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(54) **GUN HANDLE SYSTEM AND SHOCK WAVE ROBOT THERAPY SYSTEM**

(57) The present invention provides a gun handle system and a shock wave robot therapy system. The shock wave robot therapy system comprises a host and a gun handle system installed on the host, the gun handle system comprises a mechanical arm installed to the host and a gun handle, wherein the tail end of the mechanical arm is provided with an end-of-arm tooling connector; and the gun handle is detachably installed to the end-of-arm tooling connector and can move under the drive of the mechanical arm, a shock wave generator is

arranged in the gun handle, and the front end of the gun handle is provided with a gun head used for contact with a patient's body surface. The structure enables the mechanical arm to adapt to various types of end-of-arm toolings through different connectors and to identify and control different end-of-arm toolings through an identification device. Meanwhile, the structure enables the gun handle to realize automatic and mobile shock wave therapy under the drive of the mechanical arm.

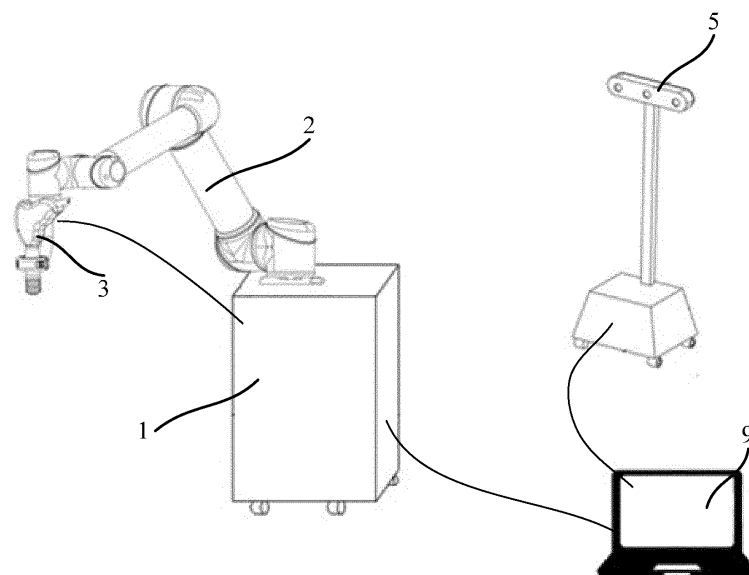


FIG. 1

Description

Technical Field

[0001] The embodiments of the present disclosure generally relate to the field of shock wave therapy, and more particularly relates to a gun handle system and a shock wave robot therapy system.

Background

[0002] As a therapy method with rapid effect and lasting therapeutic effect and without obvious side effect, the orthopedic shock wave therapy is used more and more widely in diseases such as osteoarthritis, cartilage injury, tenosynovitis and osteonecrosis (lunate necrosis, necrosis of talus and necrosis of navicular bone). However, the existing shock wave therapy system is composed of a control box or a trolley-like device, one or a plurality of gun handles, and a plurality of shock wave therapy heads. During shock wave therapy, a doctor is required to hold a shock wave gun handle in hand to keep the end surface of the gun head in close contact with a patient's body surface for therapy. When a doctor makes a shock wave therapeutic schedule, multiple parts will be always treated to and fro, and each therapeutic process generally lasts for 20-30 min. It is difficult for a doctor to hold the gun handle stably for a long time, and the continuous vibration of the shock wave gun handle in the therapeutic process is likely to cause fatigue injury of the doctor's limbs.

[0003] If the mobile therapy of the shock wave gun handle on the body surface cannot be realized by adopting a passively supporting mechanical arm to hold the gun handle of the shock wave device for targeted therapy on the affected part of a patient, the doctor has to tow the mechanical arm again each time another part is switched in therapy, consuming time and labor. Moreover, the relative position of the gun handle and a patient's body surface cannot be kept stable by holding the gun handle in a fixed position for a long time, which will affect the effective and stable transmission of shock wave energy to the treated part and thus cannot achieve an ideal therapeutic effect.

[0004] Therefore, the problem to be urgently solved at present is how to design a gun handle system which does not need to be held in hand to carry out mobile shock wave therapy and a shock wave robot therapy system.

Summary

[0005] One purpose of the present invention is to provide a gun handle system.

[0006] The other purpose of the present invention is to provide a shock wave robot therapy system comprising the gun handle system.

[0007] The embodiments of the first aspect of the present invention provide a gun handle system which is

used for a shock wave robot therapy system, wherein the shock wave robot therapy system comprises a host and a gun handle system installed on the host, the gun handle system can move under the action of the host, and the gun handle system comprises:

A mechanical arm which is installed to the host, wherein the tail end of the mechanical arm is provided with an end-of-arm tooling connector and an identification device connected with the host, and the end-of-arm tooling connector can adapt to various end-of-arm toolings;

A gun handle which is detachably installed to the end-of-arm tooling connector and can move under the drive of the mechanical arm, wherein a shock wave generator is arranged in the gun handle, and the front end of the gun handle is provided with a gun head used for contact with a patient's body surface;

The identification device can identify an end-of-arm tooling connected with the end-of-arm tooling connector, and the gun handle is one of end-of-arm toolings.

[0008] In any of the above solutions, preferably, a recording device which can record the motion track of the mechanical arm is arranged in the mechanical arm or the host.

[0009] In any of the above solutions, preferably, the gun handle system also comprises a visual acquisition device installed on the mechanical arm or the gun handle, wherein the visual acquisition device is used for collecting image information about a patient's body surface.

[0010] In any of the above solutions, preferably, the mechanical arm is a seven-degree-of-freedom flexible mechanical arm.

[0011] In any of the above solutions, preferably, the gun handle system also comprises a coupling component which is installed on the gun head, and the gun head is in contact with a patient's body surface through the coupling component in the therapeutic process.

[0012] In any of the above solutions, preferably, the gun handle also comprises a housing in which the shock wave generator is installed, wherein the front end of the gun handle extends out of the housing; and a silencing shock absorption pipe which is installed in the housing and sheathed on the shock wave generator.

[0013] Further, the housing comprises a base and a shell installed on the base, an installation cavity is formed between the shell and the base, the base is provided with a through hole communicating with the installation cavity, and the base can be detachably connected with the end-of-arm tooling connector; the gun handle also comprises: a power source control device which is used for controlling a shock wave power source to be on and off, installed in the housing and provided with an accommodating cavity, wherein the accommodating cavity is provided with an opening at one end close to the base, one end of the

shock wave generator is installed in the accommodating cavity, and the other end of the shock wave generator penetrates through the opening of the accommodating cavity and extends out of the base through the through hole; and the silencing shock absorption pipe is located in a space surrounded by the power source control device and the base, and sheathed on the shock wave generator.

