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(54) **Title:** SUPPORT APPARATUS

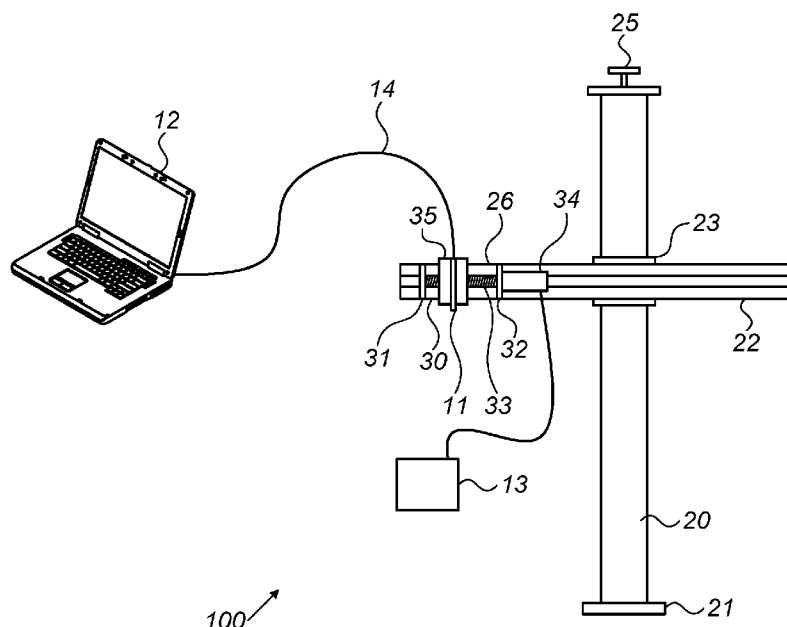


FIG. 2

(57) **Abstract:** A support apparatus for an ultrasound probe head, the support apparatus comprising a support arm, the support arm being adjustable and having an ultrasound probe head mount to receive an ultrasound probe head, the ultrasound probe head mount comprising a resilient holder to receive an ultrasound probe, and an actuator to controllably move the ultrasound probe head mount.



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Title: Support Apparatus

[1] The present application relates to a support apparatus for an ultrasound probe head, an ultrasound apparatus including a support apparatus and an ultrasound system, and a method of scanning the temporal artery of a patient, particularly but not exclusively for providing ultrasound images for use in the diagnosis of giant cell arteritis ("GCA").

Background to the Invention

[2] Ultrasound is a widely known and used technique for medical imaging and diagnosis, and it has been proposed to use ultrasound to diagnose patients with active GCA and to monitor their treatment. Giant cell arteritis is a form of vasculitis, or inflammation of arteries, usually in the head and neck. Untreated, the condition can result in loss of vision, and the usual treatment is steroid medication. The standard technique used in diagnosis is a biopsy of the temporal artery, but this has disadvantages. A biopsy is necessarily invasive and, since the inflammation is not uniformly distributed, there may be unaffected areas of the temporal artery, which means that a sufficient length of artery is removed to avoid missing the areas of abnormality. In addition, a biopsy requires the involvement of a surgeon, a surgical theatre, and a pathology department to process the samples and typically a delay before the result is known of 5 to 10 days from the sample being taken. Unfortunately, if steroid treatment is not started and the patient does actually have the disease, there is a 20% risk of permanent blindness. Therefore this is a medical emergency, and treatment with steroids has often already started by the time the biopsy is performed, and usually before the results are received; however, in temporal artery sampling, active inflammation in giant cell arteritis disappears within a few days of steroid treatment. In addition, not all patients with GCA respond to treatment in the same way, but there are no valid biomarkers to assess therapy response or to diagnose relapse. Changes in the traditional inflammatory markers (CRP and ESR) do not consistently reflect disease activity, but recent evidences have shown correlation between ultrasound changes and clinical response, potentially making ultrasound a very useful tool for monitoring disease activity.

[3] The use of ultrasound to diagnose GCA is already established, where the presence of a halo indicates that the patient has the diagnosis. Ultrasound imaging offers the prospect of

improved diagnosis and monitoring, because it can be performed on several occasions at onset and during subsequent follow up. Ultrasound can be used to assess a longer length of artery compared to the relatively small proportion removed in a biopsy (which is usually only performed on one occasion). Ultrasound examination can provide an immediate answer and could be performed before the patient started steroid treatment. If ultrasound imaging can be used to provide a rapid confident diagnosis of GCA, unnecessary steroid use in patients who do not have any evidence of GCA could be avoided, in addition to preventing patients from undergoing a potentially invasive procedure of temporal artery biopsy when the diagnosis could be made using the ultrasound test.

[4] A particular problem with ultrasound is that of consistency and training. It is necessary to have the ultrasound scanning carried out by a highly trained sonographer, who is able to properly control the ultrasound probe and interpret the results correctly. This necessarily introduces a subjective component to the test, and also means that repeated tests could be variable and potentially inconsistent. As such, at present the use of ultrasound is limited to a few centres where high expertise is maintained by high throughput and training.

