(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 509 138 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
05.11.2008 Bulletin 2008/45

(21) Application number: **03727829.8**

(22) Date of filing: **21.05.2003**

(51) Int Cl.:
A61B 8/00 *(2006.01)* ***A47B 21/03*** *(2006.01)*
G01S 15/89 *(2006.01)* ***G06F 3/02*** *(2006.01)*

(86) International application number:
PCT/IB2003/002290

(87) International publication number:
WO 2003/099129 (04.12.2003 Gazette 2003/49)

(54) **EXAMINATION ULTRASOUND SYSTEM CART WITH VARIABLE ELEVATION CONTROL PANEL**

ULTRASCHALL-UNTERSUCHUNGSWAGEN MIT HÖHENVERSTELLBAREM STEUERPULT

CHARIOT DE SYSTEME A ULTRASONS D'EXAMEN A PANNEAU DE COMMANDE A ELEVATION VARIABLE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **23.05.2002 US 154733**

(43) Date of publication of application:
02.03.2005 Bulletin 2005/09

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US-B1- 6 257 531

EP 1 509 138 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] This invention relates to ultrasonic examination imaging systems and, in particular, to ultrasound systems with control panels that have an adjustable height.

[0002] Cart-borne ultrasound systems are intended to be operated by any examinationian with the requisite training. This means that the ultrasound system may be used by some who are short in stature and others who are very tall. The system should adapt to people of different height. Otherwise, the operator may need to stretch, bend over, or otherwise contort to an uncomfortable position. Over time such contortions can lead to muscular or skeletal discomfort. To relieve these problems some manufacturers have designed the ultrasound system cart so that the control panel can be adjusted vertically. One simple approach is to hinge the control panel so that it will swing up and down. As it does so, however, it will assume a different angle at each elevational height. It is desirable for the control panel to maintain a constant angle to the operator so that the control panel is comfortable to use regardless of its elevation.

[0003] One way to maintain a constant angle is to elevate the entire control and display portion of the ultrasound system. Such an approach should take into consideration the posture of users of the ultrasound system when the control panel and display are elevated to different heights. In particular, an elevation system should provide positions of comfort for both standing and sitting users. It is desirable to provide a control panel for an ultrasound system which maintains a comfortable user angle to the operator and is comfortable for both sitting and standing users.

[0004] The invention is defined by claim 1. In the present invention, a variable elevation control panel is provided for a cart-borne ultrasound system. The control panel is supported by an articulating mechanism by which the height of the control panel can be adjusted. More precisely, the articulation mechanism enables the control panel to move vertically relatively to the cart between a highest position and a lowest position while maintaining a substantially constant angle of inclination relatively to the cart, the highest position being located closer to a center plane (which is located in a chosen position of the cart) than the lowest position. So, as the control panel is articulated vertically it simultaneously extends toward the user when lowered to better accommodate a sitting user, and extends back toward the cart when raised to better accommodate a standing user. In the invention, the articulation mechanism is configured as a parallelogram-shaped linkage.

[0005] In the drawings:

Fig. 1 illustrates a cart-borne ultrasound system in perspective;

Fig. 2 illustrates the concept of a control panel lift mechanism of the present invention;

Fig. 3 shows the mechanism of Fig. 2 with a control panel in an end view;

Fig. 4 illustrates the control panel lift mechanism of a constructed embodiment of the present invention;

Fig. 5a illustrates a preferred lift mechanism in the raised position; and

Fig. 5b illustrates a preferred lift mechanism in the lowered position.

[0006] Referring first to Fig. 1, a cart-borne ultrasound system 10 is shown in perspective. The cart includes an electronics bay 12 inside of which are located printed circuit boards for electronically processing received ultrasound signals. The ultrasound signals are processed to produce an image which is displayed on a display 16. The cart is mounted on wheels or casters 14 so that it can be rolled to a lab or a patient's bedside. In the front of the cart is a control panel 18, which contains a number of knobs, buttons, slide switches, and a trackball by which a user operates the ultrasound system. The control panel is mounted above a handle 20 which extends from the front of the ultrasound system. The handle 20 can be used to pull the cart to move it from one location to another. On the inside of the handle 20 is a lift release 22 which will be discussed below.

[0007] The concept of a lift mechanism of the present invention is shown in Fig. 2. A four bar linkage 30 is defined by four pivot points, A, B, A' and B'. Two of the bars are shown at 32 and 34, with the other two bars comprised by the pivot connections to the control panel 18 at A and B and the pivot connections to a base (not shown) at A' and B'. The linkage is shown in a raised position and a lowered position by the upper and lower locations of the control panel 18. The control panel moves between these positions as indicated by the large arrow. As can be seen by the block representation of the control panel 18, the angle of the control panel 18 does not change as the control panel is raised and lowered. In this drawing it is seen that the horizontal and vertical sides of the control panel block remain in this orientation in the raised and lowered and all intermediate positions.

