US 20130303334A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2013/0303334 A1**

(43) **Pub. Date: Nov. 14, 2013**

Adhami et al.

(54) **MEDICAL EXERCISE MACHINE CAPABLE OF FORCE ADJUSTMENT USED WITHOUT WEIGHT WITH FRICTION AND SPIRAL SPRING FORCE**

(76) Inventors: **Rasool Adhami**, Marand (IR); **Mohammad Nagizadeh**, Marand (IR)

(21) Appl. No.: **13/470,594**

(22) Filed: **May 14, 2012**

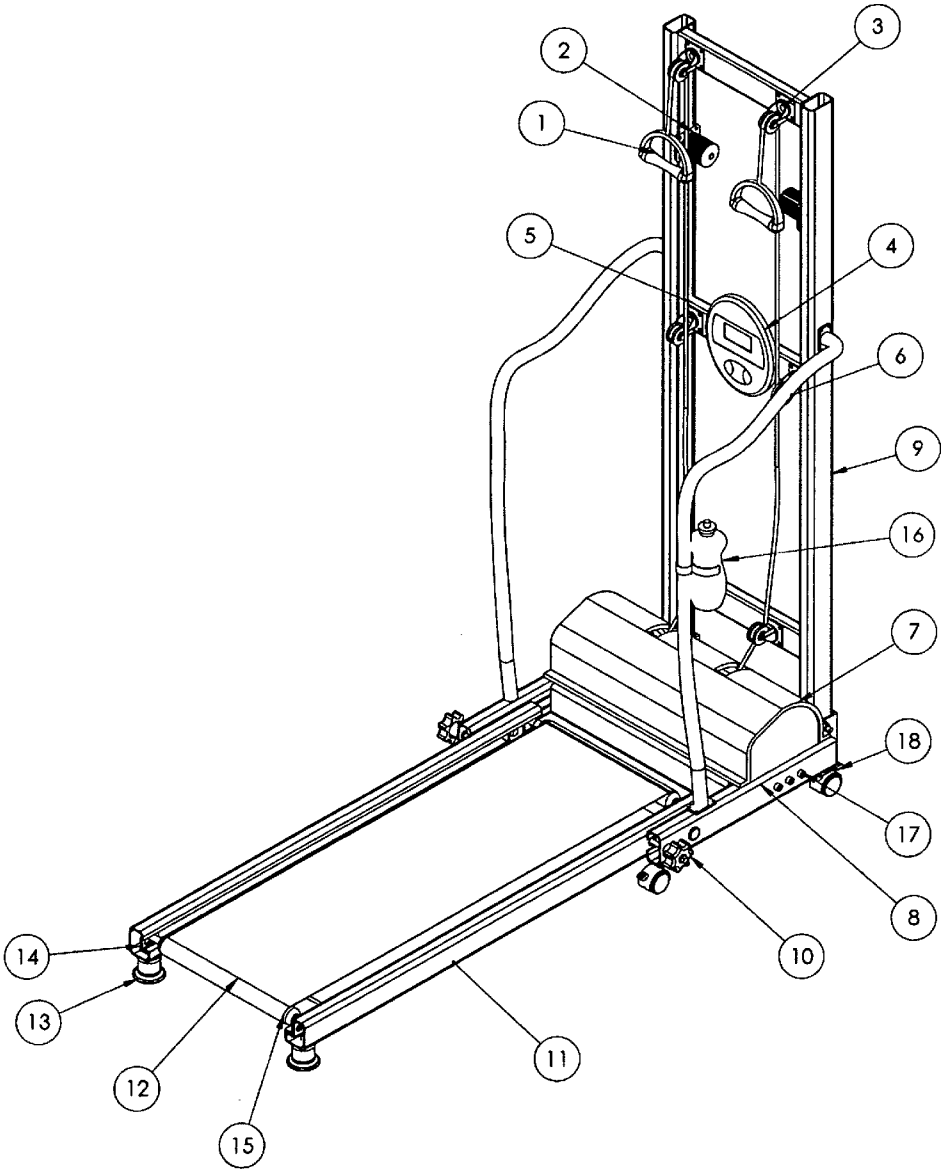
Publication Classification

(51) **Int. Cl.**
A63B 21/02 (2006.01)

(52) **U.S. Cl.**
CPC *A63B 21/025* (2013.01)
USPC **482/4**

(57) **ABSTRACT**

An exercise machine with spiral springs designed for performing all movements. The exercise machine has a small size but high in efficiency, and can be used at home and all public places. In this machine by utilizing spiral spring the force needed for movement, is derived from leather band spring and the friction between cloth leather band and fully leather band. A special mechanism is considered to adjust the machine force so that the work force can be varied by the user without weights.



