



Study the Robotic Glove

1 Karar Hussain Hetaht Sajet	1 3 4 5 Al-Hadi University College/Department Engineering of Medical Device Technologies emtttd051@huc.edu.iq
2 Zeyad Saadi Mohammed Abbas	Al-Esraa University College Department Engineering of Medical Device Technologies / Zaadsaad17@gmail.com
3 Ali Abbas Jumaa Aboud	emtttd105@huc.edu.iq 1 3 4 5 Al-Hadi University College/Department Engineering of Medical Device Technologies
4 Mohammed faeq faraj Habib	emtttd057@huc.edu.iq 1 3 4 5 Al-Hadi University College/Department Engineering of Medical Device Technologies
5 Ali Rahim Jiyad AbdAlwahid	1 3 4 5 Al-Hadi University College/Department Engineering of Medical Device Technologies / emtttd2122591@huc.edu.iq
ABSTRACT	The summary of this work is the research that was conducted for the rehabilitation of paraplegics, stroke and trauma in order to help them rehabilitate the hand without the need for surgeries, as it operates with compressed air, which can be used during the movement of the hand so that smart gloves work to enhance the strength of the hand muscles and movement Joints where the user can handle the device simply without the need for anyone's help.
Keywords:	Robotic Glove , rehabilitation , muscles , Joints

1- Introduction:

For starters, this device is considered one of the important devices needed by most patients with muscle spasms and cartilaginous calcifications, in addition to problems with nerve channels. In addition to tubes connecting air to the palm, connecting wires, an on and off switch, and a timer . This device relies on a kinetic mechanical principle because the existing motors for pumping air rotate at a specific speed to give the air a push and return it again.

The use of the device is not dependent on a specific age, such as the patient's youth, but he has an injury from hand muscle strain or bone infections that lead to difficulty in movement.

The device is a physical therapy device, like many devices used for physical therapy

- EKG device
- Monitor
- A respirator
- Operations aspirator
- Patient transport trolley
- Bed sore mattress
- Crash Trolley
- Steam inhalation devices

And many, many other devices that are used on the principle of physical therapy, which does not require surgical intervention

2- problem statement:

One of the reasons and incentives to research and manufacture the device is the actual need for it. Most patients with neurological problems in the arm are the causes of poor movement, lack of vitamins, and other reasons.

Another reason for manufacturing the device is the technologies and medical devices that stimulate the innovation and manufacture of devices at the lowest cost and are therapeutic without resorting to surgical operations, in addition to that poor diagnosis to most cases that are diagnosed as an increase in the bones or cartilage of the fingers of the hand, which leads to surgeries, that which Stimulate the manufacture of the device because most of the cases that affect the muscles do not need anything but physical exercises and treatments with these innovative and newly manufactured medical devices. Among the diseases that require natural treatment are neurological conditions, including:

brain attack.

Spinal cord injuries. Parkinson's disease. Multiple sclerosis.

The disease is vestibular neuritis. Brain injuries

Previous Works:

The beginning of the project was a simple idea that started from a bedsore bed device that works to pump an amount of air into the bed and withdraw it. The idea was taken away from the bedsore device and its usefulness and the places that the patient needs. Easy and flexible movement of the patient's arm

3- Operation Principle:

The device works on a set of foundations for the purpose of moving the muscles and nerves inside the arm, including activating the movement of the joints and articular bags for active and flexible movement, in addition to facilitating the flow of blood through the alveoli and blood veins spread along the forearm through the fingers, in addition to activating cholesterol in the blood

In addition to that, the principle of the work of the device is physical therapy, and that includes exercises for the movement of the fingers of the hand and the entire arm to activate the blood circulation passing through the arm. The cause of these calcifications and contractions in the muscles counted factors, including

- diseases and arthritis

- bone calcifications and difficulty in movement - lack of many vitamins that joints and bones need, including

-Vitamin B12

-Vitamin C

-Vitamin K

-Vitamin D

4- Device Treatment Methods:

1- Assessment of nerves and muscles:

Recommending a visit to a nerve and muscle specialist for the purpose of evaluating the condition before the physical therapy used by the device. This important matter allows you to take the appropriate decision before starting, as well as to avoid possible problems that may occur when starting the physical therapy that is included in the device.

2- Range Of Motion Of The Hand Joints:

We perform this type of procedure to find out the extent of nerve and muscle contraction and the nature of their contraction

3- Time Checks:

This information is obtained to know the extent of changes in the muscles and nerves surrounding the hand and their response according to the interventions
motor function measures different

4- Activities In Daily Life:

Including the nature of daily work to avoid heavy weights that reduce the benefit of treatment with the device and return to zero point by not adhering to the doctor's instructions

5- Device Applications:

Among the common applications of the device, the device is used for incurable patients, migraine stroke patients, calcification patients in the bones and joints, nerve problems, and muscle spasms.

Cerebral palsy, cerebral infarction, cerebral hemorrhage, cerebral apoplexy, and hemiplegia and other such series of hand dysfunctions or missing, such as brain or hand nerve damage, fractures, car accident injuries, burns, Others such as hand dysfunction caused by spinal cord injury can also be used, as long as it is hand dysfunction, hand discomfort, and hand inflexibility.

Our pneumatic rehabilitation robot gloves can be used for high muscle tension, palm bending, curling, finger spasm, paralysis, paralysis, etc. Soft rehabilitation robot gloves use bionic pneumatic artificial muscles to drive finger joints, causing finger spasm, Symptoms such as paralysis and paralysis have been improved or recovered. While effectively helping the rehabilitation of various functions of the hand, the product also acts on assisting the brain nerves, promoting the improvement of sports rehabilitation, etc.