[0008] Fig. 3 illustrates the four bar linkage 30 with the control panel 18 shown in a side view. As this drawing illustrates, the control panel is tilted at an angle which is comfortable for the user. Again it is seen that the angle of the control panel does not change between the raised and lowered positions by reason of the four bar linkage 30, which in the preferred embodiment is a parallelogram-shaped mechanism providing this benefit. The bars 34 and 32 remain parallel as the linkage moves, as do the axes between pivot points A-B and A'-B'.

[0009] Fig. 4 illustrates another articulating linkage 40 for a control panel which is suitable for use with the ultrasound system cart shown in Fig. 1. This linkage comprises a lift top cover 42 and a lift bottom cover 44. Each lift cover has two pivot holes at the front which are aligned on horizontal axes 45,46 and two pivot holes at the back which are aligned on horizontal axes 47,48. This lift cover assembly is partially visible behind the control panel 18

in Fig. 1. It is approximately 6 inches wide and 15 inches in length. The rear pivot holes at axes 47,48 are mounted to the ultrasound system cart and the control panel is mounted in the vicinity of front pivot holes at axes 45,46 as shown in the following drawings. If desired, beard covers can be provided below the linkage 40 to prevent the development of pinch points below the linkage when the control panel is elevated.

[0010] Fig. 5a illustrates the linkage assembly 40 in a raised position when attached to an ultrasound system cart. The two rear pivot points 47,48 of the assembly are connected to a lift base bracket 56, which is attached to the ultrasound system cart. The two forward pivot points are attached to a base for an ultrasound system control panel by attachment to an articulation base support 54 which supports the base. The base includes a bearing 50 on which is mounted a base slide 52. When the control panel is mounted on the base slide, it can slide forward and backward (left-right in the drawing) to an extended or retracted position selected by the system operator. Below the base the handle 20 is seen in a cutaway view.

[0011] As this drawing illustrates, the control panel can be raised and lowered by grasping the handle 20 to move the handle and control panel up and down, as both the handle and control panel are mounted on the articulating linkage 40. The articulating linkage is seen to be a four bar, parallelogram shaped linkage, as indicated by the lines w,x,y,and z drawn between the four pivot points 45,46,47,48 of the linkage.

[0012] Located beneath the lift top cover 42 is a positive lock, hydraulic piston 60 shown in phantom in Fig. 5a. The piston 60 supports the weight of the linkage, control panel and handle and is normally locked to maintain the positions of these elements. When the operator desires to raise or lower the control panel the handle 20 is grasped and the lift release 22 on the handle is depressed. The lift release could alternatively be operated by a foot pedal or located elsewhere on the cart. When the lift release 22 is depressed a valve is opened between two oil-filled compartments of the hydraulic piston. Oil then flows slowly from one compartment to the other, the direction of flow depending upon whether the control panel is being raised or lowered. The piston will extend or retract as the oil flows. When the control panel is at the desired height, the lift release is released by the operator, causing the valve of the piston to close, holding the piston and the control panel in its current elevation.

[0013] Fig. 5b shows the linkage 40 and piston 60 when the control panel is in a lowered position. It is seen that the piston is in a retracted position in comparison to Fig. 5a. It is also seen that the angle of the control panel has not changed.

[0014] When the control panel is elevated such that the parallelogram w,x,y,z of the linkage 40 forms a rectangle, the control panel is at its most forward position relative to the cart and the center of the cart, which is approximately the vertical plane of the display 16. The control panel can be rolled forward even further toward the operator by sliding the control panel on the base slide 52. In this lowered position the control panel can be positioned over the lap of a system operator who is in the sitting position. As the control panel is raised from this elevation the sides x,z of the parallelogram will draw closer together and the control panel will simultaneously pivot up and rearward toward the center of the cart. In this raised position the control panel is retracted back to be more comfortable for use by an operator who is standing for the ultrasonic exam. In a constructed embodiment the control panel has approximately a 25 mm (ten inch) range of vertical adjustment.

[0015] Various modifications of the illustrated embodiments will be readily apparent to those skilled in the art. For instance, the four bar linkage can be modified to have more than four pivot points, permitting more complex ranges of control panel movement. Instead of being manually raised and lowered, the control panel could be raised and lowered by motor control. The hydraulic piston can be a gas shock or replaced by other supporting devices such as springs or counterweights, in which case the elevation locking mechanism may comprise a mechanical device such as a detent or locking pin.