Summary of the Invention

[5] According to a first aspect of the invention there is provided a support apparatus for an ultrasound probe head, the support apparatus comprising a support arm, the support arm being adjustable and having an ultrasound probe head mount to receive an ultrasound probe head, the ultrasound probe head mount comprising a resilient holder to receive an ultrasound probe head, and an actuator to controllably move the ultrasound probe head mount.

[6] The ultrasound probe head mount may hold a probe in a downwardly directed position.

[7] The actuator may be operable to move the ultrasound probe head mount in a substantially horizontal direction

[8] The support part may be vertically adjustable.

[9] The resilient holder of the ultrasound probe head mount may comprise a deformable material to permit movement of the probe head

[10] The deformable material may comprise a foam material.

[11] The support apparatus may further comprise an operator control to control movement of the ultrasound probe head mount.

[12] According to a second aspect of the invention there is provided an ultrasound apparatus comprising a support apparatus according to the first aspect of the invention and an ultrasound system, the ultrasound system comprising an ultrasound probe head and an ultrasound controller connected to the ultrasound probe head, wherein the ultrasound probe head is supported by the ultrasound probe head mount.

[13] The ultrasound controller may be operable to take ultrasound images at physically spaced intervals.

[14] The spaced intervals may be approximately 1 mm intervals.

[15] According to a third aspect of the invention there is provided a method of scanning the temporal artery of a patient using an ultrasound apparatus according to the second aspect of the invention, comprising adjusting the support arm such that the ultrasound probe head is located over the temporal artery, operating the actuator to move the ultrasound probe head, and operating the ultrasound controller to capture a plurality of spaced images.

Brief Description of the Drawings

[16] An embodiment of the invention is described by way of example only with reference to the accompanying drawings, wherein;

[17] Figure 1 is a side view of an apparatus embodying the present invention,

[18] Figure 2 is a front view of the apparatus of figure 1,

[19] Figure 3 is an image of part of the apparatus of figure 1 in use showing an ultrasound probe support head,

[20] Figure 4 is a flow chart illustrating a method of use of the apparatus of figure 1, and

[21] Figure 5 is a diagram of an alternative apparatus embodying the present invention.

Detailed Description of the Preferred Embodiments

[22] With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[23] Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is applicable to other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

[24] Referring to figures 1 and 2, a support apparatus is shown at 10 in figure 1 and an ultrasound apparatus is generally shown at 100 in figure 2 including the support apparatus 10. The ultrasound apparatus 100 comprises an ultrasound system which has an ultrasound probe head 11 and a controller 12, and an operator control 13, as will be discussed in more detail below. The ultrasound probe head 11 is connected to the controller 12 by a suitable cable generally shown at 14. As seen in figure 1, the support apparatus 10 comprises an upright 20 mounted on a base 21. Advantageously, base 21 may be provided with wheels or castor to enable easy repositioning of the apparatus. A support arm is shown generally at 22, in this example comprising a profiled beam for easy attachment and connection to various parts of the apparatus, but it will be apparent that the support arm 22 may be constructed as desired. A bracket 23 is slidably mounted on the upright 20 and is vertically movable by means of adjustment element 24. In this example the adjustment element 24 comprises a threaded rod rotatably received in a threaded aperture in the bracket 23 and a manually adjustable handle 25 at a top end thereof to permit the adjustment of the height of bracket 23 and support arm 22. The support arm 22 may be fixedly mounted to bracket 23 or may be slidably

movable relative thereto, or may be rotatably mounted, for example about an axis substantially perpendicular to the upright 20, to allow for rotation in the plane of the image of figure 2.

[25] One end of the support arm 22 is provided with an ultrasound probe head support generally shown at 26. In this example, the ultrasound probe head support comprises a base part 30 provided with means for connection to the arm 22, provided at each end with walls 31, 32 extending outwardly from the base 30. Actuator rod 33 extends between and is supported by walls 31, 32 and is able to rotate relative thereto. Actuator 34 is connected to the actuator rod 33 and is fixed to the end wall 32. The actuator 34 in this example comprises an electric motor controllable through the operator control 13, to rotate the actuator rod 33. An ultrasound probe head mount is shown provided at 35. In this example ultrasound probe head mount 35 is supported on and movable relative to the base 30, and has a threaded aperture (not shown) to receive the actuator rod 33. Operation of the actuator 34 causes rotation of the rod 33 and linear movement of the ultrasound probe head mount 35 in a direction parallel to the support arm 22.

[26] Referring now to figure 3, an example of an ultrasound probe head mount 35 is generally shown in more detail. In this example, the ultrasound probe head mount 35 comprises a C-shaped block 36 supported on a travelling mount 37 which is slidably movable on rails 38 and which engages the actuator rod 33. To provide a resilient mount, the block 36 has a shaped deformable element 39 which holds the ultrasound probe head 11 at a desired general orientation and position whilst allowing a degree of vertical movement. The deformable element 39 may comprise a suitable foam material. Advantageously, the deformable element may be shaped to accommodate ultrasound probe heads from different manufacturers. In this example, that the ultrasound probe head is held in place by flexible straps 40 extending between suitable loops 41, sufficient to hold the ultrasound probe head 11 in place while still permitting a degree of vertical movement. In general, the ultrasound probe head mount 35 should preferably allow for movement of the ultrasound probe head 11 to accommodate variations in the patient anatomy and bone structure, during lateral movement of the ultrasound probe head as discussed below, while still allowing the ultrasound probe head 11 to be maintained with the appropriate orientation and degree of

contact. Any other resilient mount may be used, such as a spring-biased mechanical connection between the block 36 and ultrasound probe head 11.