[0014] Further preferably, the base and the shell are connected through screws.

[0015] Further preferably, the gun handle also comprises a power source connecting path which is used for communicating the shock wave generator with the shock wave power source. Specifically, a power source required by the shock wave generator can be hydra electronic, piezoelectric, electromagnetic, pneumatic, etc.

[0016] Further preferably, the base is provided with a protrusion portion, the protrusion portion is arranged by extending out of the side portion of the shell and used for being connected with the end-of-arm tooling connector, the end-of-arm tooling connector is fixedly connected with the tail end of the mechanical arm, and when the mechanical arm is connected with the end-of-arm tooling connector, part of the structure of the tail end of the mechanical arm can be abutted against part of the housing located above the protrusion portion.

[0017] The gun handle system provided by the present invention is used for a shock wave robot therapy system, and the gun handle system comprises a mechanical arm installed on the host and a gun handle installed at the tail end of the mechanical arm, wherein the mechanical arm is used for driving the gun handle to move under the control of the host, and the gun handle and the mechanical arm are detachably connected through the end-of-arm tooling connector so that the gun handle can be removed from the mechanical arm and other end-of-arm toolings can be installed on the mechanical arm. The identification device is used for identifying end-of-arm toolings. After the gun handle or other end-of-arm toolings are installed on the mechanical arm, the end-of-arm toolings which shall be installed can be controlled by the mechanical arm and the host through identification matching to realize the corresponding functions. Meanwhile, the gun handle system in the present application can be installed on the host through the mechanical arm so that the gun handle system can realize intelligent mobile shock wave therapy under the action of the host. In this way, both hands of an operator are freed, and the doctor is not required to hold the gun handle for a long time, thereby solving the technical problem existing in the therapy with the existing hand-held shock wave gun handle, i.e., solving the problems that the hand-held shock wave therapy process consumes time and labor, the gun handle cannot be kept stable when held for a long time, which will affect the effective and stable transmission of shock wave energy to the treated part and thus cannot achieve an ideal therapeutic effect, and the continuous vibration of the shock wave gun handle in the

therapeutic process is likely to cause fatigue injury of the doctor's limbs so that the shock wave therapy effect is more ideal, the operation process is more intelligent, simple and stable, and the fatigue injury caused to the doctor's limbs by holding the gun handle in hand can be avoided. Meanwhile, because the gun handle can carry out mobile therapy under the drive of the mechanical arm, the structure can realize multipoint cyclic therapy, thereby realizing the mobile therapy of the shock wave gun handle on the body surface while realizing the automatic shock wave therapy.

[0018] The embodiment of the second aspect of the present invention provides a shock wave robot therapy system, comprising a host; and a gun handle system provided by any of the embodiments of the first aspect, wherein the gun handle system is installed to the host through the mechanical arm and can move under the control of the host.

[0019] It should be understood that the contents described in the disclosure are not intended to limit the key or important features of the embodiments of the present invention or to limit the scope of the present invention. Other features of the present invention will become easy to understand by the following description.

Description of Drawings

[0020] The above and other features, advantages and aspects of each embodiment of the present disclosure will become more obvious in combination with the drawings and by reference to the following detailed description. In the figures, same or similar reference signs refer to same or similar elements, wherein

Fig. 1 is a structural schematic diagram of a shock wave robot therapy system provided by the embodiments of the present disclosure;

Fig. 2 is a structural schematic block diagram of a shock wave robot therapy system provided by the embodiments of the present disclosure;

Fig. 3 is a structural schematic diagram of a gun handle system provided by the embodiments of the present disclosure;

Fig. 4 is another structural schematic diagram of a gun handle system;

Fig. 5 is a structural schematic diagram of disassembly of a gun handle system in Fig. 4;

Fig. 6 is a sectional structural schematic diagram of a gun handle system in an embodiment;

Fig. 7 is a structural schematic diagram of a gun handle of a gun handle system in an embodiment;

Fig. 8 is a structural schematic diagram of a housing of a gun handle in Fig. 6;

Fig. 9 is a structural schematic diagram of a base of a gun handle in Fig. 6;

Fig. 10 is a structural diagram of a mechanical arm of a gun handle system provided by the embodiments of the present disclosure.

[0021] In the figures, the corresponding relation between the reference signs in Fig. 1-10 and the part names is as follows:

1 host, 2 mechanical arm, 22 end-of-arm tooling connector, 24 identification device, 26 recording device, 3 gun handle, 30 shock wave generator, 31 housing, 312 shell, 314 base, 3140 through hole, 3142 protrusion portion, 316 installation cavity, 32 power source control device, 33 silencing shock absorption pipe, 34 power source connecting path, 4 camera, 5 structural optical scanner, 6 coupling component, 7 therapy platform, 8 therapy aid, and 9 software planning device.

Detailed Description

[0022] To make purposes, technical solutions and advantages of the embodiments of the present disclosure more clear, the technical solutions in the embodiments of the present invention will be clearly and fully described below in combination with the drawings in the embodiments of the present disclosure. Apparently, the described embodiments are merely part of the embodiments of the present disclosure, not all of the embodiments. Based on the embodiments in the present disclosure, all other embodiments obtained by those skilled in the art without contributing creative labor will belong to the protection scope of the present disclosure.

[0023] As shown in Fig. 1-10, the embodiments of the first aspect of the present invention provide a gun handle system which is used for a shock wave robot therapy system, wherein the shock wave robot therapy system comprises a host 1 and a gun handle system installed on the host 1, the gun handle system can move under the action of the host 1, and the gun handle system comprises a mechanical arm 2 and a gun handle 3, specifically:

The mechanical arm 2 installed to the host 1, the tail end of the mechanical arm 2 is provided with an end-of-arm tooling connector 22 and an identification device 24 connected with the host 1, and the end-of-arm tooling connector 22 can adapt to various end-of-arm toolings;

The gun handle 3 is detachably installed to the end-of-arm tooling connector 22 and can move under the drive of the mechanical arm 2, a shock wave generator 30 is arranged in the gun handle 3, and the front end of the gun handle 3 is provided with a gun head used for contact with a patient's body surface;

The identification device 24 can identify an end-of-arm tooling connected with the end-of-arm tooling connector 22, and the gun handle 3 is one of end-of-arm toolings.