Claims

1. A cart-borne ultrasound system (10) including i) a movable cart; electronic circuitry located on the cart which processes ultrasound signals for the formation of ultrasound images, and a display (16) extending in a vertical plane and coupled to the circuitry for the display of ultrasound images, comprising:

   - a control panel (18) coupled to the electronic circuitry for user control of the ultrasound system (10); and
   - an articulation mechanism (30) mounted on the cart and coupled to the control panel (18) which enables the control panel (18) to be articulated vertically while maintaining a substantially constant angle of inclination, the articulation mechanism (30) further enabling the control panel (18) to move closer to said vertical plane in the highest position and further from said vertical plane in the lowest position, and wherein the articulation mechanism comprises a four bar linkage defined by four pivot points (A, B, A', B') defining the corners of a parallelogram, two of the pivot points (A, B) being coupled to the control panel (18) and the other two of the pivot points (A', B') being coupled to the cart.

2. The cart-borne ultrasound system (10) of claim 1, wherein the articulation mechanism (30) enables the control panel (18) to be articulated independently of the display (16).

3. The cart-borne ultrasound system (10) of claim 1, further comprising a hydraulic piston (60) for supporting the weight of the four bar linkage.

4. The cart-borne ultrasound system (10) of claim 1, further comprising a counterbalance (40) coupled to the cart and to the control panel (18) to support at least some of the weight of the control panel (18) when the height of the control panel (18) is adjusted.

5. The cart-borne ultrasound system (10) of claim 1, wherein the articulation mechanism (30) comprises a lift mechanism (32, 34) which moves the control panel (18) in a direction which is at an acute angle with respect to vertical.

6. The cart-borne ultrasound system (10) of claim 6, wherein the lift mechanism (32, 34) raises and lowers the control panel (18) in a straight line direction.

7. The cart-borne ultrasound system of claim 6, wherein the lift mechanism is motor driven.

8. The cart-borne ultrasound system of claim 8, wherein the ultrasound system further comprises a battery which powers the motor driven lift mechanism.

Patentansprüche

1. Wagengetragenes Ultraschallsystem (10) mit i) einem fahrbaren Wagen; elektronischen Schaltungen auf dem Wagen, die Ultraschallsignale verarbeiten, um Ultraschallbilder zu erzeugen; und einer Anzeigevorrichtung (16), die sich in einer vertikalen Ebene erstreckt und mit den Schaltungen gekoppelt ist, um Ultraschallbilder anzuzeigen, wobei das Ultraschallsystem Folgendes umfasst:

   - ein mit den elektronischen Schaltungen gekoppeltes Steuerpult (18) zur Steuerung des Ultraschallsystems (10) durch den Benutzer; und
   - einen an dem Wagen angebrachten und mit dem Steuerpult (18) gekoppelten Gelenkmechanismus (30), der eine freie vertikale Bewegung des Steuerpults (18) ermöglicht, während er gleichzeitig einen im Wesentlichen konstanten Neigungswinkel aufrechterhält, wobei der Gelenkmechanismus (30) es ferner dem Steuerpult (18) möglich macht, sich in der höchsten Position näher an die genannte vertikale Ebene heran zu bewegen und in der niedrigsten Position weiter von der genannten vertikalen Ebene weg zu bewegen, und wobei der Gelenkmechanismus ein Vier-Stangen-Gestänge umfasst, das durch vier Drehpunkte (A, B, A', B') definiert ist, die die Ecken eines Parallelogramms definieren, wobei zwei der Drehpunkte (A, B) mit dem Steuerpult (18) gekoppelt sind und die beiden anderen Drehpunkte (A', B') mit dem Wagen gekoppelt sind.

2. Wagengetragenes Ultraschallsystem (10) nach Anspruch 1, wobei der Gelenkmechanismus (30) ermöglicht, dass das Steuerpult (18) unabhängig von der Anzeigevorrichtung (16) frei beweglich ist.

3. Wagengetragenes Ultraschallsystem (10) nach Anspruch 1, weiterhin mit einem Hydraulikkolben (60) zum Tragen des Gewichts des Vier-Stangen-Gestänges.

4. Wagengetragenes Ultraschallsystem (10) nach Anspruch 1, weiterhin mit einem Gegengewicht (40), das mit dem Wagen und dem Steuerpult (18) gekoppelt ist, um mindestens das Gewicht des Steuerpults (18) zu tragen, wenn die Höhe des Steuerpults (18) eingestellt wird.

