate about the first motor 604. At the opposite end of the lower arm 606 is a second motor 608. Here the lower arm 606 can, in some examples, be fixed or rotate about the second motor 608. Leading from the second motor 608 can be the upper arm 610. As with the lower arm 606, there can be multiple upper arms 610a, 610b. There is no relationship between the number of lower and upper arms 606, 610. The number of arms can be equal (as illustrated) or not. In addition, the lower and upper arms 606, 610 can have a length 606L, 610L. Again, the lengths 606L, 610L may or may not be equal, depending on the example. In addition, if there are multiple arms 606, 610 there is a distance between them 606W, 610W. As above, the

distances 606W, 610W may or may not be equal. The gap between the arms can have cross-bar stabilizers to allow the arms 606a, 606b, 610a, 610b to act as a stable pair.

At the opposite end of the upper arm 610 from the second motor 608 is a joint 612. In one example this is a ball joint. The joint 612 connects to a dryer movement system 614 at the joint point 616. The joint point 616 can be fixed to a dryer slide 618 which allows the dryer 200 to move along a single axis, typically linearly. A dryer carriage 620 can slide back and forth along the dryer slide 618 for a stroke distance 618L. The dryer carriage 620 can have a dryer pan element 622. This allows the dryer 200 to be pivoted on a pan axis, providing movement approximately perpendicular, and/or pivotal, to the movement of the carriage 620 on the slide 618. The dryer movement system 614 can also have a tracking element 624 to track the user 10 in different ways, as discussed above.

Figures 9-12 illustrate the system 600 tracking and drying a user's 10 hair. Here, the system 600 is using the tracking element 624 to follow the movement of the tracker 400. The first and second motor units 604, 608 move the arms 606, 610 and the dryer 200 on the dryer movement system 614 to position the dryer nozzle 208 accordingly. In one example, the first motor 604 can have up to 360° of rotational freedom with respect to the base 602. The arms 606, 610 can each have about 160° range of motion with respect to the motors 604, 608. The dryer 200 can move along the entire stroke distance 618L and pivot up to about 100° each way with respect to the pan axis. The motors 604, 608 can be powered by any typical source, including batteries and domestic AC. A control system 630 can be built into the base 602 that controls the system 600. Alternately, any of the controllers 300 discussed above can also be used, including a smartphone interface. The controllers can power the system on and off, and set the temperature and the force of the air from the dryer 200. Other examples can have broader or narrower ranges of motion in each or all of the components.

In an example, the dryer movement system 614 is illustrated in Figures 13A-13C. Here, the dryer movement system 614 can include a manual handle 626. Handle 626 can have one or more buttons 628 to allow for manually disengaging or reengaging one or all of the locks at the joints between the base 602, motors 604, 608, arms 606, 610, and the motion of the dryer movement system 614. This allows the user 10 to manually position the dryer nozzle 208 in lieu of the tracker 400. The whole dryer movement system 614 can have a length 614L from the tracking element 624 to the handle 626. To assist with both motorized and manual movement,

the arms can include weight assist springs 632 which help stabilize the arms by balancing the weight of the arms 606, 610 and second motor 208.

Figure 14 illustrates an example of the motors 604, 608, their arms 606, 610 and their axes. The azimuth axis 640 can allow up to 360° of rotational freedom in either direction. The first motor 604 can be locked in any position along the axis 640. Both motors 604, 608 have elevation/elbow axes 642. The elevation/elbow axes 642 can have approximately 160° range of motion and are lockable in position as well. Joint 612 can also provide approximately 100° of freedom and be locked in place. This example allows the arms 606, 610 to provide three degrees of freedom.

While certain implementations of the disclosed technology have been described in connection with what is presently considered to be the most practical and various implementations, it is to be understood that the disclosed technology is not to be limited to the disclosed implementations, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Certain implementations of the disclosed technology are described above with reference to block and flow diagrams of systems and methods and/or computer program products according to example implementations of the disclosed technology. It will be understood that one or more blocks of the block diagrams and flow diagrams, and combinations of blocks in the block diagrams and flow diagrams, respectively, can be implemented by computer-executable program instructions. Likewise, some blocks of the block diagrams and flow diagrams may not necessarily need to be performed in the order presented, or may not necessarily need to be performed at all, according to some implementations of the disclosed technology.

These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means that implement one or more functions specified in the flow diagram block or blocks.

Implementations of the disclosed technology may provide for a computer program product, comprising a computer-usable medium having a computer-readable program code or

program instructions embodied therein, said computer-readable program code adapted to be executed to implement one or more functions specified in the flow diagram block or blocks. The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational elements or steps to be performed on the computer or other programmable apparatus to produce a computer-implemented process such that the instructions that execute on the computer or other programmable apparatus provide elements or steps for implementing the functions specified in the flow diagram block or blocks.

Accordingly, blocks of the block diagrams and flow diagrams support combinations of means for performing the specified functions, combinations of elements or steps for performing the specified functions and program instruction means for performing the specified functions. It will also be understood that each block of the block diagrams and flow diagrams, and combinations of blocks in the block diagrams and flow diagrams, can be implemented by special-purpose, hardware-based computer systems that perform the specified functions, elements or steps, or combinations of special-purpose hardware and computer instructions.

This written description uses examples to disclose certain implementations of the disclosed technology, including the best mode, and also to enable any person skilled in the art to practice certain implementations of the disclosed technology, including making and using any devices or systems and performing any incorporated methods. The patentable scope of certain implementations of the disclosed technology is defined in the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

We claim:

1. A hand-free motion sensing hair dryer system, comprising:

a dryer comprising a fan and heating element to generate a heated air flow;

a tracking element linked to the dryer;

a dryer base engaging the dryer and moving the dryer in at least one direction, comprising:

a first motor rotatable around the base;

a lower arm attached to and rotatable around the first motor;

a second motor attached to an opposite end of the lower arm;

an upper arm attached to and rotatable around the second motor; and

a dryer movement system attached to an opposite end of the second arm and mounting the dryer;

wherein the dryer base moves the dryer in response to the tracking of the tracking element.