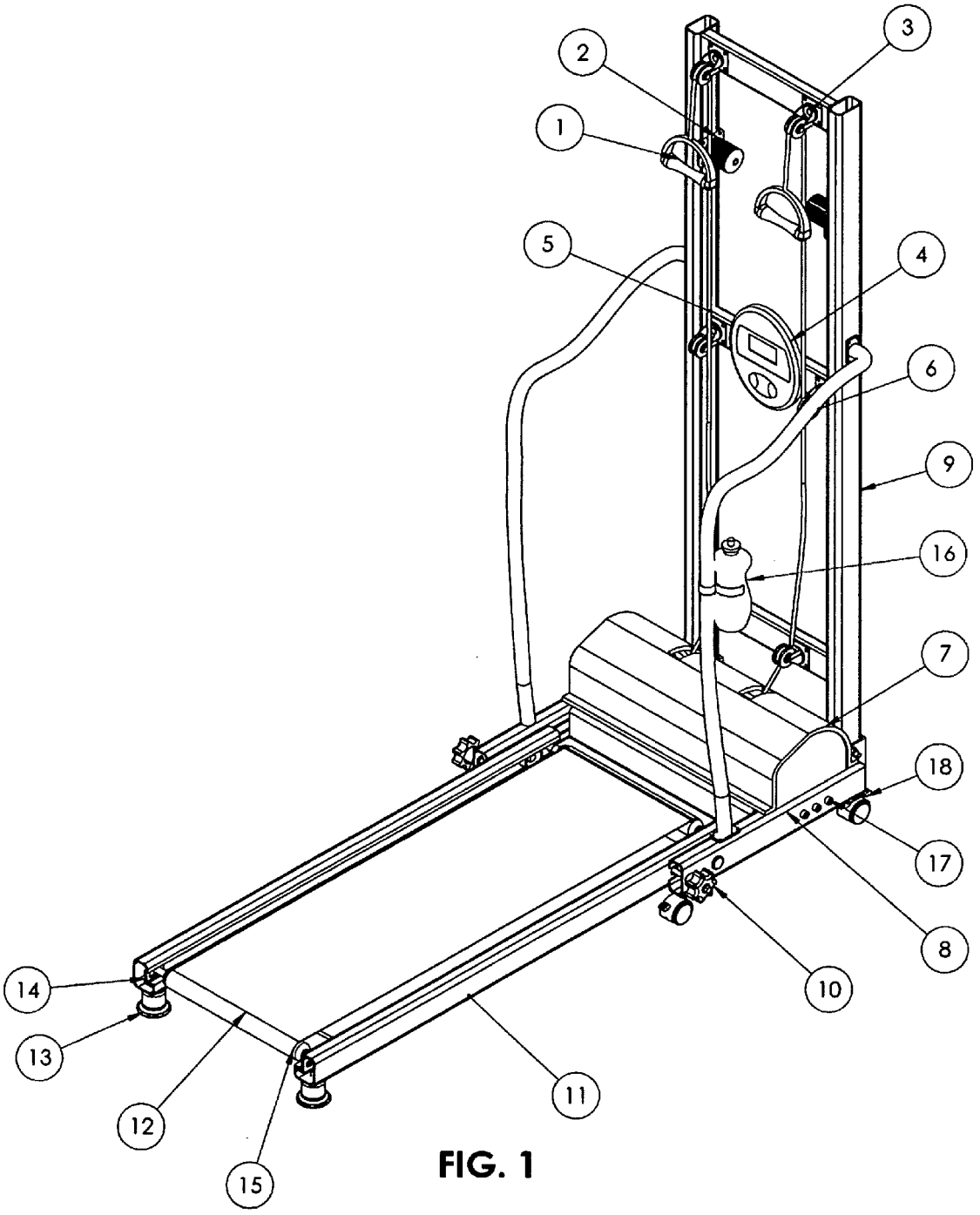


FIG. 1

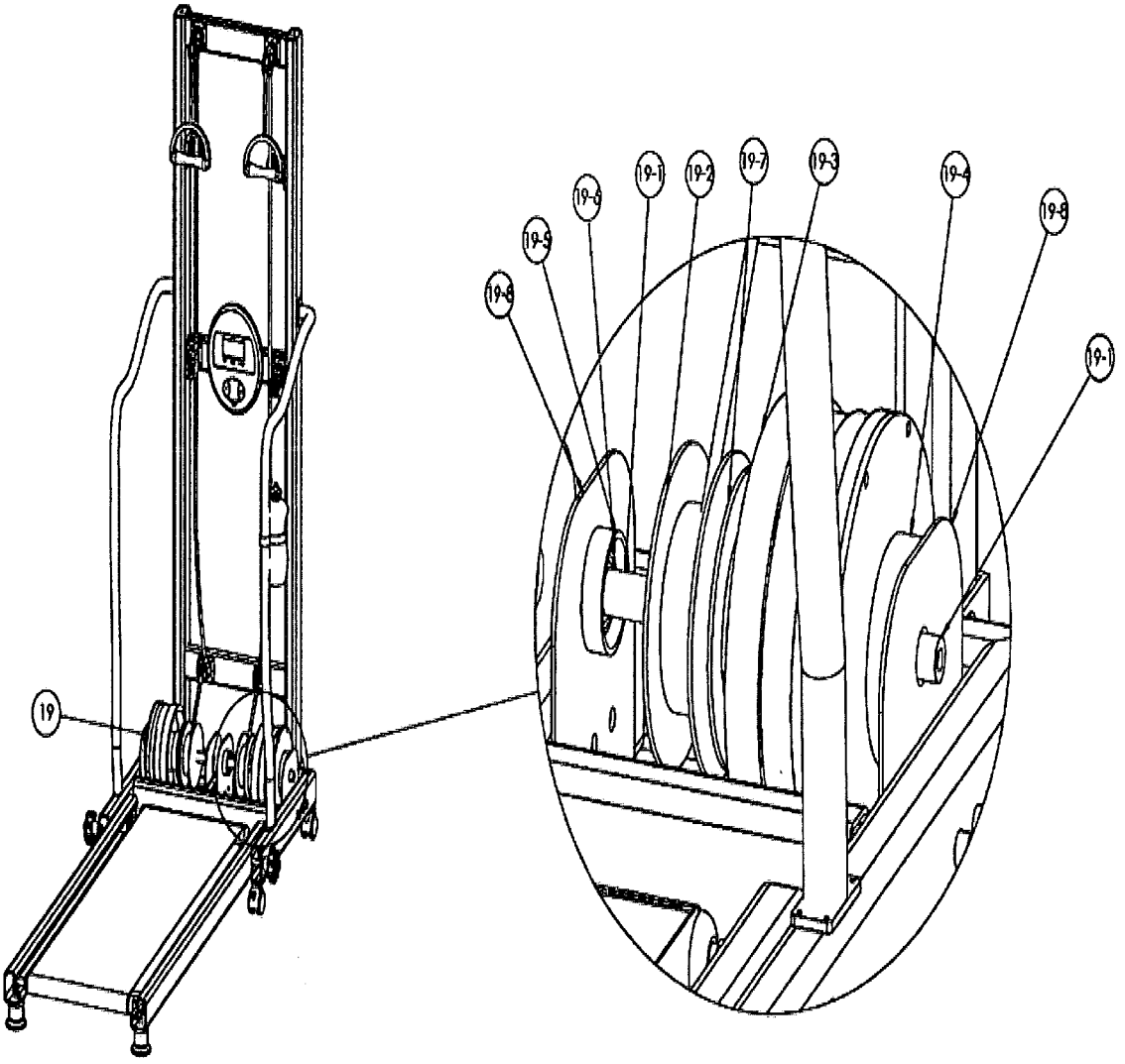


FIG.2

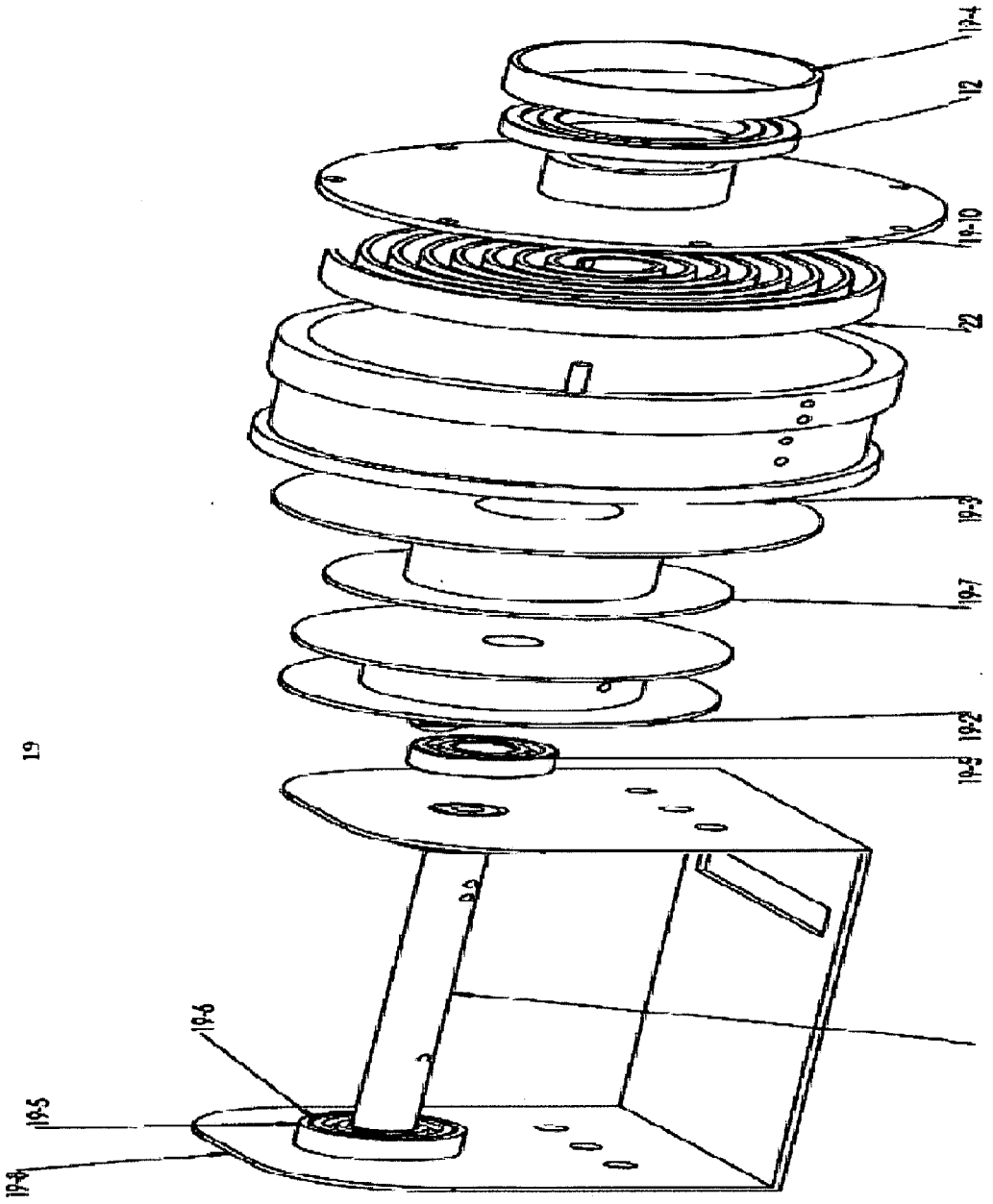


FIG. 3

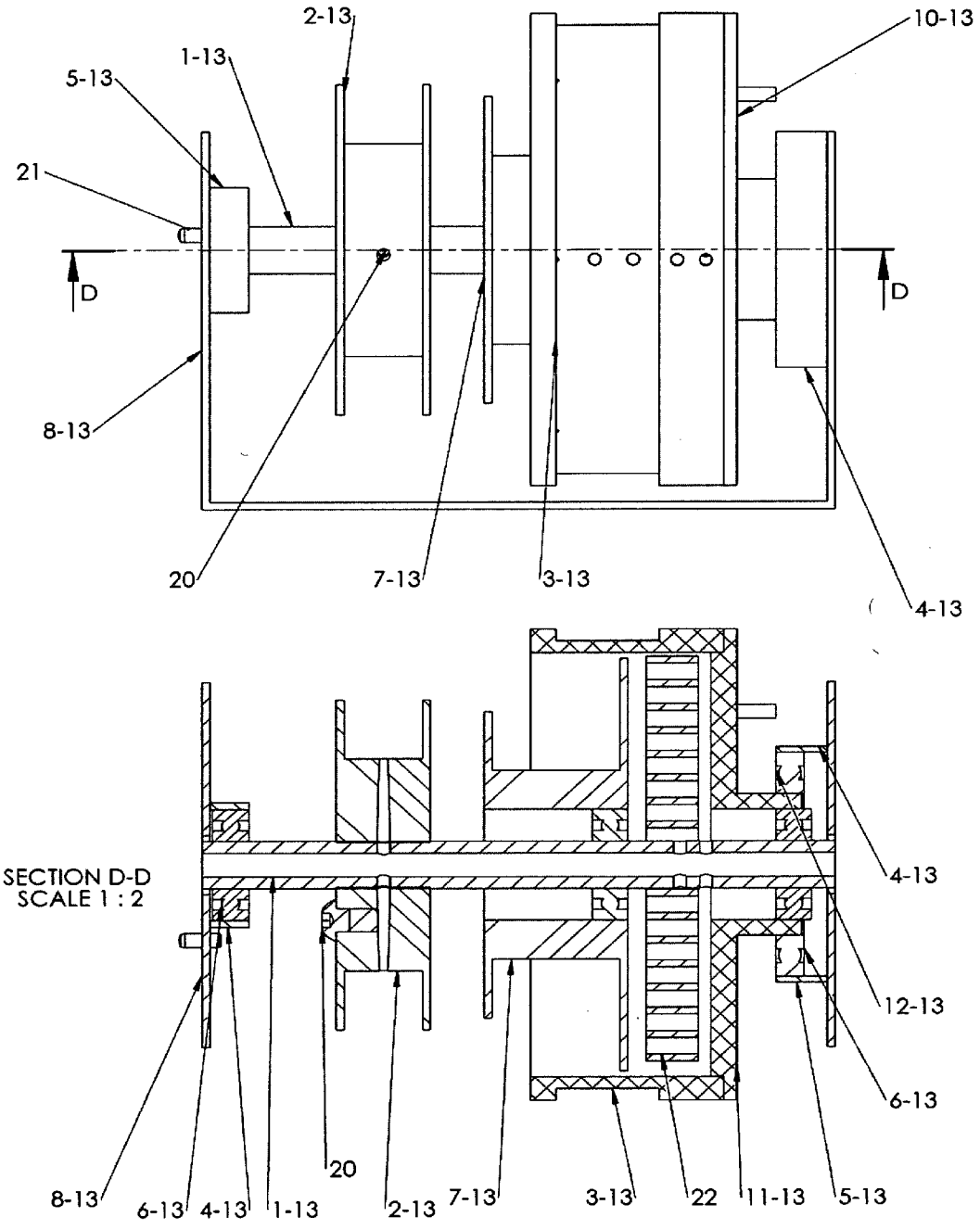

2-13
1-13
5-13
10-13
21
D
D
8-13
20
7-13
3-13
4-13
SECTION D-D
SCALE 1 : 2
4-13
12-13
6-13
8-13
6-13
4-13
1-13
20
2-13
7-13
3-13
22
11-13
5-13

