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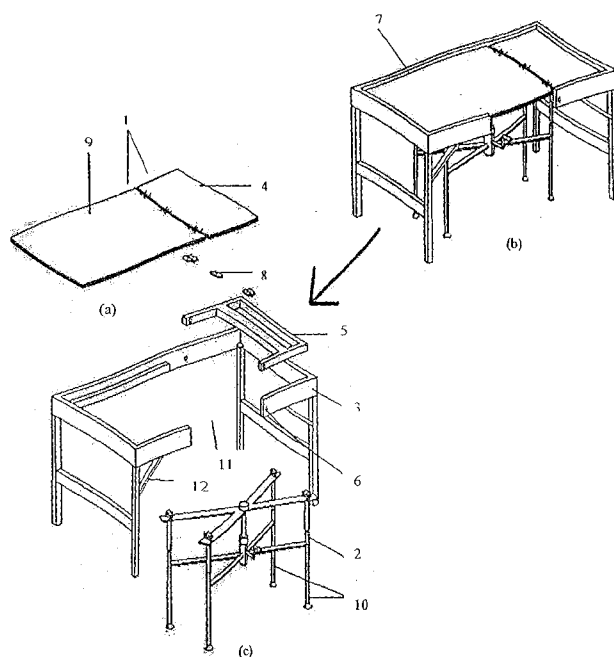
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(54) **Title:** MULTI-UTILITY HOSPITAL BED

FIGURE 1



(57) **Abstract:** A multi-utility hospital bed having inter-convertibility between bed, gurney and stretcher, said hospital bed comprising (a) a static frame (3) provided with fixed or detachable legs; (b) a dynamic frame which comprises a motion frame for movement of headrest (4) and footrest(9); (c) a stretcher frame (1) placed over the motion frame; and (d) a trolley frame(2) for mobility of stretcher frame(1); wherein the motion frame is positioned on said static frame(3), said static frame(3) acting as a base frame(3), said motion frame comprising a C-shaped frame with extrusions on either side of said base frame(3) for vertical motion of headrest (4) and footrest(9); said stretcher frame(1) being provided over said motion frame and acting as a resting base when integrated with said base frame(3) and as a gurney/stretcher without said base frame(3); said trolley frame(2) being connectable to said stretcher frame (1) to provide mobility thereto when said stretcher frame(1) is used in the gurney mode.

MULTI-UTILITY HOSPITAL BED

FIELD OF THE INVENTION

The present invention relates to a hospital bed. More particularly, the invention relates to a multifunctional hospital bed in which there is an inter-convertibility between bed, gurney and stretcher with ease which relieves the burden of the hospital staff while transferring patients without lifting them manually from bed onto a separate gurney and is safe for the patient specifically in severe slip disc and vertebral injuries and also protects the patients from infections which can arise on sharing of same stretcher or gurney.

BACKGROUND OF THE INVENTION

Hospital beds are fundamental components in the process of healing. They are required in pre-operative, operative and post operative environments. Usually, hospitals are categorized by the type and number of hospital beds they have. In other words, hospital beds constitute an integral part of the "Quality of Care" of a hospital. Hospital beds act as direct interface with patients as the patient and their family members from the time patient are admitted in the hospital till the time the patient leave are using them. Because of this, hospitals usually keep huge budgets aside for capital expenditure on beds.

During the hospital stay of the patient another common problem encountered by the patient and hospital staff is the transfer of patient to other ward or testing centre. Due to unavailability of effective transfer devices, patients are lifted manually by the hospital staff which is unsafe and inefficient. Due to such practices, patients and healthcare staff are subjected to injuries with dangers including pain, bruising, skin tears, tube dislodgement, dislocations, fractures and most importantly the possibility of being dropped by nursing staff, which caused death of at least 3% patients out of 671 adverse cases reported in USA during a span of 9 years. Although the figure seems to be small, the fact that the mere action of transferring a patient from stretcher to hospital bed has the potential to kill people itself demands attention.

In healthcare workers, this problem is severe as 87% of nurses report lower back pain. Out of those, 38% require time off and 44% amongst those are not able to return to nursing. This problem is so grave that many countries like USA, European Union Members, Australia have laws mandating the use of patient transfer aids to

shift patient rather than lifting them. This is often called the "No Lift Policy". Thus, transfer device is additional equipment added in the list for procurement by the hospital administrators, increasing their expenses.

Hospitals beds range from manual to electric. Manual beds are usually the basic bed with minimal features required to fulfill the standard conditions while electric beds come in the category of elite beds with sophisticated features and added frills.

Manual beds are mainly present in general wards and ICU of majority hospitals. Existing beds are simple mild steel/stainless steel beds having a fixed frame and adjustable CRCA sheet frame. They are equipped with a hand crank to raise and lower the head to obtain ergonomical position. These hospital beds are normally used in small nursing homes, government and private hospitals. They can be plain manual bed with no or partial head rest/foot rest movement.

Electric beds are endowed with electrical controls that take charge of all tasks of lowering and raising the head and feet as well as the adjustment of the bed's height. They are good for patients who require frequent changes in body position so that the patient can adjust the controls without an attendant.