2. The hands-free motion sensing hair dryer system of claim 1, wherein the tracking element uses at least one of RFID, GPS, magnets, color tracking, infrared (IR), visual recognition and radio frequency; and

wherein the tracking element is configured to track at least one of a user face, a tracking device, and a hair styling tool.

3. The hands-free motion sensing hair dryer system of claim 1, further comprising a tracker linked to the tracking element, wherein the tracker is separate from the tracking element.

4. The hands-free motion sensing hair dryer system of claim 3, wherein the tracker is at least one of wearable on the user and incorporated into a hair styling tool.

5. The hands-free motion sensing hair dryer system of claim 1, further comprising a controller communicating with the dryer and controlling the functions of the dryer.

6. The hands-free motion sensing hair dryer system of claim 1, wherein the dryer movement system further comprises:

a dryer slide and carriage permitting linear movement of the dryer; and

a dryer pan element permitting pivoting movement of the dryer.

7. The hands-free motion sensing hair dryer system of claim 1, wherein the tracking element is mounted to the dryer movement system.

8. The hands-free motion sensing hair dryer system of claim 1, wherein the first motor can rotate 360° about the dryer base.

9. The hands-free motion sensing hair dryer system of claim 1, wherein the lower arm can rotate about 160° about the first motor.

10. The hands-free motion sensing hair dryer system of claim 1, wherein the upper arm can rotate about 160° about the second motor.

11. The hands-free motion sensing hair dryer system of claim 1, wherein the dryer movement system can pivot about 100° about the second arm.

12. The hands-free motion sensing hair dryer system of claim 6, wherein the pan element can pivot about 100°.

13. A motion sensing hair dryer system, comprising:

a dryer comprising a fan and heating element to generate a heated air flow;

a tracking element linked to the dryer; and

a dryer base engaging the dryer and moving the dryer in at least one direction;

wherein the tracking element is configured to track at least one of a user face, a tracking device, and a hair styling tool, and

wherein the dryer base moves the dryer in response to the tracking of the tracking element.

14. The motion sensing hair dryer system of claim 13, wherein the tracking element uses at least one of RFID, GPS, magnets, color tracking, infrared (IR), visual recognition and radio frequency .