[27] By operating the operator control 13, the actuator 34 can cause the ultrasound probe head mount 35 and hence the ultrasound probe head 11 to move in a straight line, at a constant speed, whilst the ultrasound controller 12 takes a series of images at appropriate intervals, which may be equal or otherwise. In the present example, the images are physically spaced by 1 mm, but other spatial and temporal distribution of the images can be selected as desired. The spacing of the images can be determined by simply capturing images at a given time interval, assuming the speed of the ultrasound probe head mount 35 is known, or there may be a position sensor provided on the ultrasound probe head support which is connected to the controller 12 to indicate when images should be captured, or any other suitable trigger responsive to operation of the actuator 34 or the ultrasound probe head mount 35. Further alternatively, the controller 12 may be operable to control movement the actuator 34 to move the probe head mount 35 to a desired position, and then capture an image when the ultrasound probe head is stationary.

[28] The controller 12 may be operable to analyse the captured images, or the images may be supplied to a separate analysis system for concurrent or subsequent review, using any suitable approach. For example, to identify giant cell arteritis (GCA) and other similar conditions found in blood vessels, one potential approach is using machine learning techniques based on known images and documented cases held in a suitable database and to use ultrasound images to characterise the findings in the tissue surrounding the blood vessel walls as well as changes to blood flow through the vessel or changes in vessel characteristics such as stenosis (narrowing), occlusion or widening. Characteristics of a temporal artery with vasculitis include a dark halo around the artery wall with a width of approximately 0.3-0.4 mm, which is a specific indicator. Other features, such as an increase in the blood flow, presence of turbulence, and aliasing are indirect signs of stenosis, which may be correlated to inflammation of the arteries (vasculitis) but are less specific. When the disease is very severe an occlusion of the artery may occur. In an axillary artery with vasculitis, a dark halo around the artery wall with a width greater than 1.5 mm is a definite halo and greater than 1.0 mm represents a possible halo. Other features, such as the presence of stenosis and occlusions may occur due to the vasculitis. By training the software using labelled cases from

a database including images showing these characteristics, a program can then automatically identify features from the images which, statistically, best describe and demarcate both positive and negative cases of GCA. From this database, a generalised machine learned rule can be applied to future scans, for example in a similar way to known face detection algorithms.

[29] The general method of use is hence illustrated in figure 4. At step 50, the operator positions the patient and ultrasound device, and starts operation of the apparatus 100. At step 51, the controller 12 or operator control 13 operates the actuator 34 to move the ultrasound probe head 11. At step 52, the controller 12 captures an image from the ultrasound probe head 11 and stores it, as shown at step 53. At step 54, if the scan is not complete the actuator 34 is further operated and a further image captured as discussed above. At step 55, once the scan is complete, the captured images can be analysed, for example using reference images or analysis rules held in a database 56.

[30] An alternative support apparatus is shown at 10' in figure 5. Instead of the linear arm 22, the apparatus 10' comprises a flexing arm 60. The flexing arm 60 has a first arm section 61 and a second arm section 62 connected through an elbow joint 63. A first end section 64 pivotally supports the first arm section 61 and has a mount 65 to enable the apparatus 10' to be secured to a suitable support. Second end section 66 supports a resilient probe head support 67 to hold an ultrasound probe head 11. In known manner, the elbow joint 63 may include interconnections so that the angles between the elbow joint 63 and first arm section 61, and between the elbow joint 63 and second arm section 64, remain equal, and the orientation of the second end section 66 and hence the ultrasound probe head 11 remains constant throughout movement of the arm 60. To permit flexibility in positioning and movement, the arm 60 may be mounted to pivot about a vertical axis through mount 65, and the probe head support may be rotatable about a generally horizontal axis. Although not shown, one or more suitable actuators may be provided to control the movement and positioning of the arm 60 and probe head support 67.

[31] In use, as shown in figure 3 the patient is placed on a patient support surface in a suitable posture, this example recumbent with the head turned to one side. Gel or a gel pad is applied to the patient's skin to ensure that there is a sufficient layer to prevent discomfort,

but also to allow good contact with the probe as it moves up or down (distally or proximally) along the length of the artery. The support arm 22 is adjusted using bracket 23 to position the ultrasound probe head support 26 at an appropriate and comfortable height. In figure 3, the ultrasound probe head 11 is located at the start of the patient's left temporal artery. By operating the operator control 13, the actuator 34 can cause the ultrasound probe head mount 35 and hence the ultrasound probe head 11 to move in a straight line, at a constant speed, whilst the ultrasound controller 12 takes a series of images at appropriate intervals. In the present example, the images are physically spaced by 1 mm, but other spatial and temporal distribution of the images can be selected as desired. The spacing of the images can be determined by simply capturing images at a given time interval, assuming the speed of the ultrasound probe head mount 35 is known, or there may be a position sensor provided on the ultrasound probe head support which is connected to the controller 12 to indicate when images should be captured, or any other suitable trigger responsive to operation of the actuator 34 or the ultrasound probe head mount 35.