The hospitals at present have highly skilled doctors and nurses, however many categories of health care workers are neither well qualified nor trained appropriately. Some categories of personnel who come constantly in contact with patients are ill prepared to do the job and are ignorant about the needs of the patient. The present setup of patient care is difficult to manage and problems are quite frequent and difficulty is encountered in effective coordination. For example, a seemingly small error in giving the right medicine can be life threatening for the patient as due to wrong medication the patient may be susceptible to anaphylactic shock, which in severe cases can result in death of the patient, or paralytic or comatose conditions, which renders them incapable for rest of their lives.

US Patent 1,795,435 discloses the stretchers for carrying the sick or wounded from one place to another and has as an object to providing an improved construction whereby devices of this nature may be rendered more effective in the transfer, care and treatment of the sick or wounded and whereby pain and discomfort which is due

in large measure to the shocks and jars to which the patients are subjected, may be reduced.

US Patent 3,108,290 discloses an attachment for hospital beds and the like for moving or lifting a patient on the bed. The attachments may be removed from the bed
5 for use as a portable stretcher.

US Patent 3,678,519 discloses a hospital bed having a fixed frame and a movable frame, means for moving the movable frame in parallel relationship to the fixed frame and means for obtaining at least one Trendelenburg position of the bed regardless of the relationship of the movable frame relative to the fixed frame.

10 US Patent 4,843,665 discloses a patient comfort device for use in conjunction with a hospital bed having a mattress disposed between a spaced headboard and footboard and a mechanized drive for raising and lowering the mattress.

US Patent 4,945,592 discloses an apparatus and method for transporting a medical accessory in unison with a patient transport device such as gurney, hospital
15 bed or wheel chair.

US Patent 5,054,140 discloses an attachment for a hospital bed to assist patient care personnel with the lifting and turning of bedridden patients to prevent bedsores and other ailments from occurring which arise from prolonged inactivity while in contact with bed surfaces.

20 US Patent 5,083,331 discloses a mobile patient support system including a table plate, a support column for supporting the table plate and a transport carriage for transporting the table plate.

US Patent 5,577,279 discloses an invention pertaining to a hospital bed which convert from a bed configuration to a chair configuration and which in doing so,
25 provide for patient egress from the foot end of the bed and access to an onboard patient care module.

The existing designs are unable to meet certain requirements of both health care workers and patients having problems like lumbago, spinal injuries and vertebral deformations. Therefore the need arises to design a hospital bed which could meet the
30 requirements of both patients as well as of healthcare workers.

The limitations of these existing systems gave us the inspiration to innovate a design for a hospital bed that is multifunctional and cost justified and can be easily manufactured.

OBJECTS OF THE INVENTION

5 The main object of the invention is to provide a design for a multifunctional hospital bed with interconvertibility between bed, gurney or stretcher.

Another object of the present invention is to provide an inbuilt scoop stretcher, gurney and transfer board to save space and money.

10 Another object of this invention is to provide sideways tilting of the bed with the hydraulic linkages/pneumatic linkages/ manual lifting by means of manual mechanism like a screw or links which can be operated by foot lever or hand lever and can be electronic too.

SUMMARY OF THE INVENTION

15 The present invention provides a a multi-utility hospital bed in which there is an inter-convertibility between bed, gurney and stretcher with ease which relieves the burden of the hospital staff while transferring patients without lifting them manually from bed onto a separate gurney and is safe for the patient too specifically in severe slip disc and vertebral injuries.

20 Accordingly the invention provides a multi-utility hospital bed having inter-convertibility between bed, gurney and stretcher, said hospital bed comprising

(a) a static frame provided with fixed or detachable legs;

(b) a dynamic frame which comprises a motion frame for movement of headrest and footrest;

(c) a stretcher frame placed over the motion frame; and

25 (d) a trolley frame for mobility of stretcher frame;

wherein the motion frame is positioned on said static frame, said static frame acting as a base frame, said motion frame comprising a C-shaped frame with extrusions on either side of said base frame for vertical motion of headrest and footrest; said stretcher frame being provided over said motion frame and acting as a resting base
30 when integrated with said base frame and as a gurney/stretcher without said base frame; said trolley frame being connectable to said stretcher frame to provide mobility thereto when said stretcher frame is used in the gurney mode;.

In one embodiment the present invention describes wherein the legs of said static (base) frame comprise solid tubes, hollow tubes, or concentric tube for placement of load cells.

In one embodiment the present invention describes the said motion frame
5 comprises a swing frame for sideways tilting of the bed and an adjustable frame for adjusting the appropriate movement of the headrest and footrest

In one embodiment the present invention describes said swing frame is C-shaped with longitudinal and sideways elements of pipes of mild steel.

In one embodiment the present invention describes the ends of longitudinal
10 element are welded by linkages to attain the swinging motion of frame.

In one embodiment the present invention describes said linkages are hydraulic, pneumatic, manual, or electric linkages.

In one embodiment the present invention describes the said adjustment frame
15 comprises a head part, a first leg and a second leg to minimize or avoid stress on the stretcher frame.

In one embodiment the present invention describes a rod with two hydraulic or pneumatic or electrical or mechanical linkages is provided to enable relative motion between said first leg and said second leg.

In one embodiment the present invention said hydraulic or pneumatic or electrical
20 or mechanical linkages implement the motion of footrest.

In one embodiment the present invention said head part has an extrusion, and linkages are bolted or welded or screw fitted or interference fitted with mechanical members that are welded into said extrusion thereby enabling headrest motion.

In one embodiment the present invention said rod is hollow, solid, or comprises
25 bolts ranging from M20-M50.