5. Wagengetragenes Ultraschallsystem (10) nach Anspruch 1, wobei der Gelenkmechanismus (30) einen Hubmechanismus (32, 34) umfasst, der das Steuerpult (18) in einer Richtung bewegt, die in einem spitzen Winkel zu der Vertikalen verläuft.

6. Wagengetragenes Ultraschallsystem (10) nach Anspruch 6, wobei der Hubmechanismus (32, 34) das Steuerpult (18) in geradliniger Richtung anhebt und absenkt.

7. Wagengetragenes Ultraschallsystem nach Anspruch 6, wobei der Hubmechanismus durch einen Motor angetrieben wird.

8. Wagengetragenes Ultraschallsystem nach Anspruch 7, wobei das Ultraschallsystem weiterhin eine Batterie umfasst, die den motorgetriebenen Hubmechanismus mit Energie versorgt.

Revendications

1. Système de chariot à ultrasons (10) comprenant i) un chariot mobile; des circuits électroniques étant situés sur le chariot qui traitent des signaux ultrasonores pour la formation d'images ultrasonores et un dispositif d'affichage (16) s'étendant dans un plan vertical et étant couplé aux circuits pour l'affichage des images ultrasonores, comprenant:

   - un panneau de commande qui est couplé aux circuits électroniques pour la commande d'utilisateur du système à ultrasons (10); et
   - un mécanisme d'articulation (30) étant monté sur le chariot et étant couplé au panneau de commande (18) qui permet que le panneau de

commande (18) soit articulé verticalement alors qu'il est maintenu un angle sensiblement constant d'inclinaison, le mécanisme d'articulation (30) permettant encore que le panneau de commande (18) se déplace plus proche dudit plan vertical dans la plus haute position et, de plus, à partir dudit plan vertical dans la plus basse position, et dans lequel le mécanisme d'articulation comprend une liaison de quatre barres qui est définie par quatre points pivotants (A, B, A', B') définissant les coins d'un parallélogramme, deux des points pivotants (A, B) étant couplés au panneau de commande (18) et les autres deux des points pivotants (A', B') étant couplés au chariot.

2. Système de chariot à ultrasons (10) selon la revendication 1, dans lequel le mécanisme d'articulation (30) permet que le panneau de commande (18) soit articulé indépendamment du dispositif d'affichage (16).

3. Système de chariot à ultrasons (10) selon la revendication 1, comprenant encore un piston hydraulique (60) pour supporter le poids de la liaison de quatre barres.

4. Système de chariot à ultrasons (10) selon la revendication 1, comprenant encore un contrepoids (40) qui est couplé au chariot et au panneau de commande (18) pour supporter au moins quelque poids du panneau de commande (18) lorsque la hauteur du panneau de commande (18) est ajustée.

5. Système de chariot à ultrasons (10) selon la revendication 1, dans lequel le mécanisme d'articulation (30) comprend un mécanisme de levage (32, 34) qui déplace le panneau de commande (18) dans une direction qui se situe sous un angle aigu par rapport à la verticale.

6. Système de chariot à ultrasons (10) selon la revendication 6, dans lequel le mécanisme de levage (32, 34) soulève et abaisse le panneau de commande (18) dans une direction de ligne droite.

7. Système de chariot à ultrasons selon la revendication 6, dans lequel le mécanisme de levage est entraîné par un moteur.

8. Système de chariot à ultrasons selon la revendication 8, dans lequel le système à ultrasons comprend une batterie qui met sous tension le mécanisme de levage entraîné par un moteur.

