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(54) **STIMULATION DEVICE**

STIMULATIONSVORRICHTUNG

DISPOSITIF DE STIMULATION

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(73) Proprietors:
- **Carter, Alissa**
  Winchester, Hampshire SO22 5LJ (GB)
- **Carlick, Anthony**
  Winchester, Hampshire SO22 5LJ (GB)

(72) Inventors:
- **Carter, Alissa**
  Winchester, Hampshire SO22 5LJ (GB)
- **Carlick, Anthony**
  Winchester, Hampshire SO22 5LJ (GB)

(74) Representative: **Scaddan, Gareth Casey**
Spinnaker IP Limited
Cams Hall
Cams Hill
Fareham, Hants PO16 8AB (GB)

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Description

[0001] The present disclosure relates to a stimulation device, and in particular a sexual stimulation device.

[0002] There are many different types of devices and objects that may be used for sexual stimulation and/or to provide sexual pleasure. Some of these achieve stimulation by their texture or shape and may be manually manipulated. An example of this would be a phallic shaped object such as a dildo, although such objects may not necessarily be anatomically correct. Devices intended to provide sexual stimulation may also be equipped with one or more motors so as to provide vibrations to an area to be stimulated. These devices are typically referred to as vibrators. The functionality of a vibrator may be combined with a phallic shaped object to provide internal stimulation.

[0003] External vibrations may be provided by many differently shaped and configured objects or devices. Typically, for vibrators intended to be used externally and/or internally, an eccentrically mounted rotating mass is spun by a motor so as to generate the vibrations. However, the type of vibrations that may be provided by this arrangement is often somewhat limited. Additionally, depending on how the vibrator is used, energy may be dissipated away from the body part to be stimulated rather than towards it, for example, vibrating a user's hand more than the body part the user wishes to stimulate. Often, the whole device may vibrate, which may become uncomfortable for the user over time.

[0004] Furthermore, while different people have different sensitivities and some may find achieving orgasm easier than others, when a vibrator is used, for example for clitoral stimulation, many women find that the vibrations provided by the vibrator are not powerful enough and they take a long time to reach orgasm, or may not even reach orgasm at all. While some devices combine external and internal stimulation in an attempt to provide more stimulation and pleasure, even this configuration may not be sufficient for a woman to achieve orgasm and if she does, the resulting orgasm may not be that intense or long lasting. Other devices such as large powerful vibrators powered by mains electricity (sometimes referred to as wand devices) or those that may have been modified from personal massage devices, tend to be very bulky and noisy, and can lead to temporary desensitisation, sometimes even before orgasm is reached. Document WO2016205959 relates to a vibratory propagation assembly having a first source scaffold which encases a first vibrating source coupled to a first offset weight. A first vibration conducting prong extends longitudinally from the first source scaffold. The first vibrating source is one selected from a group consisting of a rotary motor, a linear motor, and a screw drive. The first offset weight is asymmetrically mounted to a drive shaft protruding from the first vibrating source. The first offset weight is symmetrically mounted to a drive shaft protruding from the first vibrating source.

[0005] The present disclosure seeks to alleviate or mitigate the above problems.

[0006] The present invention is directed to an electromechanical sexual stimulation device according to claim 1.

[0007] Therefore, for example, the first finger and the second finger can be caused to move with respect to the housing along the first pathway and the second pathway respectively so as to provide stimulation to a body part, such as the clitoris. For example, many different types of stimulation may be provided with the first finger and the second finger of the device such as rubbing or squeezing motions. Additionally, energy from the device may be transferred more efficiently into the body part because the fingers are directly drivable and because the fingers can be caused to move with respect to the housing along the first and second pathways for example. Therefore, the device is less likely to vibrate a user's hand and force may be transferred more effectively to the body part, thus providing deeper and more pleasurable stimulation. Examples of the present disclosure may thus advantageously help an orgasm to be achieved more quickly, and, once an orgasm is achieved, allow the effects to last longer.

[0008] Other aspects and features of the invention are defined in the appended dependent claims.

[0009] Examples of the present disclosure will now be described by way of example with reference to the accompanying drawings, throughout which like references refer to like parts, and in which:

Figure 1 is a schematic view of a sexual stimulation device according to examples of the present disclosure;

Figure 2 is a top view of the sexual stimulation device according to examples of the present disclosure;

Figure 3A is a schematic view of an electromechanical arrangement for driving a pair of stimulation fingers using two motors according to an example of the present disclosure;

Figure 3B is a schematic view of a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 3A according to examples of the disclosure;

Figure 4A is a schematic view of an electromechanical arrangement for driving a pair of stimulation fingers using one motor according to an example of the present disclosure not being part of the present invention;

Figure 4B is a schematic view of a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 4A according to examples of the disclosure;

Figure 5 is a schematic representation of a pair of stimulation fingers having two degrees of freedom according to examples of the present disclosure;

Figures 6A is a schematic view of an electromechanical arrangement for driving the motion of the stim-

ulation fingers as indicated in Figure 5 according to an example of the present disclosure;

Figure 6B is a schematic cross sectional view of the arrangement shown in Figure 6A according to an example of the disclosure; and

Figure 7 is a schematic view of a electromechanical arrangement for driving the stimulation fingers so that they have three degrees of freedom according to examples of the disclosure.

[0010] A stimulation device is disclosed. In the following description, a number of specific details are presented in order to provide a thorough understanding of the examples of the present invention as claimed.

[0011] Conversely, specific details known to the person skilled in the art are omitted for the purposes of clarity in presenting the examples. Additionally, in the drawings, some features described below are omitted from the drawings for ease of understanding the drawings, but will be apparent to the skilled person in light of the present invention as claimed.

[0012] Figure 1 is a schematic view of a sexual stimulation device 1 according to examples of the present disclosure. Figure 2 is a top view of the sexual stimulation device according to examples of the present disclosure. The device 1 comprises a housing 10, a first stimulation finger 12, and a second stimulation finger 14. The first stimulation finger 12 is directly drivable so as to be able to oscillate with respect to the housing along a first pathway, and the second stimulation finger 14 is directly drivable so as to be able to oscillate with respect to the housing 10 along a second pathway. In the context of the present disclosure, the term directly drivable shall, for example, be taken to mean that the finger is coupled, for example mechanically or electromechanically, to a prime mover mounted within the housing, such as a motor, such that force generated by the prime mover can be transferred directly from the prime mover to the finger (e.g. finger 12 or 14) so as to cause the finger (e.g. finger 12 or 14) to move with respect to the housing 10.

[0013] The first finger 12 is constrained to be moveable with respect to the housing along the first pathway and the second finger 14 is constrained to be moveable with respect to the housing along the second pathway. For example, the first finger and the second finger can be caused to move with respect to the housing 1 along the first pathway and the second pathway respectively so as to provide stimulation to a body part, such as the clitoris. For example, many different types of stimulation may be provided by the first finger 12 and the second finger 14 of the device 1 such as rubbing or squeezing motions. Additionally, energy from the device may be transferred more efficiently into the body part because the fingers are directly drivable and because the fingers can be caused to move with respect to the housing 10 along the first and second pathways for example. Therefore, the device is less likely to vibrate a user's hand and force may be transferred more effectively to the body part, thus providing deeper and more pleasurable stimulation. Examples of the present disclosure may thus advantageously help an orgasm to be achieved more quickly, and once an orgasm is achieved allow the effects to last longer.

[0014] In examples, the first pathway and the second pathway are spatially separated from each other. The first stimulation finger 12 and the second stimulation finger 14 are arranged in examples so that they are both able to stimulate a body part such as the clitoris. In other words, for example, the fingers 12, 14 can be thought of as being able to be positioned so that they can be either side of the same body part, or so that ends of the fingers 12, 14 may stimulate the body part. However, it will be appreciated that depending on the body part to be stimulated, portions of the fingers 12, 14 which may contact or stimulate that body part could vary. In examples, a closest distance between the first stimulation finger 12 and the second stimulation finger 14 is between 1 to 10 mm, although it will be appreciated that other suitable distances could be used. In examples, the fingers are arranged so that they can directly contact the body part.

[0015] In other examples, the device 1 comprises a flexible membrane which covers the fingers and at least a portion of the housing so that the membrane can contact the body part and stimulation may be provided by the fingers via the membrane. In some examples, the membrane is a waterproof elastomer, although any suitable material may be used. In other examples, the membrane may be removable. The use of a membrane may help allow the device to be able to be kept clean more easily, for example.

[0016] In examples, the stimulation fingers 12 and 14 are the same material, although it will be appreciated that they could be different materials. Additionally, in examples, the fingers 12 and 14 are molded as one piece, i.e. from the same material, although it will be appreciated that several different materials could be used to make up a finger 12, 14. In examples, the fingers 12, 14 comprise body safe silicone, although other materials such as rubber, plastics materials, elastomer, or metal may be used. Preferably, the material used for the fingers is hypoallergenic since the fingers 12, 14 are intended to be in contact with the body part, such as the clitoris.

[0017] In examples, the first stimulation finger 12 and the second stimulation finger 14 are drivable so that their relative motion with respect to each other can be controlled. For example, the first finger 12 can be caused to linearly oscillate 180 degrees out of phase with respect to linear oscillations of the second finger 14. More generally, in examples, the relative phase difference between the first finger 12 and the second finger 14 can be controlled. In other words, in examples, the device can control the relative phase difference between the oscillations of the first stimulation finger 12 and the second stimulation finger 14. However, other modes of oscillation of the fingers 12, 14 are possible as will be described in more detail later below.

[0018] For example, a user may decide to position the device so that the first stimulation finger 12 and the second stimulation finger 14 are positioned either side of the clitoris, in other words so that there are in both in contact with the clitoris (or any other body part the user may choose). This may help stimulate more nerve endings because, for example, direct mechanical stimulation may be provided to different areas of the same body part at the same time. Additionally, in examples, the first stimulation finger and the second stimulation finger are drivable so that their relative motion with respect to each other can be controlled. Therefore, many different types of motion may be provided thus providing many different types of stimulation of nerve endings. Additionally, the stimulating forces are thought to penetrate to a greater tissue depth than traditional vibrators, for example.