In one embodiment the present invention describes the head rest of the stretcher frame are flexible enabling bending in a range of 0° to 90°.

In one embodiment the present invention said foot rest is flexible enabling
30 bending in a range of 0° to 90° upwards and 0° to 90° downward to form a wheel chair.

In one embodiment the present invention said head rest and said foot rest are each provided with hydraulic, pneumatic, manual and /or electric means to enable movement thereof.

In one embodiment the present invention said electric mechanism comprises linkages, screw, shaft, attached spring or a combination thereof.

In one embodiment the present invention said stretcher frame is a bed when integrated with said base frame and is a gurney /stretcher when without back frame.

In one embodiment the present invention said stretch frame is a scoop stretcher when wheels from the gurney are removed.

In one embodiment the present invention describes the base of said stretcher frame comprises two strips with four cup shaped legs (A 1) welded thereon or cylindrical structures having length parallel to width of the bed and made of hollow pipes or solid pipes.

In one embodiment the present invention said trolley frame provides mobility to the stretcher frame when used in the gurney mode.

In one embodiment the present invention describes load cells are provided on the legs of the base frame to measure the weight of the patient, if desires.

In one embodiment the present invention the hospital bed described with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates the hospital bed with its separated components as well as completely assembled bed;

(a) depicts the separate view of the stretcher frame;

(b) depicts the separate view of static frame and trolley frame;

(c) depicts the completely assembled bed;

Figure 2 illustrates separated view of the base frame;

Figure 3 illustrates the stretcher frame in a separated view;

Figure 4 illustrates the top view of the hospital bed;

Figure 5 illustrates the adjustment frame with its divisions.

DETAILED DESCRIPTION OF THE INVENTION

In the following detailed description of the invention, reference is made to the accompanying drawings in which like references indicate similar elements.

The present invention relates to a multi utility hospital bed as depicted in figure 1(c) in which there is an inter-convertibility between bed, gurney and stretcher with ease which relieves the burden of the hospital staff while transferring patients manually from bed onto a separate gurney and is safe for the patient too specifically in severe slip disc and vertebral injuries. It also protects the patients from infections which can arise on sharing of same stretcher or gurney.

The mechanical structure of the bed is divided into the following frames, namely,

a) a static frame with fixed or detachable legs, serving as the base frame (3) as depicted in Figure 2;

b) dynamic frame which further comprises

- a motion frame for movement of headrest and footrest,

c) a stretcher frame(as depicted in Figure 3) placed over the motion frame and

d) a trolley frame (as depicted in figure 1(b)) for mobility of stretcher frame,

Each frame and its functions are described below:

BASE FRAME (3)

Base frame (3) as shown in figure 2 is the frame on which all other frames are mounted, and thus needs to be rigid and robust. It may be built up of L- section beams of Mild steel/ stainless steel /aluminium /cast iron. This frame serves as the foundation and supports for all other parts and is static under all conditions.

The structure is a rectangular frame 2 meter by 1 meter in dimensions. A T-section beam is welded along length to form one end of the foot rest and similar section is welded to form one end of head support. There is no structure present in the middle portion thus allowing the movement of the legs of stretcher frame (1) and trolley frame (2). These T-section beams can have angular structure attached to them, whose one end is welded to the leg of the base frame and another welded to these T-structures. The angular are pipes (solid or hollow) which can or cannot have an arc. There are 25 mm diameter holes in the head and leg side beams aligned near right end for the free rotation of Swing frame. Fixed Tubular grill railings on head, leg and left side are provided. Whereas, on the right side, variable height tubular grill railings are implemented that have 4 distinct locking positions.

Ranges of base frame:

- Length : 4ft to 10 ft

- Width : 1.5 to 6ft
- Height : 2ft to 5ft

The legs of the static frame (3) can be solid or hollow tube/hollow beam or concentric tube for placement of load cells. The legs can be fixed or detachable or can be with or without wheels having stopper or without stopper.

MOTION FRAME

Motion frame is required for the appropriate movement of the headrest and footrest. It can be divided into two parts which are as follows:

a) Swing Frame

Swing frame is the frame required for carrying out the sideways tilting of the bed. It is a C-shape frame, whose longitudinal element is a 2-inch by 4-inch rectangular cross-section pipe, and the sideways elements being 2-inch square cross section pipes of Mild Steel. These are welded together to form a C shape structure and have small circular section extrusions on either side end pipes to ensure that a proper rotary motion is achieved and the swing frame remains in its proper position. These extrusions are mated with the holes provided on the head and leg side beam of base frame. The linkages welded on the ends of the longitudinal element helps in attaining the swinging motion of frame. The other ends of the linkages are welded to the longitudinal T-section beam of the base frame. The mechanism used for the linkages can be hydraulic or pneumatic or manual or electric.

b) Adjustment Frame (Fig. 5)

Adjustment frame (Fig. 5) is required for the appropriate movement of the headrest and footrest. It is divided into two parts viz. head (14), and leg 1 (16) and leg 2 (17), lengthwise. The ratios are modified so that the adjustment frame does not exert any stress on stretcher frame in any position. The head and foot of the adjustment frame are bolted to the static frame. Below these some extrusions are provided for attachment of linkages for appropriate movement. Linkages (mechanism can be hydraulic/ pneumatic/ manual/electric) can be welded or bolted or interference fitted or screwed into the extrusion to implement the motion of footrest or headrest. The linkage mechanism will be perpendicular to the head rest/foot rest structure. This mechanism can or cannot be operated by foot lever/hand lever and can be mechanical/hydraulic/pneumatic/electronic. The mechanism will be placed on

the extreme side of head rest if seen from side view. Similar mechanism will exist on the foot rest side for its motion.