[32] The support apparatus thus allows an operator to position the ultrasound probe 11 in the optimal place to acquire images of the artery, either at the most proximal position, just in front of the ear, or over the temple, above the ear. In a conventional system, the operator would need to hold the probe manually and then move it along the course of the artery at a steady pace in order to acquire images and video along the length of the vessel. It is not easy to manually move the probe at a set pace whilst keeping the probe in a linear path, as well as ensuring that the probe is kept in constant contact with the gel with the same amount of pressure, and allowing for variation in facial contours. If the probe is pressed too lightly, the signal is lost or distorted. If the probe is pressed too hard, this may cause discomfort, distort the image and may even occlude the vessel, leading to complete loss of signal. By contrast, in the present embodiments the actuator 34 can be set to move the ultrasound probe head 11 at a fixed rate in a straight line. The movement of the probe head is thus standardized, and will be consistent each time the support apparatus is used. Although the examples of the support apparatus shown above move the probe head in a substantially horizontal direction, it will be apparent that the support apparatus may be configured or positioned to provide movement of the probe head in an inclined or substantially vertical direction as most suitable for the particular target area to be scanned.

[33] The resilient mount which means that when the probe is placed against the patient's skin, slight pressure is exerted by the support apparatus onto the probe head, so that any contours of the patients head and face are followed closely. This ensures that the probe head remains in contact with the gel or gel pad and that the image obtained is adequate throughout the length of the artery. A further advantage is that the image data can be transformed into a 3-dimensional view. This would allow information about abnormalities that are either symmetrically or asymmetrically distributed along the length of the artery to be recorded.

[34] Use of the support apparatus means that scans can be repeated, such that it is possible to reproducibly measure the same area of artery so any changes in response to treatment given can be assessed. The 3-D information may be used for determining further risks to the patient, particularly of developing complications from GCA, either in the short term (e.g. loss of vision or stroke) or the long term (e.g. risk of aortic aneurysms in the future).

[35] Example of other uses of the apparatus can include scans of hand and wrist joints. For the assessment of the hand joints, each hand is scanned separately. The palmar surface of the hand will be faced down and a layer of gel applied to the metacarpophalangeal joints (MCPs), and proximal and distal interphalangeal joints (PIPs and DIPs) to allow the contours of the joints to become more harmonized and easier to scan. The apparatus is then controlled to make the probe move in a horizontal direction from the lateral to the medial region of the hand. Initially, it will place the probe on the 5th MCP longitudinally across the joint space and it will scan towards the 1st MCP in a linear movement. This will be repeated 4 times, taking approximately 3 minutes per sweep. The probe will then move to the PIPs and the same procedure will be performed. Depending on the condition to be assessed, the probe may also be moved to the DIPs. For each joint the initial 2 longitudinal scans will only be done using B-Mode to assess grey scale synovitis, and the other two longitudinal scans will be performed using power Doppler to assess the presence of active inflammation or synovitis.

[36] If there is any query regarding the presence of joint erosions or the need for their monitoring, a transverse scanning of the hand joints can also be performed, as follows. After the longitudinal scanning, the probe will be placed again on the 5th MCP, but now on a transverse plane over the joint, and through the mechanical arm, the probe will be moved distally towards the 5th PIP (or DIP, depending on the disease assessed). This linear

movement will be repeated 2 times only using B-mode and taking approximately 1 minute per sweep. The same procedure will be repeated on the rest of the fingers.

[37] To image a wrist joint, the patient will need to have the hand palm faced down in pronation. The probe will be placed on a transverse view over the dorsal aspect of the wrist to allow proper identification of the extensor tendons. The mechanical arm will move laterally with the probe until the 6 tendon compartments are identified. Power Doppler will be used in the last sweep to assess the presence of active inflammation/synovitis. The apparatus will then be rotated the probe to allow a longitudinal view and, therefore, the evaluation of each tendon's integrity in a linear motion. The last sweep will be performed using power Doppler to assess the presence of active inflammation/synovitis. To image the volar aspect of the wrist, the patient will rotate the dorsal wrist to face the examination table. The mechanical arm will place the probe transversely at the wrist crease, and will allow some tilting of the probe, back and forth, to optimize depiction of the soft-tissues contained within the carpal tunnel. It will then move proximally, to the musculo-tendinous junctions, and distally to the tendons insertions. This movement will allow the evaluation of the median nerve, assessing the presence of the common carpal tunnel syndrome, and the ulnar nerve, assessing its integrity. The apparatus will then be rotated to move the probe to a longitudinal view and perform two sweeps to assess the integrity of the tendons and surrounding structures.