[0019] In examples, the device comprises a user input device 17 operable to allow a user to select a desired mode of operation relating to the motion of the stimulation fingers 12, 14 and/or operation of the device 1. In examples, the user input device is a user input panel that comprises a plurality of user input buttons 19a, 19b, 19c, 19d. The user input buttons 19a, 19b, 19c, 19d are associated, in examples, with motion of the stimulation fingers and/or functions of the device. For example, the buttons 19a and 19b could be used to control the frequency of oscillation of the fingers 12, 14, the button 19c used to switch the device 1 on or off, and the button 19d could be used to cycle through preprogrammed oscillation modes. However, it will be appreciated that the user input device 17 could comprise any suitable user input device such as dials, knobs, sliders, touch panels, touch sensitive screen or touch sensitive area, although it will be appreciated that any suitable input device could be used.

[0020] Additionally, in examples, the device comprises one or more display elements such as light emitting elements, for example light emitting diodes (LED) 13a, 13b, 13c, and/or a display screen to indicate status or functionality of the device 1, such as charge state, mode of operation and the like. The light emitting elements 13 may be any suitable form of light emitting element such as LEDs, OLEDs (organic light emitting diodes), neon lamp, vacuum fluorescent display, and the like. It will be appreciated that a display screen could be used such as liquid crystal display, OLED display, or any other appropriate display or indicating element could be used.

[0021] In examples, the device 1 comprises a power source arranged to be able to provide electrical power to the device 1. In examples, the device 1 comprises a rechargeable battery (not shown) and a charging port 21 for providing electrical power from an external source to the battery to charge it. In examples, the charging port is a micro universal serial bus (USB) port, although it will be appreciated that any suitable connector could be used. Additionally, it will be appreciated that the device 1 could be mains powered, could comprise a battery compartment for removal batteries such as rechargeable or disposable batteries, fuel cell, or could be powered by a combination of these. In other examples, wireless charging such as by induction charging may be used. It will also be appreciated that any appropriate source of power could be used. For example, the motion of the fingers could be driven mechanically using a clockwork power source such as those typically found in wind up radios or mechanical watches.

[0022] In order to control the relative motion of the first finger 12 and the second finger 14 with respect to each other, the device 1 comprises a controller 15 operable to control the relative motion of the first and second stimulation fingers. The first finger 12 and the second finger 14 are independently drivable and controllable with respect to each other, each being driven by a respective electric motor. In these examples, the device 1 comprises a motor controller operable to control motion of the motor such as speed and direction. In examples, the motor controller is an electronic motor controller operable to control the speed and/or direction of one or more motors using known techniques such as pulse width modulation, although it will be appreciated that any form of motor controller could be used. Additionally, in examples, the motor controller can operate so as to control the relative phase of oscillation of the fingers 12, 14.

[0023] In examples, the controller 15 comprises an electronic control unit, although in other examples, the controller 15 comprises a mechanical linkage or other mechanical arrangement so as to control the relative motion of the fingers. Additionally, it will be appreciated that a combination of electronic and mechanical components may be used to act as the controller 15. However, it will also be appreciated that the controller could be omitted. In examples, the device 1 comprises a mechanical linkage arranged to mechanically couple the first stimulation finger 12 with the second stimulation finger 14. The mechanical linkage, can for example, be thought of as acting as a controller, but this need not be the case. In other examples, the mechanical linkage between the first finger 12 and the second finger 14 may be omitted.

[0024] Referring to Figure 2, in examples, the first finger 12 and the second finger 14 are arranged to be able to move in the x-direction as well as the y-direction, where the x-y plane is defined parallel to an upper face 16 of the device. In examples, the upper face 16 of the device 16 is substantially planar, although it will be appreciated that is could be a convex, concave surface, combination of convex and concave surfaces, or any other shape as deemed appropriate by the skilled person. In other words, in examples, the x-y plane is defined to be perpendicular to a longitudinal axis 18 of the device 1, although it will be appreciated that other suitable configurations could be used. Additionally, it will be appreciated that the x-y plane need not be flat but could correspond to a curved surface.

[0025] In the example shown in Figure 2, the first finger 12 and the second finger 14 have two degrees of freedom. However, in other examples, the first finger 12 and the second finger 14 may have one degree of freedom,

or three degrees of freedom. Additionally, the first finger 12 and the second finger 14 may have different degrees of freedom from each other, or they may have the same degrees of freedom as each. Additionally, in examples, the controller 15 is operable to control the number of degrees of freedom of motion of at least one of the first finger 12 and the second finger 14.

[0026] In examples, the fingers 12,14 are controllable so that they can oscillate perpendicular to the longitudinal axis 18 of the device 1. It will however be appreciated that the choice of longitudinal axis is arbitrary and could be oriented in any direction or position with respect to the device 1 as desired by the skilled person. In other words, for example, the first finger 12 and the second finger 14 can be thought of as being movable in any combination of left/right, up/down, and in/out with respect to the housing 10 of the device 1. By being able to control the relative motion of the first finger 12 and the second finger 14 with respect to each other, examples of the disclosure may help provide more varied and deeper stimulation.

[0027] Figures 3A and 4A schematically show arrangements for driving the stimulation fingers according to examples of the disclosure. Figure 3B schematically shows a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 3A according to examples of the disclosure. Figure 4B schematically shows a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 4A according to examples of the disclosure not being part of the present invention.

[0028] In particular, in the examples of Figures 3A, 3B and 4A and 4B, the first pathway and the second pathway are substantially linear, although it will be appreciated that they could be different from each other. More specifically, in examples, the first pathway and the second pathway are substantially linear and parallel to each other. In other words, more generally in the examples of Figures 3 and 4, the first finger 12 and the second finger 14 are each constrained to move in a substantially straight line due to their mechanical arrangement.

[0029] Figure 3A is a schematic view of an electromechanical arrangement for driving a pair of stimulation fingers using two motors according to the present disclosure. For example the motors may be mounted within the housing 10. In the example shown in Figure 3A, the first finger 12 and the second finger 14 each have one degree of freedom. In other words, for example, the first finger 12 is arranged to be able to oscillate linearly along the first pathway, and the second finger 14 is arranged to be able to oscillate linearly along the second pathway. In the example of Figure 3A, a direction of oscillation 20 of the first finger 12 is substantially parallel to a first direction of oscillation 22 of the second finger 14. In other words, for example, the first pathway is substantially parallel to the second pathway. However, it will be appreciated that the direction of linear oscillation of the first finger 12 could be different from the direction of linear oscillation of the second finger 14. In other words, the pathways could be different from each other.

[0030] In the example of Figure 3A, the device 1 comprises a first driving arrangement, for example within the housing 10. The first finger driving arrangement comprises a first motor 30, a first crank 32, and a first connecting rod 34. The first crank 32 and the first connecting rod 34 mechanically couple the first motor 30 to the first finger 12 so that rotational movement of the first crank 32 (for example as indicated by arrow 36) can cause the first finger 12 to oscillate back and forth in a first direction 20. The first finger 12 is constrained to move along the first pathway by suitable guiding elements, for example, although it will be appreciated that the first finger 12 could be caused to be able to move along the first pathway using any suitable means. In other words, for example, rotational movement of the first crank 32 can cause the first finger 12 to perform reciprocating motion. It will be appreciated that the direction of rotation of the first crank 32 may be clockwise, or anticlockwise, depending on the desired motion of the first finger 12, for example in accordance with the relative motion between the two fingers 12,14 as set by the controller 15.

[0031] Additionally, in the example of Figure 3A, the device 1 comprises a second driving arrangement, for example within the housing 10. The second finger driving arrangement comprises a second motor 40, a second crank 42, and a second connecting rod 44. The second crank 42 and the second connecting rod 44 mechanically couple the second motor 40 to the second finger 14 so that rotational movement of the second crank 42 (for example as indicated by arrow 46) can cause the second finger 14 to oscillate back and forth in the direction 22. The second finger 14 is constrained to move along the second pathway by suitable guiding elements, for example, although it will be appreciated that the first finger 12 could be caused to be able to move along the second pathway using any suitable means. In other words for example, rotational movement of the second crank 42 can cause the second finger 14 to perform reciprocating motion. It will be appreciated that the direction of rotation of the second crank 42 may be clockwise, or anticlockwise, depending on the desired motion of the second finger 14, for example in accordance with the desired relative motion between the two fingers 12,14 as set by the controller 15.

[0032] It will be appreciated that in examples, the first finger 12 and/or the second finger 14 may be constrained so as to move in one dimension (or one degree of freedom), for example linearly as in the example Figure 3A. However, in other examples, two dimensional or three dimensional movement may be used. It will be appreciated that the term "one degree of freedom" could apply to a curved pathway (e.g. within two spatial dimensions), for example such that a position of the finger on the pathway may be specified using one parameter, such as distance from a centre position, or from one end of the path-

way. Similarly, in examples of two degrees of freedom within a surface, the surface may be three-dimensional but two parameters may be used to specify the position of the finger. More generally, for example, a degree of freedom could refer to a translational degree of freedom and/or a rotational degree of freedom. In other words, for example, the number of degrees of freedom refers to the number of parameters needed to specify a position and/or orientation of the finger.

[0033] In examples, the controller 15 comprises an electronic control unit operable to control the speed and direction of the first motor 30 and the second motor 40. This allows the device 1 to be able to control the motion of at least one of the first finger 12 and the second finger 14. More generally, in examples, the device 1 is operable to control a position of at least one of the first finger 12 and the second finger 14 with respect to at least one of the first pathway and the second pathway respectively. In examples, the device 1 is operable to control the relative directions of motion of the first stimulation finger 12 and the second stimulation finger 14.

[0034] In order to allow the controller 15 to determine the motion of the fingers, in examples, the device 1 comprises a first detector 38 operable to detect motion of the first finger 12 with respect to the detector 38. The first detector 38 is operable to communicate with the controller 15 so as to indicate a speed and/or position of the first finger 12 to the controller 15. In examples, the first finger 12 comprises a plurality of detection marks 39 that can be detected by the first detector 38. However, it will be appreciated that one or more detection marks 39 may be used. In examples, the detection marks 39 have a different optical reflectance from a surrounding area of the first finger 12.