FIG. 4

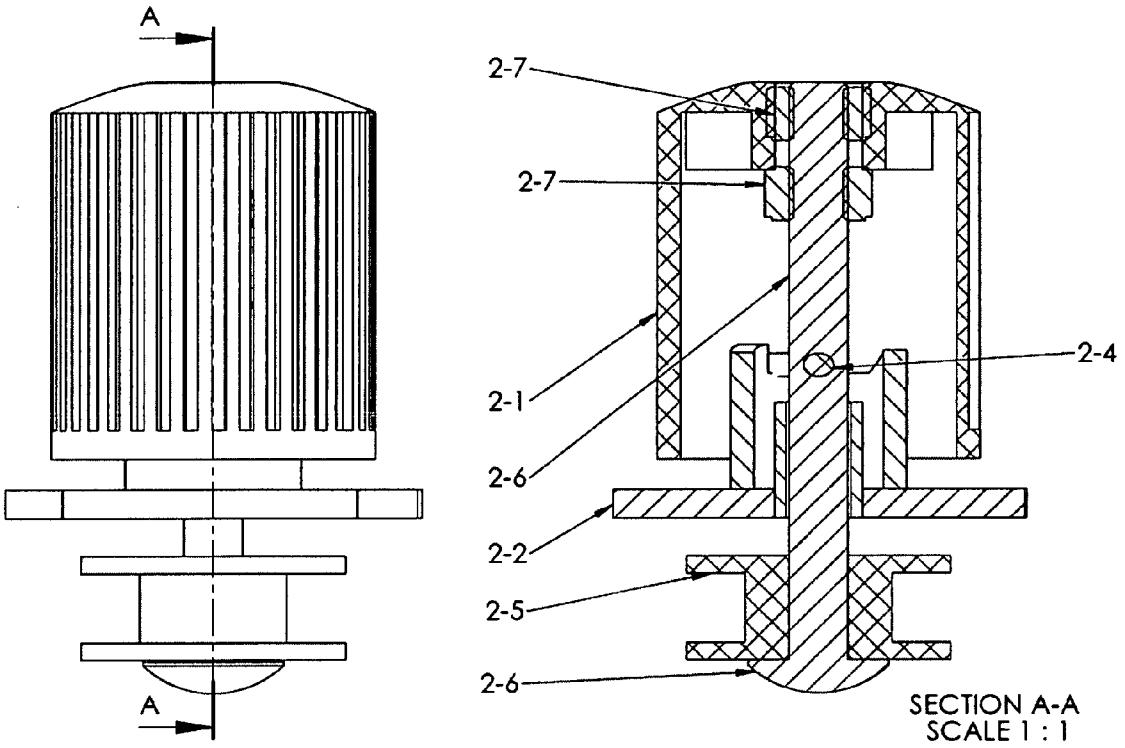

A
A
2-7
2-7
2-1
2-6
2-2
2-5
2-6
2-4
SECTION A-A
SCALE 1 : 1

FIG. 5-A

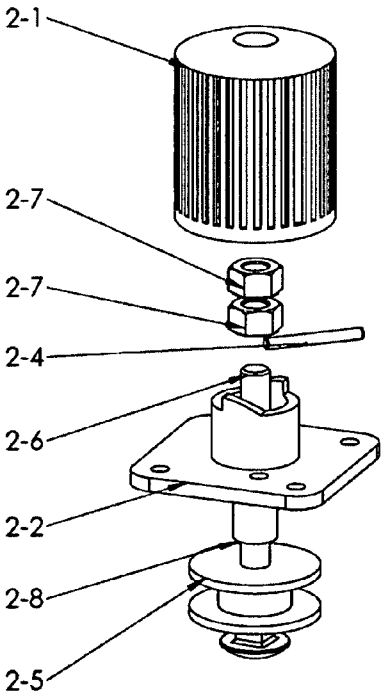

2-1
2-7
2-7
2-4
2-6
2-2
2-8
2-5

FIG. 5-B

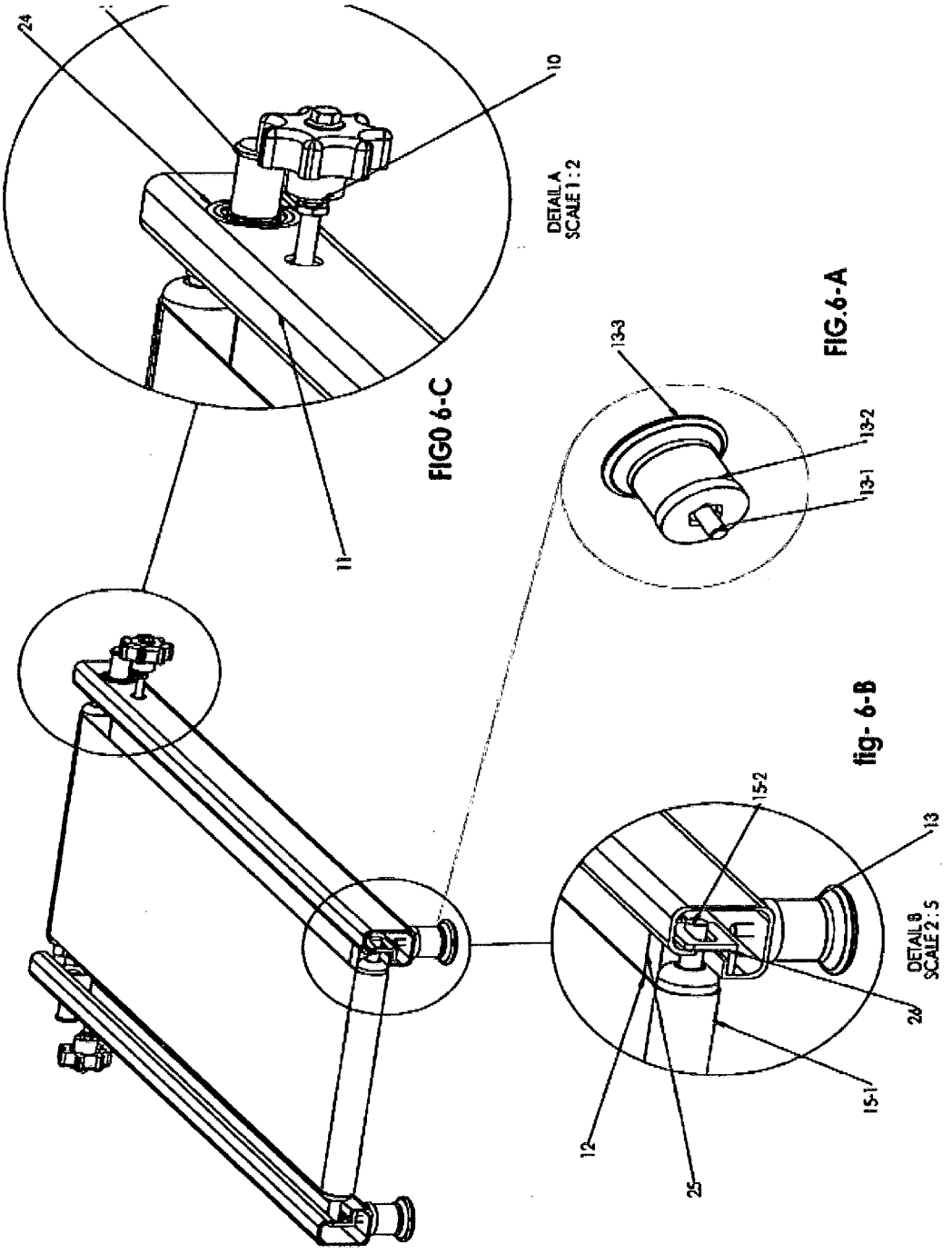


FIG0 6-C

FIG.6-A

fig- 6-B

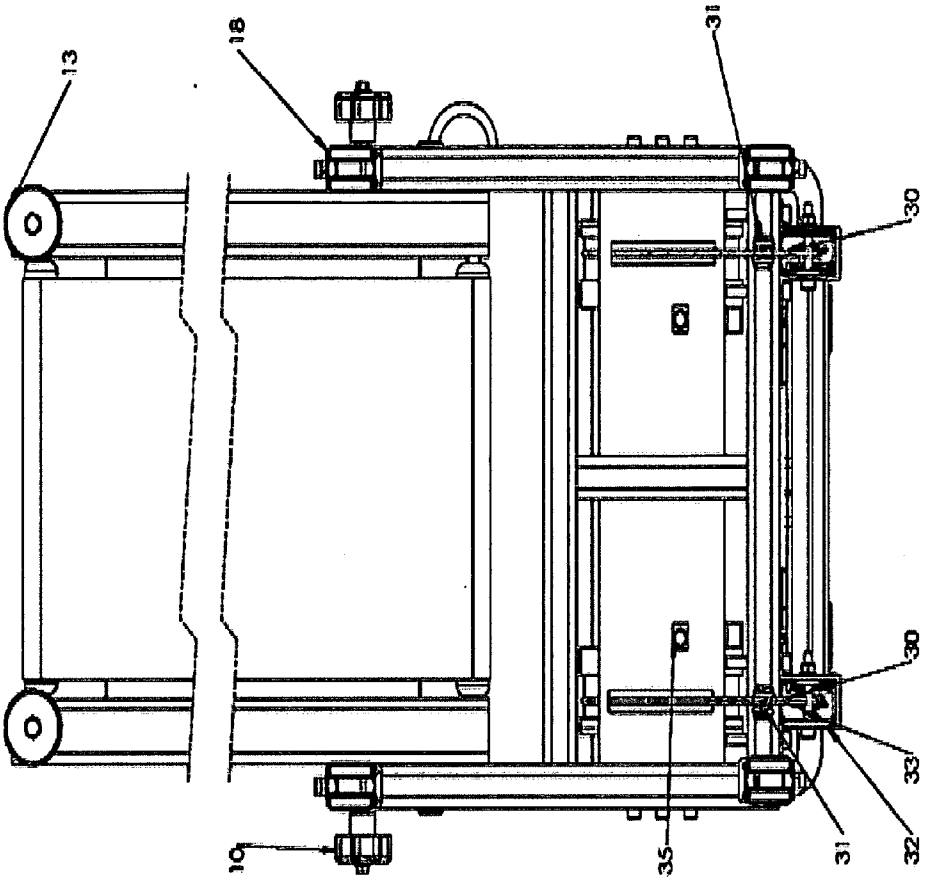
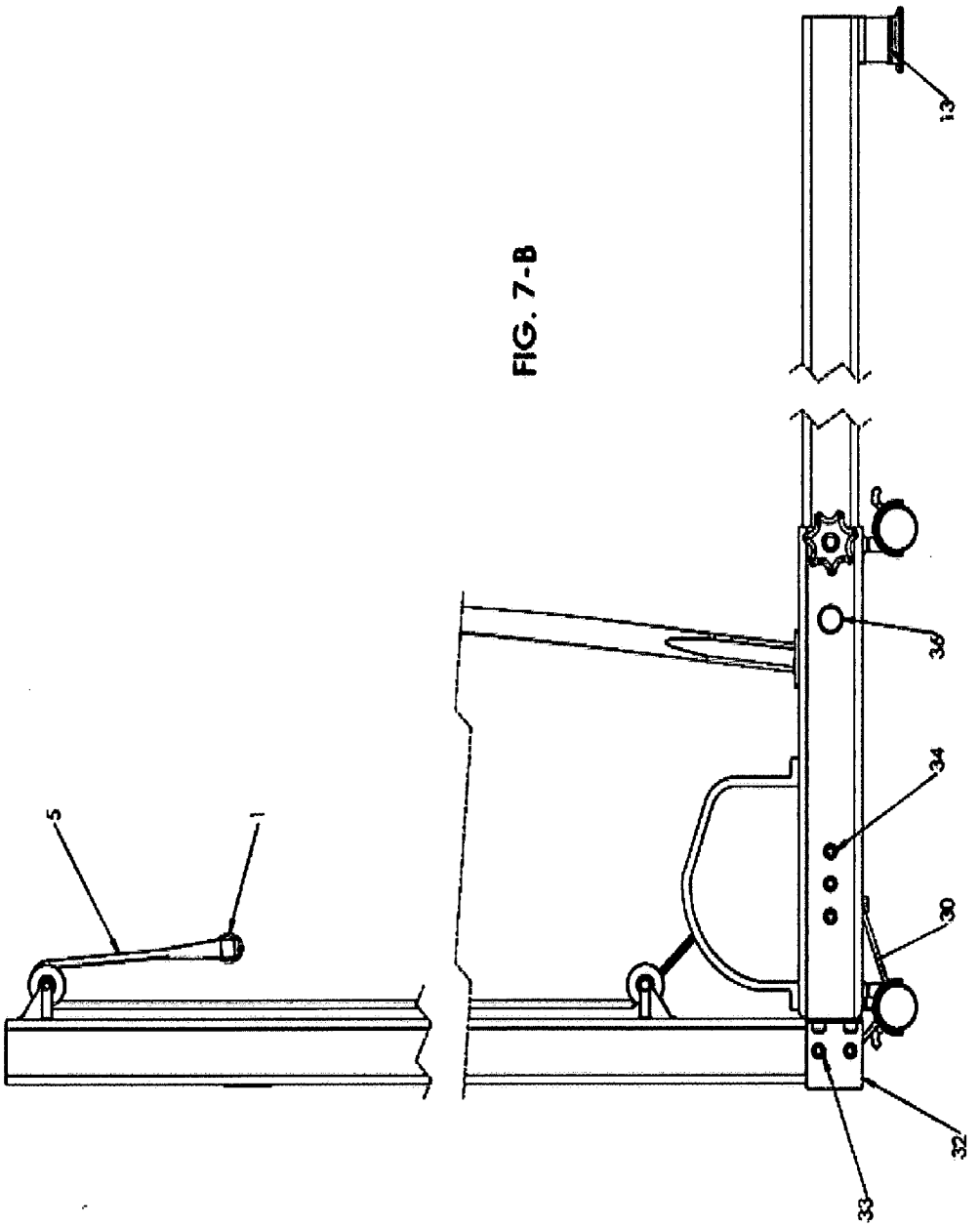