The ratios of the adjustment frame can alter according to the requirements of the stretcher frame. The same ratios could not be copied from the stretcher frame due to three reasons.

1. The overall length of the adjustment frame was lesser than the length of the stretcher frame.
2. The clearances between consecutive parts were different for both the frames.
3. While the folding up of the headrest and footrest, we needed to account for the thickness of the stretcher frame that would have otherwise induced compressive stresses in stretcher frame and tensile stresses in the adjustment frame.

The motion frame is made up of rectangular shape beams/circular rods which can be hollow, solid. Bolts used can range from "M20-M50. The maximum angle of the head rest can go is: 0-90 degree and the maximum angle for the foot rest can go is: 0-90 degree upwards and 0-90 degree downwards to form a wheel chair.

The mechanism used for head rest and foot rest movement can be hydraulic or pneumatic or manual or electric. The manual mechanism can be: linkages, screw, cam shaft, spring attached/actuated or it can be mix of all. All these mechanism can be actuated by leg, by hand, by remote. The positioning of mechanism can be behind the head/foot or on side of the bed.

STRETCHER FRAME (1)

The stretcher frame (1) as shown in figure 3 and figure 1(a) is placed over the motion frame and acts as resting base for the patient. This frame serves as bed when integrated with base frame (3) and gurney/stretcher without the base frame (3). It acts as scoop stretcher when wheels from the gurney are removed, i.e. trolley frame (2) is detached. The base of stretcher frame (fig. 1 (a)) has two strips welded on it which has 4 cup shaped legs or small cylindrical structures which is a small cylinder lying horizontally along the length of the bed but will be of dimensions (0.5 feet in length and can have a diameter from 1 inch to 5 inches). These legs acts as mechanism for attachment and detachment with trolley frame (2). These legs act as support when in

stretcher mode it is rested on ground as well as play an important role in combining of
 stretcher and trolley frame. The legs have a curved profile on the top followed by a
 cylinder. This curved surface allows smooth alignment of the legs of stretcher frame
 and upper pipes of trolley frame. Safety factor is taken into consideration when bed is
 5 converted to gurney mode. Additional locks are provided by means of latches. In
 gurney and stretcher mode, latches arrest the relative motion of head rest and foot rest
 which is free when in bed mode. For the deployment of handles in the stretcher and
 gurney modes, a unique system has been devised. Four U shape rods having unequal
 length limbs are placed into holes provided for them in the frame. The longer limb
 10 has a stopper at its end and is spring mounted. For taking out the handles, the middle
 portion serving as the handgrip is pulled out; and the shorter limb is swiveled onto a
 protrusion meant for locking its position. The bed surface is proposed to be a weave
 of aluminium strips 25 mm in width and 2mm in thickness having a gaping of 25 mm
 between consecutive strips.

15 The structure shape of the stretcher frame (1) can be rectangular or circular
 and is made up of hollow pipes or solid pipes. The frame is divided into head rest (4),
 foot rest (9) and middle portion (13). Frame comprises of movable head rest and can
 have a movable/fixed foot rest, middle portion is fixed and it has no motion. Frame
 has two strips welded at its lower portion from where 4 legs are welded. These 4 legs
 20 can be made of hollow pipes or solid pipes. Stretcher frame (1) is detachable from
 trolley frame and can be made scoop's stretcher. The Gap between head rest(4) and
 middle frame(13) ranges from 1 inch to 3 inches a gap between foot rest (9) and
 middle frame(13) ranges from 1 inch to 3 inches. The aluminium weave is used to
 make stretcher frame(1) lighter without compromising with its strength. Such a
 25 structure has better strength to weight ratio than perforated sheets.

TROLLEY FRAME (2)

The trolley frame (2) as shown in figure 1 (b) (2) provides mobility to the
 stretcher frame(1) (fig. 1(a)), when it is to be used in the gurney mode. The platform
 of the frame resting on wheels is a cross structure of MS welded at the center to a
 30 platform. Over this platform is erected an axial screw, which is mated with a cylinder
 having internal threads. The top of the cylinder is welded to a bevel gear whose axis
 is concentric with the axis of cylinder. This bevel gear is mated with a similar gear in

perpendicular direction and is run by a handle provided. Rotation of the handle causes the gear connected to it to rotate in vertical plane and this causes the other gear to rotate in horizontal plane, which rotates with itself the cylinder. This rotation causes the axial advance of the cylinder with respect to the screw and thus height is altered.