[0035] The first detector 38 in the example of Figure 3, is an optical detector operable to shine light on the finger 12 and detect reflectance from the finger 12 and the detection marks 39. As the finger 12 moves relative to the first detector 38, the reflected intensity will change and thus modulate an output signal of the first detector 38. The output signal is sent to the controller 15 so as to allow the controller to determine attributes of the motion of the first finger 12 such as speed, position and direction of motion.

[0036] In the example of Figure 3A, the device 1 comprises a second detector 48 and the second finger 14 comprises a plurality of second detection marks 49, although it will be appreciated that one or more detection marks could be used. In examples, the second detector 48 and the second detection marks 49 are configured and operate in the same way as the first detector 38 and the first detection marks 39, although it will be appreciated that they could be different from each other depending on the desired design requirements.

[0037] Additionally, it will be appreciated that other forms of sensor may be used to detect the motion of the fingers 12, 14 such as magnetic, physical, electrical or other suitable methods of detection as will be understood by the person skilled in the art.

[0038] In some examples, the controller 15 is operable to control the direction of motion of at least one of the first stimulation finger 12 and the second stimulation finger 14. For example, the controller 15 may be arranged to be able to control the motion of the first finger 12 or the second finger 14 or both. In examples, the controller 15 is operable to control the direction of motion based on the output signal from the first sensor 38 and/or the second sensor 48, for example using an appropriate feedback loop. In other words, in examples, the controller 15 is operable to control the relative directions of motion of the first stimulation finger 12 and the second stimulation finger 14. More generally, in examples, the device 1 comprises a motion sensor (such as the first detector 38 or the second detector 48) operable to detect motion of at least one of the first finger 12 and the second finger 14, and the device 1 is operable to control the motion of at least one of the first finger 12 and the second finger 14 based on data generated by the motion sensor. In examples, the motion sensor comprises a position detector operable to detect a position of the finger with respect to the housing. Therefore, for example, the device 1 is operable to control the frequency of oscillation of at least one of the first stimulation finger 12 and the second stimulation finger 14. In some examples, a suitable feedback loop may be employed as will be understood by a person skilled in the art.

[0039] In some examples, the controller 15 can take the form of an mechanical linkage, for example so that the first finger 12 is mechanically coupled to the second finger 14. In other words, in some examples, the controller 15 comprises a mechanical linkage arranged to mechanically couple the first stimulation finger with the second stimulation finger. Additionally, the controller 15 may comprise electronic and mechanical components so as to help control the relative motion of the fingers 12 and 14.

[0040] Figure 3B is a schematic view of a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 3A according to examples of the disclosure. In particular, Figure 3B shows a first pathway 110 associated with the first direction of oscillation 20, and a second pathway 120 associated with the second direction of oscillation 22. In the example of Figure 3B, the first pathway 110 and the second pathway 120 are substantially linear and parallel to each other, and have substantially the same length as each other. In other words, in examples, the first pathway 110 and the second pathway 120 are substantially the same as each other. However, in other examples, the first pathway 110 and the second pathway 120 may be different from each other. Additionally, in examples, the device 1 is operable to vary a shape of at least one of the first pathway 110 and the second pathway 120 with respect to time, as will be described in more detail later below.

[0041] In examples, the first pathway 110 and the second pathway 120 are spatially separated from each other.

In the example of Figure 3B the first pathway 110 and the second pathway 120 are spatially separated from each other by a distance 130 as measured perpendicularly to the direction of motion of the fingers 12,14 i.e. perpendicular to the pathways 110, 120. As mentioned above, the first finger 12 is constrained to move along the first pathway 110, and the second finger 14 is constrained to move along the second pathway 120. For example, the motion of the fingers 12, 14 can be constrained in any suitable way, such as hinged shafts and joints coupled with the body 10 and the fingers 12, 14 so as to restrict lateral movement. For example, protrusions extending from the fingers and slidable along corresponding grooves formed in the body 10 of the device 1 may be used, or other suitable arrangements.

[0042] In examples, the distance 130 between the first pathway 110 and the second pathway 120 is between 1 mm and 10 mm, although it will be appreciated that other suitable distances, such as between 3mm and 8mm could be used depending on design choice. The distance may be chosen so as to correspond with the average width of the clitoris or female nipple, although if the device is intended to be used to stimulate the glans of the penis for example, the distance 130 could be larger, say between 10mm and 50mm, or smaller if the device is intended to stimulate a male nipple, although it will be appreciated that any particular distance could be used. Additionally, in some examples, the device 1 is operable to control the distance 130 between the first pathway 110 and the second pathway 120. For example, the distance 130 can be controlled via the user input device 17.

[0043] In examples. the first pathway 110 comprises a first end 114 and a second end 116, and the second pathway 120 comprises a first end 124 and a second end 126. In examples, a length of the first pathway 110 (first pathway length) corresponds to a distance between the first end 114 and the second end 116 of the first pathway 110. In examples, a length of the second pathway 120 (second pathway length) corresponds to a distance between the first end 124 and the second end 126 of the second pathway 120. In examples, the first pathway length and the second pathway length are substantially the same as each other. This may help make manufacturing easier. However, in other examples, the lengths of the pathways can be different.

[0044] In examples, the first finger 12 is arranged to be able to oscillate along the first pathway 110 between the first end 114 and the second end 116 about a centre position 112, and the second finger 14 is arranged to be able to oscillate along the second pathway 120 between the first end 124 and the second end 126 about a centre position 122. In examples, the first finger 12 is able to be positioned anywhere on the first pathway 110 as driven by the first finger driving arrangement, and the second finger is able to be positioned anywhere on the second pathway 120 as positioned by the second driving arrangement. Typically, the length of the first pathway 110 and the length of the second pathway 120 is between 1 mm to 5 mm although it will be appreciated that the other suitable lengths such as 1mm to 20 mm or greater or smaller could be chosen.

[0045] Figure 4A is a schematic view of an electromechanical arrangement for driving a pair of stimulation fingers using one motor according to an example of the present disclosure not being part of the present invention. In particular, in the example of Figure 4A, the device 1 comprises a motor 50 that comprises a motor shaft 51. The motor 50 is mechanically coupled to both the first finger 12 and the second finger 14 so that rotational movement of a shaft 51 of the motor can cause the first finger 12 and the second finger 14 to oscillate linearly, as indicated by arrows 52 and 54 respectively. In the example of Figure 4A, the first crank 32 and the first connecting rod 34 mechanically couple the motor shaft 51 of the motor 50 to the first finger 12 so that rotational movement of the first crank 32 can cause the first finger 12 to oscillate back and forth in the direction indicated by arrow 52. The second crank 42 and the second connecting rod 44 mechanically couple the motor shaft 51 of the motor 50 to the second finger 14 so that rotational movement of the second crank 42 can cause the second finger 14 to oscillate back and forth in the direction indicated by the arrow 54.

[0046] In other words, more generally for example, the first crank 32, the first connecting rod 34, the second crank 42 and the second connecting rod 44, can be thought of as a mechanical linkage arranged to mechanically couple the first stimulation finger 12 with the second stimulation finger 14, and so cooperatively act together as a controller, such as the controller 15. However, it will be appreciated that any appropriate mechanical linkage to couple the the first finger 12 with the second finger 14 could be used.

[0047] In examples, a relative angle θ (theta) between the first crank 32 and the second crank 42 may be set by the controller 15 so as to control the relative motion of the first finger 12 and the second finger 14 with respect to each other. In other words, in the example of Figure 4A, the controller 15 comprises a mechanical link operable to control the relative motion of the fingers 12, 14. More generally, for example, the coupling of the first crank 32 and the second crank 42 to the motor shaft 51 can be thought of as a mechanical linkage that allows the relative motion of the fingers 12, 14 to be controlled.

[0048] In examples, an angular relationship between the first crank 32 and the second crank 42 is fixed. However, in other examples the angle between the first crank 32 and the second crank 42 may be set for example based on the preference of a user. In these examples, the first crank 32 comprises a first toothed gear with the teeth arranged to project perpendicular to a planar face of the first gear, and the first crank is coupled to the motor shaft 51. The second crank 42 comprises a second toothed gear with the teeth arranged to project away from a planar face of the second gear so as to be able to engage with the teeth of the first gear of the first crank

32. In other words, for example the teeth of the first gear and the second gear can be thought of as facing each other. In examples, the first gear and the second gear are arranged between the first crank 32 and the second crank 42 so as to allow them to be coupled together. Therefore, when coupled together rotational force of the first crank 32 can be transferred to the second crank 42.

[0049] In examples, the gears are arranged so as to be biased apart by a resilient biasing member such as a leaf spring, coil spring or other suitable resilient member such as an elastomer. In examples, the device 1 comprises a locking mechanism arranged so that the first gear and the second gear may be locked together using a suitable camming lever or other locking mechanism. In an unlocked configuration, the gears are able to disengage because they are biased apart by the resilient biasing member and so are able to rotate freely with respect to each other. In a locked configuration, the teeth of the first gear are able to engage with the teeth of the second gear so that rotational motion of the first crank 32 with respect to the second crank 42 is restricted.

[0050] For example, if a user wishes to change the angular relationship between the first crank 32 and the second crank 42, they can operate the locking mechanism so as to move it to the unlocked configuration. In this position, the first finger 12 is able to move independently from the second finger 14 because the cranks 32 and 42 are not coupled together. The user can then manually position one of the fingers into a desired translational position with respect to the other finger thus changing the relative angle theta (θ) between the first crank 32 and the second crank 42. The relative angle can then be set by operating the locking mechanism so that the teeth of the first gear engage with the teeth of the second gear.

[0051] Although in examples the locking mechanism comprises toothed gears, it will be appreciated that any other form of clutch mechanism that is able to couple the first crank to the second crank could be used. Additionally, it will be appreciated that the locking mechanism (such as a clutch or the locking mechanism described above) could be actuated mechanically, electromechanically (for example based on signals from the controller 15), electromagnetically, or any other suitable mechanism. Additionally, it will be appreciated that the mechanism for setting the relative angle between the first crank 32 and the second crank 42 could be thought of as a controller such as controller 15. The locking mechanism may also be used with other examples described herein, as appropriate.

[0052] Figure 4B is a schematic view of a first pathway and a second pathway associated with the arrangement for driving the stimulation fingers shown in Figure 4A according to examples of the disclosure not being part of the present invention.