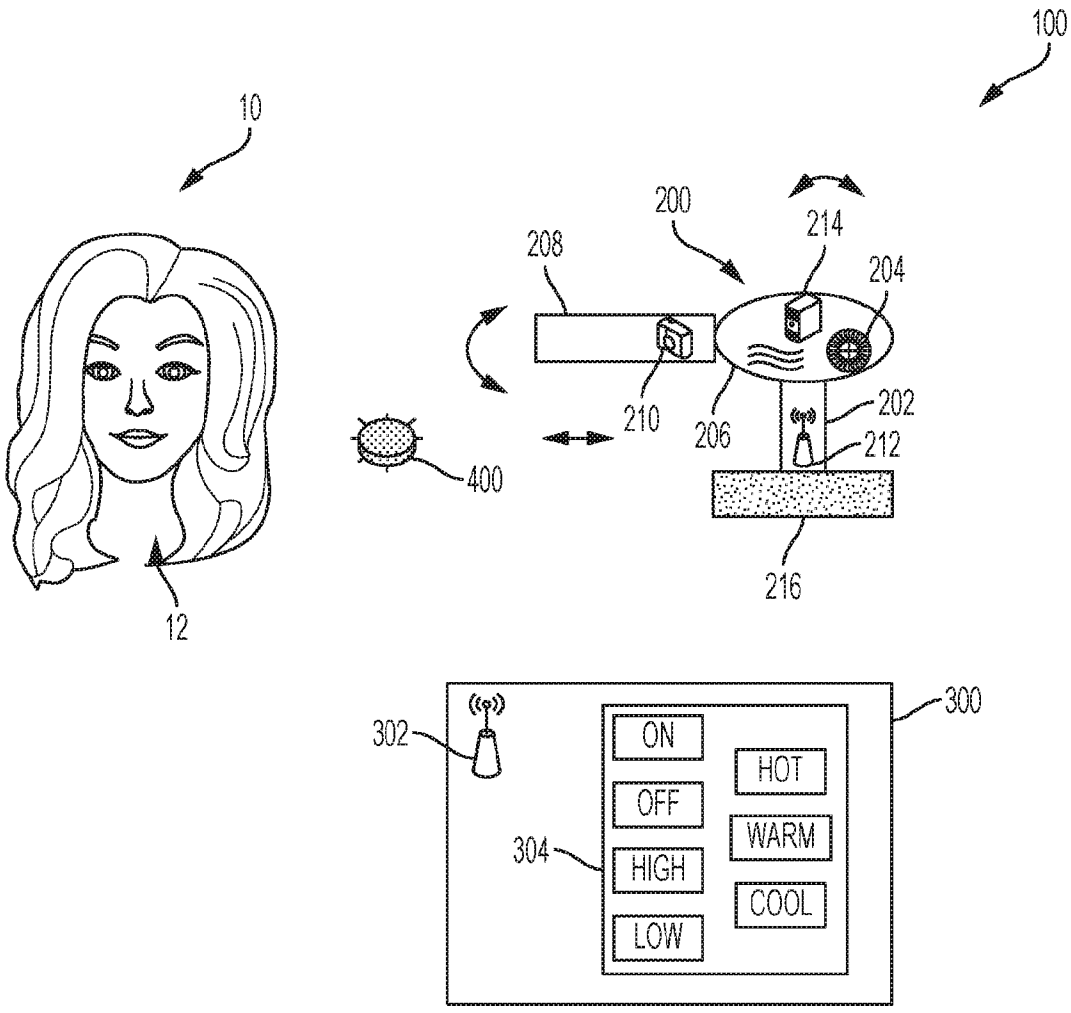


Figure 1

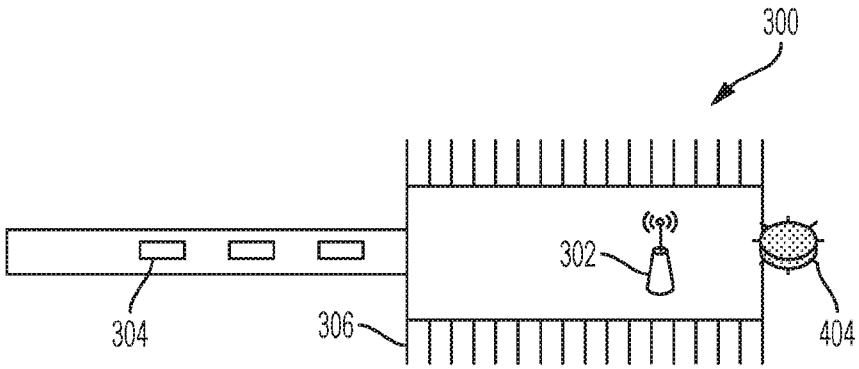


Figure 3A

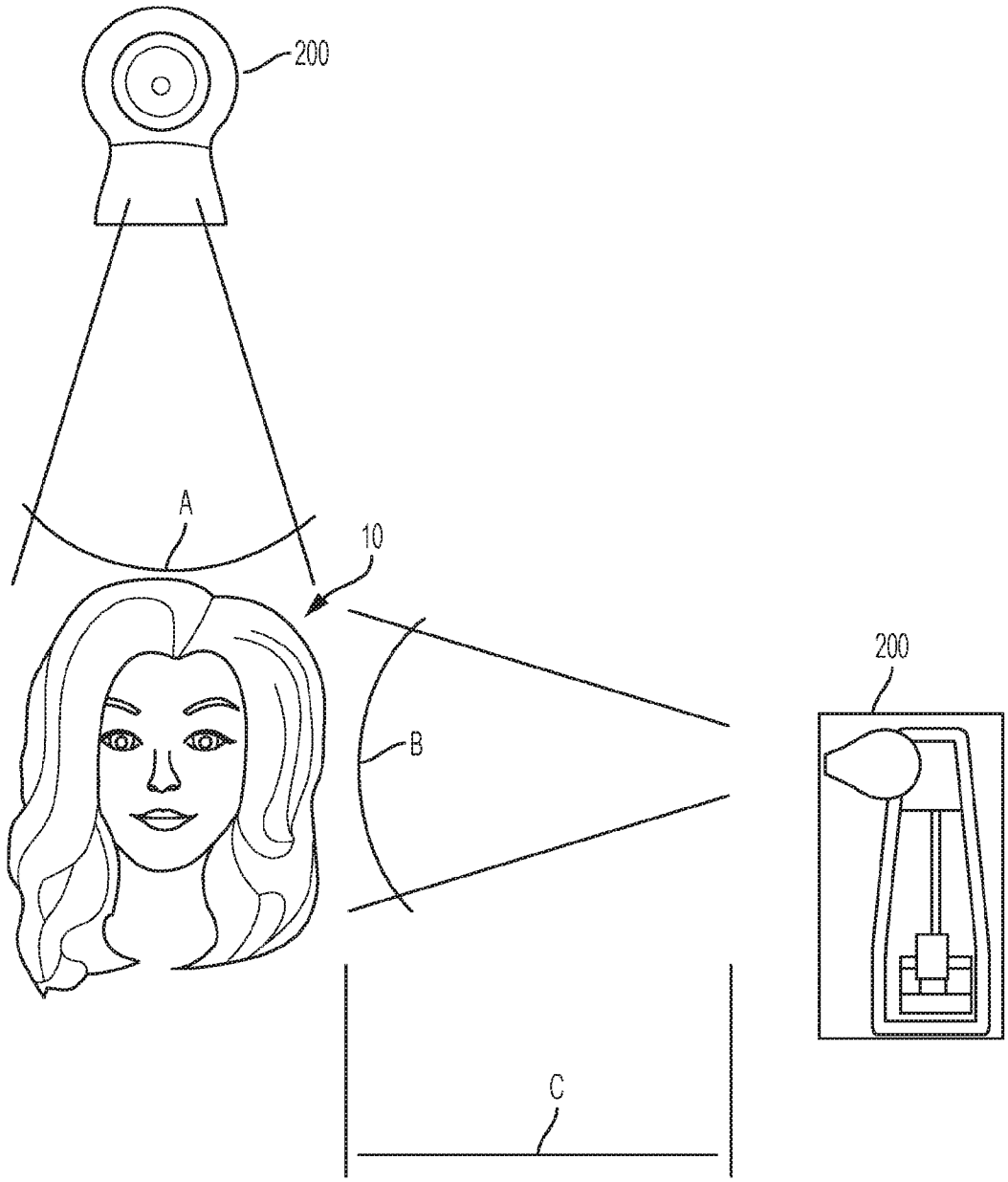


Figure 2

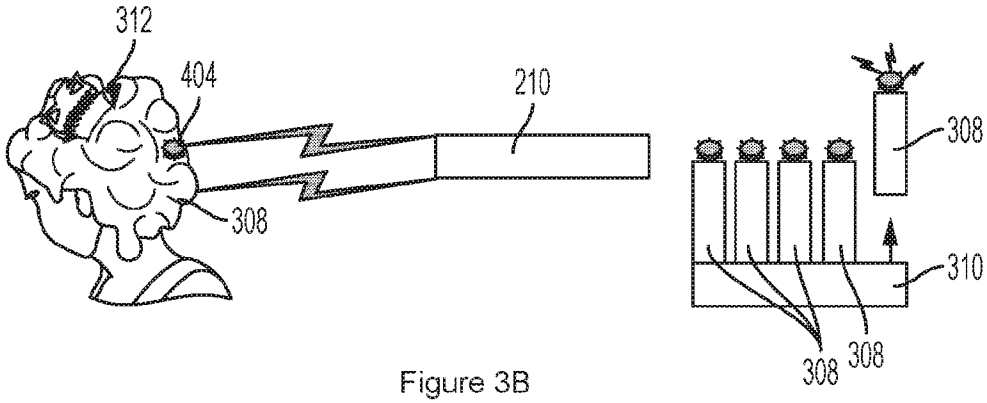


Figure 3B

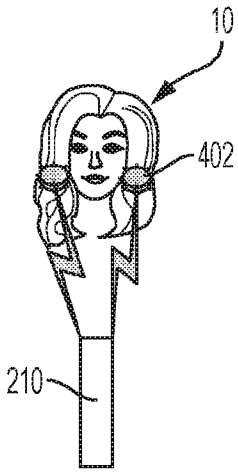


Figure 4A

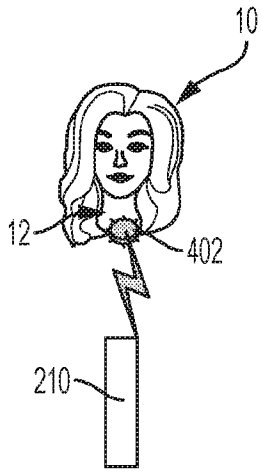