5 A thick cylinder rests on a stopper welded to the threaded cylinder and this thick cylinder has 4 pipes connected in the same cross fashion as the flats. These pipes have vertical pipes welded to them that can just fit the geometry of the legs of stretcher frame. These pipes go well beyond the pipe cross structure in other direction where they end in concentric pipes of a larger diameter that rise from the ends of the crossed
10 flats. These upper pipes have a thin disc at their ends that matches the internal diameter of the lower pipes and between the disc and surface of lower pipe, a spring is compressed that acts as the shock absorber, lowering the vibrations due to irregularities in the ground surface and while riding up/ going down an incline. Legs of trolley frame (10) are telescopic. It can be divided into two sections: upper portion
15 and lower portion. It has four legs (10) that can be connected at bottom by crossed tubes which can be hollow or solid or telescopic. The tubes are arranged in straight pattern that can be solid or hollow or telescopic. The legs are also connected by tubes arranged in crossed pattern. Tubes can be hollow or solid or telescopic. Trolley frame has 4 wheels at bottom of their legs (10), these wheels can have a stopper or can be
20 devoid of it. The upward motion of trolley for attachment with legs can be done by screw mechanism/ hydraulic/ pneumatic/ Hand jack mechanism. Hydraulic and pneumatic linkages can work through foot lever/ hand lever. The adjustment of headrest (4) and footrest (9), and sideways tilting is implemented by use of hydraulics, pneumatic, manual and/or electric. If hydraulic linkage is used for the
25 headrest movement, the cylinder piston arrangement is bolted with a linkage, whereas for the footrest motion, the cylinder itself is welded via an extrusion to the rod connecting leg1 and leg 2 parts. For the sideways tilting, cylinder piston arrangement has a ball and socket joint for allowing it more degrees of freedom. Piston is kept fixed in all these arrangements and it is the cylinder that is being moved. The forward
30 motion is due to fluid being pumped inside the cylinder in front of the piston, whereas for the backward motion, oil is pumped behind the piston. When the lever is pushed forward, the spool valve allows the oil from the pump to rush to the front section and

the cylinder moves forward, whereas when the lever is brought back, the spool valve starts closing the front section supply and opening the rear section supply. At any intermediate position, the hydraulic forces on either side of the piston balance each other and the system is in equilibrium. For our design, we require three sets of levers and spool valves for the three motions. The oil supply line between the valve and cylinder is bifurcated for the 2 cylinders present for each motion via a 3-way T-connector that evenly distributes the oil in two cylinders. The pump and oil reservoir is common to all.

Mattress selection in a bed is very important. They provide support to patient's spine and helps maintaining their proper curve, which is very important, even for patients who are currently not suffering any vertebral ailment. They should be neither too firm nor too soft as excessively firm mattress will exert excessive force on spine's inner curve which can lead to deformation in its curve and excessively soft mattress will result in unequal force distribution where thoracic region of spine will be at a level lower than cervices thus exerting more force on cervices and can result in cervical spondylitis type of disorders. It has been noticed that at times bed-ridden patients develop decubitus ulcers or bedsores as a result of their confinement.

There are various kinds of mattresses available in market like Pocket spring mattress, Latex Mattress, Visco-elastic mattress and Air Filled Mattress. We chose air filled mattress in our design proposition because it has individual air chambers, which gently cushion and provide contour to the entire body. It helps minimize pressure points and enhances better spinal alignment. It also relaxes the muscles completely and is light in weight. When the bed is used as a gurney or stretcher, making it light is necessary; and thus because of these features use of this mattress is highly desirable.

Load cells are provided to weigh the patient without moving him from the bed. When a patient lies on bed, the load cells are compressed, pushing the plunger downwards and that stretches the elastic diaphragm, which has a foil type strain gauge, attached. The strain is reproduced in the strain gauge whose resistance changes. All the load cells are connected in series and thus total weight is reflected in the total change in resistance, which can be measured easily by strain gauge indicator that employs single active Wheatstone bridge. Suitable calibration of the indicator would give accurate reading of the weight of patient. Thus, weight of the patient can

be gauged without moving the patient and is useful in conditions where the patient can't be moved and their weight is needed to diagnose the symptoms of any disease or side effects of medicine for proper administration of drugs, as in some diseases or in side effects the patient tends to gain or loose weight. Their simplicity and ease of implementation makes it a desirable feature.

The load cells are placed in the legs of the static bed so that all the weight of bed and patient acts on them. Since, the load cells are connected in series, the output across them would give the total inertial force acting on them. The legs of the static frame are concentric pipes with outer diameter of inner pipe same as inner diameter of outer pipe. The inner pipe is kept 2-3 cm longer than the outer pipe so that all the weight finally rests on inner pipe. A thick plate is welded on the upper portion of the inner pipe upon which the load cell is placed. The reading can be taken whenever needed and fed in the APMS for keeping permanent record for future reference and administration.

Certain optional features can be implemented like,

1. A patient monitoring system can be attached to the bed.
2. Side grills can be present which can be detachable or can be lowered.
3. Sideways tilt motion is possible which can tilt from 0-30 degrees
4. Night lamps can be added on the sides of the bed
5. Alarm system for medicines can be added
6. On side of the bed, a stand for hanging of glucose bottles/IV drop/Blood bottle can be attached. This stand can be fixed or detachable
7. On main frame a hanging hinged table can be attached which when moved about the hinge act as a table and after use can be kept back in the hanging position
8. Other side of bed can have a stool attached where no specific gap is provided for moving out trolley frame.