FIG. 7-A

FIG. 7-B



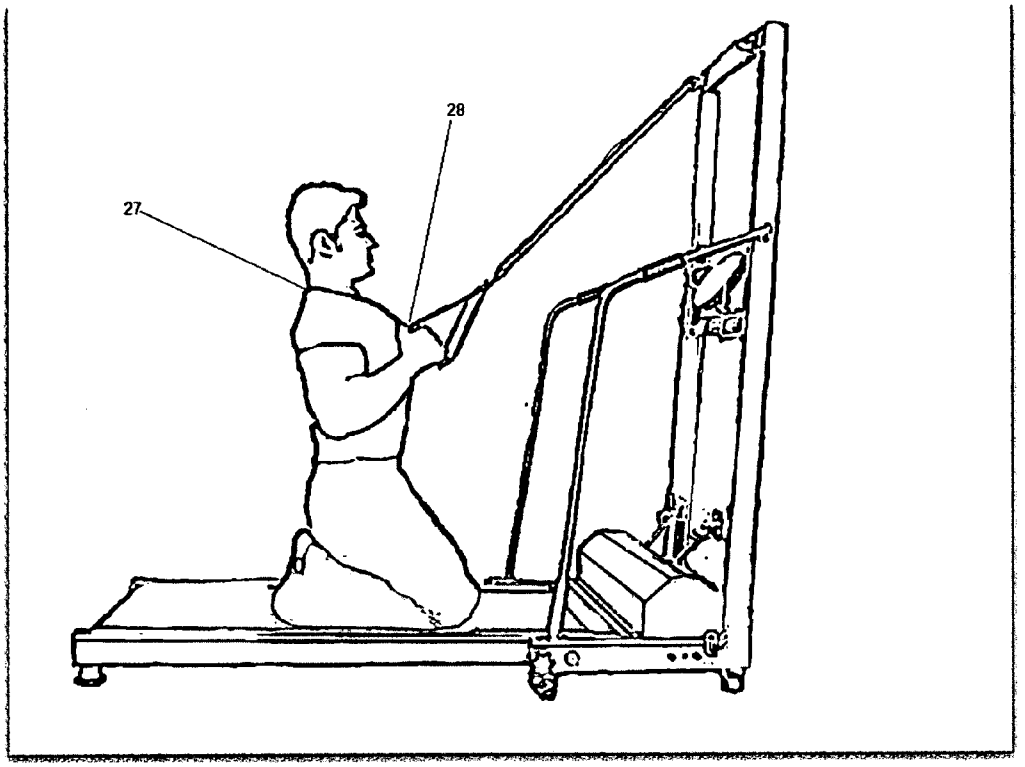


FIG. 8

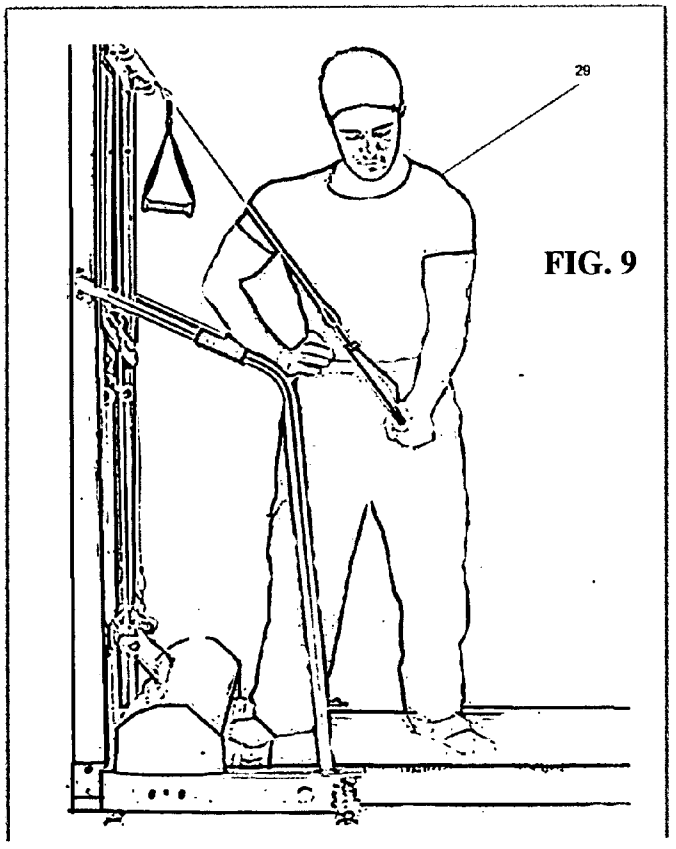


FIG. 9

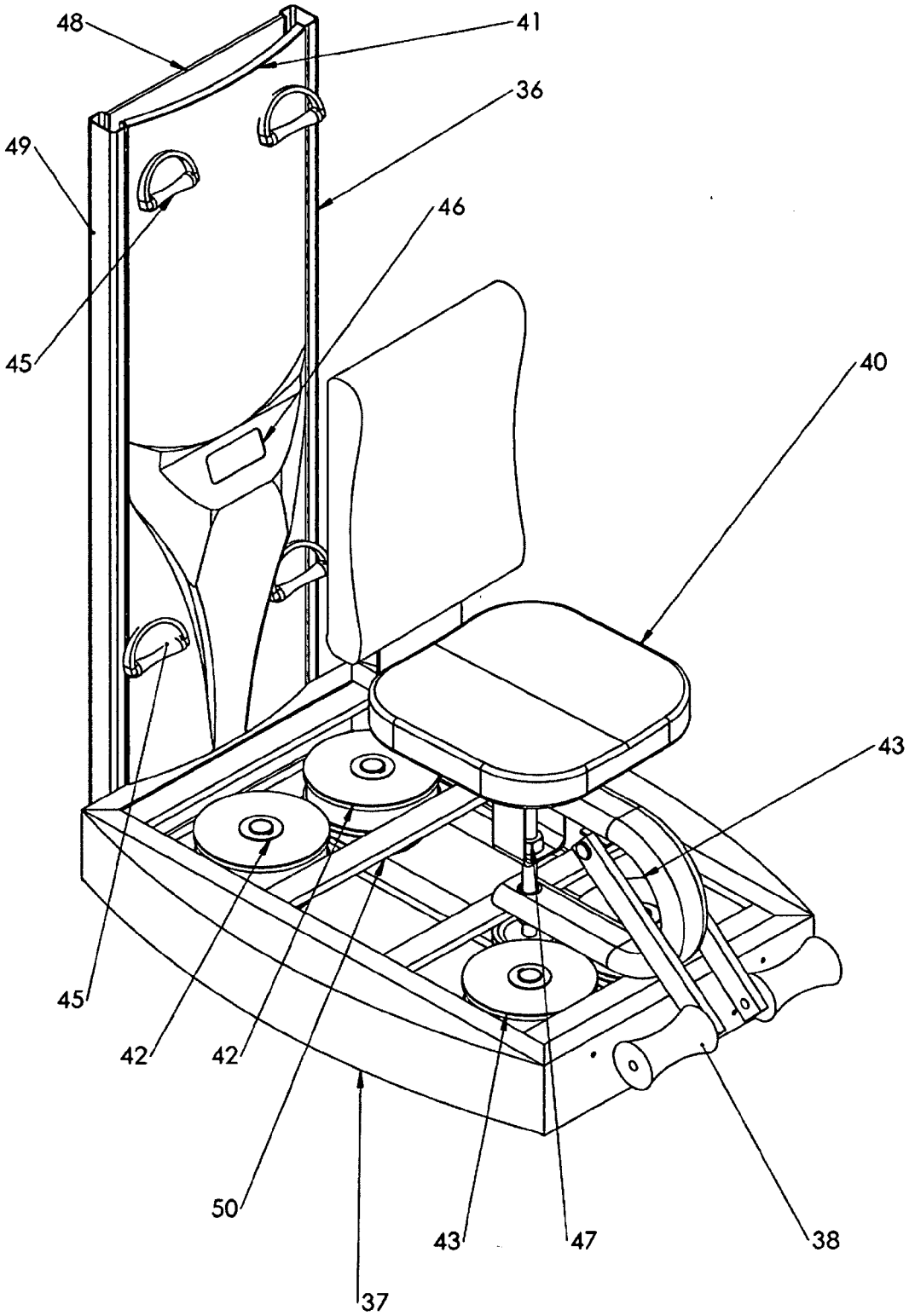


FIG. 10

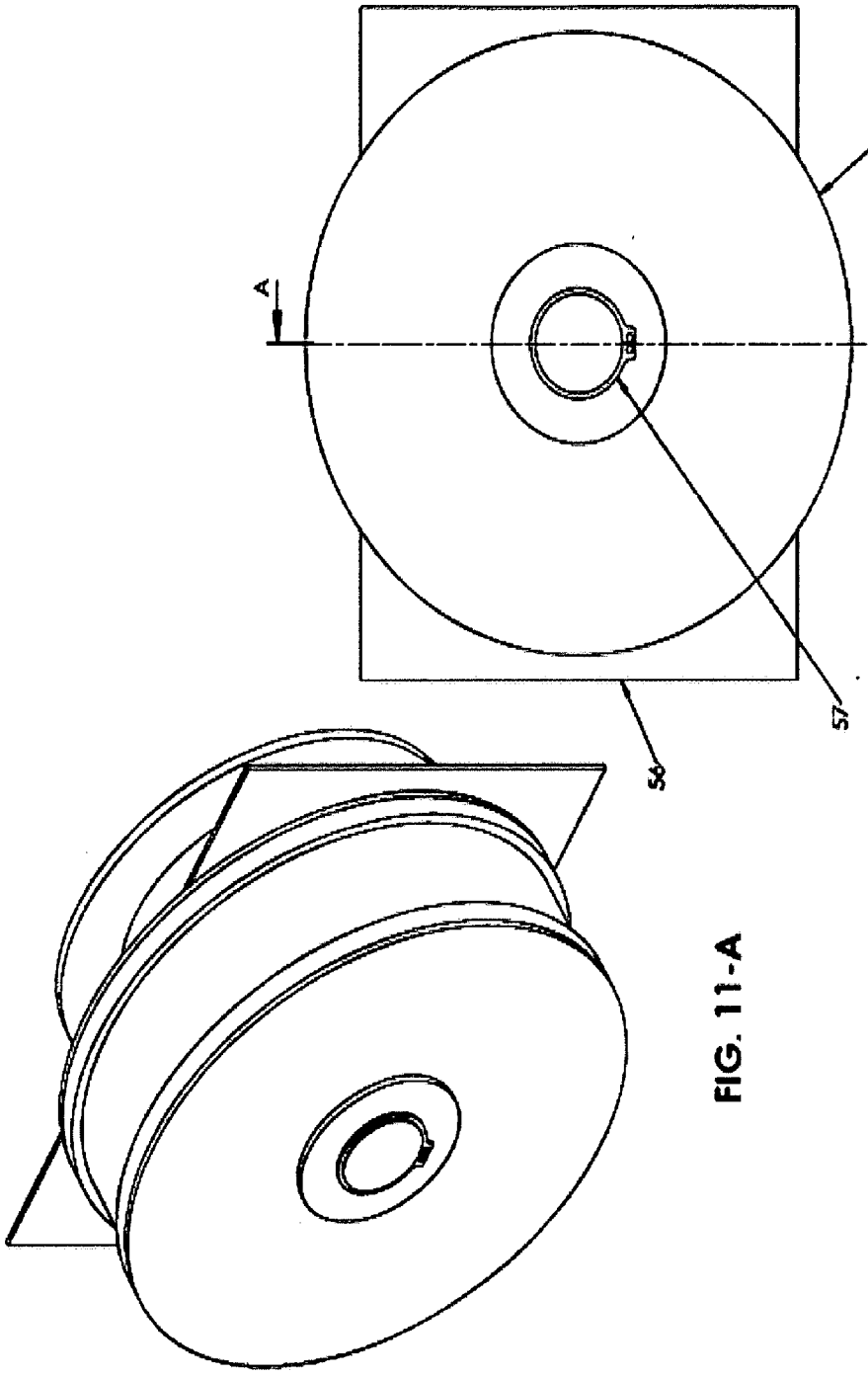


FIG. 11-B

FIG. 11-A

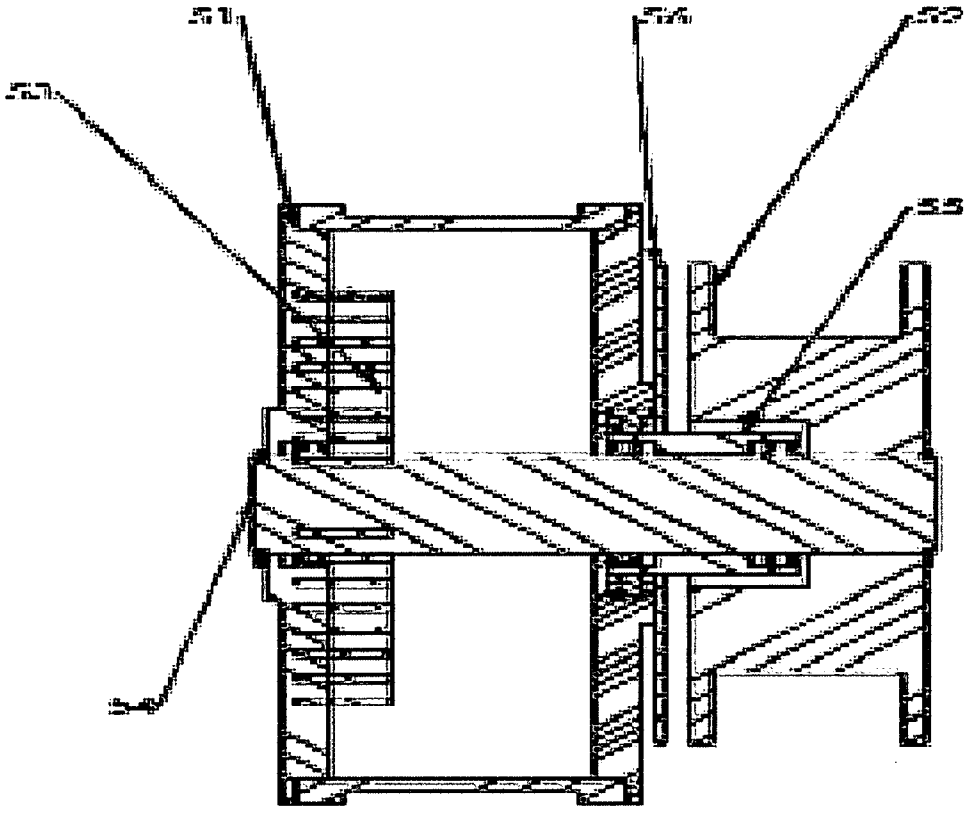


FIG. 11-C

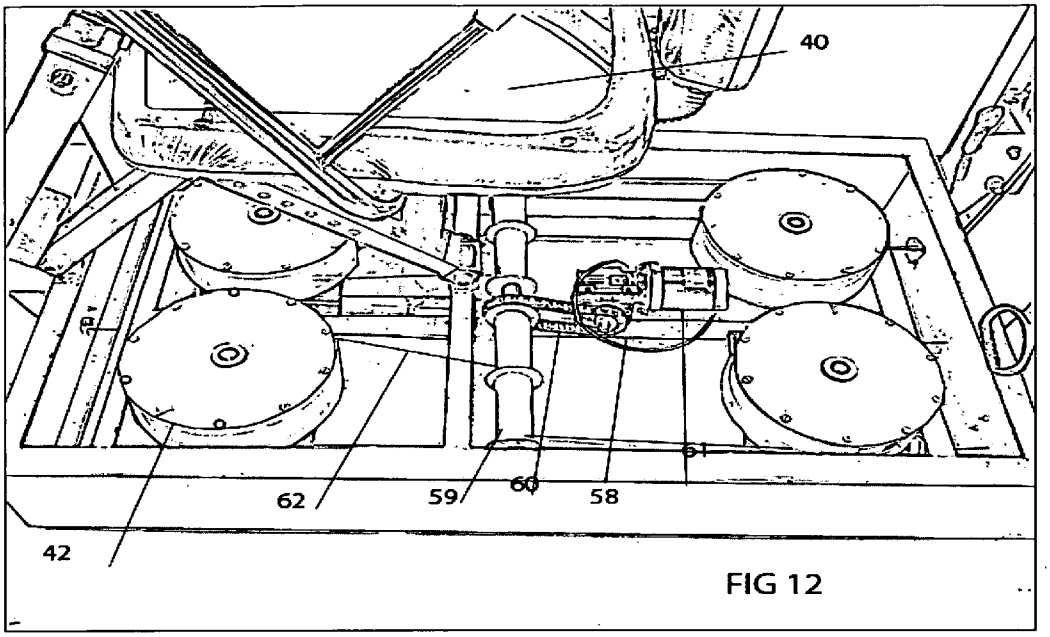


FIG 12

FIG. 13

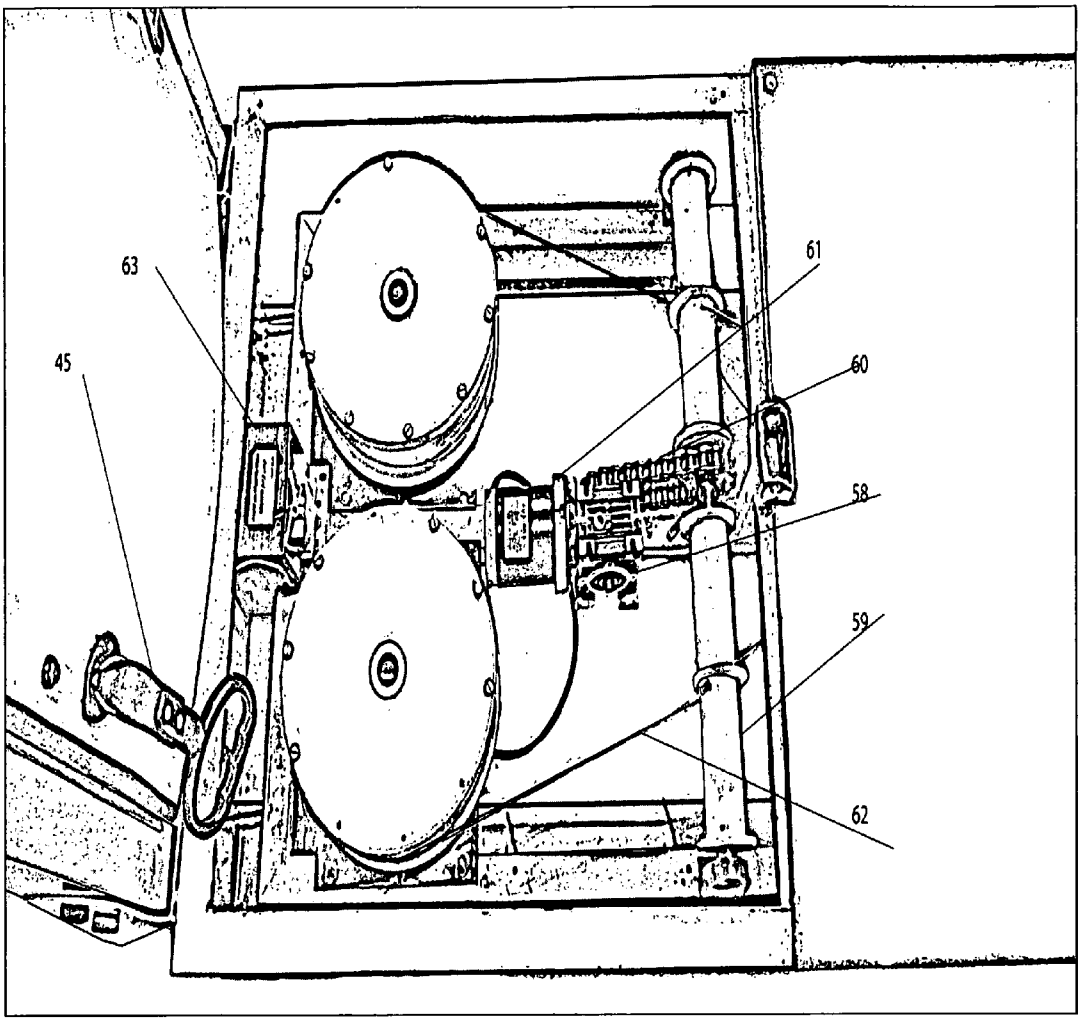
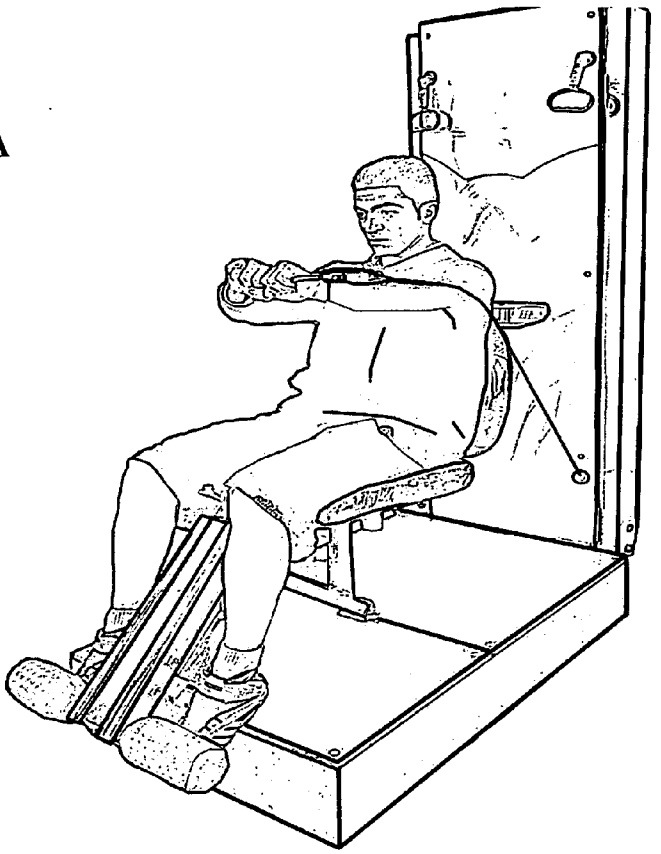