Figure 4B

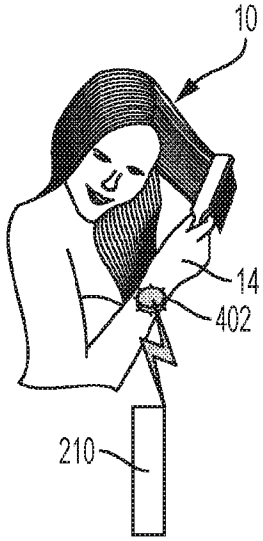


Figure 4C

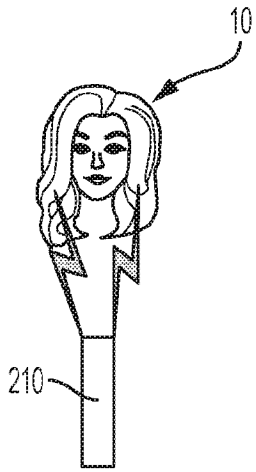


Figure 5A

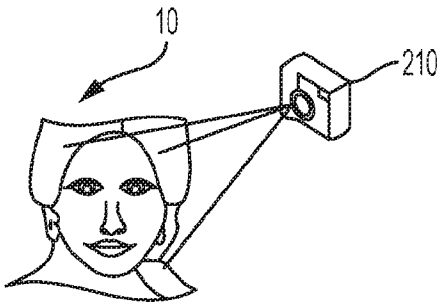


Figure 5B

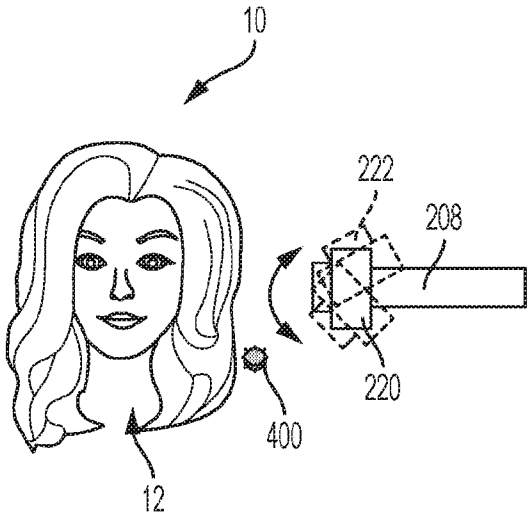


Figure 6A

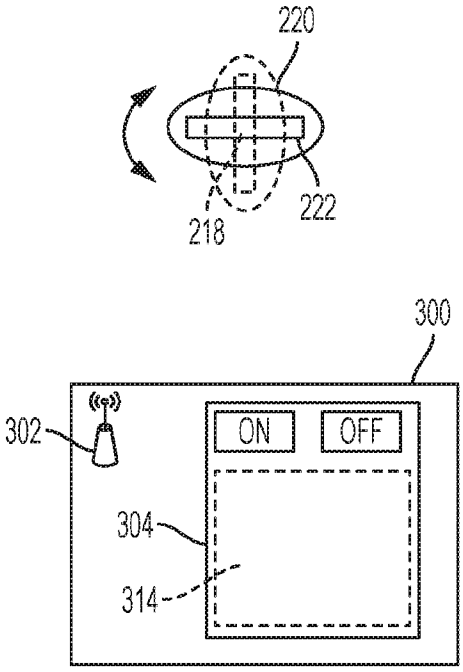
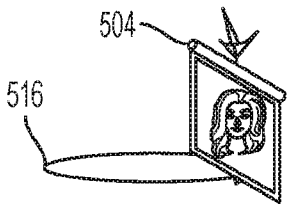