ADVANTAGES OF THE INVENTION

1. The most important advantage of the present invention is the inter-convertibility between bed, gurney and stretcher with ease. This relieves the burden that hospital staff undergoes while transferring patients manually from bed onto a separate gurney and is safe for the patient too. This feature holds special significance in cases where:

- Patients are to be moved with precaution, e.g. severe slip-disc, vertebral injuries.
 - Patient is too heavy to be transferred easily, e.g., for bariatric cases
2. Inbuilt scoop stretcher, gurney and transfer board. Thus saves space.
 - 5 3. Sideways tilting in case of hydraulic linkages is available.
 4. Built-in weighing scale which is useful for monitoring medical condition of the patient.
 5. Saves patients from various infections which can be contracted if same gurney or stretcher is used for transferring a patient.
 - 10 6. It is very convenient for patients as well as staff when the patient is critically injured and shouldn't be moved at all as in cases of traction and spinal cord injuries.

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We claim:

1. A multi-utility hospital bed having inter-convertibility between bed, gurney and stretcher, said hospital bed comprising

- 5 (a) a static frame provided with fixed or detachable legs;
(b) a dynamic frame which comprises a motion frame for movement of headrest and footrest;
(c) a stretcher frame placed over the motion frame; and
(d) a trolley frame for mobility of stretcher frame;

10 wherein the motion frame is positioned on said static frame, said static frame acting as a base frame, said motion frame comprising a C-shaped frame with extrusions on either side of said base frame for vertical motion of headrest and footrest;

said stretcher frame being provided over said motion frame and acting as a resting
15 base when integrated with said base frame and as a gurney/stretcher without said base frame;

said trolley frame being connectable to said stretcher frame to provide mobility thereto when said stretcher frame is used in the gurney mode;.

20 2. The hospital bed as claimed in claim 1, wherein the legs of said static (base) frame comprise solid tubes, hollow tubes, or concentric tube for placement of load cells.

25 3. The hospital bed as claimed in claim 1, wherein said motion frame comprises a swing frame for sideways tilting of the bed and an adjustable frame for adjusting the appropriate movement of the headrest and footrest.

4. The hospital bed as claimed in claim 1 or 3, wherein the said swing frame is C-shaped with longitudinal and sideways elements of pipes of mild steel.

30 5. The hospital bed as claimed in claim 4, wherein the ends of longitudinal element are welded by linkages to attain the swinging motion of frame.

6. The hospital bed as claimed in claim 5, wherein said linkages are hydraulic, pneumatic, manual, or electric linkages.
7. The hospital bed as claimed in claim 3, wherein said adjustment frame comprises a head part, and a first leg and second leg part to minimize or avoid stress on the
5 stretcher frame.
8. The hospital bed as claimed in claim 7, wherein a rod with two hydraulic or pneumatic or electric or mechanical linkages is provided to enable relative motion between said first leg and said second leg.
- 10 9. The hospital bed as claimed in claim 8, wherein said hydraulic or pneumatic or electric or mechanical linkages implement the motion of footrest.
10. The hospital bed as claimed in claim 7, wherein said head part has an extrusion,
15 and two linkages are bolted or welded or screw fitted or interference fitted with mechanical members that are welded into said extrusion thereby enabling headrest motion.
11. The hospital bed as claimed in claim 8, wherein said rod is hollow, solid, or
20 comprises bolts ranging from M20-M50.
12. The hospital bed as claimed in claim 1, wherein the head rest of the stretcher frame are flexible enabling bending in a range of 0° to 90° .
- 25 13. The hospital bed as claimed in claim 1, wherein said foot rest is flexible enabling bending in a range of 0° to 90° upwards and 0° to 90° downward to form a wheel chair.
14. The hospital bed as claimed in claim 1, 12 or 13, wherein said head rest and said
30 foot rest are each provided with hydraulic, pneumatic, manual and /or electric means to enable movement thereof.
15. The hospital bed as claimed in claim 14, wherein said electric mechanism comprises linkages, screw, shaft, attached spring or a combination thereof.

16. The hospital bed as claimed in claim 1, wherein said stretcher frame is a bed when integrated with said base frame and is a gurney /stretcher when without back frame.

5 17. The hospital bed as claimed in claim 1 to 16, wherein said stretch frame is a scoop stretcher when wheels from the gurney are removed.

18. The hospital bed as claimed in claim 1 to 17, wherein the base of said stretcher frame comprises two strips with four cup shaped legs (A 1) welded thereon or
10 cylindrical structures having length parallel to width of the bed and made of hollow pipes or solid pipes.

19. The hospital bed as claimed in claim 1, wherein said trolley frame provides mobility to the stretcher frame when used in the gurney mode.

15 20. The hospital bed as claimed in claim 1, wherein, if desired, load cells are provided on the legs of the base frame to measure the weight of the patient.