[0053] In the example of Figure 4B, the first pathway 110 and the second pathway 120 are substantially the same as those described above with reference to Figure 3B. However, in the example of Figure 4B, a distance 140 between the first pathway 110 and the second pathway 120 is, for example, greater than that in Figure 3B.

[0054] Referring to Figures 3A and 4A, in examples, the controller is operable to control the relative phase of motion between the first finger 12 and the second finger 14. More generally, this can, for example be thought of as the device being operable to control the relative phase difference between the oscillations of the first stimulation finger and the second stimulation finger.

[0055] For example, when the first finger 12 is at an extreme right hand position and the second finger 14 is at an extreme left hand position, and the frequencies of the oscillation of the two fingers are the same, then this could be thought of as the motion being 180 degrees out of phase. Here, extreme is taken to mean the furthest most position from a centre position (such as centre position 112 or centre position 122) about which the finger oscillates. In examples, the extreme position is the position of greatest displacement with respect to the centre position, for example corresponding to the first end 114, 124 or second end 116, 126 of the first or second pathway respectively.

[0056] As another example, if the first finger 12 and the second finger 14 both start oscillating from the same position such as the first ends 114 and 124 of the respective first pathway 110 and second pathway 120 and maintain their relative positions over time, then this can be thought of as the motion being in phase. However, it will be appreciated that the motion could be out of phase by any appropriate amount, such as 30 degrees, 60 degrees, 90 degrees, 120 degrees and so forth, although this need not be an integer and could take any value. In other words, for example, if the displacement from the centre position of each finger is plotted against time, then a phase difference between the resultant waveform for the first finger 12 and the second finger 14 respectively can be thought of as corresponding to the phase difference of motion of the fingers. Additionally, in some examples, the phase difference may change over time.

[0057] Referring to Figure 4A, it will be appreciated that the speed of fingers (frequency of oscillation) is the same because both the first finger 12 and the second finger 14 are both directly driven by the same motor 50. However, in the example of Figure 3A, the first finger 12 and the second finger 14 could have a different frequency of oscillation from each other. In this example, other modes of oscillation are possible so that beat frequencies can arise and the relative phase difference between the waveforms of the two fingers can change over time. In examples, the controller 15 is operable to control the frequency of oscillation of at least one of the first finger 12 and the second finger 14, for example to control the relative phase difference between the fingers. In other examples, the controller 15 is operable to control the beat frequencies that may arise from the first finger 12 having a different frequency from the second finger 14. Therefore, examples of the disclosure can provide more interesting and varied stimulation.

[0058] Furthermore, a user may, for example, be able to use the controller 15 to select a particularly pleasurable frequency, phase difference, and/or beat frequency. In other words, for example, the relative frequencies of oscillation can be thought of as being tuneable, for example depending on a desired sensation.

[0059] Additionally, for example, this may allow the vibrations to penetrate into tissue more deeply. This is because, in examples, the device 1 is operable to drive at least one of the first finger 12 and the second finger 14 at the same or different frequencies as well as being able to control the frequency of oscillation. Therefore, for example, an oscillation frequency could be picked that corresponds with a resonant frequency of a part or all of the body part, thus allowing a more efficient energy transfer to the body part. Furthermore, in examples, the relative motion of the stimulation finger may be controlled with respect to each other, thus creating deeper and more varied motion, and so more pleasurable sensations. In some examples, the amplitude of oscillation may also be controlled.

[0060] Figure 5 is a schematic representation of a pair of stimulation fingers having two degrees of freedom according to examples of the present disclosure. In the example shown in Figure 5, the device 1 comprises a first guide element 210 arranged to constrain motion of the first finger 12 in the first direction 20, and a second guide element 220 arranged to constrain motion of the second finger 14 in the first direction 22. In the example of Figure 5, a guide channel is formed in the first guide element 210 along which the first finger 12 may be caused to move. The guide channel is substantially elongate and linear in the example of Figure 5, although it will be appreciated that other suitable shapes could be used. In other words, in examples, the guide element 210 can be thought of as comprising a groove that acts as the guide channel, although it will be appreciated that other configurations are possible. In examples, the second guide element 220 has substantially the same arrangement as the first guide element 210, although it could be different.

[0061] In the example of Figure 5, the first guide element 210 is arranged to be able to move in a second direction 230 associated with the first guide element 210, and the second guide element 220 is arranged to be able to move in second direction 250 associated with the second guide element 220. In examples, the second direction 230 of the first guide element 210 and the second direction 250 of the second guide element 220 are substantially the same as each other, although it will be appreciated that, in other examples, they could be different. In examples, an angular relationship between the first directions 20, 22 and the second directions 230, 250 is 90 degrees. In other words, for example, the first directions 20,22 are substantially perpendicular to the second directions 230, 250. However, it will be appreciated that they could have different angular relationships, and that the angular relationship could be different for each of the first guide element 210 and the second guide element 220. Additionally the angular relationship could be changed with time, for example.

[0062] In examples, the first finger 12 is arranged to be able to be guided by the first guide element 210 so as to be movable along the first pathway. For example, the first finger 12 can be caused to move in the first direction 20 and the second direction 230 as guided by the guide element 210. In examples, the first pathway is defined by the combination of movement in the first direction 20 and the second direction 230, for example in a similar manner to an x-y plotter. In examples, the device 1 is operable to control movement in the first direction 20 and the second direction 230 so that the first pathway is substantially elliptical. Similar functionality may be provided for the second pathway.

[0063] More generally, in examples, at least one of the first pathway and the second pathway is substantially elliptical. In the context of the disclosure, elliptical is taken to include circular for example. However, it will be appreciated that the first pathway and the second pathway could have different shapes such as substantially triangular, square, trapezoid, rhombus and the like, or other shape. Additionally, the pathway(s) could be pseudo-random as controlled by the controller. However, it will be appreciated that it may be preferable for the shape of at least one of the pathways to have rounded corners so as to help provide a smoother and more comfortable user experience. This may also make the construction of the device simpler. Moreover, in examples, it will be appreciated that the first pathway and/or second pathway is the path or track along which the respective finger can be caused to move and may result from the combination of motion of guide elements, for example.

[0064] In examples, the device 1 is operable to control a shape of at least one of the first pathway and the second pathway. For example, as mentioned above, the device 1 is operable to control the shape of the first pathway and/or second pathway so that they are substantially elliptical. However, the first pathway and/or second pathway could be linear (for example as described above with reference to Figures 3b and 4b). In examples, the first pathway has substantially the same shape as the second pathway, although in other examples, the first pathway has a different shape from the second pathway.

[0065] In examples, the device 1 is operable to vary a shape of at least one of the first pathway and the second pathway with respect to time. For example, the device 1 may vary the shape of the first pathway between elliptical and linear every second, although it will be appreciated that other variations with time of the shape of the first pathway and/or second pathway are possible. It will also be appreciated that many different shapes of pathway are possible, and are not limited to elliptical, linear and circular, but could be any other suitable shapes such as those corresponding to Lissajous curves, sawtooth curves, sinusoids, pseudo-random, convex or concave curves (e.g. with respect to a position located between the two fingers). It will also be appreciated that one or

more of the pathways could be one dimensional, lie in a two dimensional plane, or have a three dimensional configuration.

[0066] In examples, a frequency of oscillation in the first direction 20 is f1 and a frequency of oscillation in the second direction is f2. In examples, f1 and/or f2 are within the region of 2000-6000Hz. For example, lower frequency vibrations may penetrate to a greater tissue depth whereas higher frequencies may feel more intense. However, it will be appreciated that any suitable value could be used, for example 1-100Hz, 100-500Hz, 500Hz-2000Hz, and that frequencies outside this range could be used or the ranges could overlap. Additionally, it will be appreciated that these frequency ranges could apply to any suitable direction, or could refer to a time between the finger returning to the same position, for example when the finger is moving with two or three degrees of freedom.

[0067] In examples, when the frequency of oscillation in the first direction 20 is substantially the same as the frequency of oscillation in the second direction 230 (i.e. when $f1 \approx f2$), the shape of the first pathway substantially corresponds to an ellipse or circle depending on the relative amplitudes of oscillation. In the case where f1 = f2, the first pathway should be circular or elliptical for example, but this may depend on design considerations and/or limitations. In other examples, the frequency of oscillation in the first direction 20 is greater than the frequency of oscillation in the second direction 230 (i.e. f1 > f2). In other examples, the frequency of oscillation in the first direction 20 is less than the frequency of oscillation in the second direction 230 (i.e. f1 < f2).

[0068] In examples, the device 1 is operable to control the frequency of oscillation in the first direction 20 and/or the second direction 230 so as to control the shape of the first pathway. In some examples, the device 1 is operable to control the frequency of oscillation in the first direction 20 and/or the second direction 230 so as to control the shape of the first pathway with respect to time. This may help provide a more varied and exciting user experience. In examples, the second finger 14 can be driven with substantially the same functionality with respect to the first direction 22 and the second direction 250 as that described above with reference to f1 and f2 respectively.

[0069] Figure 6A is a schematic view of an electromechanical arrangement for driving the motion of the stimulation fingers as indicated in Figure 5 according to an example of the present disclosure. Figure 6B is a schematic cross sectional view of the arrangement shown in Figure 6A according to an example of the disclosure. In the examples of Figures 5, 6A and 6B, the first finger 12 and the second finger 14 have two degrees of freedom. Figures 6A and 6B are described in relation to the first finger 12 but it will be appreciated that a similar configuration can be used to drive the second finger 14 as appropriate.

[0070] In the example of Figures 6A and 6B, the arrangement for driving the first finger 12 in the first direction 20 is substantially the same as that described above with respect to Figure 3A with reference to the first driving arrangement. However, in the examples of Figures 6A and 6B, the device 1 comprises a third driving arrangement. The third driving arrangement comprises a first cradle 200 in which the first driving arrangement of Figure 3A and 3B is mounted. The first cradle 200 comprises a plurality of mounting posts 202 arranged to mechanically couple the motor 30 to the cradle so that motion of the first cradle 200 can be transferred to the first finger 12. In other examples, the cradle may be coupled to the first guide element 210 so as to be able to drive the first guide element as a whole in the second direction 230. However, other appropriate methods of driving the first finger 12 in the first direction 20 and the second direction 230 could be used.