Figure 6B



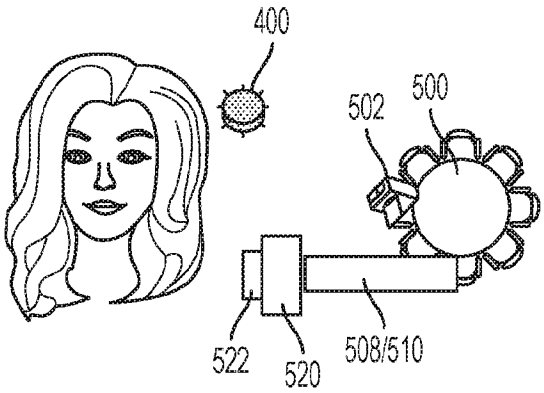


Figure 7

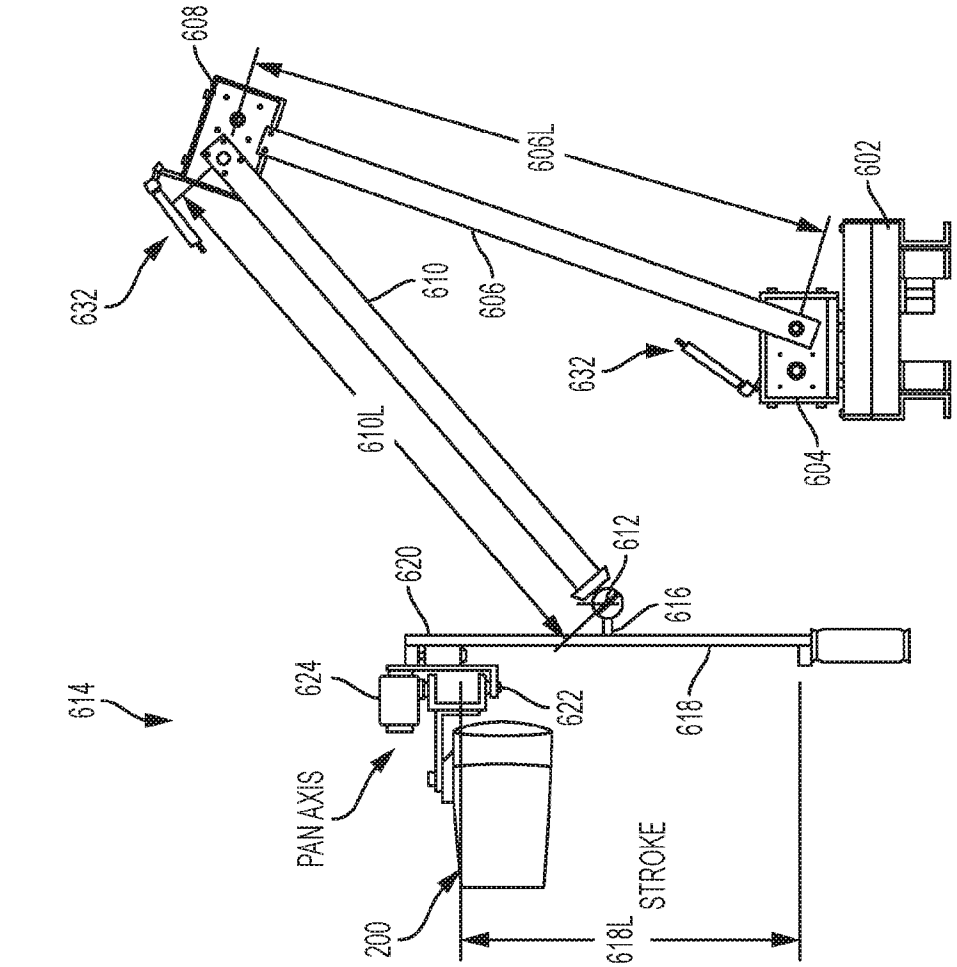


Figure 8B

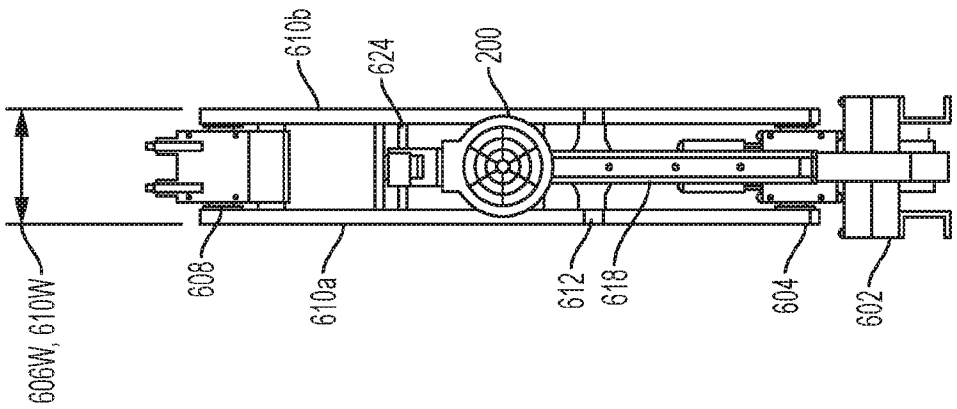


Figure 8A

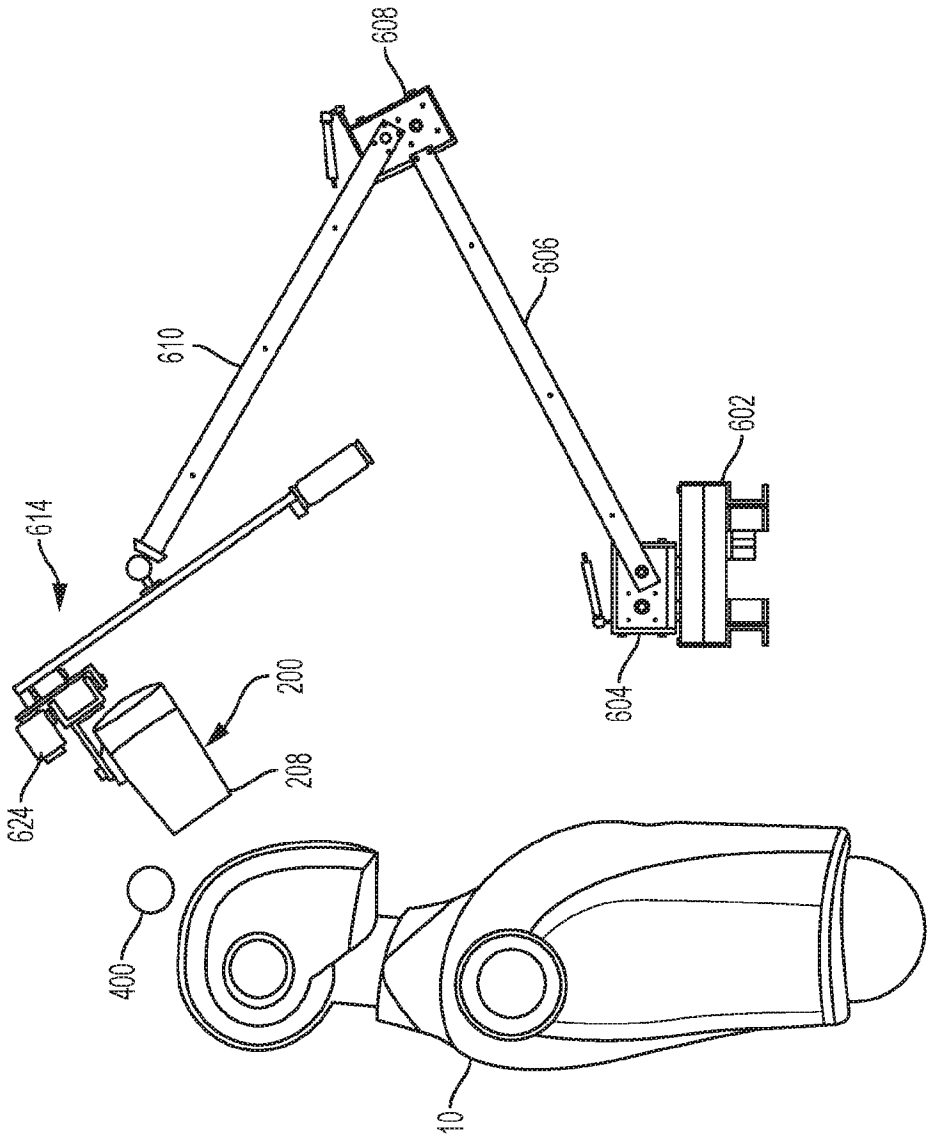


Figure 9

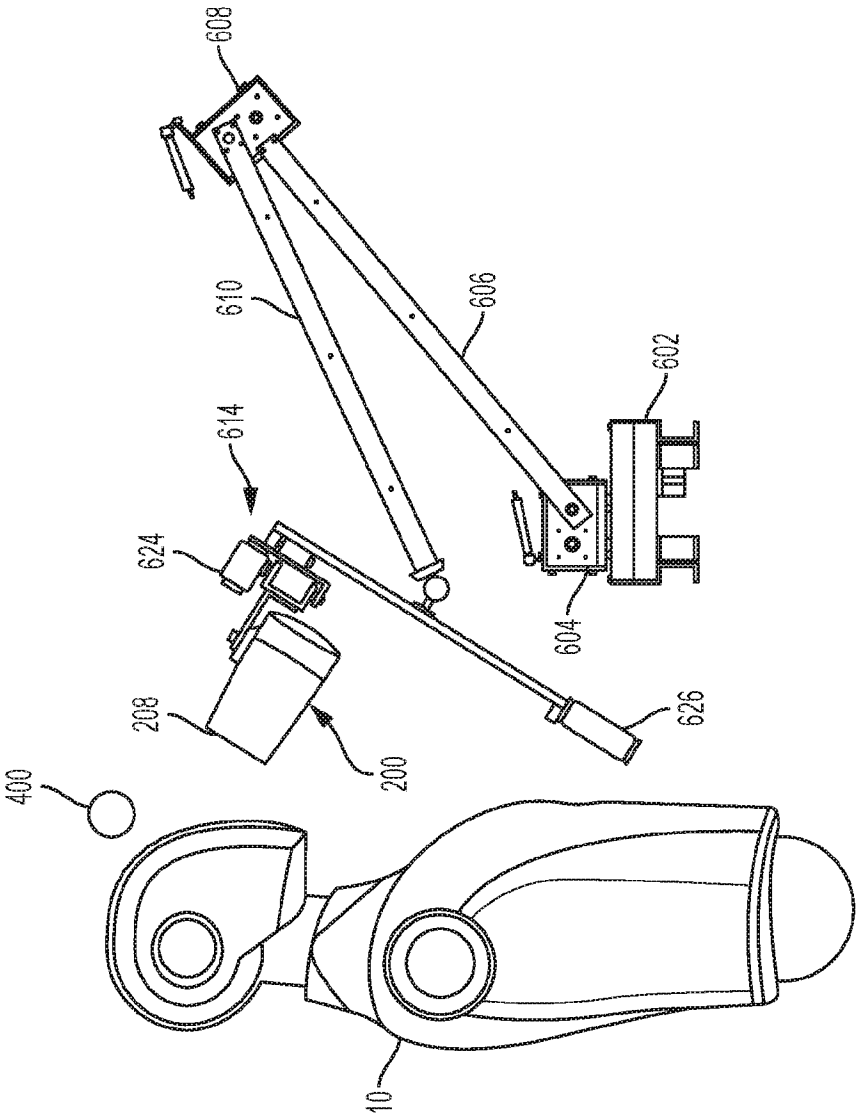


Figure 10

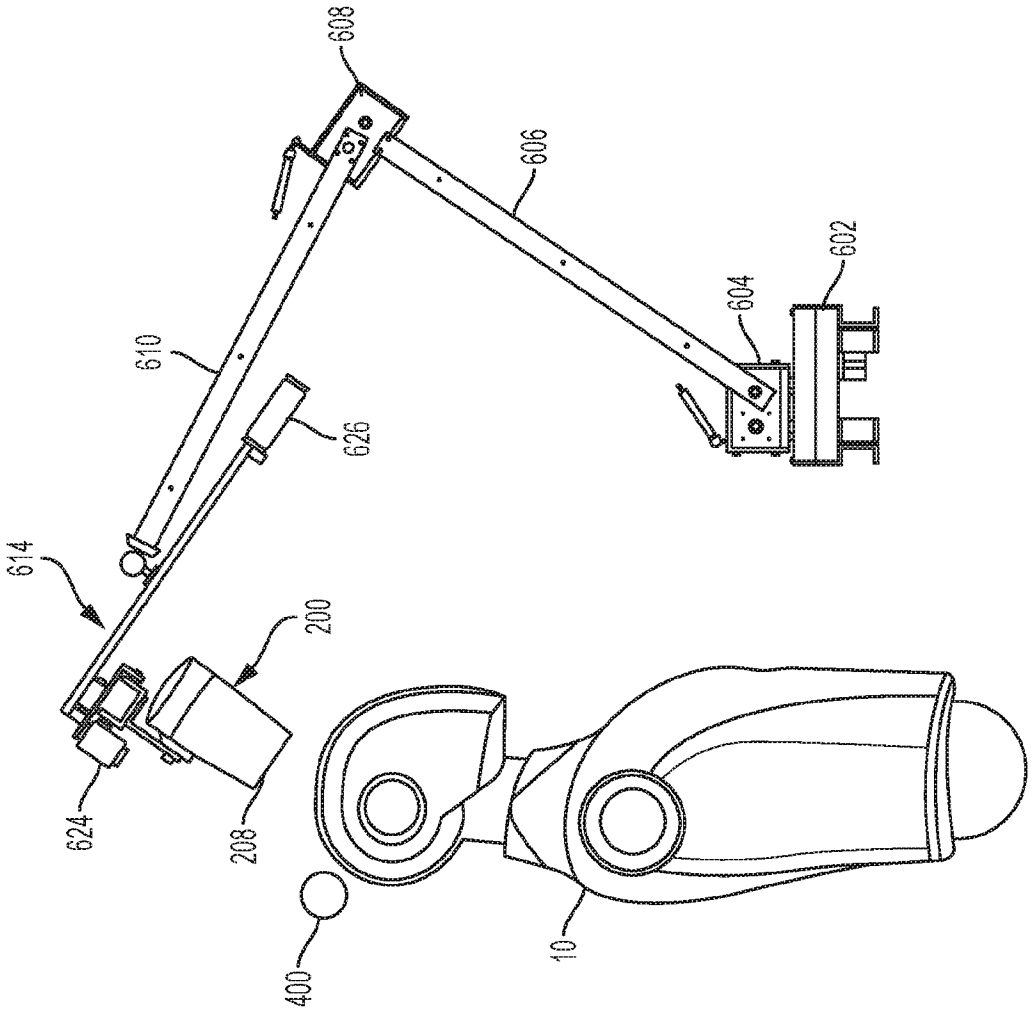


Figure 11

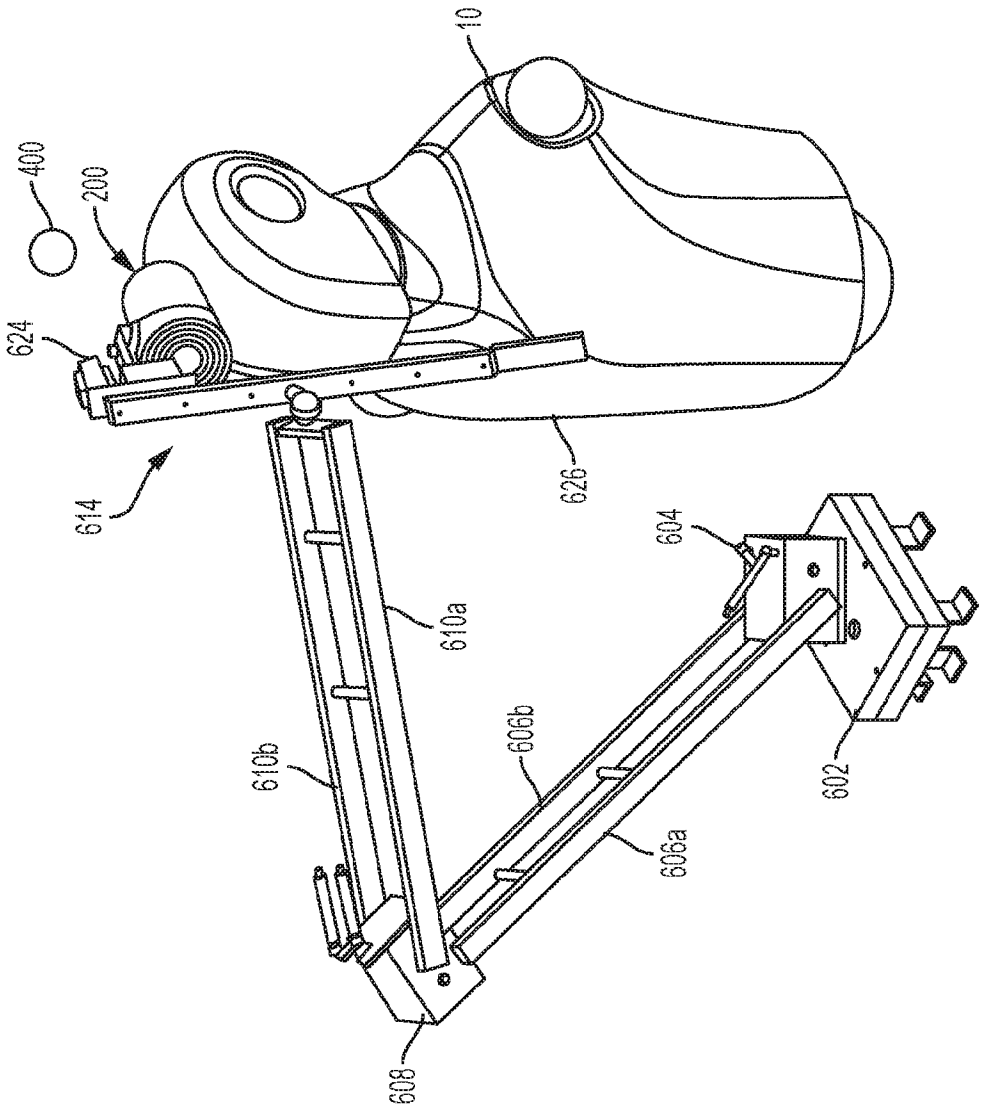


Figure 12

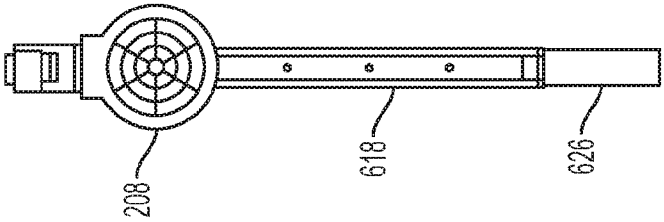


Figure 13B