[38] Although the apparatus described above has been particularly described with reference to GCA, and imaging of the metacarpophalangeal and proximal interphalangeal joints of fingers to evaluate synovitis in patients with inflammatory joint disease, there are many other potential uses. Other potential areas to access and image would include other tendons, looking for tendon tears, other peripheral arteries to look for evidence of atherosclerosis, and peripheral veins to look for evidence of clotting or venous incompetence. Other vessels, such as the carotid, vertebral, axillary, subclavian, humeral, radial, ulnar, femoral, anterior and posterior tibial and peroneal arteries, as well as the abdominal aorta, could also be scanned to diagnose and monitor large-vessel vasculitis or other disorders of the vessels such as atherosclerosis, fibromuscular dysplasia, heritable disorders of connective tissue (e.g. Marfan's syndrome), etc. This automated ultrasound system could also be used to screen for and monitor abdominal aortic aneurysms in asymptomatic people at risk of

developing aneurysms (such as men aged 65 and over) and in patients with known large-vessel vasculitis.

[39] This apparatus may also be used to scan elbows (humeroradial, humeroulnar, proximal radioulnar joints), feet (mid-tarsal, intertarsal, tarsometatarsal, intermetatarsal, metatarsophalangeal and proximal and distal interphalangeal joints), ankles (talocrural, subtalar and inferior tibiofibular joints) and knees (tibiofemoral and patellofemoral joints) to assess the bone surfaces, cartilage, soft tissue and fluid-containing structures, allowing the diagnosis and monitoring of inflammatory arthropathies, such as rheumatoid arthritis or psoriatic arthritis, osteoarthritis, crystal associated arthropathies and others. In addition, tendons, ligaments, entheses and muscles of the lower and upper limbs could be evaluated, looking for an inflammatory process or tear. Injuries and compression of peripheral nerves, could also be assessed through this scanning device.

[40] Ultrasound examination of the abdominal organs using this automated device will also be explored. For example, its use to scan the uterus for diagnosing and monitoring pregnancy or the liver for assessing hepatic lesions (e.g. haemangiomas or cysts) will be tested.

[41] In the above description, an embodiment is an example or implementation of the invention. The various appearances of “one embodiment”, “an embodiment” or “some embodiments” do not necessarily all refer to the same embodiments.

[42] Although various features of the invention may be described in the context of a single embodiment, the features may also be provided separately or in any suitable combination. Conversely, although the invention may be described herein in the context of separate embodiments for clarity, the invention may also be implemented in a single embodiment.

[43] Furthermore, it is to be understood that the invention can be carried out or practiced in various ways and that the invention can be implemented in embodiments other than the ones outlined in the description above.

[44] Meanings of technical and scientific terms used herein are to be commonly understood as by one of ordinary skill in the art to which the invention belongs, unless otherwise defined.

CLAIMS

1. A support apparatus for an ultrasound probe head, the support apparatus comprising a support arm, the support arm being adjustable and having an ultrasound probe head mount to receive an ultrasound probe head, the ultrasound probe head mount comprising a resilient holder to receive an ultrasound probe head, and an actuator to controllably move the ultrasound probe head mount.
2. A support apparatus according to claim 1 wherein the ultrasound probe head mount holds a probe in a downwardly directed position.
3. A support apparatus according to claim 1 or claim 2 wherein the actuator is operable to move the ultrasound probe head mount in a substantially horizontal direction
4. A support apparatus according to any one of the preceding claims wherein the support arm is vertically adjustable.
5. A support apparatus according to any one of the preceding claims wherein the resilient holder of the ultrasound probe head mount comprises a deformable material to permit movement of the ultrasound probe head
6. A support apparatus according to claim 5 wherein the deformable material comprises a foam material.
7. A support apparatus according to any one of the preceding claims further comprising an operator control to control movement of the ultrasound probe head mount.
8. An ultrasound apparatus comprising a support apparatus according to any of the preceding claims and an ultrasound system, the ultrasound system comprising an ultrasound probe head and an ultrasound controller connected to the ultrasound probe head, wherein the ultrasound probe head is supported by the ultrasound probe head mount.

9. An ultrasound apparatus according to claim 8 where the ultrasound controller is operable to take ultrasound images at physically spaced intervals.
10. An ultrasound apparatus according to claim 9 wherein the spaced intervals are approximately 1 mm intervals.
11. A method of scanning the temporal artery of a patient using an ultrasound apparatus of any one of claims 8 to 10 comprising adjusting the support arm such that the ultrasound probe head is located over the temporal artery, operating the actuator to move the ultrasound probe head, and operating the ultrasound controller to capture a plurality of spaced images.