[0071] In examples, the first cradle 200 comprises a pair of trunnions 204 arranged to engage with corresponding trunnion seats (not shown) formed in the device housing 10 so that the cradle 200 may rock backwards and forwards so as to cause motion of the first finger 12 in the second direction 230. In other words, for example, the cradle 200 can be caused to be able to pivot about the trunnions 204.

[0072] In examples, the third driving arrangement comprises a third motor 210 for example mounted in the housing, a third crank 212, and a third connecting rod 214. The third connecting rod 214 is mechanically coupled to the first cradle 200 so as to be able to pivot the first cradle 200 about the trunnions 204. In other words, for example, the third crank 212 and the third connecting rod 214 mechanically couple the third motor 210 to the first cradle 200 so that rotational movement of the third crank 212 can cause the first finger 12 to oscillate back and forth in second direction 230.

[0073] Referring to the example of Figure 6A, rotational movement of the first crank 32 can cause the first finger 12 to move in the first direction 20 (for example within the plane of the page) and rotational movement of the third crank 212 can cause the first finger 12 to move in the second direction 230 (for example into and out of the page). Similarly, referring to the example shown in Figure 6B, rotational movement of the first crank 32 can cause the first finger 12 to move in the first direction 20 (for example into and out of the page) and rotational movement of the third crank 212 can cause the first finger 12 to move in the second direction 230 (for example within the plane of the page).

[0074] It will be appreciated that, in the examples of Figures 6A and 6B, the first direction is substantially linear and the second direction is substantially arcuate, because the first cradle 200 can be caused to pivot about the trunnions 204. Therefore, in these examples, the motion of the fingers may be three dimensional although they are constrained to have two degrees of freedom corresponding to the first direction and second direction. In other words, for example, the first pathway and the

second pathway can be any of one dimensional, two dimensional, and three dimensional and that the dimensionality of the pathways may be different from the number of degrees of freedom of the fingers.

[0075] Figure 7 is a schematic view of a electromechanical arrangement for driving the stimulation fingers so that they have three degrees of freedom according to examples of the disclosure. Figure 7 is described in relation to the first finger 12 but it will be appreciated that a similar configuration can be used to drive the second finger 14 as appropriate.

[0076] In the example of Figure 7, the device 1 comprises a fourth driving arrangement. The fourth driving arrangement comprises the third driving arrangement described above with respect to Figures 6A and 6B. In the examples of Figure 7, the fourth driving arrangement comprises a second cradle 300. The second cradle 300 is mounted with respect to the housing 10 so as to be slidable within the housing. More generally, in examples, the fourth driving arrangement is arranged so that the first finger 12 can be caused to be able to move in a third direction 302 (indicated by double ended arrow 302). In examples, the third direction is arranged so that the first finger 12 can be caused to oscillate in a direction parallel to the longitudinal axis 18 of the device 1, although it will be appreciated that any appropriate direction could be used.

[0077] In the examples of Figure 7, the trunnions 204 are mounted in trunnion seats formed in the second cradle 300 so that the first driving arrangement can pivot with respect to the second cradle 300. In examples, the second cradle 300 comprises mounting posts 250 arranged to mechanically couple the third motor 210 to the second cradle 300. In other words, for example, the third motor 210 is mounted in the second cradle 300 by the mounting posts 250 so that motion of the second cradle 300 can be transferred to the third driving arrangement.

[0078] In examples, the fourth driving arrangement comprises a fourth motor 310, a first gear wheel 312, a second gear wheel 314 and a fourth connecting rod 316. The first gear wheel 312 is arranged to be able to be driven by the fourth motor 310. The first gear wheel 312 is arranged to be able to drive the second gear wheel 314 so that a plane of rotational movement of the first gear wheel 312 is transformed so that a plane of rotation of the second gear wheel 314 is at ninety degrees to the first gear wheel 312, although other angular relationships are of course possible. In examples, this is so that that fourth motor 310 may fit more compactly within the form factor of the housing 10. However, it will be appreciated that, in other arrangements, the first gear wheel 312 and the second gear wheel 314 may be omitted, or other appropriate driving arrangements could be used, for example, based on the desired form factor of the housing 10 or internal configuration of the driving arrangements.

[0079] In examples, the second gear wheel 314 is arranged to act as a crank in cooperation with the fourth connecting rod 316. The fourth connecting rod 316 is mechanically coupled to the second cradle 300 so as to be able to cause the second cradle 300 to oscillate in the third direction 302. In other words, for example, the first gear wheel 312, second gear wheel 314, and the fourth connecting rod 316 mechanically couple the fourth motor 310 to the second cradle 300 so that rotational movement of the second gear wheel 314 (acting as a crank) can cause the first finger 12 to oscillate back and forth in third direction 302, for example linearly.

[0080] In examples, the first direction (e.g. first direction 20 and first direction 22), the second direction (e.g. second direction 230 and second direction 250) and the third direction 302 are all orthogonal to each other, for example depending on the driving configuration of the fingers. For example, the first direction could correspond to an 'x' direction, the second direction could correspond to a 'y' direction and the third direction correspond to a 'z' direction. In these examples, linear actuators or other mechanisms that may provide substantially linear motion may be used. However, it will be appreciated that any suitable angular relation between the directions could be used. Additionally, it will be appreciated that the angular relationship between the directions may vary with time.

[0081] In some examples, the charging port 21 can also act as a communication port for receiving audio signals, or for communicating with other devices. In examples, charging port 21 is a USB (universal serial bus) port, but it will be appreciated that any other suitable communication port could be used. In some examples, the communication port may be separate from the charging port 21. In some examples, the device 1 comprises a communication module. In examples, the communication module is a wireless communication module such as a WiFi module, near field communication module, or bluetooth module for communicating wirelessly with one or more external devices, a network and the like, although it will be appreciated that any suitable module for communicating wirelessly could be used.

[0082] In examples, the device 1 comprises sound input device operable to detect a sound signal. In examples, the controller may have the functionality of a signal processing device, or, more generally, a portable computing device. The sound signal may be any form of audio signal. In examples, the sound input device comprises a microphone operable to detect sound in an environment in which the device 1 is located so as to generate the audio signal. In other examples, the sound input device comprises an audio line-in socket, USB port or other audio interface for receiving audio signals from an external device, such as an mp3 player, portable music player, TV, computing device, or any other sort of other media player or media source. In some examples, the audio signal can be received from the communication port or communication module. In other examples, an audio signal may be generated internally, for example where the device 1 has additional functionality similar to a media player. Additionally, it will be appreciated that the audio signal may be received from any suitable source and that

more than one source and input method may be used.

[0083] In examples, the device 1 is operable to control the motion of at least one of the first stimulation finger 12 and the second stimulation finger 14 based on the audio signal. In some examples, the frequency of oscillation can be caused to depend on the amplitude (volume) of the audio signal, and/or the frequency of the audio signal. In some examples, additional audio filtering may be used to smooth the audio signal so as to make it more suitable for being associated with motion of the fingers 12, 14. In another example, the motion of at least one of the fingers 12, 14 is based on a main frequency of the audio signal such as that corresponding to drum beat. In other examples, the phase difference may be controlled based on the audio signal. However, it will be appreciated that the motion of a finger or fingers could be controlled based on the audio signal in any other suitable way. Therefore, for example, a more varied experience may be provided because motion of the fingers can be linked to a piece of music, or sound track from a film, or other audio visual material that a user might find stimulating for example. In some examples, motion of a finger or finger may be controlled by signals received from an external source such as via a Bluetooth link, WiFi, internet, or the like.

[0084] In some examples, the device 1 is operable to respond to voice commands as received from the sound input device. For example, voice commands using known audio recognition techniques could be used to control some or all of the functionality of the device 1, such as the frequency of oscillation (e.g. voice command "faster" / "slower"), path shape (e.g. voice commands "linear", "circular", "elliptical", "Lissajous", etc.), function on or off (e.g. voice command "on" / "off") or any other appropriate voice command for controlling the device 1.

[0085] In some examples, the motion of at least one of the first finger 12 and the second finger 14 is dependent on a source signal that is input to the device 1. In examples, the source signal comprises, one or more or: audio information; video information; and biological information such as pulse rate, breathing rate, electroencephalographic information, blood pressure and the like. The source signal may be input via the USB port, although other communication interfaces such as wifi, or bluetooth could be used.

[0086] In examples, the device 1 is operable to generate a sequence of commands for controlling the motion of at least one of the first stimulation finger 12 and the second stimulation finger 14, and control the motion of at least one of the first stimulation finger 12 and the second stimulation finger 14, based on the sequence of commands. In examples, the device 1 comprises a memory operable to store the sequence of commands and the controller 15 is operable to execute the sequence of commands based on those stored in the memory. The sequence of commands may be user programmable, or preprogrammed, for example. In examples, the sequence of commands applies to at least one of the first finger and the second finger and relates to one or more of: a frequency of oscillation: a time period for a particular function; a phase difference; a path shape (e.g. shape of a pathway); a path shape with respect to time; and designation of operation of the one or more of the first finger 12 and the second finger 14.

[0087] In examples, the sequence of commands may be loaded or transferred to the device 1 from an external source via the communication module. In examples, the external source can for example be a smartphone, an audiovisual apparatus such as a TV, a laptop computer, a desktop computer, media player, augmented reality headset, games console, and the like. Additionally, it will be appreciated that the external source could be used to control the device 1, for example so as to control motion of the fingers via a wireless or wired connection, such as by using a suitable application on a smartphone connected to the device 1 via Bluetooth for example, or over the internet via wifi.

[0088] In some examples, the sequence of commands may be time synchronised with an external media source such as a video or audio. For example, the sequence of commands may be such that the motion of at least one of the first finger 12 and the second finger 14 is dependent on media content. As an example, a user may have some media content that they find stimulating to watch. The user may for example, then program the sequence of commands so that stimulation from the device 1 that they find particularly pleasurable can coordinate with parts of the media that the user finds particularly stimulating. Accordingly, the sequence of commands, can for example, thus be thought of as a "storyboard" of functions that may accompany other media.