Combined with flexible robot technology and neuroscience, it can help patients relieve hand spasm and stiffness, and promote patients' motor relearning.

Patients can recover at home by themselves, save the cost of rehabilitation hospital and accompanying care, independently complete the daily rehabilitation training plan, and carry out functional task-oriented training, including daily activity training such as stretching, machine holding, etc, as well as rehabilitation training under the real situation at home, so as to increase the initiative.

Using air pressure as a driving force, automatic finger grasping and stretching is the rehabilitation treatment equipment for finger spasm, paralysis and other symptoms. It can reduce the muscle tension

of the hand, relieve edema and stiffness, accelerate the rehabilitation process of hand function, and promote the recovery of cerebral nerve injury, so as to achieve the goal of rehabilitation.

The glove can buffer and protect the metacarpophalangeal joint and the interprocedural joint, and can gently promote the sensory stimulation of the hand after stroke through the pneumatic pump, so as to complete the flexion and extension of the fingers.

Since muscles represent more than 50% of the body by weight, it is not surprising that approximately 10% of cases diagnosed as nonspecific or idiopathic hand pain are presumed to be caused by sprains and soft tissue strains. Despite this prevalence, there is no generally accepted method for diagnosing muscles as a source of pain or for muscle assessment/treatment to be included in any of the proposed guidelines.

6- Robotic glove parts:

–A timer to control the blowing and extinguishing time:

NDS8 Series Digital time relay, is on-delay type. Applicable to the circuit of 50/60Hz, operating voltage up to AC380V as a delay component to connect or break the circuit as per presetting time. This series comply with the standard of Q/ZND 1011-2000, GB14048.5 and JB/T10047-999.

–A motor to push air (to inflate the palm with air):

Specialized high speed ball bearing (NMB) provides long service life, lower noise, pressure rise and flow length output by small size and features high efficiency, more efficient than brush motor blower and high efficiency, specialized controller makes work more reliable, high intelligence, PWM speed regulation, Reflection, PG signal signs.

–An electric vacuum cleaner (to empty the palm of air when turning off the motor

DIN 43650 Type B MPM Solenoid Valve Coil Connector IP65 DIN43650B The MPM range of DIN 43650 connectors is used extensively to provide electrical connections in a wide range of applications. The most common application for mPm connectors is in conjunction with hydraulic, pneumatic or electro magnetic devices including solenoid valves. DIN 43650 solenoid connectors are available in three formats: Form A, Form B or Form C.

They're made to function within certain voltage limits. There are also three gasket options available for DIN connectors: NBR Profile, NBR Flat or EPDM Flat, each with different characteristics. While NBR rubber is an oil- resistant material, EPDM rubber isn't as resilient against oils but can cope better with ozone, heat and adverse weather conditions.

–Swig control for switching on and off:

A small switch that controls turning the circuit off and on

–connection wires:

It is used to connect parts of an electric circuit

–Rubber palm:

Used to control the injured hand when opening and contracting

–Rubber air tubes:

These tubes are used to transfer air to the palm, and are also used to discharge air from the palm.

7- Possible output:

1. time
2. Cost
3. Competence

8- The time:

After examining a group of studies, it was found that the average rate of medical treatment exercises came to my kidneys

- 1- People at home do exercises for an average of 45 minutes, 5 days a week
- 2- In physiotherapy centers, three times a week, and the time is 90 minutes as an average.
- 3- Using the device three times a day and every time 120 minutes throughout the week because it does not cause any stress to the patient.

9- The cost:

As mentioned in the previous chapters, the reason for manufacturing the device is due to the costs of physiotherapy centers and the difficulty of purchasing devices from abroad.

10- Competence:

Legitimate efficiency is less efficient compared to the available devices, as the device used works on one case. People whose fingers are clenched towards the inside work to open them with high efficiency.

11- Conclusions:

1- Stiffness or stiffness of the hand or fingers:

The most important symptoms Stiffness of the hand or fingers

Spasm of the muscles of the hand or fingers Poor control of the hand or fingers

Results of using the device Prevents spasms

Reducing muscle tension Improve the ability to exercise

2- Partial or local paralysis (Soft Paralysis or Flaccid Paralysis:)

The most important symptoms Hand or finger muscle weakness Results of using the device

Effortless training to accelerate muscle recovery and active strength

3- Symptoms of postoperative recovery period:

The most important symptoms Movement is very little during this period General weakness of the hand or fingers Control is poor in hand or fingers.

- **Results of using the device**

Stimulates nerves and muscles to accelerate blood flow and motor nerve recovery 'Full recovery of hand function, however, requires a lengthy recovery process, and commitment to step-by-step training, After our

practical test, there will be obvious feeling within 15 days, and improvement within 2-3 months.

The tag rehabilitation robot glove is suitable for hemiplegic patients with dysfunction and training of wrist and fingers, improving muscle strength and increasing joint range of motion. Stiffening of the contracture, wrist extensor and extension tendons (called lateral repair paralysis) can be prevented and corrected. Effectively relieve hand fatigue, finger joints and pain.

Scientific rehabilitation, help you gradually restore the brain and motor nerves, relieve stiffness and weakness, complete the exercise independently Through the activation of mirror neurons, this rehabilitation robot glove promotes self-recovery of the brain, drives hand function rehabilitation, accelerates hand function recovery, helps the user's brain nerves to relearn, and accelerates the recovery of brain complements. For nerve damage, in order to restore the patient's ability to take care of himself.

Reference:

1. <https://wyss.harvard.edu/technology/soft-robotic-glove/>
2. <https://www.hindawi.com/journals/rerp/2022/3738219/>
3. <https://www.wevolver.com/specs/soft.robotic.glove>