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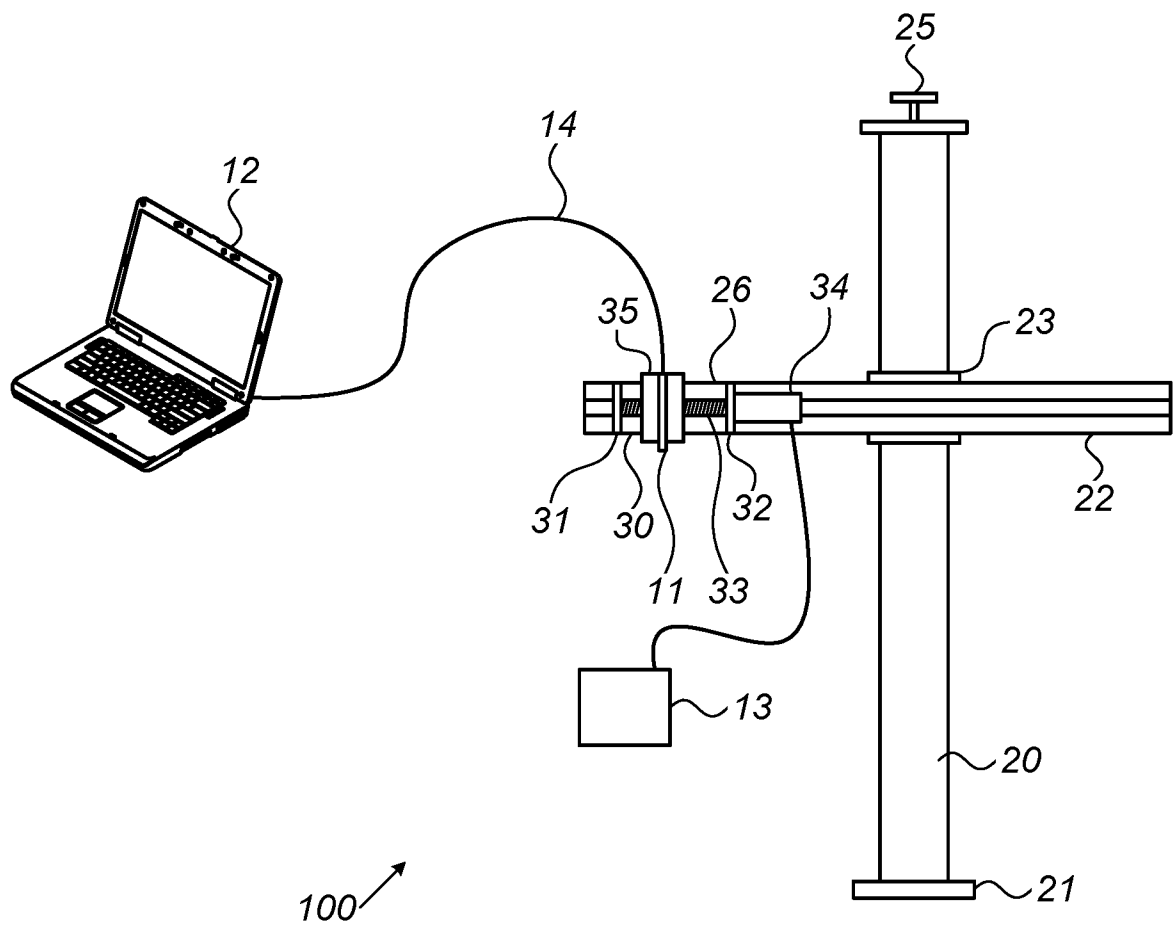
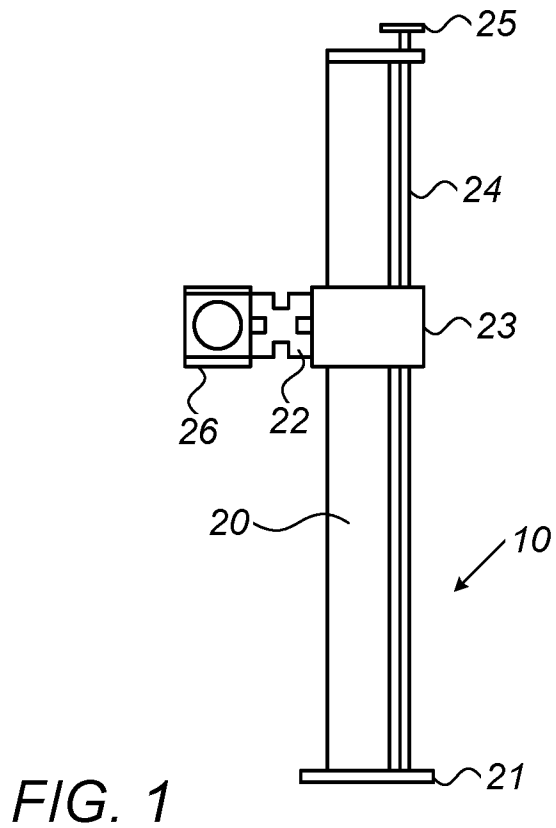