[0089] In some examples, one or more of the first finger 12 and the second finger 14, comprises a roller able to freely rotate about a longitudinal axis of the finger. In examples, each finger comprises one or more rollers (e.g. two or more rollers for each finger could be used). The use of one or more rollers may help reduce friction between the finger(s) and the body part by allowing the roller(s) to rotate with respect to the finger, for example by being in contact with the body part. Therefore, a squeezing sensation may be provided. This may also help reduce a risk of a user hurting themselves if the frequency and/or amplitude is too high, for example depending on how delicate the body part of the user is.

[0090] In examples, the roller has a circular cross section. In examples, the finger comprises a shaft about which the roller may rotate. Any suitable bearing between the shaft and the roller can be used, such as a plain bearing, rolling element bearing or jewel bearing. In some examples, the roller is substantially cylindrical, but other shapes such as spherical, barrel shaped, conical, or other appropriate shape may be used. In examples, the surface of the roller (or rollers) is textured with, for example, ridges or bumps so as to provide different sensations for the user. In some examples, the roller(s) are removable and can be swapped with other rollers, for example based on user preference. The same type of roller or rollers may

be used on both the first finger 12 and the second finger 14, although it will be appreciated that the rollers on each of the fingers could be different from each other.

[0091] Additionally, in some examples, only one of the fingers comprises a roller or rollers. In other examples, the roller or rollers may be omitted, such as those described above with respect to Figure 2. Alternatively, a different number of rollers may be used on each finger.

[0092] In other examples, one or more of the fingers comprises a removable roller arrangement designed to cooperate with the finger so as to provide the functionality of the roller and shaft arrangement described above. In other words, for example, the roller arrangement may be replaceably detachable to the finger. In an example, the roller arrangement is arranged so as to be able to engage with the first finger 12 (and/or second finger 14) by sliding over the finger (such as those described above with respect to Figure 2) and being held in place with a suitable catch or detent mechanism, or by friction for example. In the examples with one or more rollers, it may be considered that the finger or fingers could have more than three degrees of freedom, for example with a degree of freedom corresponding to the rotation of the roller or rollers.

[0093] The present disclosure has been described above with respect to a first finger 12 and a second finger 14. However, it will be appreciated that any number of fingers could be used with adaptations to the device 1 as appropriate as will be understood by the skilled person. For example, three or more fingers could be used with the same or similar functionality to that described above.

[0094] While the present disclosure has generally been described in reference to providing stimulation to the clitoris, the skilled person will appreciate that the examples of the present disclosure is not so limited and the examples could be used to provide stimulation to any body part, such as nipples, labia, penis, and testicles, or any other body part that a user chooses, for example such that they find it pleasurable and/or sexually stimulating. However, the device 1 need not be used for sexual stimulation and may be used for other purposes if desired.

[0095] Therefore, according to examples of the disclosure, many different and varied pathways are possible which may thus provide many different, varied and powerful sensations for a user. Furthermore, because the device 1 may more easily provide stimulation to a user, for example a female user may find that it is easier to become aroused, thus stimulating production of fertile cervical fluid, for example. The increased production of fertile cervical fluid may thus may help sperm transport and may help improves rates of conception. Additionally, the device 1 of the present disclosure may help previously people who have anorgasmia or have difficulty achieving orgasm to achieve orgasm more easily. Male users may also find the device pleasurable to use. It is also envisaged that the stimulation device of the present disclosure could be used by two or more people for example during sexual intercourse because the device may be used externally can concentrate stimulation in a small area for example.

[0096] It will be appreciated that the features of one or more of any of the different examples described above may be combined together as appropriate with changes as appropriate, which will be apparent to the skilled person from the present Z disclosure as claimed. Z

Claims

1. An electromechanical sexual stimulation device (1) for providing sexual stimulation to a body part, the device (1) comprising:

   a housing (10);
   a first motor (30) and a second motor (40) mounted within the housing (10);
   a first stimulation finger (12) for stimulating the body part, the first finger being directly drivable by the first motor (30) to oscillate with respect to the housing (10) along a first pathway (110);
   a second stimulation finger (14) for stimulating the body part, the second finger being directly drivable by the second motor (40) to oscillate with respect to the housing (10) along a second pathway (120); and
   a controller (15) arranged to control a position of the first finger (12) and the second finger (14) with respect to the first pathway (110) and the second pathway (120) respectively;
   in which:

      the first finger is constrained by a first guide element (210) to move with respect to the housing (10) along the first pathway (110) and the second finger is constrained by a second guide element (220) to move with respect to the housing (10) along the second pathway (120);
      the controller (15) is configured to control the relative motion of the first stimulation finger (12) and the second stimulation finger (14) with respect to each other.

2. A device (1) according to claim 1, Z in which the controller (15) is arranged to control a shape of at least one of the first pathway (110) and the second pathway (120).

3. A device (1) according to any preceding claim, in which the controller (15) is arranged to control the frequency of oscillation of at least one of the first stimulation finger (12) and the second stimulation finger (14).

4. A device (1) according to any preceding claim, in

which the controller (15) is arranged to control the relative phase difference between the oscillations of the first stimulation finger (12) and the second stimulation finger (14).

5. A device (1) according to any preceding claim, comprising a mechanical linkage arranged to mechanically couple the first stimulation finger (12) with the second stimulation finger (14).

6. A device (1) according to any preceding claim, in which the controller (15) is operable to vary a shape of at least one of the first pathway (110) and the second pathway (120) with respect to time.

7. A device (1) according to any preceding claim, in which the first pathway (110) and the second pathway (120) are spatially separated from each other.

8. A device (1) according to any preceding claim, in which at least one of the first pathway (110) and the second pathway (120) are substantially linear.

9. A device (1) according to claim 8, in which the first pathway (110) and the second pathway (120) are both substantially linear and parallel to each other.

10. A device according to any of claims 1 to 6 , in which at least one of the first pathway (110) and the second pathway (120) is substantially elliptical.

11. A device (1) according to any preceding claim, in which at least one of the first finger (12) and the second finger (14) have at least one of: one degree of freedom; two degrees of freedom; and three degrees of freedom.

12. A device (1) according to claim 11, in which the number of degrees of freedom of the first finger (12) and/or the second finger (14) is user selectable.

13. A device (1) according to any preceding claim, comprising a motion sensor (38, 48) operable to detect motion of at least one of the first finger (12) and the second finger (14), and in which the device (1) is operable to control the motion of at least one of the first finger (12) and the second finger (14) based on data generated by the motion sensor (38, 48).

14. A device (1) according to any to any preceding claim, comprising:

a sound input unit operable to detect a sound signal,
in which:
the device is operable to control the motion of at least one of the first stimulation finger and the second stimulation finger based on the sound signal.

15. A device according to any preceding claim, comprising a memory operable to store a sequence of commands for controlling the motion of at least one of the first stimulation finger (12) and the second stimulation finger (14), and the controller (15) is operable to control the motion of at least one of the first stimulation finger (12) and the second stimulation finger (14), based on the sequence of commands.

Patentansprüche

1. Eine elektromechanische Vorrichtung für sexuelle Stimulation (1) um eine sexuelle Stimulation einem Körperteil zu gewähren, wobei das Gerät (1) Folgendes umfasst:

ein Gehäuse (10);
einen ersten Motor (30) und einen zweiten Motor (40), die innerhalb des Gehäuses (10) eingebaut sind;
einen ersten Stimulationsfinger (12) zur Stimulation des Körperteils, wobei der erste Finger direkt durch den ersten Motor (30) angetrieben werden kann, um in Bezug mit dem Gehäuse (10) entlang einer ersten Strecke (110) zu schwingen;
einen zweiten Stimulationsfinger (14) zur Stimulation des Körperteils, wobei der zweite Finger direkt durch den zweiten Motor (40) angetrieben werden kann, um in Bezug mit dem Gehäuse (10) entlang einer zweiten Strecke (120) zu schwingen; und
ein Steuergerät (15), das so angeordnet ist, dass es die Stellung des ersten Fingers (12) und des zweiten Fingers (14) in Bezug auf der ersten Strecke (110) bzw. der zweiten Strecke (120) steuert;
in dem:

der erste Finger durch ein erstes Leitelement (210) gezwungen ist, sich in Bezug mit dem Gehäuse (10) entlang der ersten Strecke (110) zu bewegen, und der zweite Finger durch ein zweites Leitelement (220) gezwungen ist, sich in Bezug mit dem Gehäuse (10) entlang der zweiten Strecke (120) zu bewegen;
das Steuergerät (15) ist so gestaltet, dass es die relative Bewegung des ersten Stimulationsfingers (12) und des zweiten Stimulationsfingers (14) in Bezug aufeinander steuert.

2. Eine Vorrichtung (1) nach Anspruch 1, bei dem das Steuergerät (15) so angeordnet ist, dass es die Form

mindestens einer der ersten (110) und zweiten (120) Strecke steuert.

3. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem das Steuergerät (15) so angeordnet ist, dass es die Schwingungsfrequenz des ersten Stimulationsfingers (12) und/oder des zweiten Stimulationsfingers (14) steuert.

4. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem das Steuergerät (15) so angeordnet ist, dass es die relative Phasendifferenz zwischen den Schwingungen des ersten Stimulationsfingers (12) und des zweiten Stimulationsfingers (14) steuert.

5. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, die eine mechanische Verbindung umfasst, die so angeordnet ist, dass sie den ersten Stimulationsfinger (12) mit dem zweiten Stimulationsfinger (14) mechanisch verbindet.

6. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem das Steuergerät (15) so betrieben werden kann, dass es die Form der ersten Strecke (110) und/oder der zweiten Strecke (120) zeitabhängig verändert.

7. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem die erste Strecke (110) und der zweite Strecke (120) räumlich voneinander getrennt sind.

8. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem mindestens eine der ersten (110) und zweiten (120) Strecke im Wesentlichen geradlinig ist.

9. Eine Vorrichtung (1) nach Anspruch 8, bei dem der erste Strecke (110) und die zweite Strecke (120) beide im Wesentlichen geradlinig und parallel zueinander sind.

10. Eine Vorrichtung nach einem der Ansprüche 1 bis 6, bei dem mindestens eine der ersten (110) und zweiten (120) Strecke im Wesentlichen elliptisch ist.

11. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei dem mindestens einer des ersten Fingers (12) und des zweiten Fingers (14) mindestens einen der folgenden Freiheitsgrade aufweist: einen Freiheitsgrad; zwei Freiheitsgrade; und drei Freiheitsgrade.

12. Eine Vorrichtung (1) nach Anspruch 11, bei dem die Anzahl der Freiheitsgrade des ersten Fingers (12) und/oder des zweiten Fingers (14) vom Benutzer wählbar ist

13. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, mit einem Bewegungssensor (38, 48), der so betrieben werden kann, dass er die Bewegung mindestens eines des ersten Fingers (12) und des zweiten Fingers (14) erfasst, und bei dem das Gerät (1) so betrieben werden kann, dass es die Bewegung mindestens eines des ersten Fingers (12) und des zweiten Fingers (14) aufgrund der von dem Bewegungssensor (38, 48) erzeugten Daten steuert.

14. Eine Vorrichtung (1) nach einem der vorhergehenden Ansprüche, die Folgendes umfasst:

eine Toneingabeeinheit, die betrieben werden kann, um ein Tonsignal zu erfassen,
in der:
die Vorrichtung so betrieben werden kann, dass es die Bewegung mindestens eines des ersten Stimulationsfingers und des zweiten Stimulationsfingers aufgrund des Tonsignals steuert.

15. Eine Vorrichtung nach einem der vorhergehenden Ansprüche, mit einem Speicher, der so betrieben werden kann, dass er eine Folge von Befehlen zur Steuerung der Bewegung des ersten Stimulationsfingers (12) und/oder des zweiten Stimulationsfingers (14) speichert, und mit einem Steuergerät (15), das so betrieben werden kann, dass es die Bewegung mindestens eines des ersten Stimulationsfingers (12) und/oder des zweiten Stimulationsfingers (14) aufgrund der Reihenfolge von Befehlen steuert.

Revendications

1. Dispositif de stimulation sexuelle électromécanique (1) pour fournir une stimulation sexuelle à une partie du corps, le dispositif (1) comprenant :

un boîtier (10);
un premier moteur (30) et un deuxième moteur (40) montés à l'intérieur du boîtier (10) ;
un premier doigt de stimulation (12) pour stimuler la partie du corps, le premier doigt étant directement entraînable par le premier moteur (30) pour osciller par rapport au boîtier (10) le long d'un premier chemin (110);
un deuxième doigt de stimulation (14) pour stimuler la partie du corps, le deuxième doigt étant directement entraînable par le deuxième moteur (40) pour osciller par rapport au boîtier (10) le long d'un deuxième chemin (120);
un contrôleur (15) agencé pour contrôler une position du premier doigt (12) et
du deuxième doigt (14) par rapport au premier chemin (110) au deuxième chemin (120) respectivement ;

dans lequel :

le premier doigt est contraint par un premier élément de guidage (210) de se déplacer par rapport au boîtier (10) le long du premier chemin (110) et le deuxième doigt est contraint par un deuxième élément de guidage (220) de se déplacer par rapport au boîtier (10) le long du second chemin (120) ;
le contrôleur (15) est configuré pour contrôler le mouvement relatif du premier doigt de stimulation (12) et du deuxième doigt de stimulation (14) l'un par rapport à l'autre.

2. Dispositif (1) selon la revendication 1, dans lequel le contrôleur (15) est configuré pour contrôler une forme d'au moins l'un du premier chemin (110) et du second chemin (120).

3. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel le contrôleur (15) est configuré pour contrôler la fréquence d'oscillation d'au moins l'un du premier doigt de stimulation (12) et du deuxième doigt de stimulation (14).

4. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel le contrôleur (15) est configuré pour contrôler la différence de phase relative entre les oscillations du premier doigt de stimulation (12) et du deuxième doigt de stimulation (14).

5. Dispositif (1) selon l'une quelconque des revendications précédentes, comprenant une liaison mécanique agencée pour coupler mécaniquement le premier doigt de stimulation (12) avec le deuxième doigt de stimulation (14).

6. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel le contrôleur (15) peut fonctionner pour faire varier dans le temps une forme d'au moins l'un du premier chemin (110) et du second chemin (120).

7. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel le premier chemin (110) et le second chemin (120) sont spatialement séparés l'un de l'autre.

8. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel au moins l'un parmi le premier chemin (110) et le second chemin (120) est sensiblement linéaire.

9. Dispositif (1) selon la revendication 8, dans lequel le premier chemin (110) et le second chemin (120) sont à la fois sensiblement linéaires et parallèles l'un à l'autre.

10. Dispositif selon l'une quelconque des revendications 1 à 6, dans lequel au moins l'un du premier chemin (110) et du second chemin (120) est sensiblement elliptique.

11. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel au moins l'un du premier doigt (12) et du deuxième doigt (14) ont au moins l'un de : un degré de liberté ; deux degrés de liberté ; et trois degrés de liberté.

12. Dispositif (1) selon la revendication 11, dans lequel le nombre de degrés de liberté des premiers doigts (12) et/ou du deuxième doigt (14) est sélectionnable par l'utilisateur.

13. Dispositif (1) selon l'une quelconque des revendications précédentes, comprenant un capteur de mouvement (38,48) pouvant fonctionner pour détecter le mouvement d'au moins l'un du premier doigt (12) et du deuxième doigt (14), et dans lequel le dispositif (1) peut fonctionner pour contrôler le mouvement d'au moins l'un du premier doigt (12) et du deuxième doigt (14) en se basant sur des données générées par le capteur de mouvement (38, 48).

14. Dispositif (1) selon l'une quelconque des revendications précédentes, comprenant : une unité d'entrée de son utilisable pour détecter un signal sonore, dans lequel :
le dispositif peut fonctionner pour contrôler le mouvement d'au moins l'un du premier doigt de stimulation et du deuxième doigt de stimulation sur la base du signal sonore.

15. Dispositif (1) selon l'une quelconque des revendications
précédentes, comprenant une mémoire pouvant fonctionner pour stocker une séquence de commandes pour contrôler le mouvement d'au moins l'un du premier doigt de stimulation (12) et du deuxième doigt de stimulation (14), et le contrôleur (15) pouvant fonctionner pour contrôler le mouvement d'au moins l'un du premier doigt de stimulation (12) et du deuxième doigt de stimulation (14), en se basant sur la séquence de commandes.

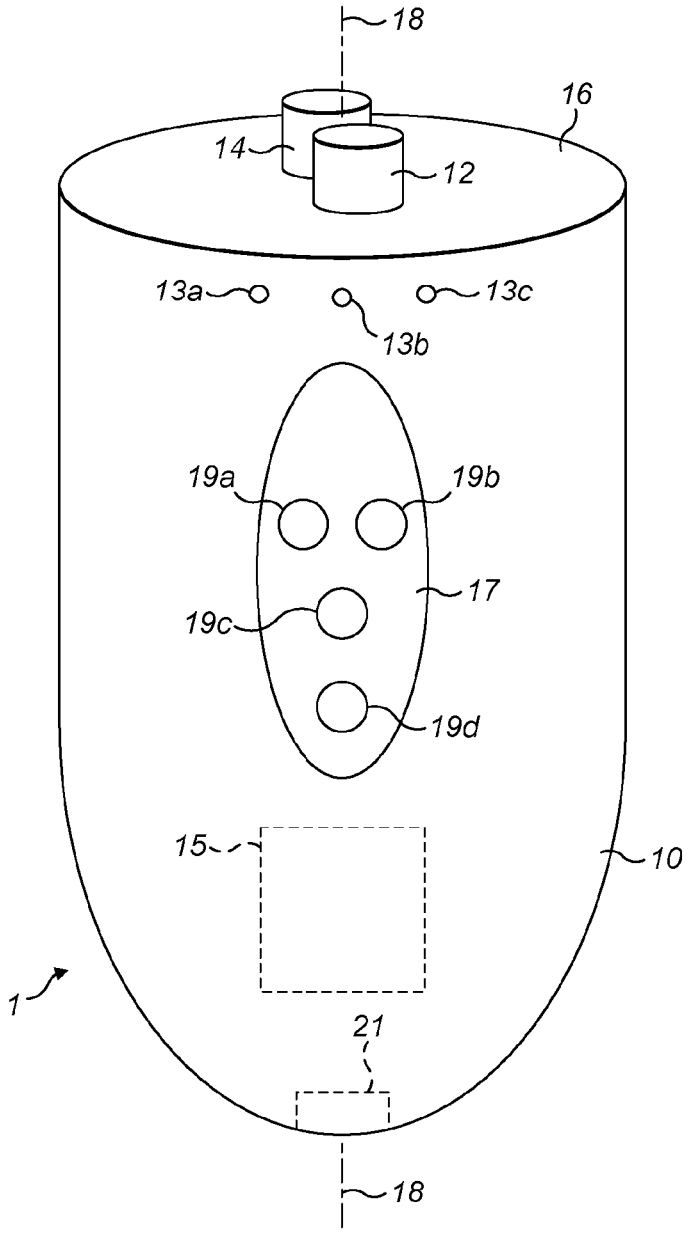

FIG. 1

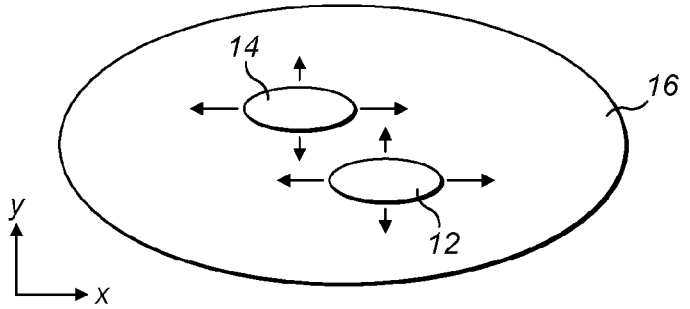

FIG. 2

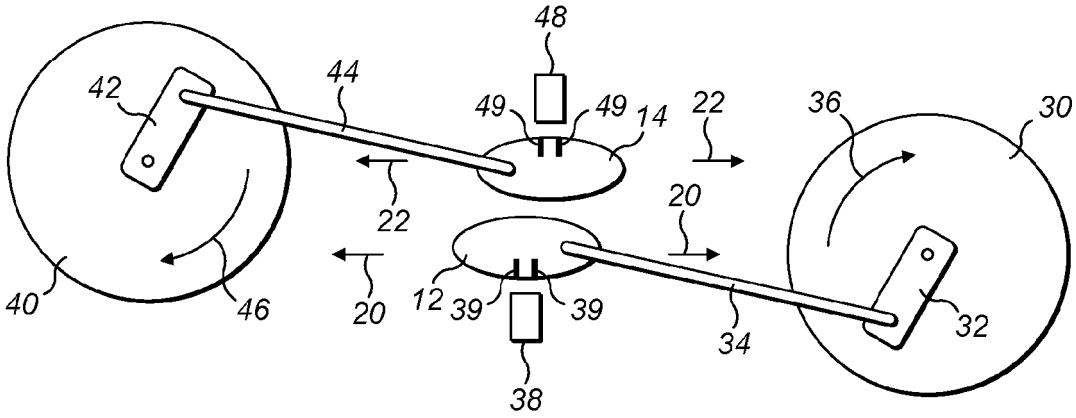
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FIG. 3A