FIG. 1

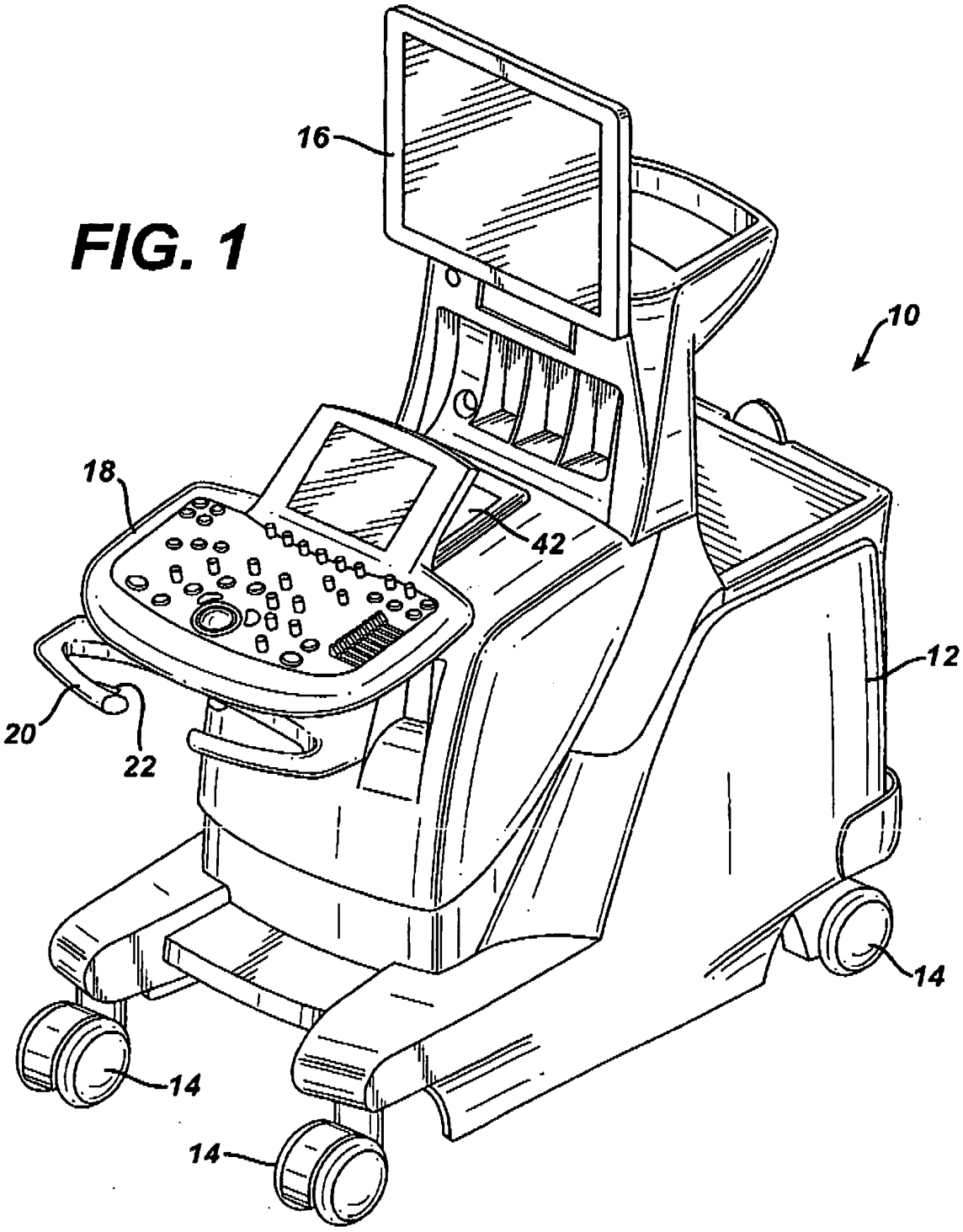
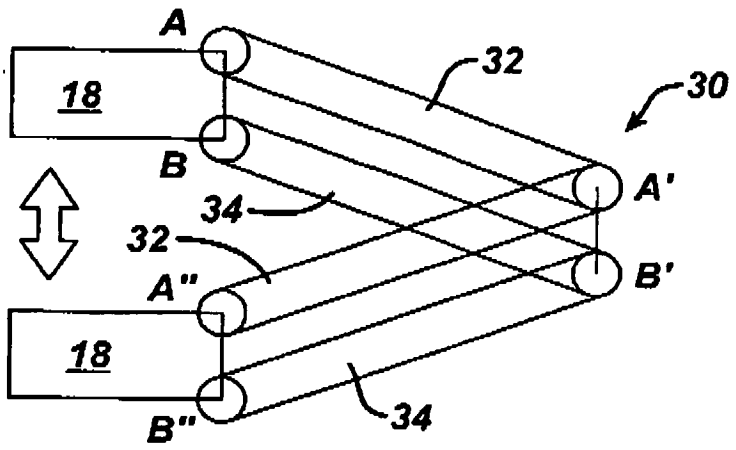