FIG. 2

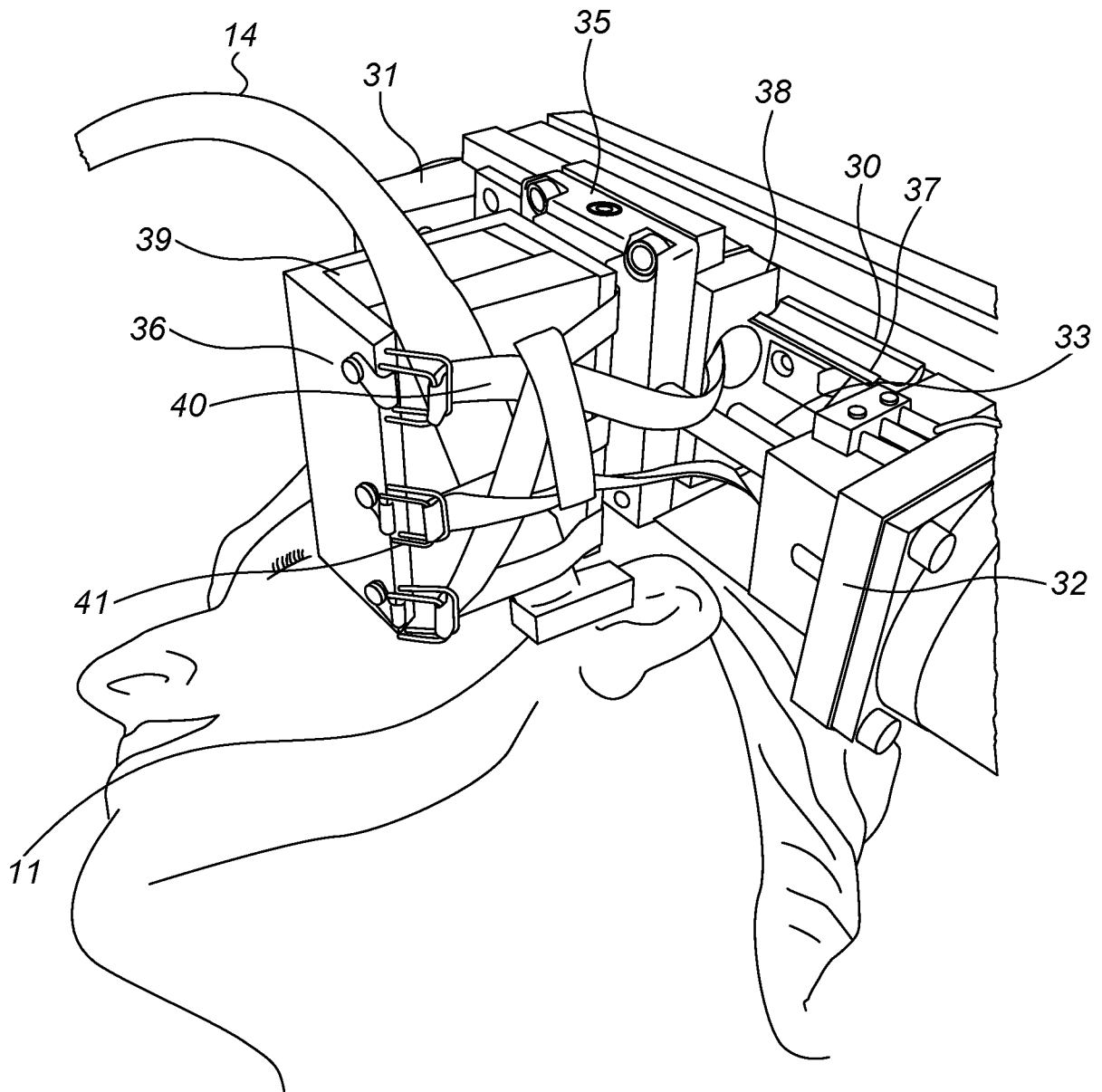


FIG. 3

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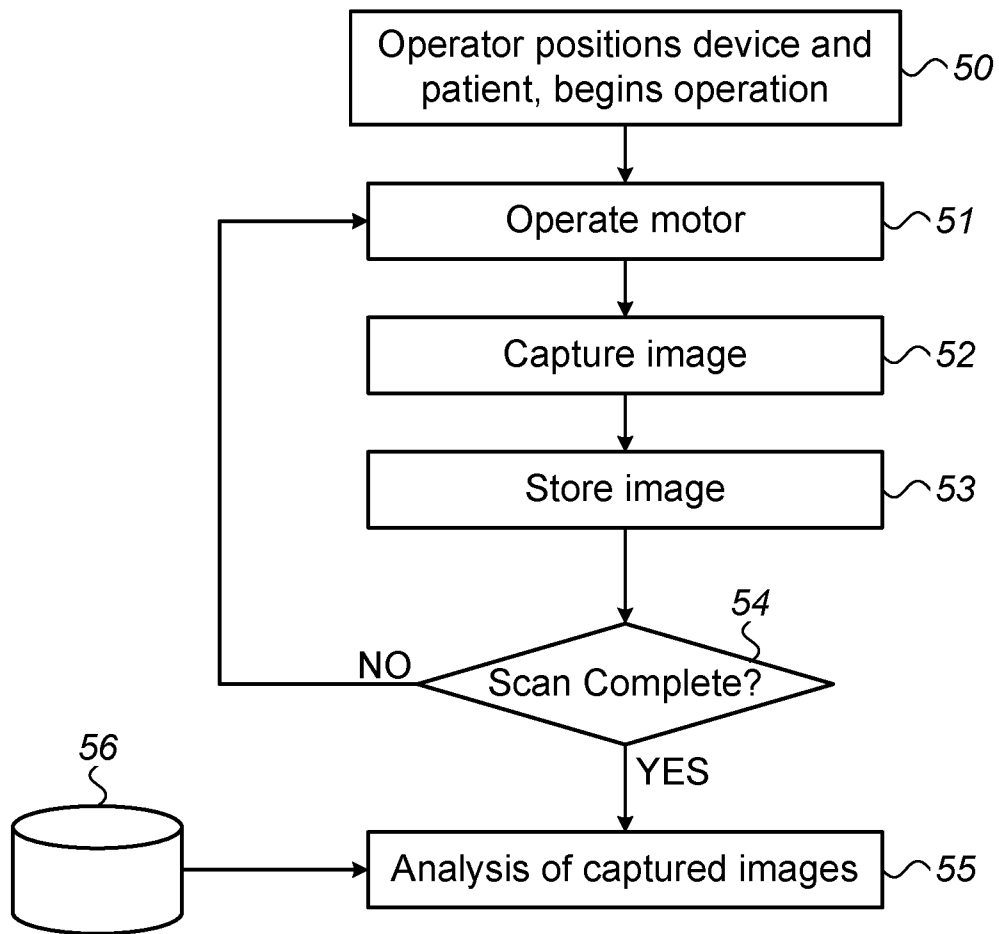
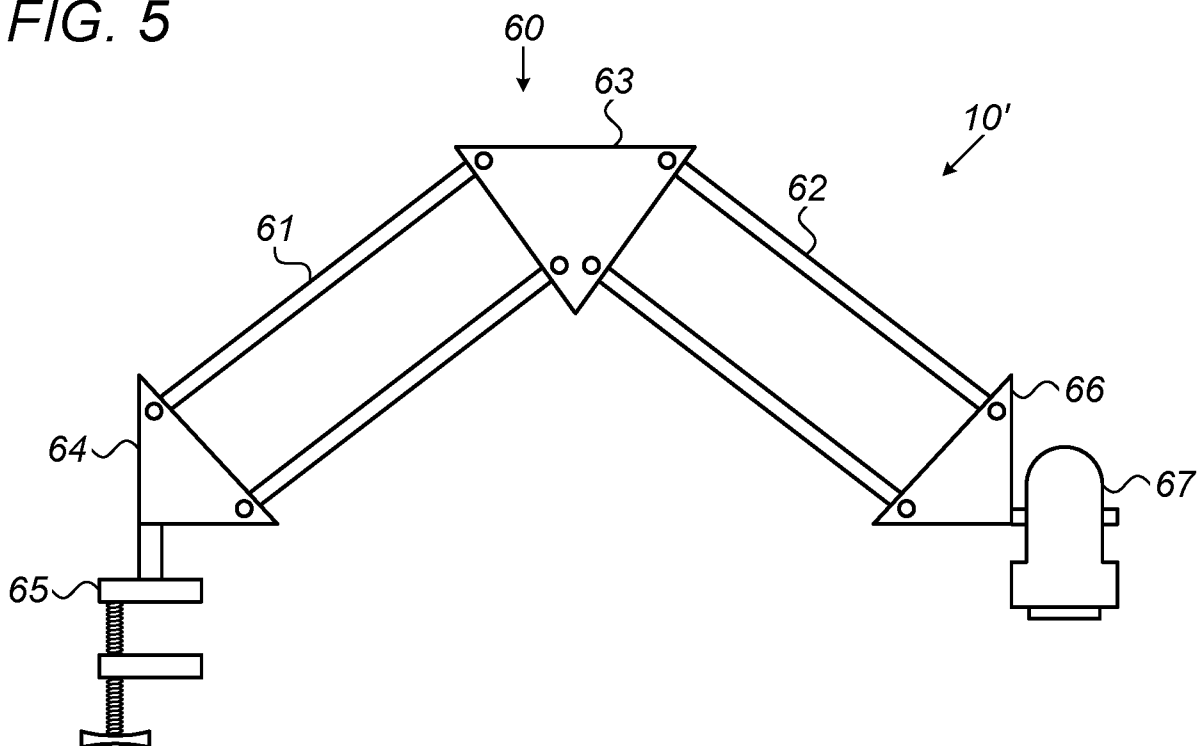


FIG. 4

FIG. 5



INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2016/053488

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B8/00 A61B8/08 F16B2/22
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2005 143783 A (ALOKA CO LTD) 9 June 2005 (2005-06-09)	1-5,7-10
Y	(70), (72), (20); paragraphs [0040], [0044], [0039]; figure 4	6,11
Y	----- WO 2007/047506 A2 (DARTMOUTH HITCHCOCK CLINIC [US]; HICKEY KATHERINE M; PARASHAR AMISH [U] 26 April 2007 (2007-04-26) page 19, line 21 - page 20, line 5; page 27, line 26 - page 28, line 6	6
Y	----- US 2014/194740 A1 (STEIN STUART [US] ET AL) 10 July 2014 (2014-07-10) paragraph [0096] ----- -/-	11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

31 August 2016

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No

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