21. The hospital bed substantially as herein above described with reference to the
20 accompanying drawings

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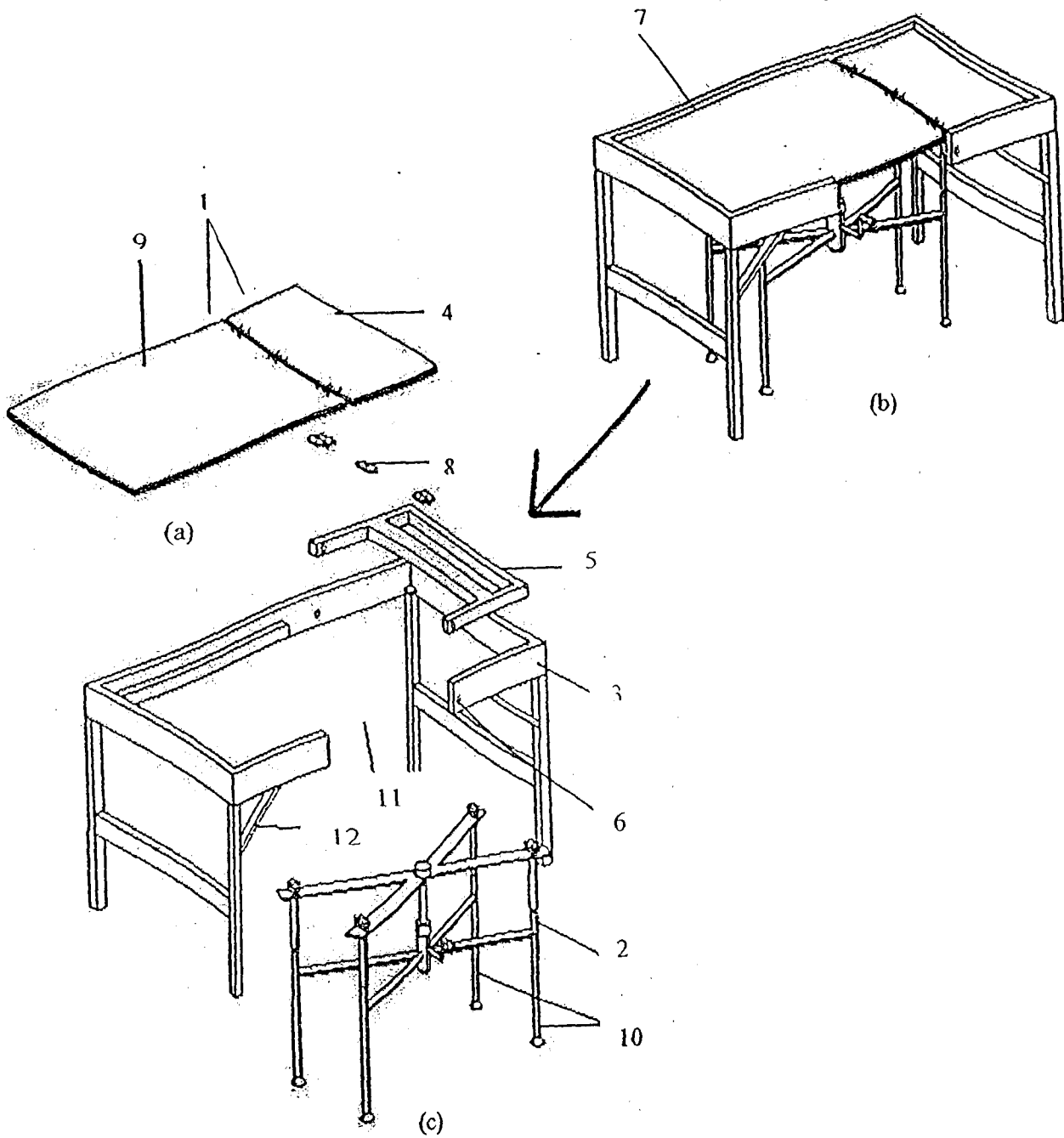


FIGURE 1

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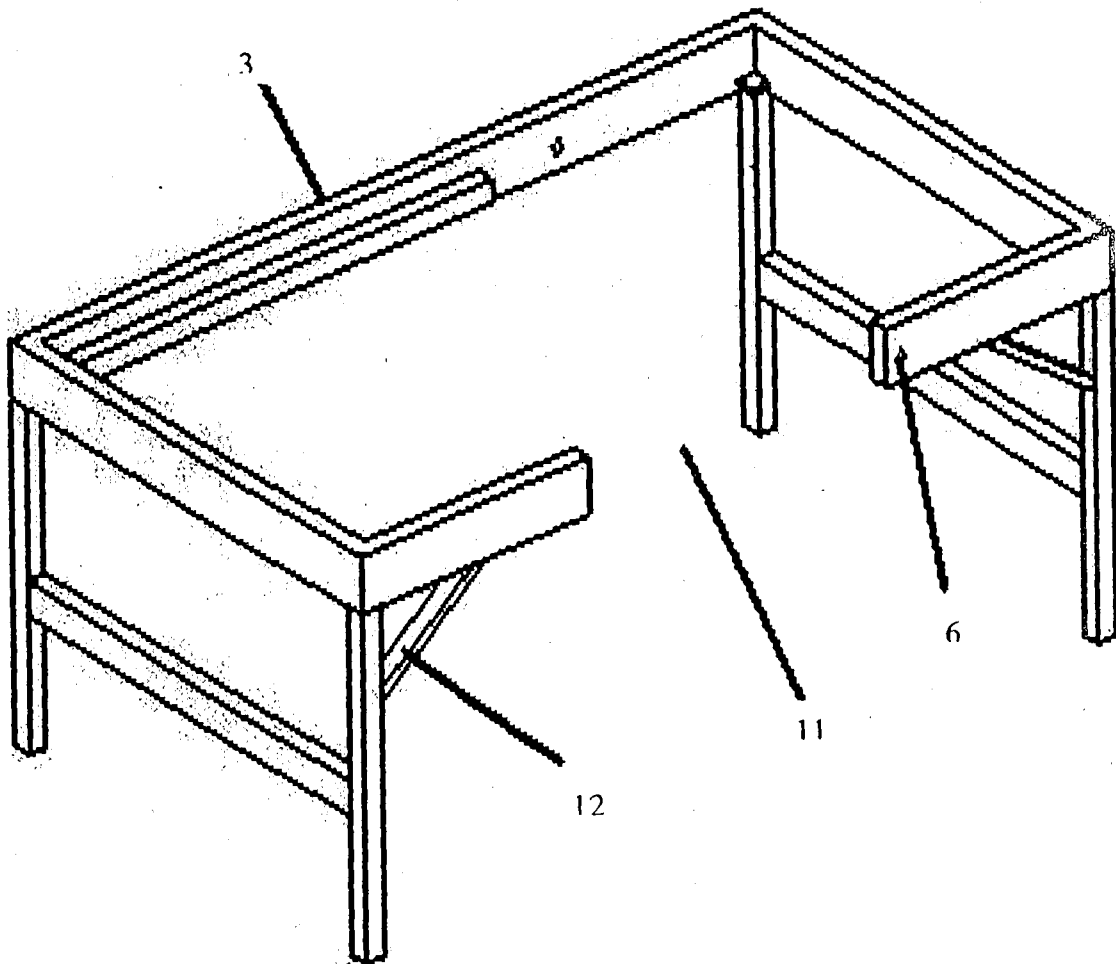