FIG. 14- A



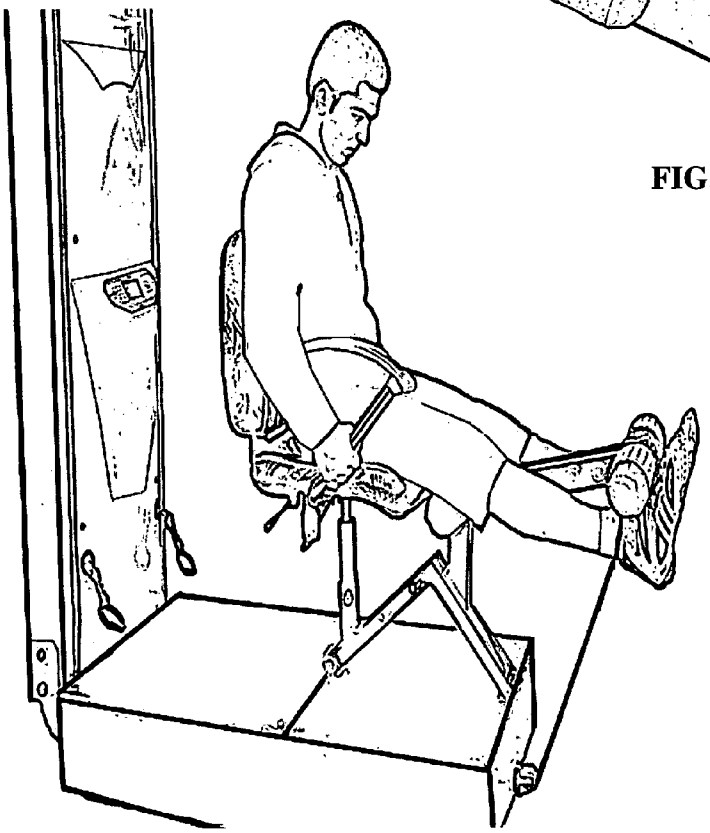


FIG. 14- B

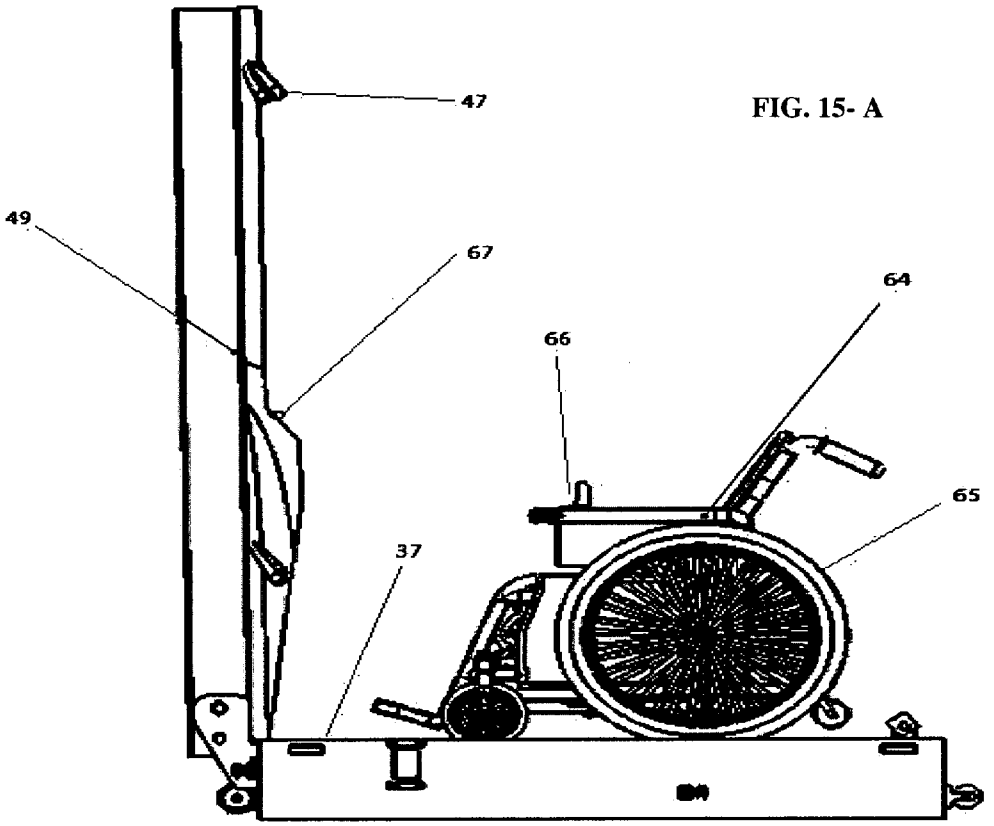
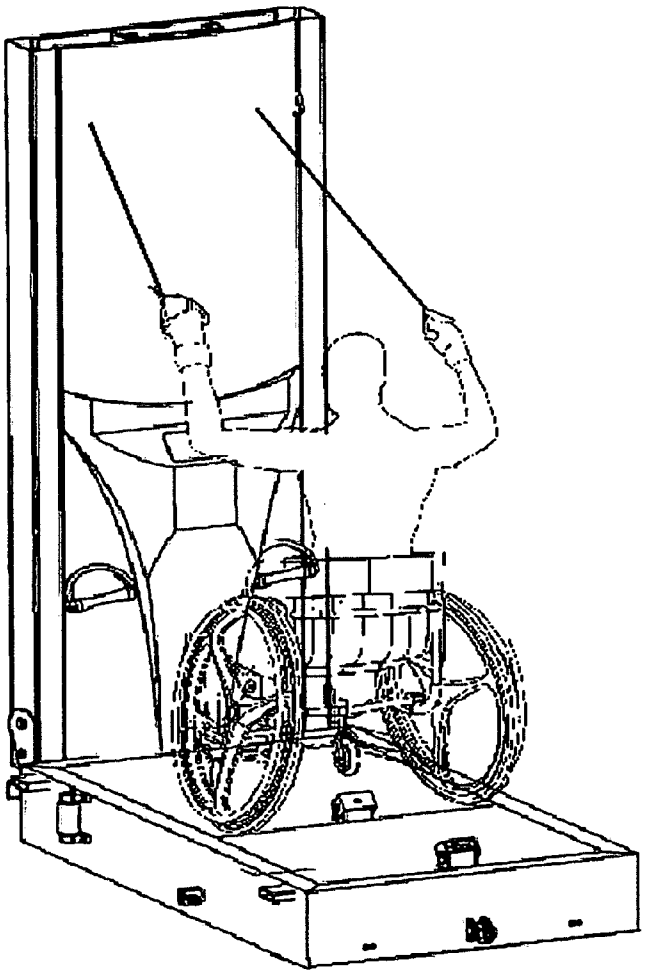


FIG. 15- A

FIG. 15- B



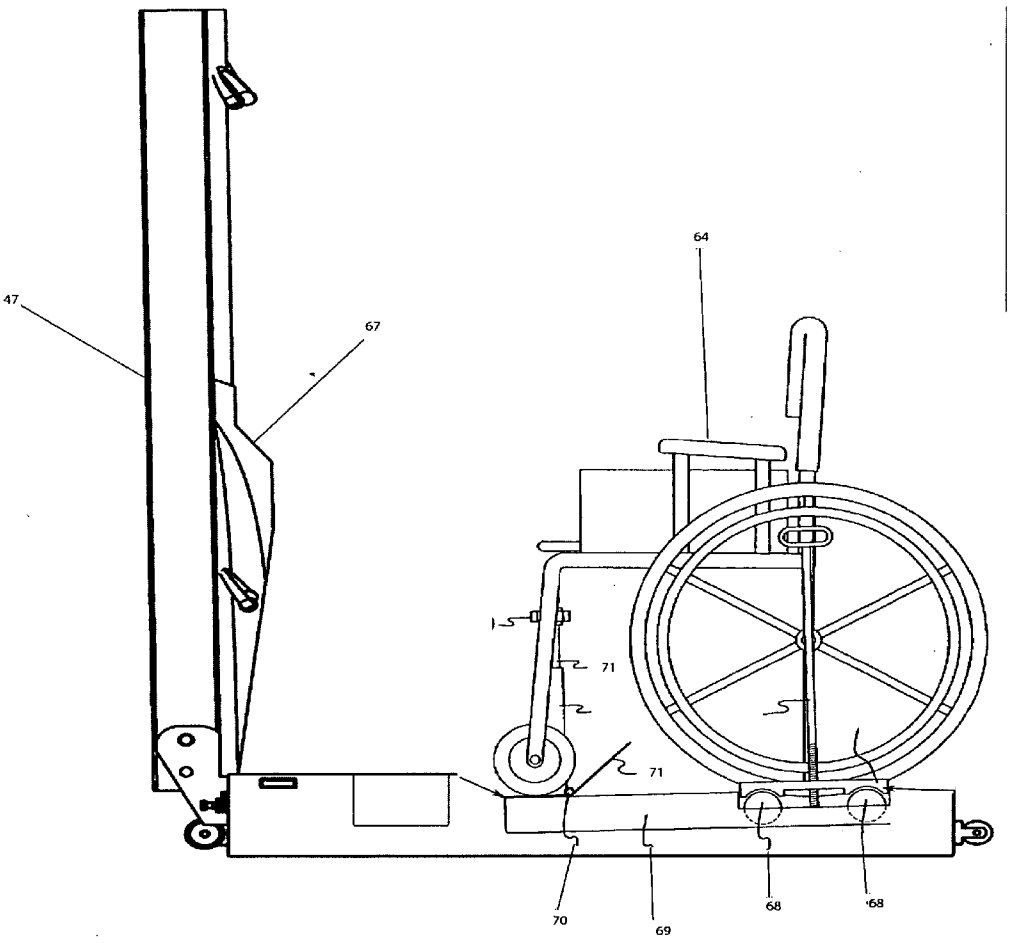


FIG 16- A

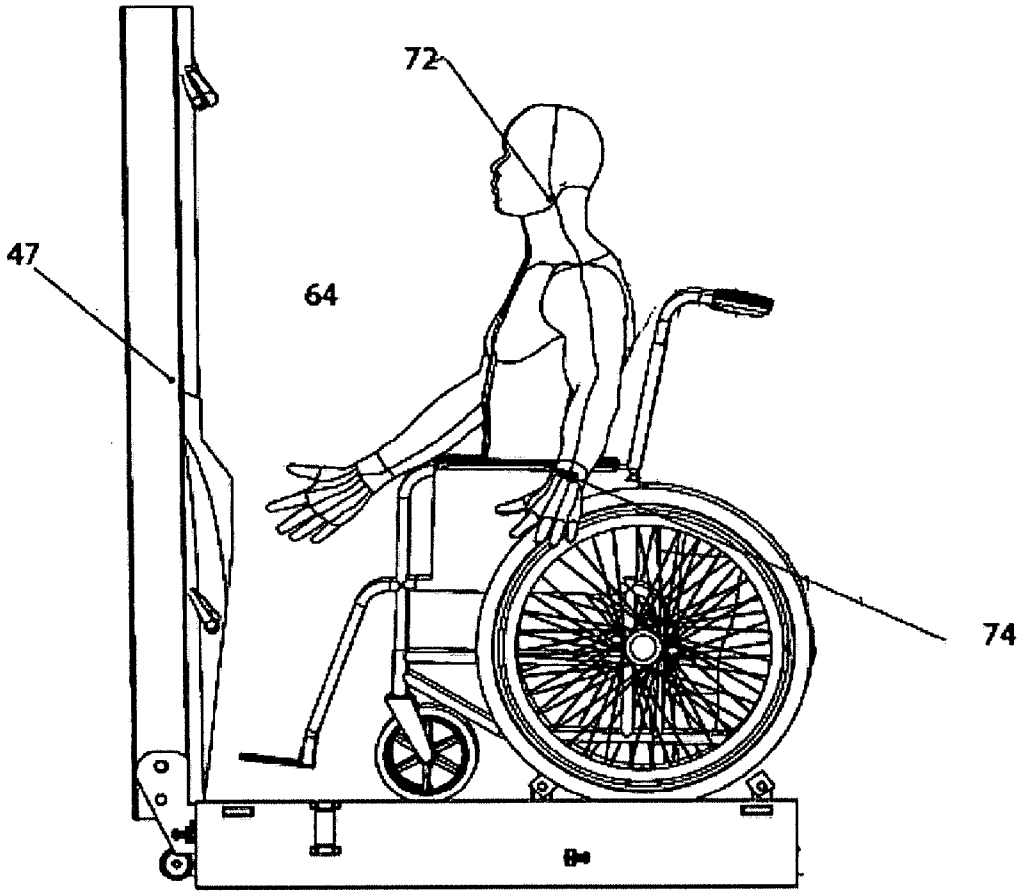


FIG 16- B

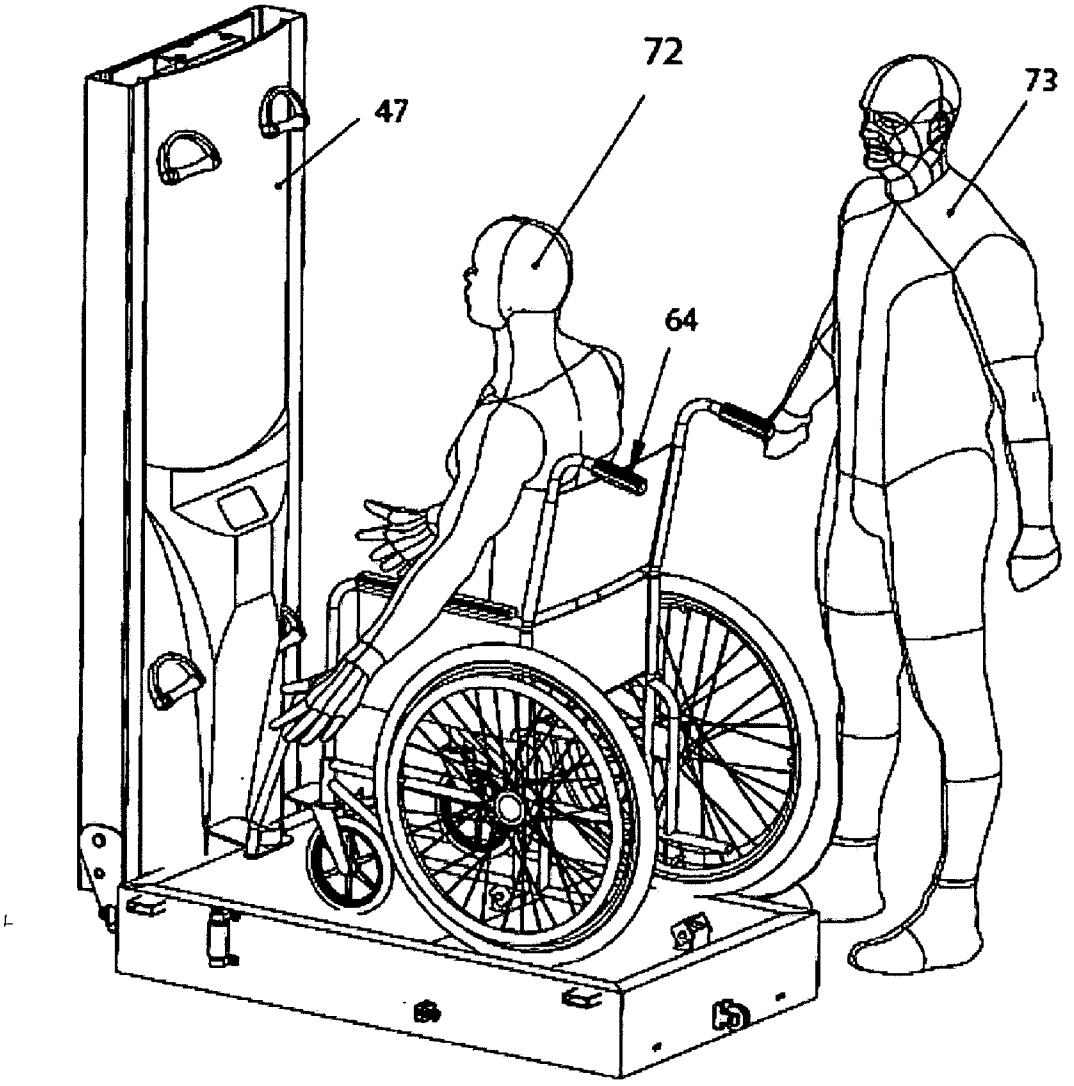


FIG. 17

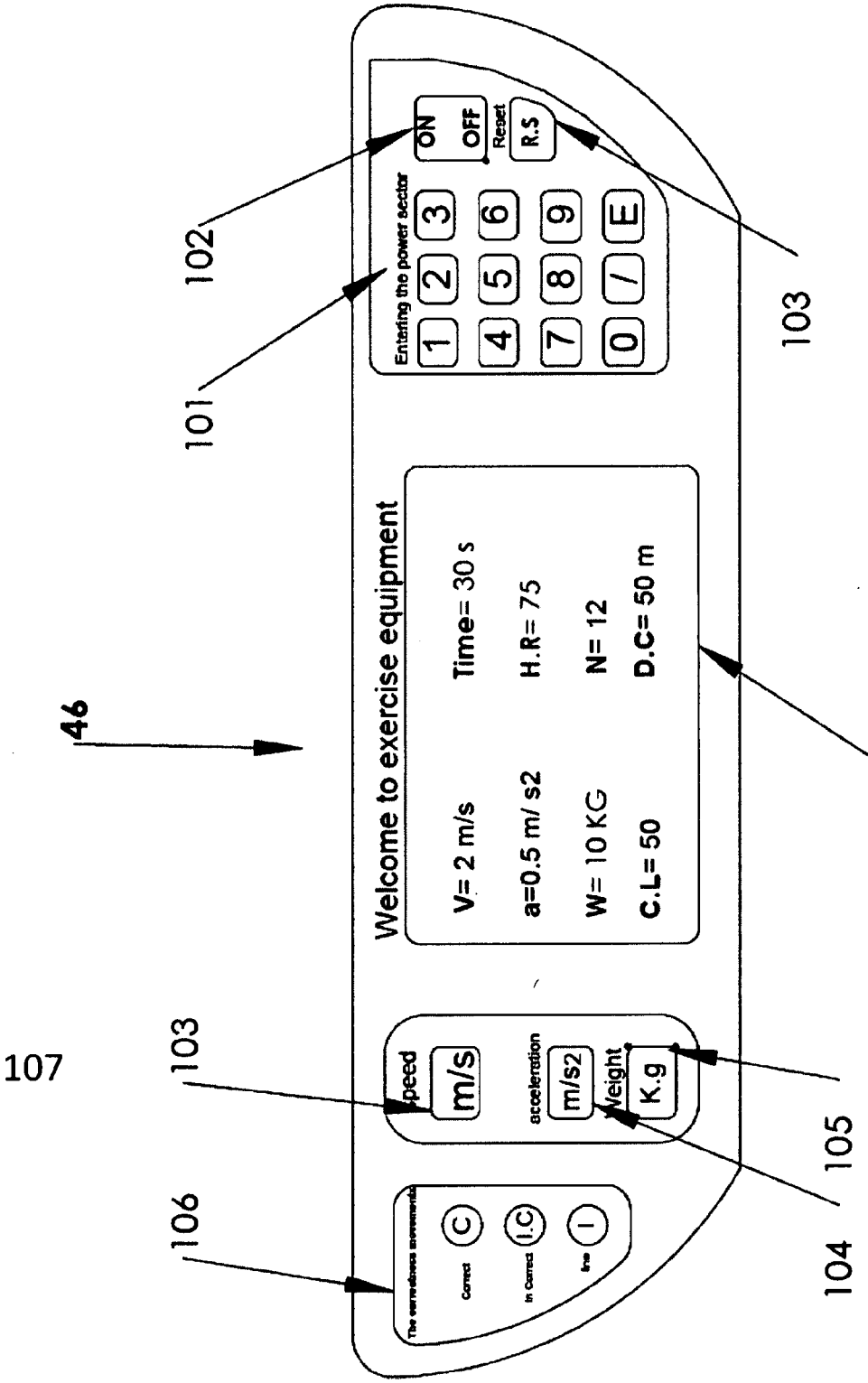

46
107
102
101
103
100
105
104
106
Welcome to exercise equipment
V= 2 m/s
Time= 30 s
a=0.5 m/ s2
H.R= 75
W= 10 KG
N= 12
C.L= 50
D.C= 50 m
Entering the power sector
ON
OFF
Reset
R.S
1 2 3
4 5 6
7 8 9
0 / E
Speed
m/s
acceleration
m/s2
Weight
K.g
Correct
In Correct
C
I.C
I