[0024] The gun handle system provided by the present invention is used for the shock wave robot therapy system, and the gun handle system comprises a mechanical arm 2 installed on the host 1 and a gun handle 3 installed

at the tail end of the mechanical arm 2, wherein the mechanical arm 2 is used for driving the gun handle 3 to move under the control of the host 1, and the gun handle 3 and the mechanical arm 2 are detachably connected through an end-of-arm tooling connector 22 so that the gun handle 3 can be removed from the mechanical arm 2 and then other end-of-arm toolings can be installed on the mechanical arm 2. The identification device 24 is used for identifying end-of-arm toolings. After the gun handle 3 or other end-of-arm toolings are installed on the mechanical arm 2, the end-of-arm toolings which shall be installed can be controlled by the mechanical arm 2 and the host 1 through identification matching to realize the corresponding functions. Meanwhile, the gun handle system in the present application can be installed on the host 1 through the mechanical arm 2 so that the gun handle system can realize intelligent mobile shock wave therapy under the action of the host 1. In this way, both hands of an operator are freed, and the doctor is not required to hold the gun handle for a long time, thereby solving the technical problem existing in the therapy with the existing hand-held shock wave gun handle 3, i.e., solving the problems that the hand-held shock wave therapy process consumes time and labor, the gun handle 3 cannot be kept stable when held for a long time, which will affect the effective and stable transmission of shock wave energy to the treated part and thus cannot achieve an ideal therapeutic effect, and the continuous vibration of the shock wave gun handle 3 in the therapeutic process is likely to cause fatigue injury of the doctor's limbs so that the shock wave therapy effect is more ideal, the operation process is more intelligent, simple and stable, and the fatigue injury caused to the doctor's limbs by holding the gun handle 3 in hand can be avoided. Meanwhile, because the gun handle 3 can carry out mobile therapy under the drive of the mechanical arm 2, the structure can realize multipoint cyclic therapy, thereby realizing the mobile therapy of the shock wave gun handle 3 on the body surface while realizing the automatic shock wave therapy.

[0025] In any of the above embodiments, preferably, as shown in Fig. 2, a recording device 26 which can record the motion track of the mechanical arm 2 is arranged in the mechanical arm 2 or the host 1.

[0026] In the embodiment, before automatic therapy, an experienced doctor can manually control the gun handle 3 or the mechanical arm 2 for demonstration therapy first to enable the mechanical arm 2 or the host 1 to record the movement track of the mechanical arm through the recording device 26 in the process of demonstration therapy so that the mechanical arm can repeatedly execute the recorded motion track to realize automatic and mobile therapy. This way uses the function of automatically recording the path of the mechanical arm 2, and a camera and a graphical analysis device at the tail end of the mechanical arm can be omitted, so the load of the robot can be reduced.

[0027] In the above solution, preferably, as shown in

Fig. 2, the gun handle system also comprises a visual acquisition device installed on the mechanical arm 2 or the gun handle 3, wherein the visual acquisition device is used for collecting image information about a patient's body surface.

[0028] In the embodiments, to realize the automatic therapy of the robot, identification points and lines can be set on the patient's body surface first to indicate a preset therapeutic path, the information of the preset path marked on the patient's body surface is obtained through the visual acquisition device, a doctor can modify and confirm the image information of the preset path to plan a practical therapeutic path, and the robot can be controlled through instructions to perform reciprocating therapy. In the present application, the mechanical arm 2 or the gun handle 3 is provided with a visual acquisition device for image acquisition, and after the visual acquisition device collects images, the therapeutic path of the gun handle 3 can be planned through analysis on the images so that the gun handle system can be controlled by the planned therapeutic path to carry out automatic and mobile therapy according to the planned path, which realizes the intelligent navigation of the mechanical arm 2 based on visual acquisition information, wherein the visual acquisition device can be the camera 4.

[0029] A path editing module is arranged in the host 1, and the preliminary path can be subjected to reasonable editing or modification (including addition, deletion and adjustment) through the path editing module after being obtained through the recording device 26 so as to realize reasonable planning of the path.

[0030] In any of the above embodiments, preferably, as shown in Fig. 4 and Fig. 10, the mechanical arm 2 is a seven-degree-of-freedom flexible mechanical arm, wherein the seven-degree-of-freedom flexible mechanical arm 2 can be understood as an arm with flexibility closest to a human arm, the mechanical arm 2 can keep the base 314 and the end position unchanged, and the spatial attitude of the mechanical arm 2 can be changed.

[0031] In any of the above embodiments, preferably, as shown in Fig. 2, the gun handle system also comprises a coupling component 6 which is installed on the gun head, and the gun head is in contact with a patient's body surface through the coupling component 6 in the therapeutic process, wherein the coupling component 6 is used for realizing the interface coupling of the energy transmission process after being assembled with the gun head of the gun handle 3 of the shock wave robot to ensure the effective and stable transmission of shock wave energy. In general, a solid coupling medium is embedded in the coupling component. In this way, it is not necessary to apply a couplant to the patient's body surface in advance, thus simplifying the operation. Of course, in other solutions, the gun head is not required to be provided with the coupling component 6, and at this time, the couplant can be applied to the patient's body surface in advance.

[0032] In any of the above embodiments, preferably,

as shown in Fig. 3-9, the gun handle 3 also comprises: a housing 31 in which the shock wave generator 30 is installed, wherein the front end of the gun handle 3 extends out of the housing 31; and a silencing shock absorption pipe 33 which is installed in the housing 31 and sheathed on the shock wave generator 30.

[0033] In the embodiment, the gun handle 3 comprises a shell 312, a shock wave generator 30 and a silencing shock absorption pipe 33, the housing 31 is composed of the shell 312 and a base 314, and the silencing shock absorption pipe 33 is used for reducing noise and vibration so as to reduce noise and vibration of the shock wave generator 30 in the process of generating shock wave so that the gun handle is quieter in use.