FIG. 2



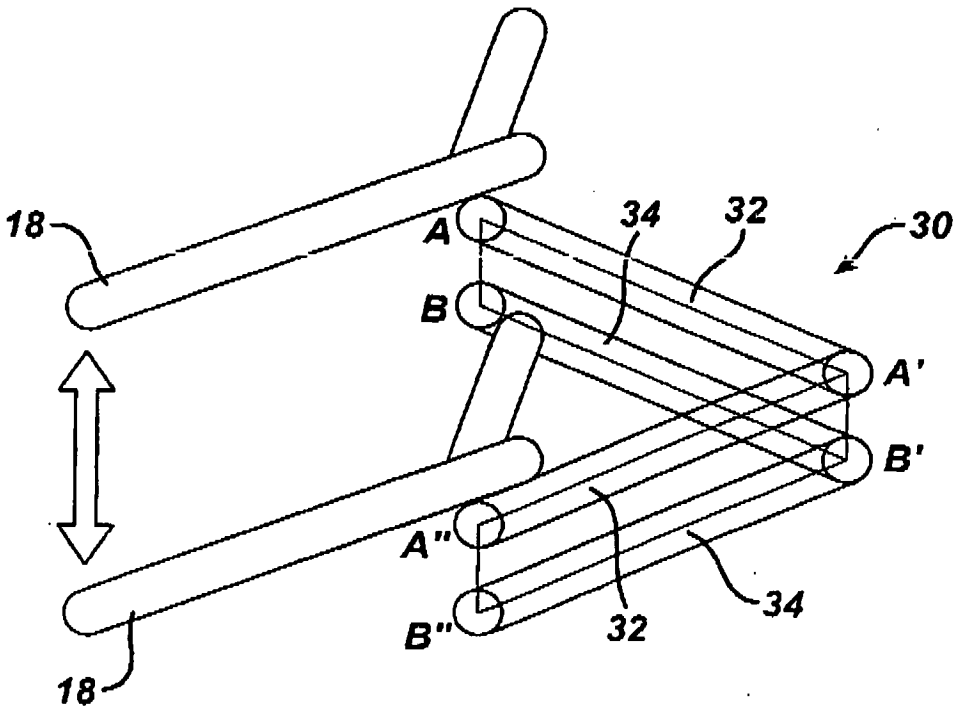


FIG. 3

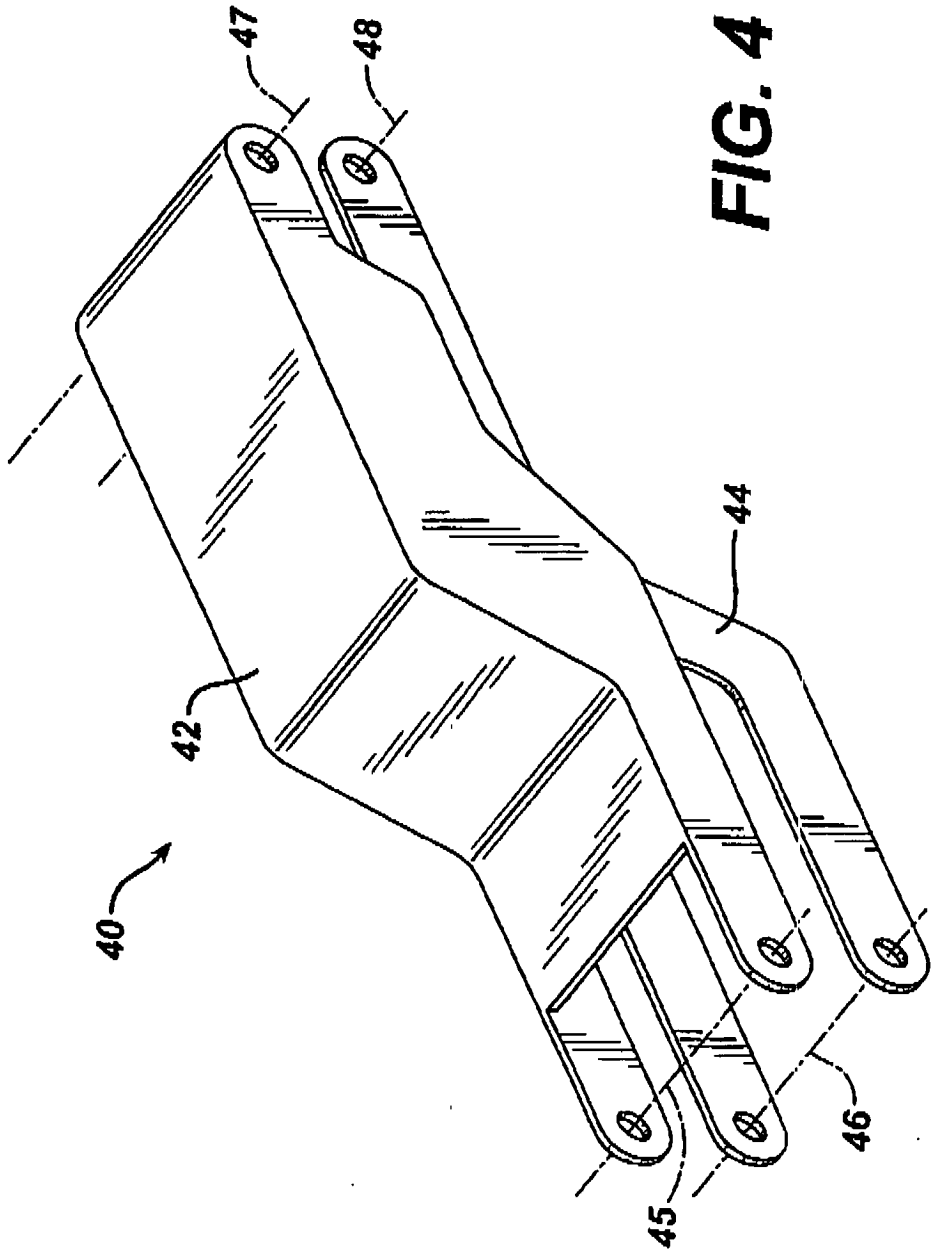


FIG. 4

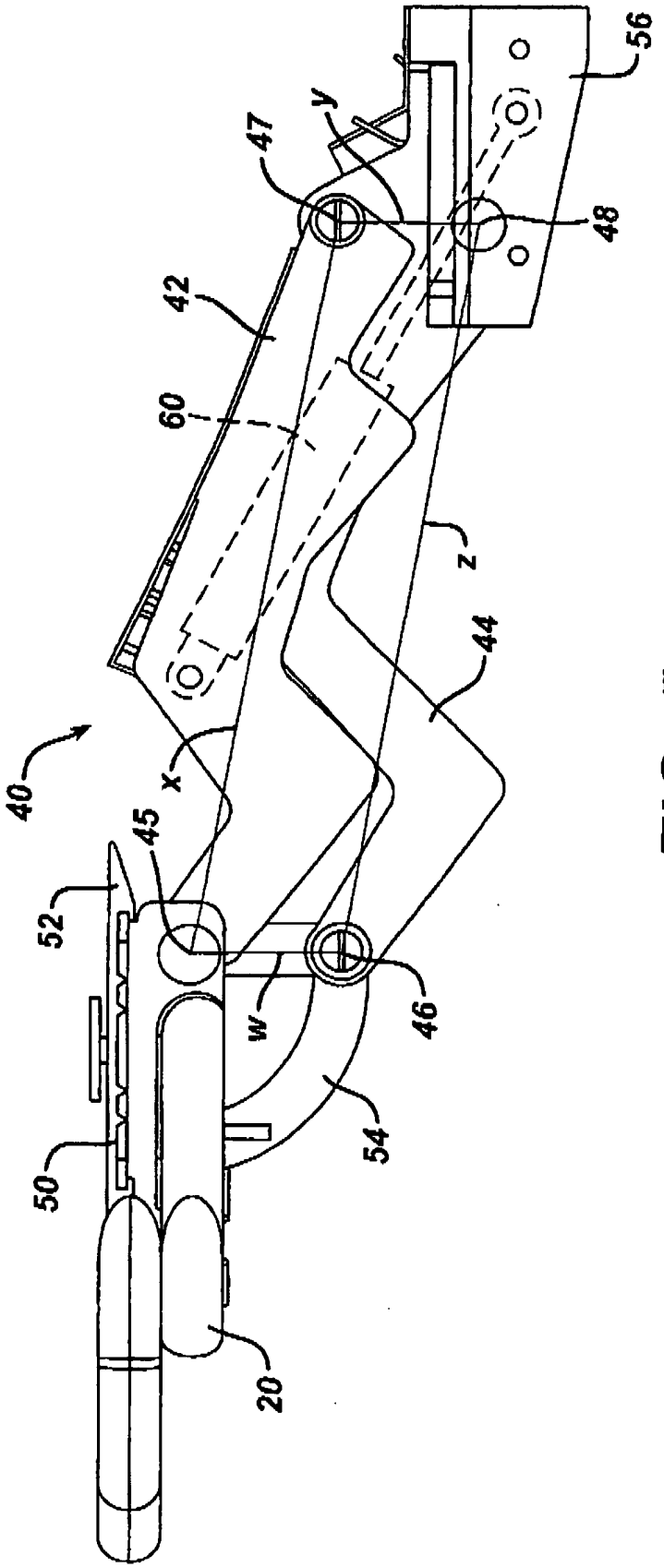


FIG. 5a

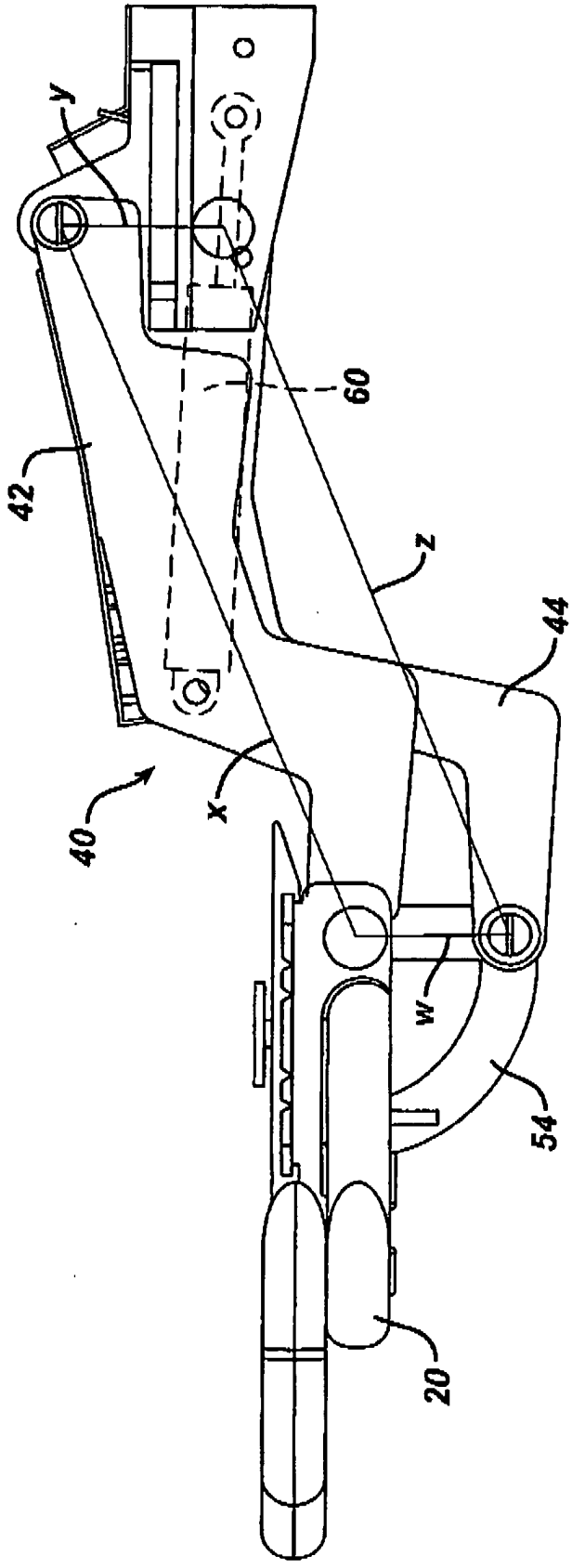


FIG. 5b

专利名称(译)	检查超声波系统推车带可变高度控制面板		
公开(公告)号	EP1509138B1	公开(公告)日	2008-11-05
申请号	EP2003727829	申请日	2003-05-21
[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