FIG. 18

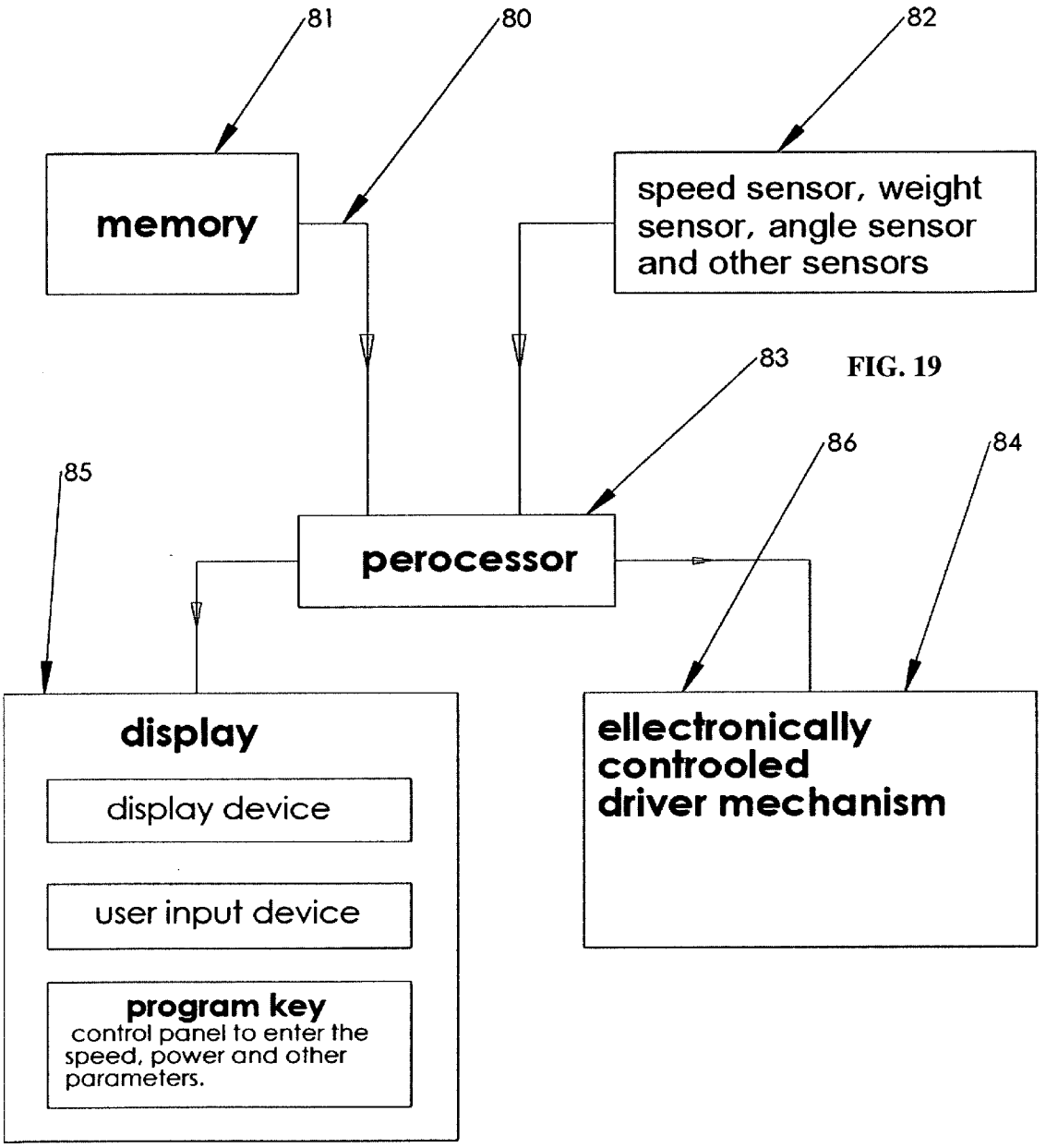

81
80
82
memory
speed sensor, weight sensor, angle sensor and other sensors
83
85
86
84
perocessor
display
display device
user input device
program key
control panel to enter the speed, power and other parameters.
ellectronically controoled driver mechanism

FIG. 19

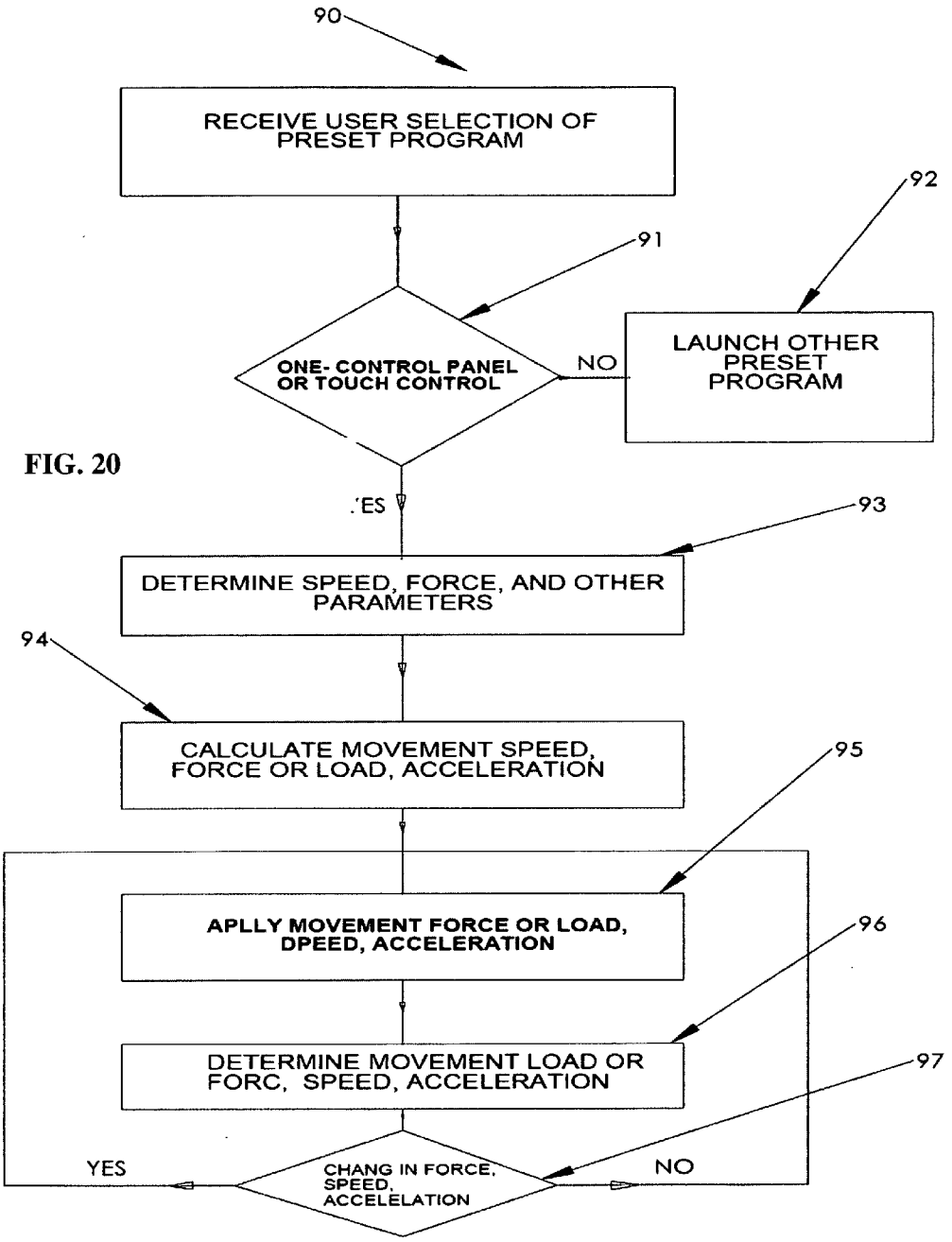

90
RECEIVE USER SELECTION OF PRESET PROGRAM
92
91
ONE- CONTROL PANEL OR TOUCH CONTROL
NO
LAUNCH OTHER PRESET PROGRAM
:ES
93
DETERMINE SPEED, FORCE, AND OTHER PARAMETERS
94
CALCULATE MOVEMENT SPEED, FORCE OR LOAD, ACCELERATION
95
APLLY MOVEMENT FORCE OR LOAD, DPEED, ACCELERATION
96
DETERMINE MOVEMENT LOAD OR FORC, SPEED, ACCELERATION
97
YES
CHANG IN FORCE, SPEED, ACCELELATION
NO