[0034] Further, as shown in Fig. 3-9, the housing 31 comprises the base 314 and the shell 312 installed on the base 314, an installation cavity 316 is formed between the shell 312 and the base 314, the base 314 is provided with a through hole 3140 communicating with the installation cavity 316, and the base 314 can be detachably connected with the end-of-arm tooling connector 22; and the gun handle 3 also comprises: a power source control device 32 which is installed in the housing 31 and provided with an accommodating cavity, wherein the accommodating cavity is provided with an opening at one end close to the base 314, one end of the shock wave generator 30 is installed in the accommodating cavity, the other end of the shock wave generator 30 penetrates through the opening of the accommodating cavity and extends out of the base 314 through the through hole 3140, and the power source control device 32 is connected with the power source for providing the power source for the shock wave generator 30 after control treatment, wherein the silencing shock absorption pipe 33 is located in a space surrounded by the power source control device 32 and the base 314, and sheathed on the shock wave generator 30.

[0035] In the embodiment, the housing 31 is composed of the shell 312 and the base 314, and the power source control device 32 is used for controlling the operation of the shock wave generator 30 to ensure that the shock wave generator 30 can generate shock wave with required parameters.

[0036] Further preferably, as shown in Fig. 5, the base 314 and the shell 312 are connected through screws.

[0037] Further preferably, as shown in Fig. 5 and Fig. 6, the gun handle 3 also comprises a power source connecting path 34 installed on the shell 312, wherein the power source connecting path 34 is used for communicating the shock wave generator 30 with the shock wave power source. Preferably, the power source control device 32 is installed in the housing and used for controlling the shock wave power source to be on and off. Specifically, a power source required by the shock wave generator 30 can be hydra electronic, piezoelectric, electromagnetic, pneumatic, etc.

[0038] Further preferably, as shown in Fig. 7-9, the base 314 is provided with a protrusion portion 3142, the

protrusion portion 3142 is arranged by extending out of the side portion of the shell 312 and used for being connected with the end-of-arm tooling connector 22, the end-of-arm tooling connector 22 is fixedly connected with the tail end of the mechanical arm 2, and when the mechanical arm 2 is connected with the end-of-arm tooling connector 22, part of the structure of the tail end of the mechanical arm 2 is abutted against part of the housing 31 located above the protrusion portion 3142. This arrangement can make the mechanical arm 2 and the gun handle 3 match more reliably.

[0039] As shown in Fig. 1 and Fig. 2, the embodiment of the second aspect of the present invention provides a shock wave robot therapy system, comprising: a host 1; and a gun handle system provided by any of the embodiments of the first aspect, wherein the gun handle system is installed to the host 1 through the mechanical arm 2 and can move under the control of the host 1.

[0040] The shock wave robot therapy system provided by the embodiment of the second aspect of the present invention comprises the gun handle system provided by any of the embodiments of the first aspect and thus comprises the beneficial effects of the gun handle system provided by any of the embodiments of the first aspect, which will not be repeated herein.

[0041] In any of the above embodiments, preferably, as shown in Fig. 1, the shock wave robot therapy system also comprises a therapy platform 7 for a patient to sit or lie down and therapy aids 8 for ensuring a patient's therapy posture. Specifically, the therapy platform 7 is a therapeutic bed or a therapeutic chair, and the therapy aids 8 comprise one or more of a positioning tool for positioning a patient, a fixture for partially fixing a patient and a positioning and supporting device for positioning and/or supporting the shock wave robot and the gun handle 3, wherein the therapeutic bed (or chair) of the shock wave robot and the other therapy aids 8 of the shock wave robot are appliances selected or customized for meeting the requirements of shock wave robot therapy to maintain the patient's therapy posture, which not only meet the functional requirements but also let a patient feel very comfortable in the therapeutic process.

[0042] Further preferably, as shown in Fig. 1, the host 1 and the structural optical scanner 5 also can be externally connected with a software planning device 9 to facilitate program editing and management on the host 1 and the structural optical scanner 5.

[0043] Further, the shock wave robot therapy system also comprises other end-of-arm toolings (not shown in the figures).

[0044] The application process of the shock wave robot therapy system provided by the present invention in clinical practice can be divided into two modes of application: one is the demonstration mode of automatically recoding a track based on the mechanical arm, and the other is the autonomous navigation mode of generating a path based on image acquisition and analysis.

[0045] The operation process of the clinical flow in the

demonstration mode is as follows:

- A patient is in place;
- The patient assumes a required therapeutic posture as required by the doctor, and the doctor fixes the patient with the therapy aids;
- The doctor makes a diagnosis, plans a therapeutic schedule and makes corresponding marks in the affected area of the body surface (drawing marks with a colored pencil or pasting mark points);
- The doctor applies a shock wave therapy couplant to the affected part (or assembling the coupling component on the gun head of the gun handle of the shock wave device);
- The robot device is in place (an appropriate position between the robot and the treated part is found, and the caster fixing device is locked);
- The shock wave robot is turned on, and the doctor holds and drags the tailed end of the robot to keep the end surface of the gun head of the gun handle of the shock wave robot in close contact with the surface of the affected part and conducts demonstration therapy according the diagnosis result and the planned therapeutic schedule;
- The path is edited, and the invalid path is deleted to realize the final planning of the path; the direction and the speed of the travel path of the gun head are set; and the targeted therapy time of the key therapy points is set;
- The doctor turns on the shock wave therapy device and sets the energy value, the frequency value and the number of times of therapy;
- Simulated therapy is conducted (animation demonstration);
- The robot performs the automatic full course of therapy according to the planned path and the set parameters;
- After therapy, the shock wave device is turned off, and the robot device is turned off;
- The robot device is removed;
- The affected part is cleaned, and the patient leaves;
- The shock wave gun handle of the robot is cleaned.

[0046] The operation process of the clinical flow in the autonomous navigation mode is as follows:

- A patient is in place;
- The patient assumes a required therapeutic posture as required by the doctor, and the doctor fixes the patient with the therapy aids;
- The doctor makes a diagnosis, plans a therapeutic schedule and makes corresponding marks in the affected area of the body surface (drawing marks with a colored pencil or pasting mark points);
- The robot device is in place (an appropriate position between the robot and the treated part is found, and the caster fixing device is locked);
- The robot device is turned on, the tail end of the robot

is dragged to 30-50 cm directly above the affected part (to ensure that the field of view of the visual component can cover the entire area of the affected part to be treated);

- The therapeutic schedule is planned on the robot controller according to the visual acquisition information; the direction and the speed of the travel path of the gun head are set; the targeted therapy time of the key therapy points is set; and the shock wave energy value, the frequency value, the number of times of therapy, and the cycle mode and number of therapy are set;
- Simulated therapy is conducted (animation demonstration);
- The doctor applies a shock wave therapy couplant to the affected part (or assembling the coupling component on the gun head of the gun handle of the shock wave device);
- The planned therapeutic schedule is executed for therapy;
- After therapy, the shock wave device is turned off, and the robot device is turned off;
- The robot device is removed;
- The affected part is cleaned, and the patient leaves;
- The shock wave gun handle of the robot is cleaned.