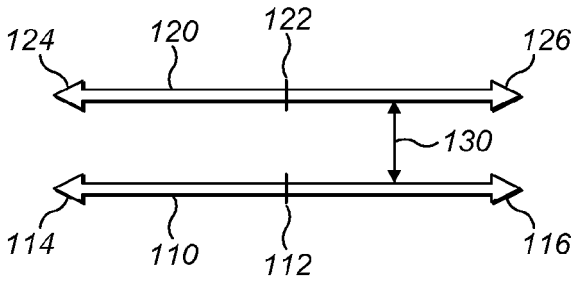
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FIG. 3B

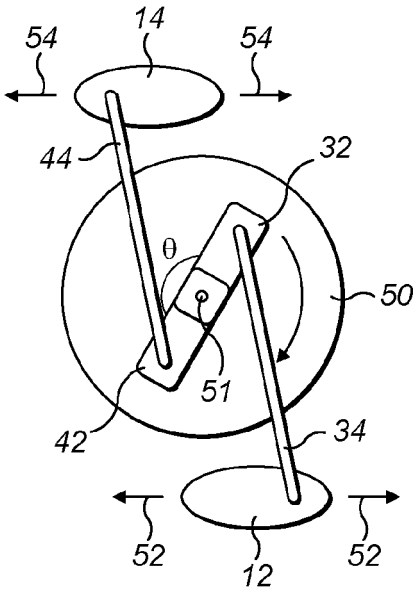

FIG. 4A

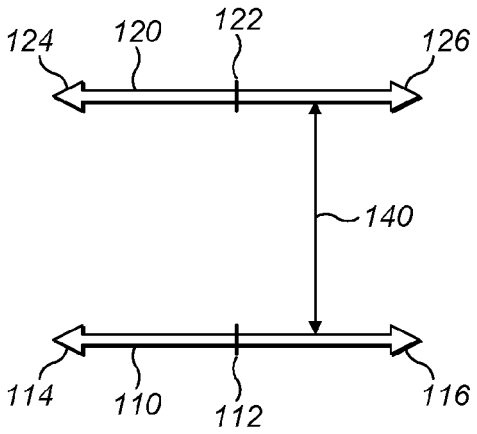

FIG. 4B

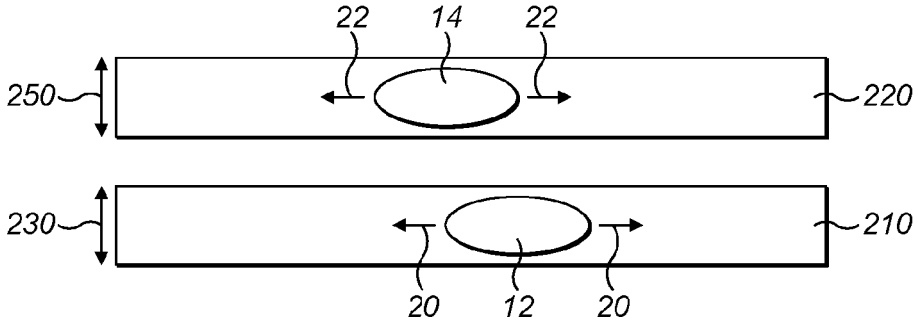

FIG. 5

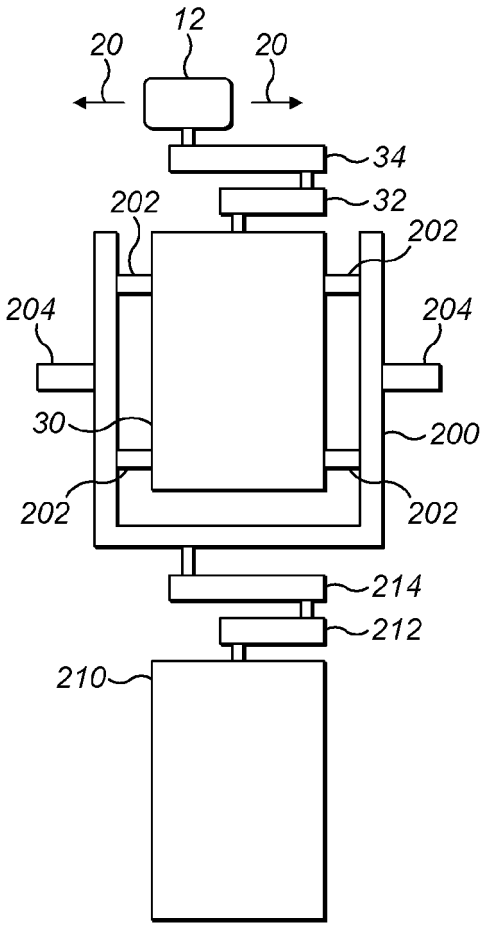
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FIG. 6A

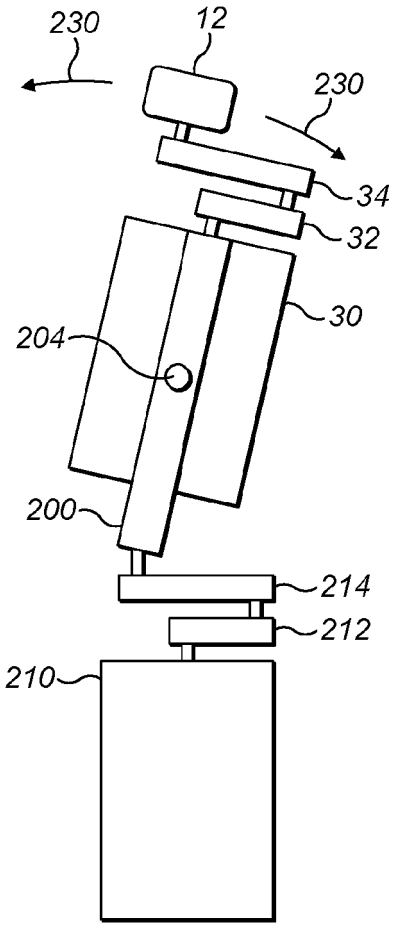
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FIG. 6B

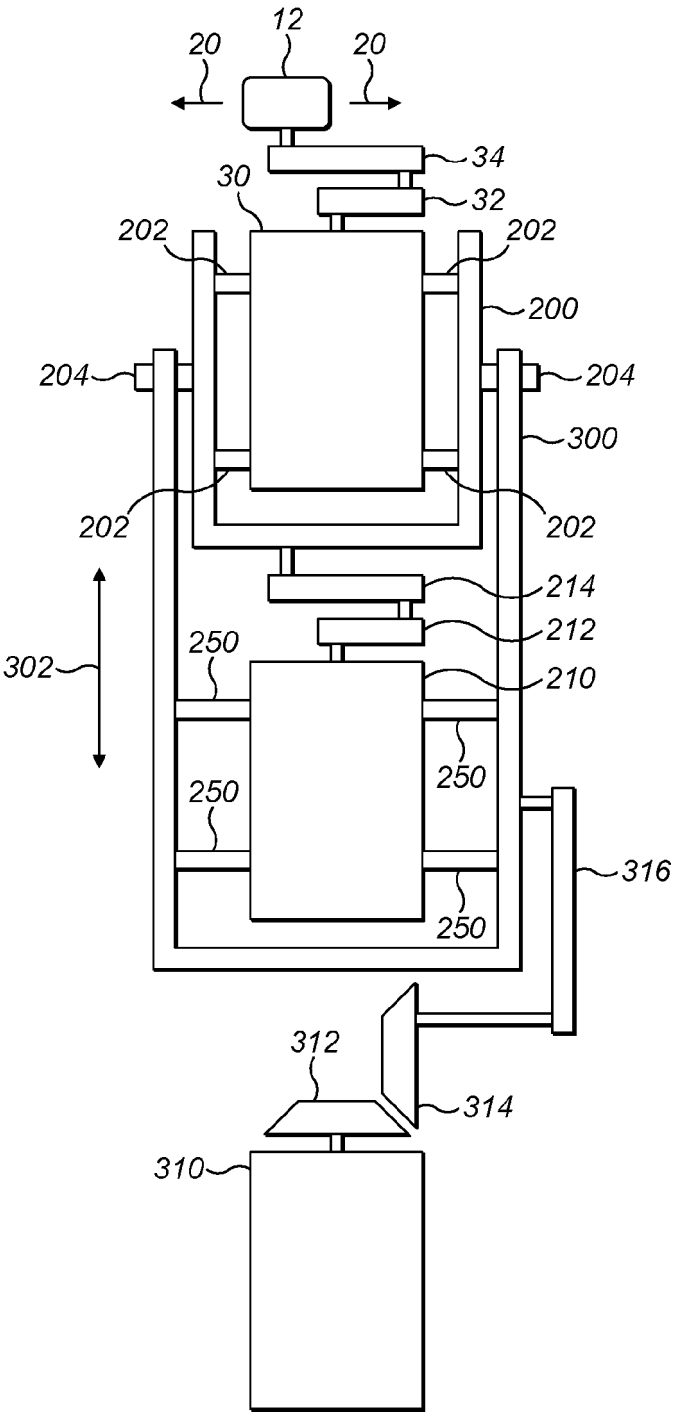
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FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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