FIG. 20

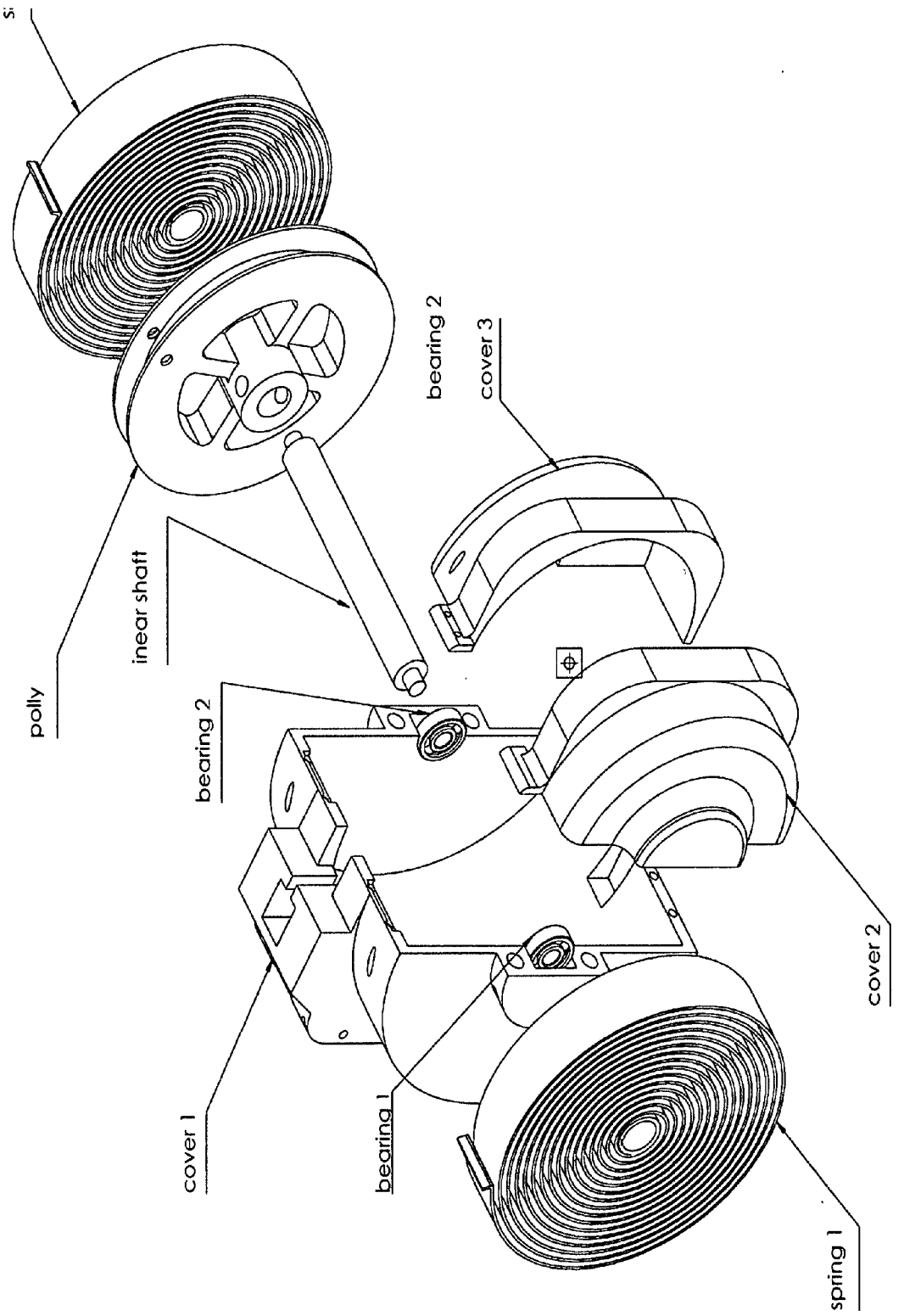

polly
inear shaft
bearing 2
bearing 2
cover 3
cover 1
bearing 1
cover 2
spring 1

FIG. 21

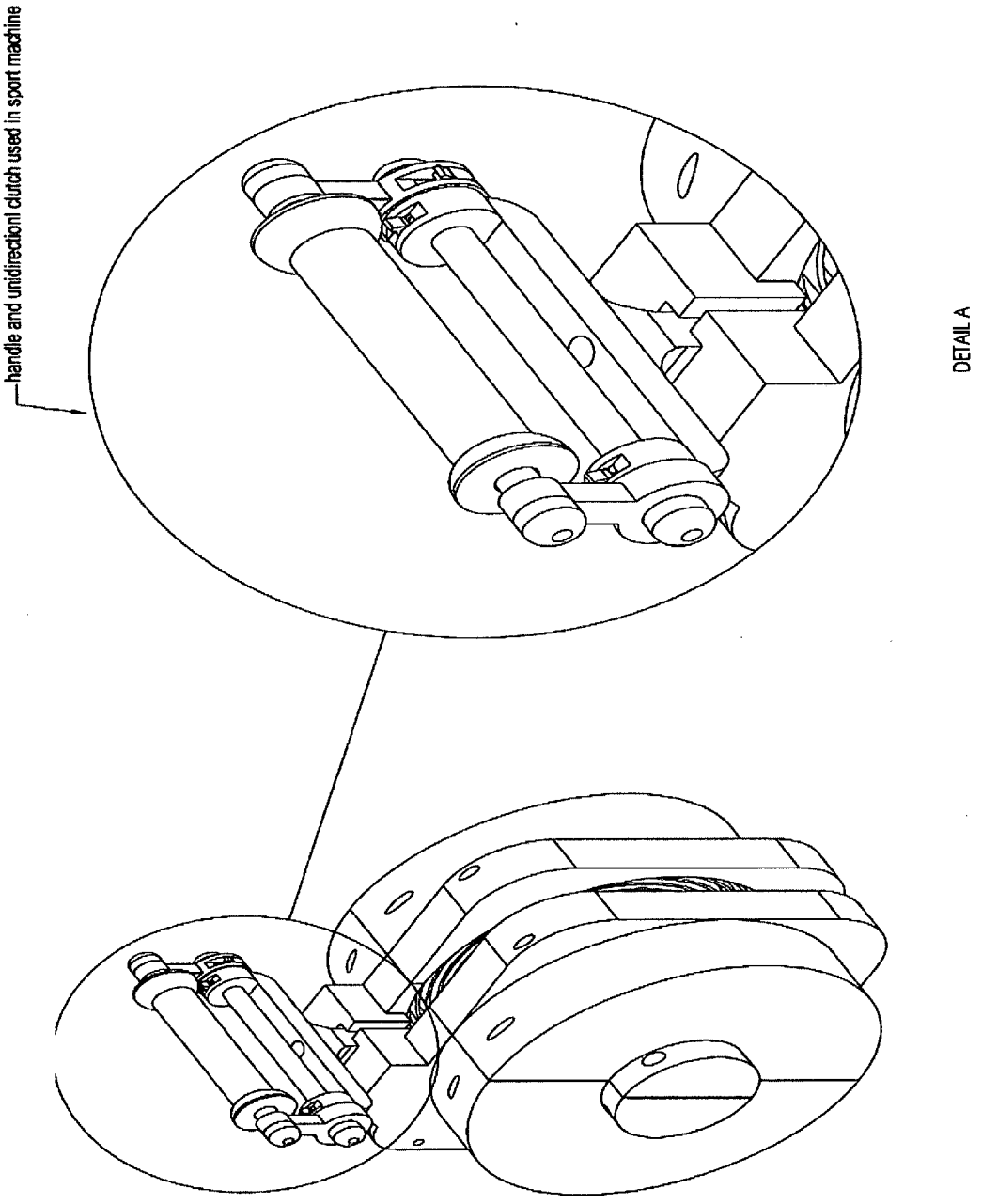
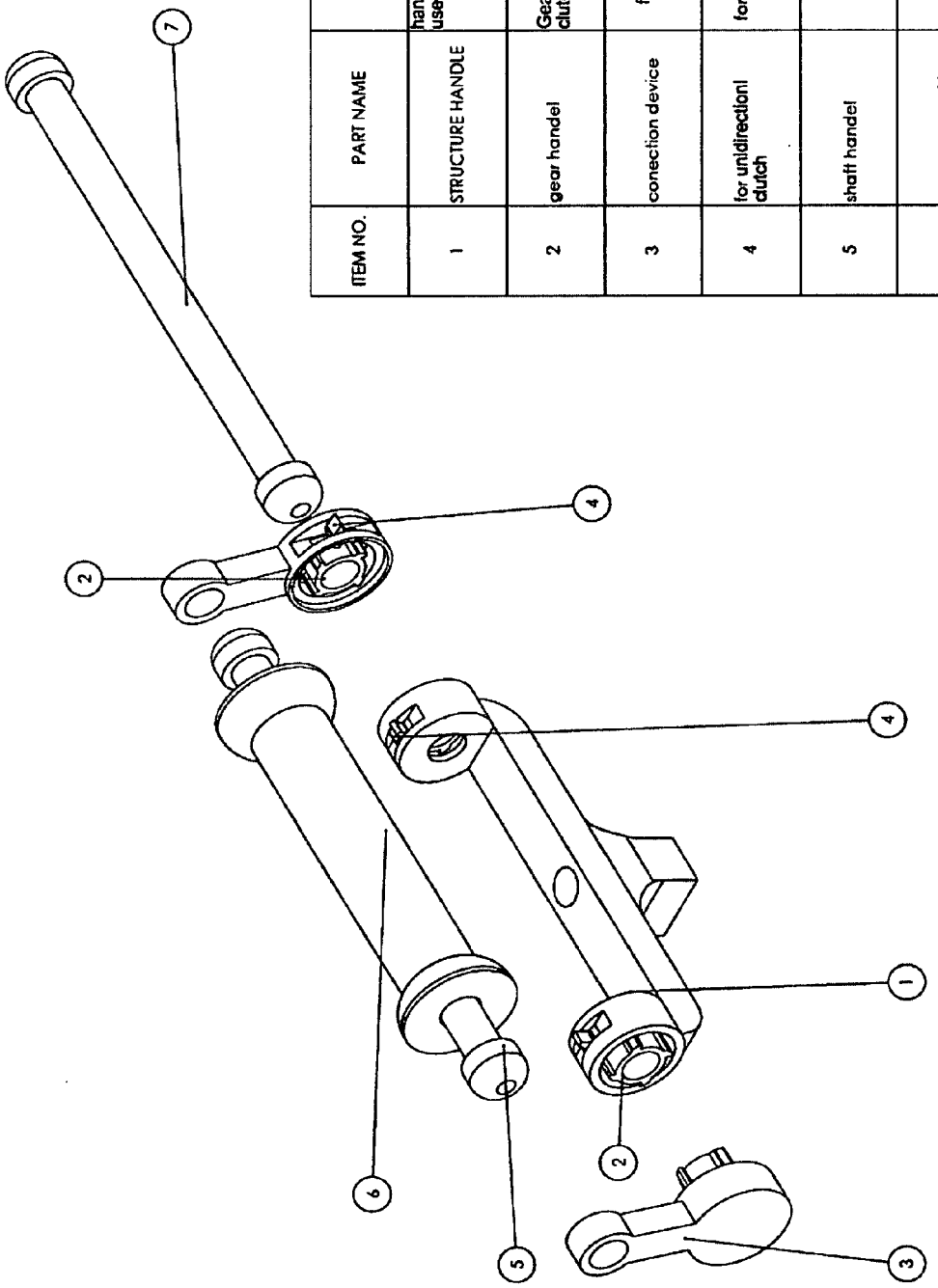

handle and unidirectionl clutch used in sport machine
DETAIL A

FIG. 22



ITEM NO.	PART NAME	DESCRIPTION	QTY.
1	STRUCTURE HANDLE	handle and unidirectional clutch used in sport machine	1
2	gear handel	Gear handle for unidirectional clutch	4
3	conection device	for conecting two parts of handle	2
4	for unidirectionl clutch	for unidirectionl clutch used by ompration	3
5	shaft handel	handle shaft	2
6	shaft handel002	plastic cover handle shaft	1
7	linear shaft	linear shaft for copied all part to center line	1

FIG. 23

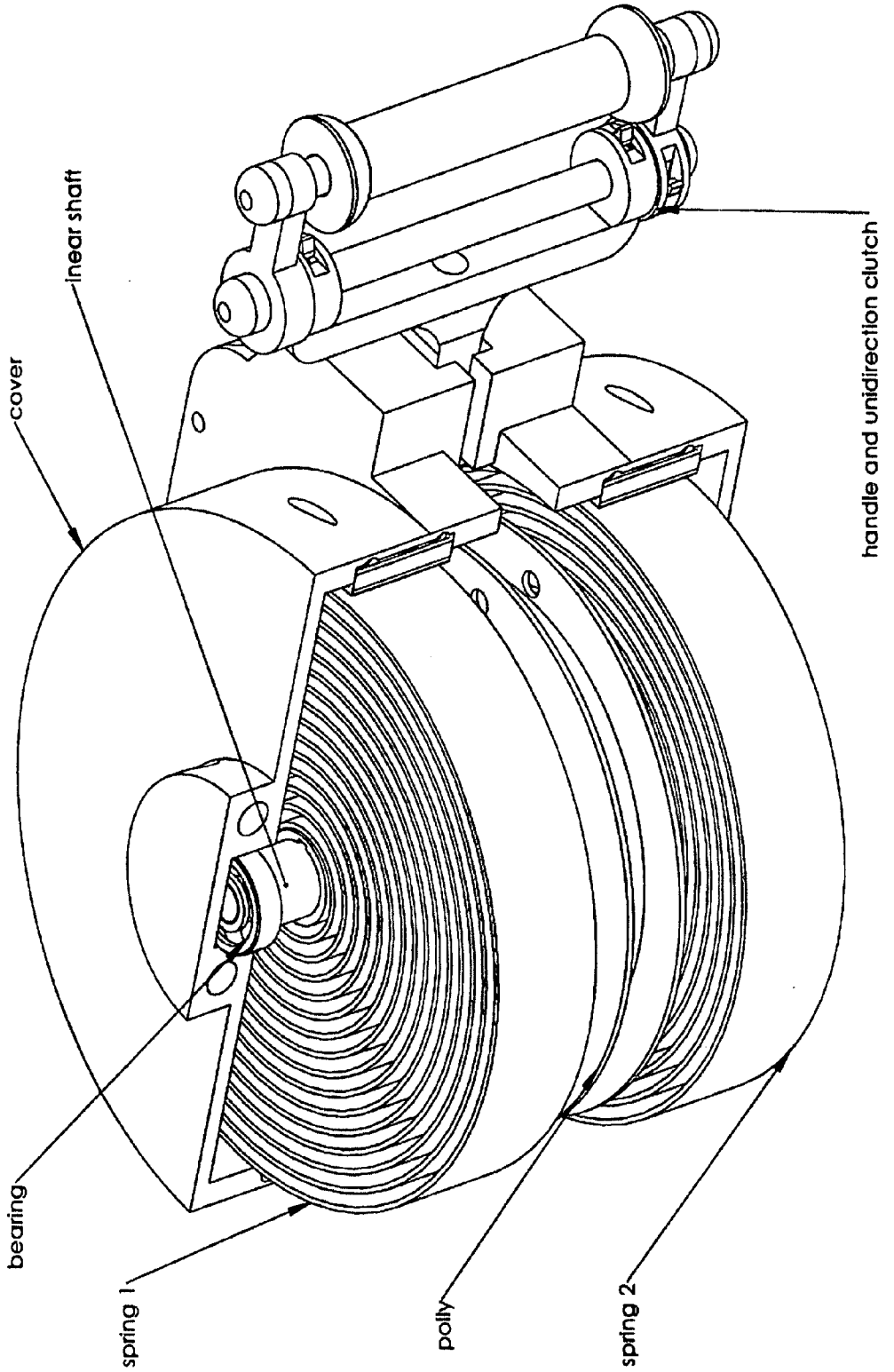

cover
linear shaft
handle and unidirection clutch
bearing
spring 1
polly
spring 2

FIG. 24

MEDICAL EXERCISE MACHINE CAPABLE OF FORCE ADJUSTMENT USED WITHOUT WEIGHT WITH FRICTION AND SPIRAL SPRING FORCE

BACKGROUND OF THE INVENTION

[0001] In previous inventions related to exercise tools, the machine force changes with weights and causes them to be heavier, and the force remains fixed in machine springs which is used to perform movements. As a result, it is not possible to use them for different movements by different users. However, in this invention both the weight and volume has been reduced and force is adjustable so that various movements can be performed using the same machine.

SUMMARY OF THE INVENTION

[0002] An exercise device has been designed for medical body movements in low weight and volume with a high efficiency. The force utilized is from the energy of spiral springs and friction resistance force. Mechanism has been installed on the machine for force adjustment. The electronic power of this machine has been updated such as different data like number of movements, work force, speed, and time has been designed.

[0003] This machine is specially used in physiotherapy and rehabilitation centers and the basic performance of this machine is like the previous one. The only difference is that unlike conventional exercise machines, where the user used to stand, a wheelchair/special chair has been located so that the user can sit and do his/her work-out there.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] These as well as other features of the present invention, will become more apparent upon reference to the drawings wherein:

[0005] FIG. **1**, Shows an overall image of the system in which basic parts are represented.

[0006] FIG. **2**, displays an overall image of the system in which the cover is removed and internal parts are blown up in size.

[0007] FIG. **3**, Internal parts of the system are shown in separate and deassembled way.

[0008] FIG. **4**, Internal parts of the system are shown after assembling and their configuration in respect to each other is displayed.

[0009] FIG. **5**, Force change mechanism is displayed, where its different parts are shown in FIG. **5**-A and FIG. **5**-B.

[0010] FIG. **6**-A, displays the pillar of the moving body and its location with regards to the moving body.

[0011] FIG. **6**-B, shows the hardening mechanism of internal roller in the moving body.

[0012] FIG. **6**-C, displays a blown up image of the joint of the moving body on the fixed body.

[0013] FIG. **7**-A, displays a lower part image of the system in which the system is given a longitudinal cut maximize better. The connection between the force adjusting cable on the pulley spring is shown.

[0014] FIG. **7**-B, a cross section of the front of the system is displayed.

[0015] FIG. **8**, work out process of a user is displayed wherein the user can do different movements using handles and force change mechanism.

[0016] FIG. **11**-A, operating part of the system is displayed separately.

[0017] FIG. **11**-B, front perspective of the operating part, which is opposite to FIG. **11**-A is displayed.

[0018] FIG. **11**-C, Show a cross section of the operating part, displaying how the system is put together.

[0019] FIG. **12**, displays the internal parts of the system.

[0020] FIG. **13**, shows a blown up view of the system.

[0021] FIG. **14**, displays the system during its operation.

[0022] FIG. **15**, displays the method of using the system in conjunction with a wheelchair. The device has an accuracy of 100 grams and therefore can be used in rehabilitation facilities. Wheelchair is placed on the system and after configuration can be operated for different tasks.

[0023] FIG. **16**, displays utilizing the wheelchair in fixed movements. Wheelchair chairs **65** are placed on rollers **68**, and with their rotation real walking is imitated.

[0024] FIG. **17**, displays a physiotherapist controlling the movements and operation of the device.

[0025] FIG. **18**, displays the digital control panel and its parameters. Parameters such as velocity, force, acceleration, heart rate, calories burned, time, number of repeation are displaced on the screen.

[0026] FIG. **19**, displays the flowchart and diagram of the control panel manual.

[0027] FIG. **20**, displays the flowchart of the operation of the electrical unit.

[0028] FIG. **21**, displays a secondary embodiment of the device.

[0029] FIG. **22**, displays the system used in the secondary embodiment, with handles and control parts are blown up.

[0030] FIG. **23**, displays the secondary embodiment as deassembled.

[0031] FIG. **24**, displays the system without the cover.