[0047] Note: In the therapeutic process of the shock wave robot, the axis of the gun head of the gun handle of the shock wave robot is required to be always perpendicular to the body surface of the affected part, and meanwhile, the end surface of the gun head of the gun handle is required to remain in contact with the body surface and keep a constant force.

[0048] In the illustration of this description, terms such as "connecting", "installation", "fixation" and the like shall be understood in broad sense, and for example, may refer to fixed connection or detachable connection or integral connection, and may refer to direct connection or indirect connection through an intermediate medium. For those ordinary skilled in the art, the specific meanings of the above terms in the present application may be understood according to concrete conditions.

[0049] In the illustration of this description, the illustration of terms of "one embodiment", "some embodiments", etc. means that specific features, structures, materials or characteristics illustrated in combination with the embodiment or example are included in at least one embodiment or example of the present application. In this description, exemplary statements for the above terms shall not necessarily refer to the same embodiment or example. Moreover, the described specific features, structures, materials or characteristics can be combined appropriately in any one or more embodiments or examples.

[0050] The above only describes preferred embodiments of the present application and is not intended to limit the present application. For those skilled in the art, various variations and changes can be made to the

present application. Any modification, equivalent replacement, improvement, etc. made within the spirit and the principle of the present application shall be included within the protection scope of the present application.

Claims

1. A gun handle system, which is used for a shock wave robot therapy system, comprising:

a mechanical arm which is installed to a host of the shock wave robot therapy system, wherein the tail end of the mechanical arm is provided with an end-of-arm tooling connector which can adapt to various end-of-arm toolings;
a gun handle which is detachably installed to the end-of-arm tooling connector and can move under the drive of the mechanical arm, wherein a shock wave generator is arranged in the gun handle, and the front end of the gun handle is provided with a gun head used for contact with a patient's body surface.

2. The gun handle system according to claim 1, wherein the gun handle also comprises:

a power source control device which is installed in the housing and provided with an accommodating cavity, wherein the accommodating cavity is provided with an opening at one end close to the base, one end of the shock wave generator is installed in the accommodating cavity, and the other end of the shock wave generator penetrates through the opening of the accommodating cavity and extends out of the base through the through hole; and the power source control device is used for controlling a shock wave power source to be on and off;
a power source connecting path which is used for communicating the shock wave generator with the shock wave power source.

3. The gun handle system according to claim 2, wherein the gun handle also comprises:

a housing in which the shock wave generator is installed, wherein the front end of the gun handle extends out of the housing; and the housing comprises a base and a shell installed on the base, an installation cavity is formed between the shell and the base, the base is provided with a through hole communicating with the installation cavity, and the base can be detachably connected with the end-of-arm tooling connector;
a silencing shock absorption pipe which is installed in the housing, located in a space surrounded by the power source control device and

the base, and sheathed on the shock wave generator.

4. The gun handle system according to claim 3, wherein the base is provided with a protrusion portion, the protrusion portion is arranged by extending out of the side portion of the shell and used for being connected with the end-of-arm tooling connector, the tail end of the mechanical arm can be connected with the end-of-arm tooling connector from above the end-of-arm tooling connector, and when the mechanical arm is connected with the end-of-arm tooling connector, part of the structure of the mechanical arm is abutted against part of the housing located above the protrusion portion.

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5. The gun handle system according to any of claims 1-4, wherein the gun handle system also comprises an identification device connected with the host, wherein the identification device can identify an end-of-arm tooling connected with the end-of-arm tooling connector, and the gun handle is one of end-of-arm toolings.

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6. The gun handle system according to any of claims 1-4, wherein the gun handle system also comprises a visual acquisition device installed on the mechanical arm or the gun handle, wherein the visual acquisition device is used for collecting image information about a patient's body surface.

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7. The gun handle system according to any of claims 1-4, wherein a recording device which can record the motion track of the mechanical arm is arranged in the mechanical arm or the host.

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8. The gun handle system according to any of claims 1-4, wherein the mechanical arm is a seven-degree-of-freedom flexible mechanical arm.

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9. The gun handle system according to any of claims 1-4, wherein the gun handle system also comprises a coupling component which is installed on the gun head, and the gun head is in contact with a patient's body surface through the coupling component in the therapeutic process.

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10. A shock wave robot therapy system, comprising:

a host, and

the gun handle system according to any of claims 1-9, wherein the gun handle system is installed to the host through the mechanical arm and can move under the control of the host.

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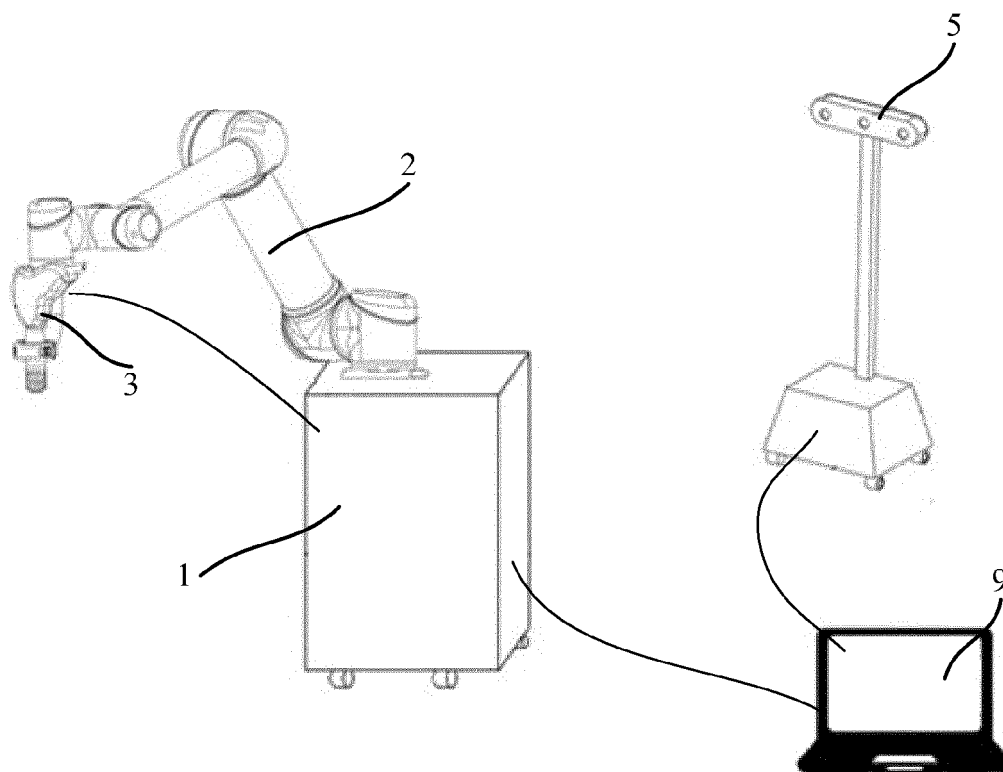