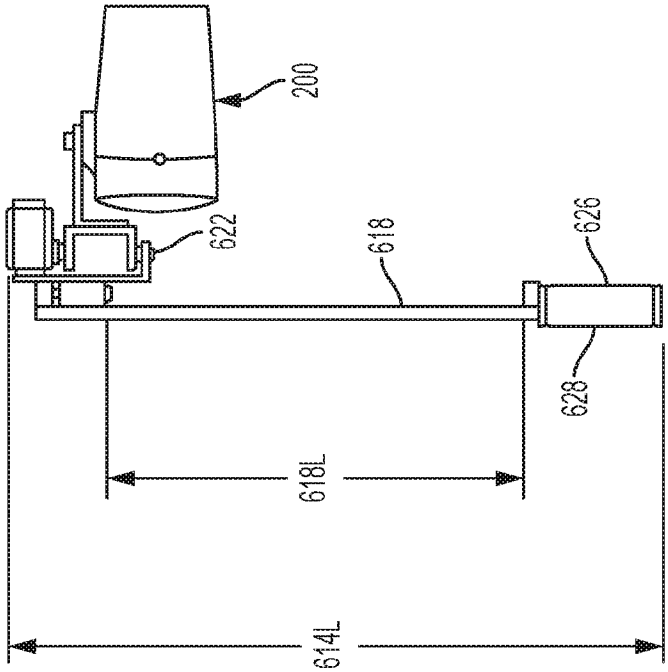


Figure 13A

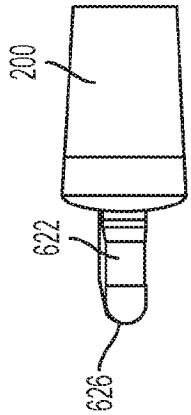


Figure 13C

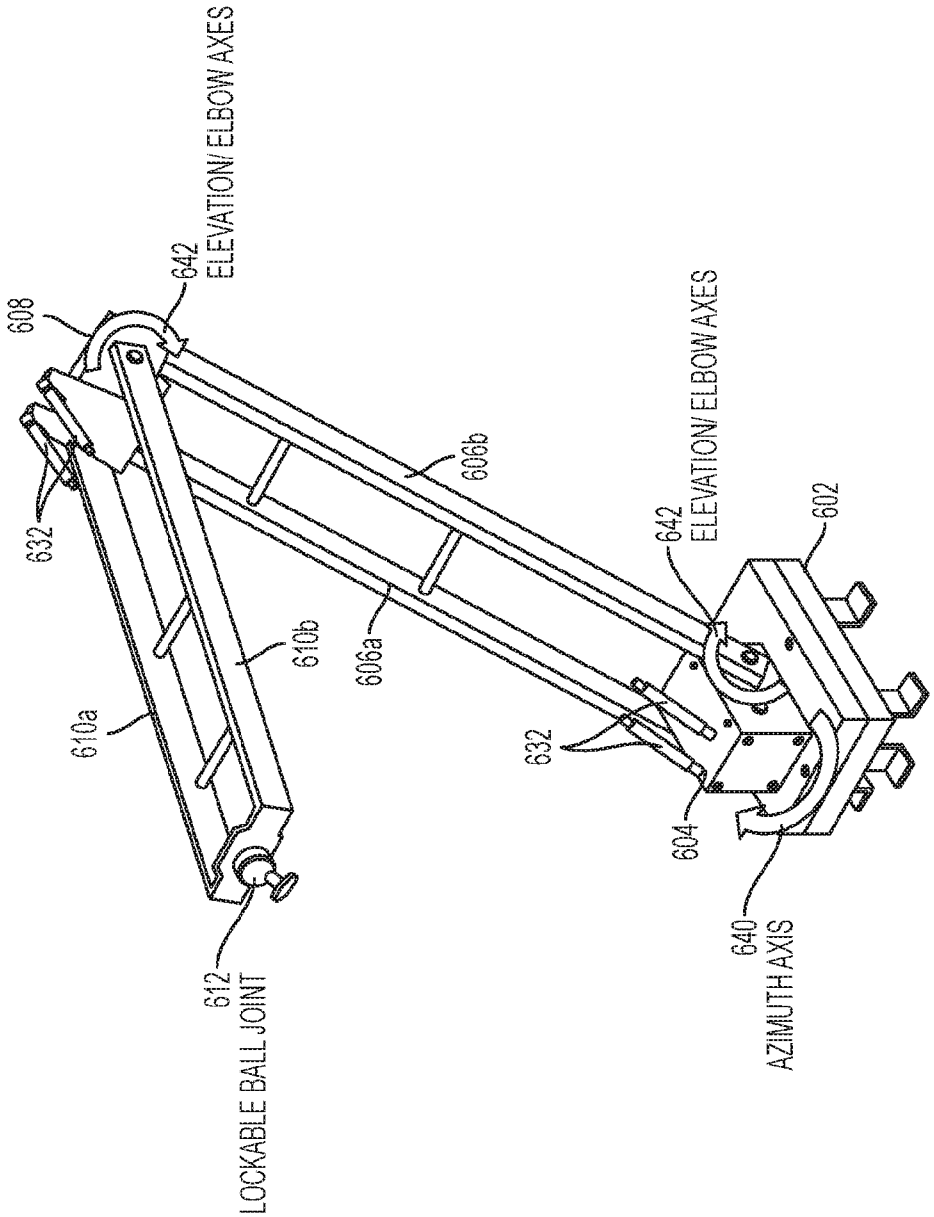

608
642
ELEVATION/ ELBOW AXES
606b
642
ELEVATION/ ELBOW AXES
602
632
610b
606a
610a
632
604
612
LOCKABLE BALL JOINT
640
AZIMUTH AXIS

Figure 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/041185

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A45D 20/16; B25J 13/08; B25J 19/02 (2017.01)

CPC - A45D 20/16; A45D 2020/128; B25J 13/086; B25J 19/02; B25J 19/021; B25J 19/027 (2017.08)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC - 34/283; 34/289; 901/8; 901/9; 901/46 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/0100037 A1 (ALLSUP) 09 April 2015 (09.04.2015) entire document	13, 14
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Y		1-12
Y	US 5,332,181 A (SCHWEIZER et al) 26 July 1994 (26.07.1994) entire document	1-12
Y	US 5,345,087 A (LUBER et al) 06 September 1994 (06.09.1994) entire document	3, 4
P,A	US 9,408,452 B1 (AL-KHULAIFI) 09 August 2016 (09.08.2016) entire document	1-14
A	US 5,640,781 A (CARSON) 24 June 1997 (24.06.1997) entire document	1-14
A	US 2006/0076464 A1 (VAN) 13 April 2006 (13.04.2006) entire document	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 August 2017	14 SEP 2017
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774