LIST OF PARTS

[0032] In this section the parts used in the drawings and their associated numbering will be explained:

[0033] **1**: User's hands

[0034] **2**: Force change mechanism

[0035] **3**: Guiding spools of operating cables

[0036] **4**: Electronic monitor showing movement parameters

[0037] **5**: Cables attached to handles

[0038] **6**: Metal and standing handles

[0039] **7**: Cover on internal parts

[0040] **8**: Basic/main body of the machine

[0041] **9**: Metal leg

[0042] **10**: Locking handles of the body

[0043] **11**: Moving body of the machine

[0044] **12**: Standing place for the user

[0045] **13**: Legs of moving body

[0046] **14**: Connector of hardening rollers

[0047] **15**: Rollers

[0048] **15-1**: Teflon covers of spools

[0049] **15-2**: Internal shaft

[0050] **16**: Canteen

[0051] **17**: Connection screws of internal parts

[0052] **19**: Internal and operation part

[0053] **19-1**: Internal shaft of operating part

[0054] **19-2**: Cable spool of user

[0055] **19-3**: Plastic covering of external spring

[0056] **19-4**: Big bush of ball bearing attached to plastic spring

[0057] **19-5**: Small ball bearing bush
[0058] **19-6**: Small ball bearing
[0059] **19-7**: Leather band spool for friction
[0060] **19-8**: Metal body of the operating part
[0061] **19-9**: One-side ball bearing inside leather band spool
[0062] **19-10**: Side cork on the cover of plastic spring
[0063] **19-11**: Big ball bearing attached to the cover of the plastic spring
[0064] **20**: Sensor attached to cable spool
[0065] **21**: Sensor attached to the body in internal part in front of sensor **20**
[0066] **22**: Spiral spring with rectangular section
[0067] **23**: Attaching moving body to fixed body
[0068] **24**: Ball bearing attached to the bush and fixed body
[0069] **25**: Plastic internal leg in place of a user
[0070] **26**: Connector adjusting a level of tightness of rollers
[0071] **27**: User during exercise
[0072] **28**: User holding the handles
[0073] **29**: User while doing other movements
[0074] **30**: Cable adjusting force attached to spool adjusting force mechanism
[0075] **31**: Spool attached to the fix body for force adjusting
[0076] **32**: Connector of metal handles on the fixed body
[0077] **33**: Screws attaching metal legs on the fixed body
[0078] **34**: Screws attaching internal parts on the fixed body
[0079] **35**: Lower screws attaching internal parts on the fixed body
[0080] **36**: Body specially used for physiotherapy
[0081] **37**: Metal legs of moving body
[0082] **38**: Mechanism for performing lower part body movement by the user and foot movements
[0083] **39**: Mechanism for automatic rising of the chair
[0084] **40**: Chair installed on the system
[0085] **41**: Plastic cover in front of the machine
[0086] **42**: Internal part and operating part to create force needed for upper part body movement
[0087] **43**: Internal parts and operating part to create force needed for lower part body movement
[0088] **44**: Force changing mechanism
[0089] **45**: Handles for the user
[0090] **46**: Control panel
[0091] **47**: Raising connector of the tire attached to the dynamo
[0092] **48**: Back cover of the machine
[0093] **49**: Metal legs of the machine
[0094] **50**: The frame of fixed part
[0095] **51**: Plastic cover of operating part
[0096] **52**: Cable spool of user
[0097] **53**: Spiral internal spring
[0098] **54**: Internal shaft of operating part
[0099] **55**: Internal ball bearing
[0100] **56**: Surface attaching internal part to the system body
[0101] **57**: Spring pin controlling the cable spool on the internal shaft
[0102] **80-85**: Flowchart of control panel and digital display
[0103] **90-97**: Flowchart of the driver of the device driver
[0104] **100**: Digital display
[0105] **101**: Force entering keypad
[0106] **102**: On/off switch
[0107] **103**: The reset button
[0108] **104**: Speed button
[0109] **105**: Movement acceleration button
[0110] **106**: Weight display button
[0111] **107**: Three lights to show the correctness of movements

VARIOUS PARTS OF THE INVENTION AND THEIR PERFORMANCE

[0112] Lack of exercise and an increase in illness has a direct effect on the economy and a reduction on peoples' spirit. The migration of people to cities and increase in city population and the reduction of living space and all the limitations of living in an apartment, has all led to a dissatisfying life for most people around the world.

[0113] On the other hand the increase in activities, social and occupation has caused these people to avoid using public places for exercise so physical and mental illness has increased in modern life. To help remove this problem in offices and homes the designers have tried to build some machines in order to be used inside houses as well as offices. This invention also has the same objective so that it can cover many movements in low volume and it replaces many heavy machines.

[0114] Its special type can also be used in rehabilitation places and sport medicine. In this machine the force needed for performing movement is provided by leather band spring and the friction between cloth leather band and pulley leather band.

[0115] The transformed force from user's muscles to internal parts of the system is done by the cable. This makes the leather band spring recollecting and creating friction between the cloth and pulley leather band, which helps resist against the force initiated by user's muscles.

[0116] In this system the force exchange mechanism **2** is also considered, which helps users to adjust the force for different activities. They can adjust by moving the handle so that leather band springs **22** recollect and the turning angle increases. On the other hand the friction between cloth leather band **51** and pulley leather band **19-7** also increases and as a result, this will increase the resistance force against different movements.

[0117] The overall system is designed in the way so that adjusting force causes a wide variety of sport movements. Therefore the people can use this machine at different places. In this machine the electronic part **4** is used which helps to show different kinds of information such as the number of movements, force, the speed of movements, and others. This kind of information can help motivate the users a lot.

[0118] Using spiral springs in conjunction with friction force and also employing force exchange mechanism without using weight can decrease the overall weight of the machine. The system has been designed in a way so that it can be used in three different altitudes and cover upper part body movement as well as lower part body movements and all the people in a group can use it. A special type of this machine can be used in physiotherapy and rehabilitation centers different components of the inventions.

[0119] In this design, electronic parts are employed to control the functionality of the device better. Many important movement parameters can be displayed by the monitor. Also,

the machine is capable of sending movement information to the physiotherapist's computer.

[0120] To increase efficiency, four parts have been used. Force adjustment is done through entering force in electronic panel **67**. A dynamo of dc **61** along with a gearbox **58** is used. Through entering the amount of required force in the panel by the user, performance can be analyzed in the program. Then the dynamo is enacted and using the gearbox the force is transmitted to the wheel by chain **60** in ¼₀ rate. As a result, the drupe **4** starts turning. On top of the drupe **4** spools are coupled and a cable **62** has been installed on every spool, which helps the outer bowl work. As soon as the drupe **4** turns, the spools start turning as well and the attached cables cause the band spring to recollect and the loaded force of the spring increases.

[0121] The user can perform different activities with an adjusted force. This force is adjustable from 1 kilogram to 30 kilogram in 100 gram intervals. To adjust force, the user inters the required force in panel using buttons on the panel. The programs designed for the system analyzes the data and determines the number of turns made by dynamo to provide the needed force.

[0122] The dynamo starts turning and after completing the required turns it stops and the user can start performing various movements. This system is capable of showing the speed, acceleration, and the number of turns in the digital monitor. This is of high significance from medical point of view. To perform this aim, different sensors have been employed and transmit data to the electronic part. Through the defined program, the data is analyzed and will be displayed on the digital monitor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0123] When operating the device, the user can pick up handles **1** in three altitudes and start doing various movements. The exercised force by the user enters cables **5** by handles **1** and this force is transformed to internal pulley **19-2** by the cable **5**. This pulley is attached to internal shaft **19-1**. The spiral spring **22** is attached to this shaft from inside and to the cover **19-3** from the outside. Over this pulley shaft the friction band **19-7** is placed and over the pulley the friction band **51** is placed. This is attached to the pulley **19-2** on one side and on the other side to a fixed body **8**. So the cable force moves to the pulley **19-2** and to the spiral spring **22**. Through the internal shaft **19-1** and to the friction pulley **19-7**, which causes recollection of the spring and creation of resistant's between cloth band **51** and friction pulley **19-7**. As a result it can resist the force made by the user.

[0124] During every movement this process is repeated and effects the spring force and therefore the created friction is the means for using the weight in the sport machines. A monitor is attached to the sensors **20** and **21**. Wherein sensor **20** is placed on the pulley **19-2** and sensor **21** is placed on the body **19-8**.

[0125] During performing different movements pulley **19-2** also moves and as a result the sensor **20** attached to it moves in every cycle and therefore moves away from sensor **21** on the body. This back and forth movement creates a pulse.

[0126] The created pulse is sent to monitor **4** an after being processed by the electronic part. The monitor displays the information like the number of movements, work force, speed, and the time every movement lasts.

[0127] For adjusting force, the force change mechanism **2** is used. The user can adjust the force needed for every movement by utilizing the work force mechanism. To do this, the user turns the force change mechanism handle **2** which works like a one-sided clutch. The created force reaches to the pulley **2-5** and causes the cable attached to it roll on the other side of the pulley. The opposite side of the cable is attached to the external cover of the spring **19-3**.The friction bond **51** is also placed on the cover. As a result the cable force is transferred to the cover **19-3**.

[0128] Inside the cover is a spring **22** which is attached externally to the cover and internally to the internal shaft **19-1**. This causes the spring **22** to recollect. A potential force created during this procedure is transferred to the shaft when the internal shaft **19-1** moves. This creates a resistance against the shaft movement.

[0129] On the other hand since the cover **19-3** is attached to the friction band **51** and the other side of this band is attached to the fixed body **8**, the turning of cover **19-3** increases the friction between the band **51** and pulley band friction **19-7**.

[0130] This in turn increases the friction force against internal shaft movement **19-1**. During the performance of the machine, when the force is adjusted by the force changing mechanism, the resistance force against the user's muscles increases and as a result the force needed for any movement can be adjusted as needed.

[0131] FIG. **11** shows a special embodiment of the machine used for physiotherapy and rehabilitees centers. In order for the users to perform better, a special automatic chair is used by the user.

[0132] For medical use, the user can stand on this chair and for performing upper part body movements the user picks up handles **45** and starts his exercise. By pulling the handles the enacted force from the cable is sent to the part **42** and causes a tension in the spring inside cover **41**.

[0133] In FIGS. **11**-A to **11**-C the internal and operating parts are shown. According to the fact that the cable attached to the handles **42** are also attached to internal spool **52** and this spool is also attached to the internal shaft **54**, so pulling the handles by the user transfers the force to the internal spool **52** and this force is then transferred to the spiral spring through the shaft **54**.

[0134] This causes recollection and force creation against user's muscles. To do lower part body movements the user sits on chair **40** and puts the feet in the foot place **38** and starts moving the feet.

[0135] The force generated by exercise **38** is transferred to the internal up prating parts **43** by the cable. The mechanism in this section looks exactly like mechanism **42** and the resistance of the spiral spring in this section is basically the performance of the machines.

[0136] The internal and operating parts of the system are inside the main frame with numbers **42** and **43**.This machine provides its force from spiral springs because in physiotherapy and rehabilitation centers we don't need much work force.

[0137] It will be understood that, while presently preferred embodiments of the invention have been illustrated and described, the invention is not limited thereto, but may be otherwise variously embodied within the scope of the following claims. It will also be understood that the claims are not intended to be limited to the particular sequence in which the steps are listed therein, unless specifically stated therein or required by description set forth in the steps.

We claim:

1- A medical exercise machine with force adjustment capability and no lifting weight for upper and lower abdominal activities used at gyms, physiotherapy and rehabilitees centers and home, comprising utilizing resistive force of spiral spring and frictional force instead of weights, wherein said system comprises force creation against movement section, a manual and automatic adjustment unit, electrical unit and a touch screen control panel, fixed and moving bodies, handles and cables, a cover for said machine and rollers; said machine comprises no metal weight and creates forces in place of said metal weight with an accuracy of 100 grams, allowing people with disabilities to use said machine; performance of said machine and therefore the quality of exercise is controlled with said electrical unit.

2- The medical exercise machine of claim **1**, wherein necessary force for performing exercise is created by spiral springs and frictional force.

3- The medical exercise machine of claim **2**, wherein said resistive force against movement is increased by utilizing said electric unit or by adjusting potential force of said springs.

4- The medical exercise machine of claim **3**, wherein said control panel comprises a section for controlling and adjustment of force with an accuracy of 100 grams operated by said used, wherein after initial setup electrical unit of said machine automatically controls force available to said user.

5- The medical exercise machine of claim **3**, further comprising wherein said control panel is a touch screen monitor, and wherein number of each movement, the velocity of each push up, resistive force and other parameters are displayed on said touch screen monitor and are modified as needed.

6- The medical exercise machine of claim **3**, wherein history and performance of each session is saved on said machine and is transferred to a computer or any processing unit via said cable or wirelessly; activity and health improvement is determined from said history.

7- The medical exercise machine of claim **1**, further comprises a fixed body and a moving body; wherein said bodies can be deassembled and does not take a lot of space; and wherein since metal weights have been eliminated said machine is very light in weight.

8- The medical exercise machine of claim **1**; wherein said spiral spring and frictional force is replaced with cogwheel and combwheel; wherein passive movement and pressure induced movements are performed with said machine and each movement can be programmed and controlled accordingly.

9- The medical exercise machine of claim **8**; wherein said machine is a martial art training machine and wherein said machine is a physiotherapy machine, wherein passive force and induced force are more important than others.

10- The medical exercise machine of claim **7**, wherein said machine has a high accuracy and wherein said machine is a physiotherapy machine.

11- The medical exercise machine of claim **1**; further comprises a wheelchair; wherein muscle exercises for training strength is performed with said wheelchair; a user with disability will sit on said wheelchair and special setup will be selected from a control panel according to each individual's needs.

12- The medical exercise machine of claim **11**; further comprising balance control features installed on said machine during use.

13- The medical exercise machine of claim **11**; further comprises a treadmill feature utilizing said wheelchair; wherein said rollers and said electrical unit are modified to accommodate for said wheelchair, wherein said rollers rotate with the rotation of said wheelchair imitating fixed movement with said wheelchair.

14- The medical exercise machine of claim **2**, wherein a magnetic force is created against a pulling force of said user pulling a cable; and a resistive force for passive movement is created by resistive springs.

15- The medical exercise machine of claim **1**; wherein a shaft in conjunction with spiral spring, cable, handles and a one way clutch are utilized for adjusting the tension and force of said machine.

16- The medical exercise machine of claim **1**; wherein said machine has light weight and takes very small space; and wherein a space between springs is covered with a sticky liquid with enough viscosity; wherein said liquid reduces frictional noise between said springs and increases efficiency of said machine.

17- The medical exercise machine of claim **2**; wherein said resistive force of said springs is replaced with a resistive force of a disc inside a liquid, having specific viscosity; wherein by changing a pressure inside a container of said liquid said resistive force can be adjusted as needed.

18- The medical exercise machine of claim **17**; wherein said machine utilizes all of a cogwheel mechanism, spring resistive force and liquid disc resistive force and frictional force are used in conjunction with one another.

19- The medical exercise machine of claim **1**; further comprises a chair attached to said machine and said chair is removable from said machine as needed and wherein said chair helps with lower body exercises.

20- The medical exercise machine of claim **1**; wherein said machine is low weight and takes minimum space and is used in tight places, such as inside a vehicle, and small office rooms; wherein said machine is installed on different surfaces, wherein force is adjusted by utilizing a one way clutch and a handle.

* * * * *