FIG. 1

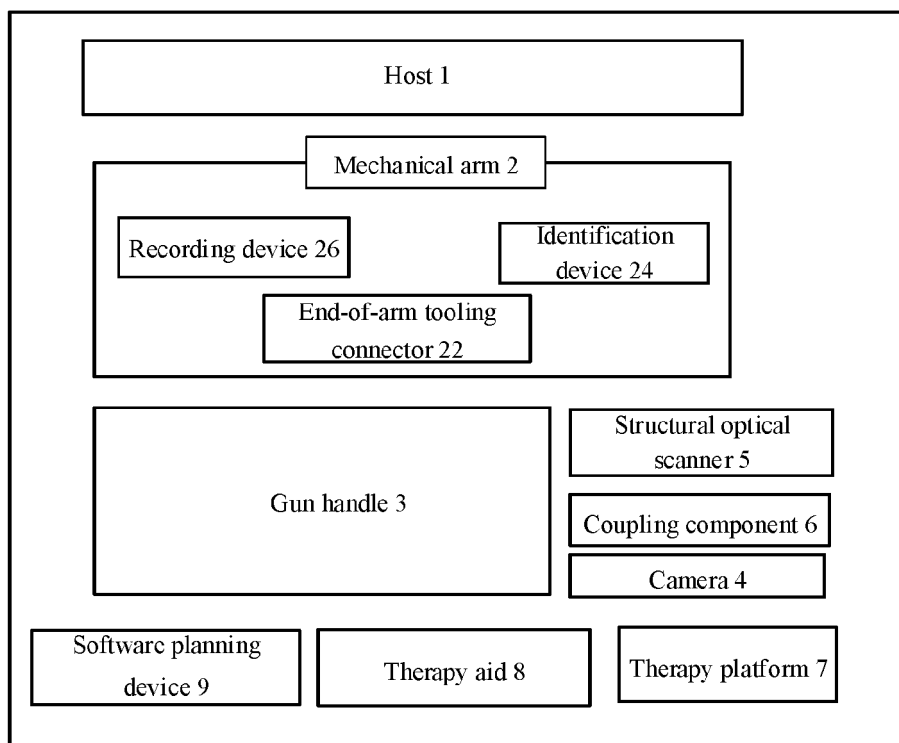


FIG. 2

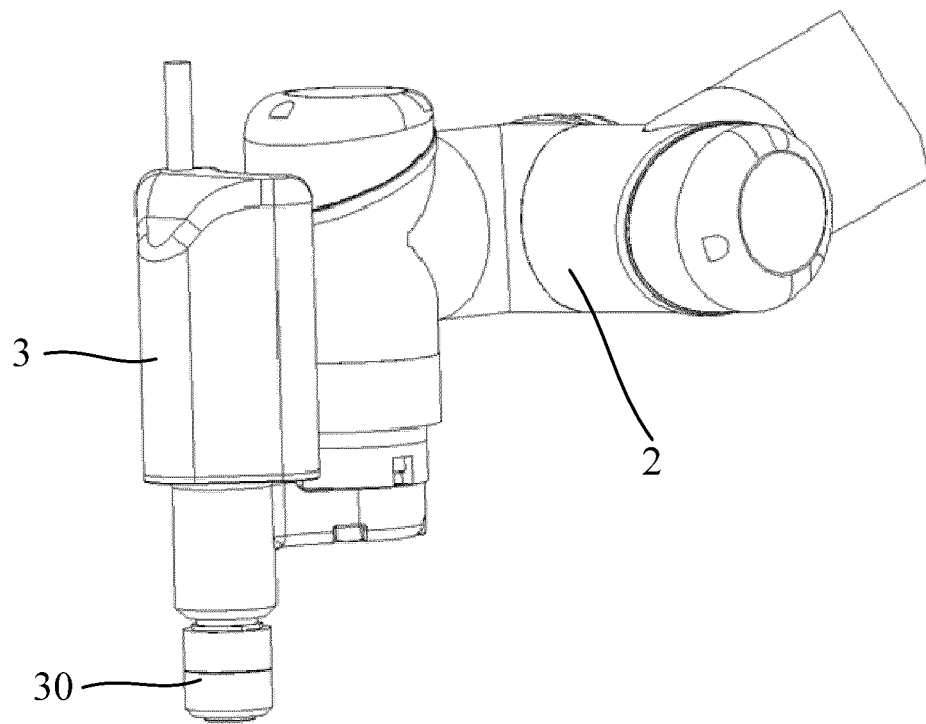


FIG. 3

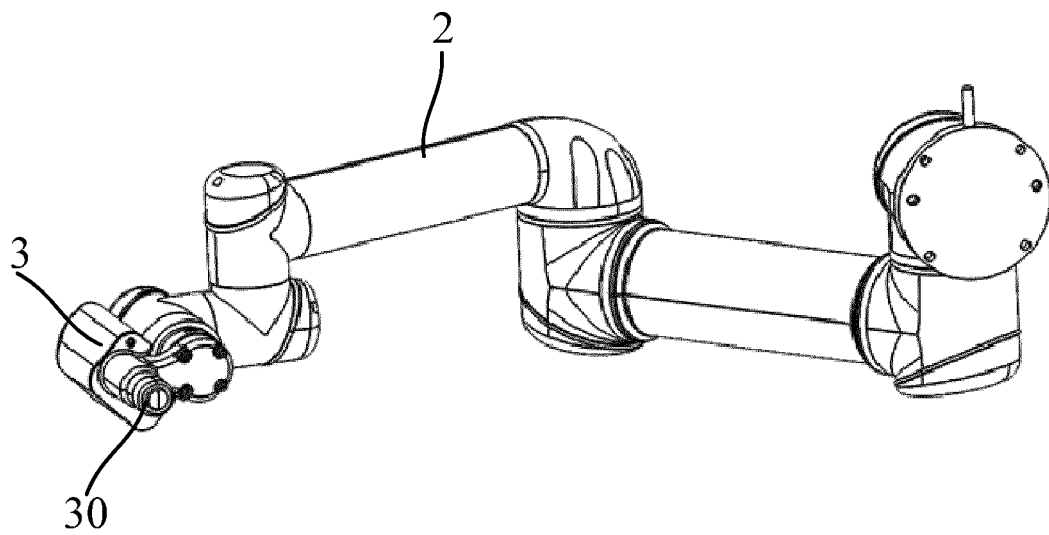


FIG. 4