申请(专利权)人(译)	皇家飞利浦电子N.V.		
当前申请(专利权)人(译)	皇家飞利浦电子N.V.		
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发明人	WILKINS, JAY MESAROS, ROBERT MATSUI, YAS LORD, RANDALL, D. MURKOWSKI, JOHN, R. HOLLMAN, WILLIAM RANKERS, ULRICH		
IPC分类号	A61B8/00 A47B21/03 G01S15/89 G06F3/02 G01S7/521		
CPC分类号	A61B8/4405 A61B8/00 F16M11/046 F16M11/048 F16M11/18 F16M11/2092 F16M11/24 F16M11/42 F16M2200/021 F16M2200/044 F16M2200/063 G01S7/52079 G01S15/899		
优先权	10/154733 2002-05-23 US		
其他公开文献	EP1509138A1		
外部链接	Espacenet		

摘要(译)

描述了一种车载超声系统，其包括保持超声系统的电子电路的便携式推车，用于控制超声系统的控制面板和显示器。控制面板由铰接机构支撑，该铰接机构使得控制面板能够升高和降低以适应不同高度的操作者，并且使控制面板能够朝向和远离用户移动以适应坐着或站立位置的用户。在一个优选实施例中，铰接机构包括平行四边形形状的连杆，当控制板升高和降低时，该连杆也保持控制板的恒定倾斜角度。