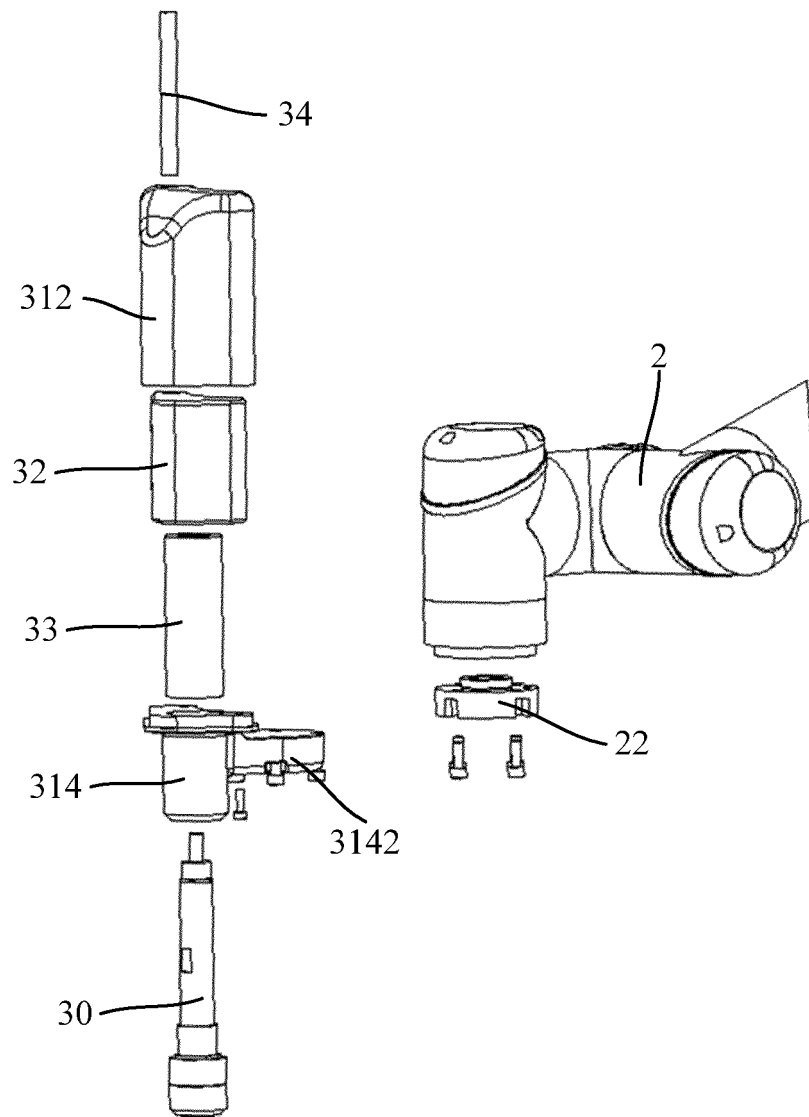


FIG. 5

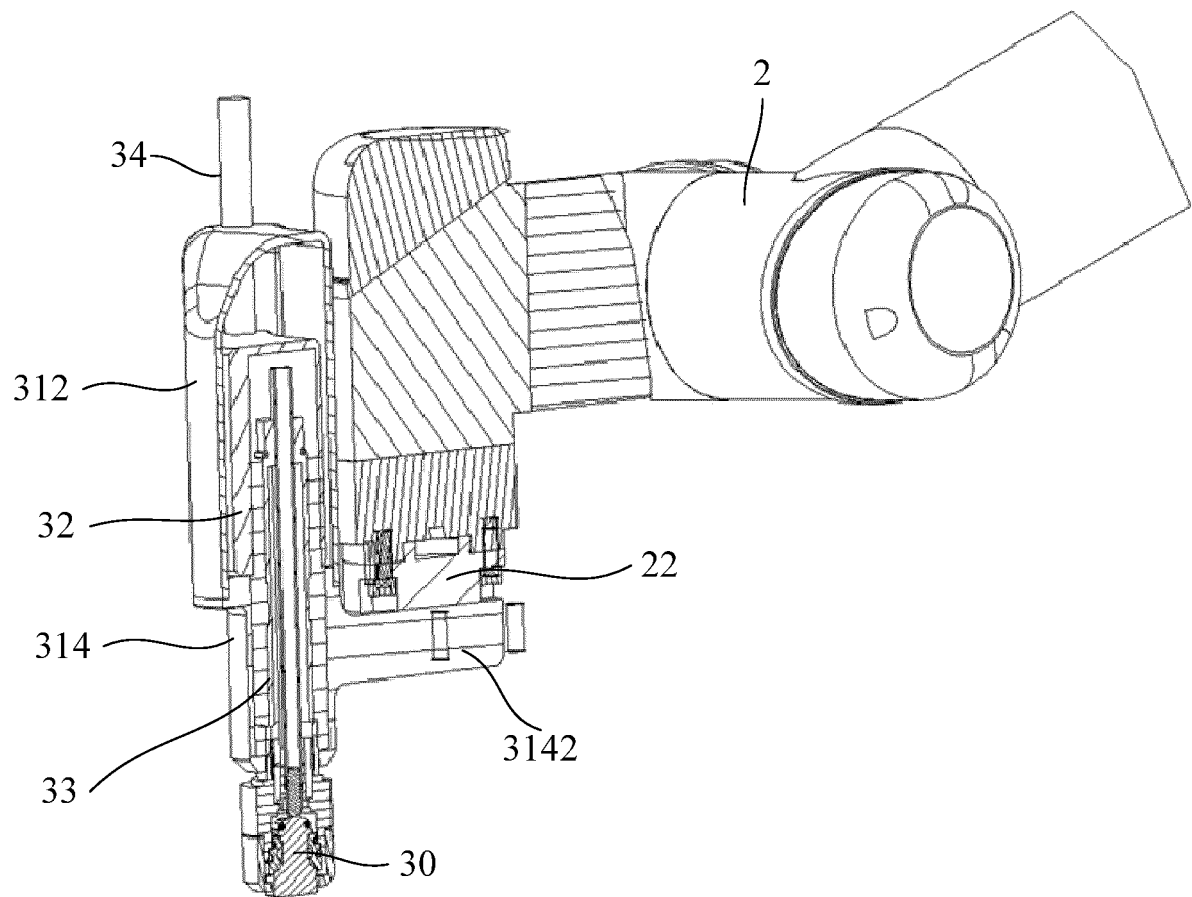


FIG. 6

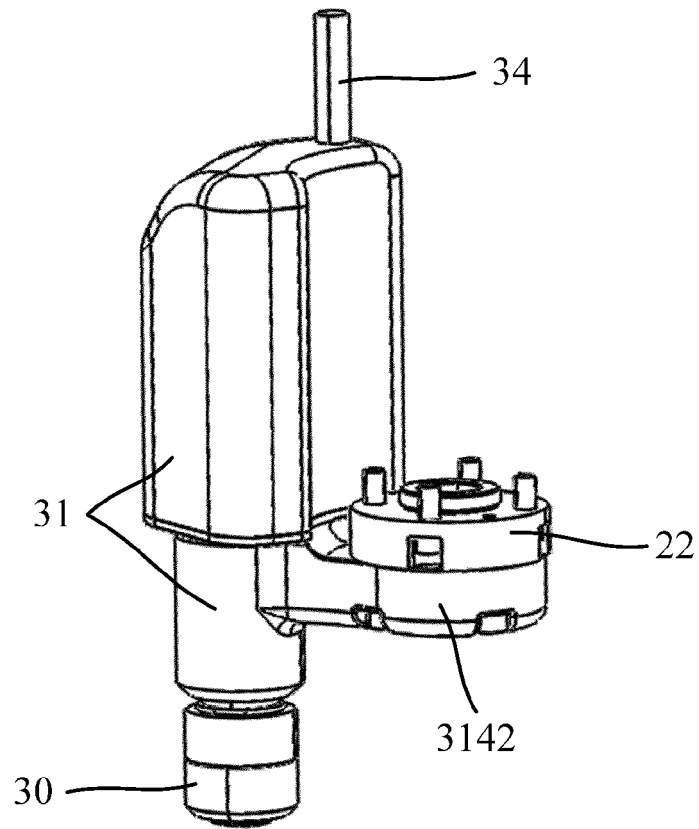


FIG. 7

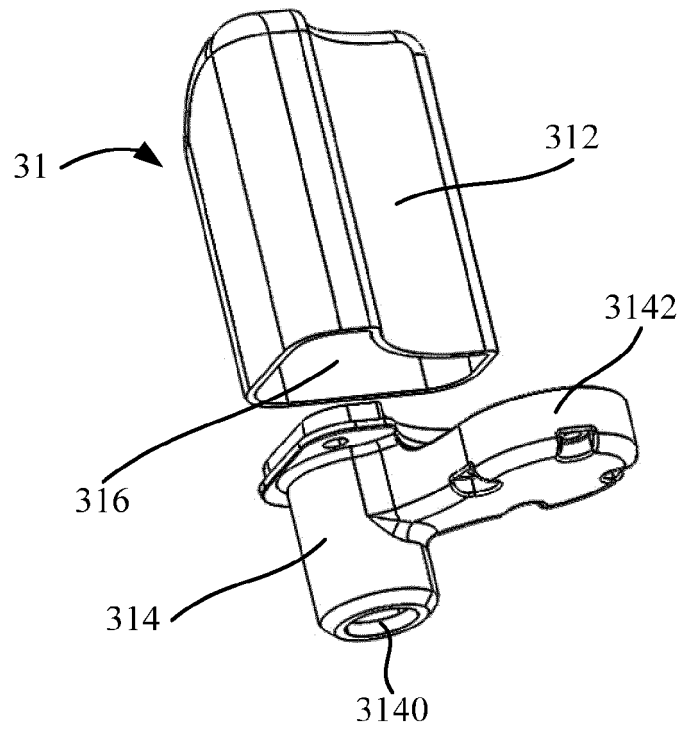


FIG. 8

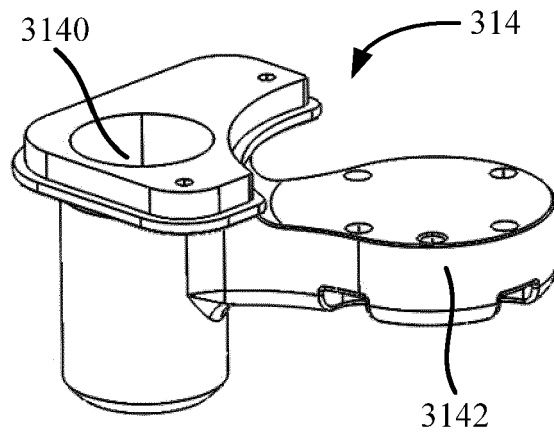


FIG. 9

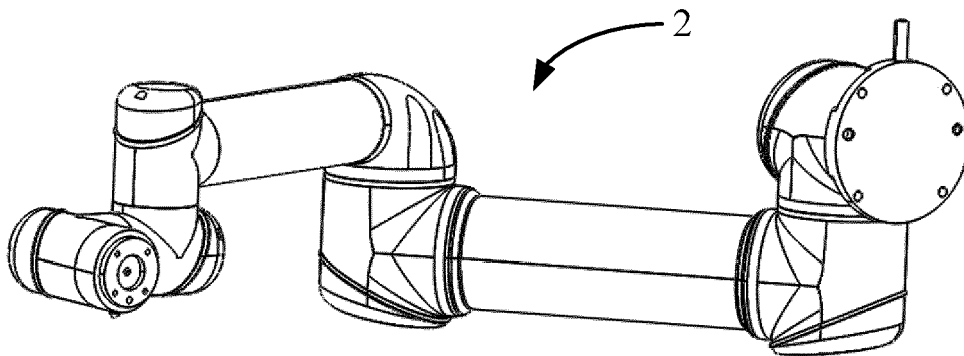


FIG. 10



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