FIGURE 2

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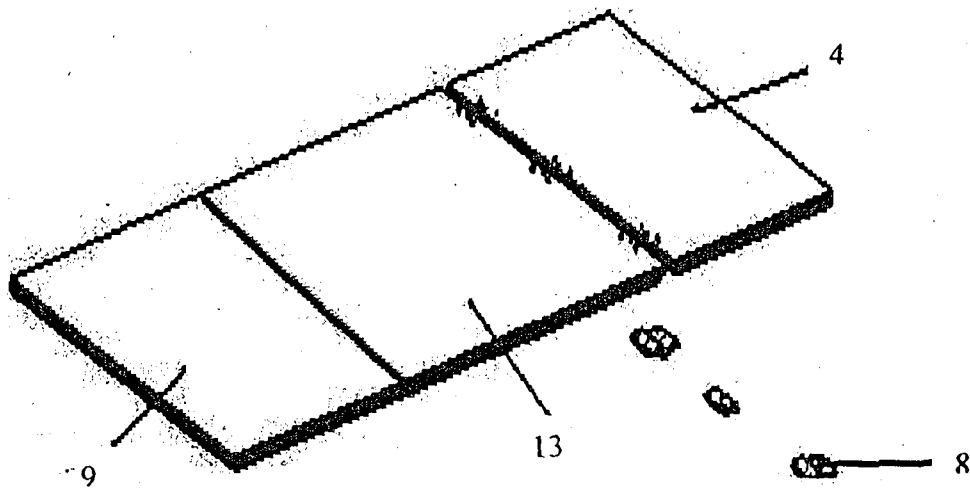


FIGURE 3

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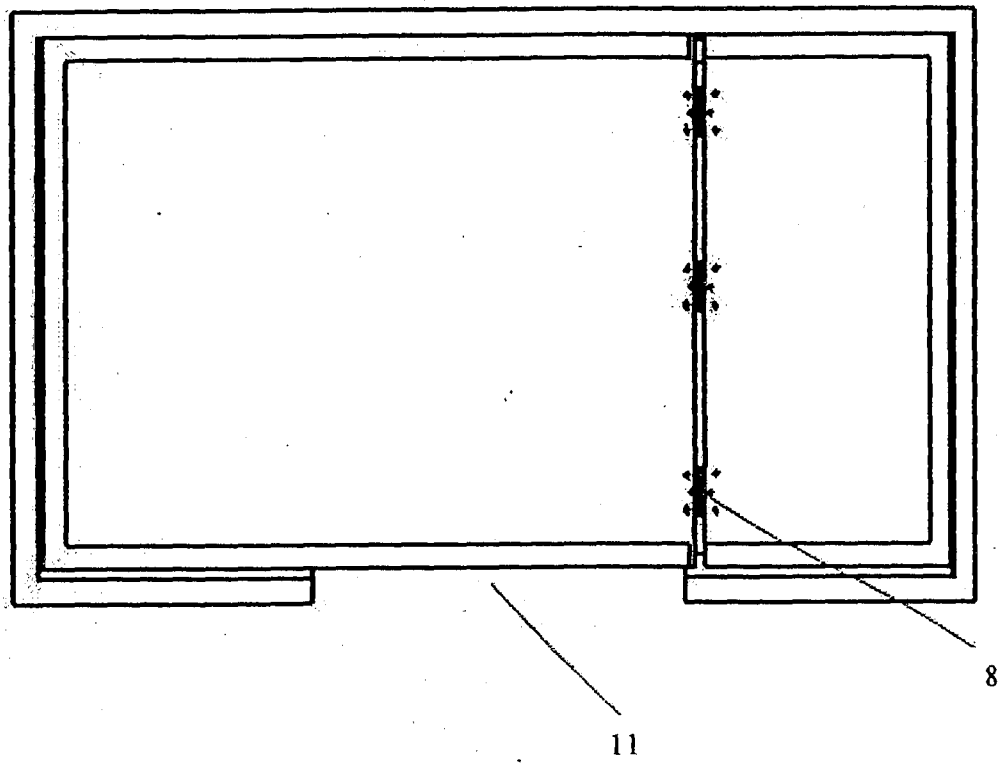


FIGURE 4

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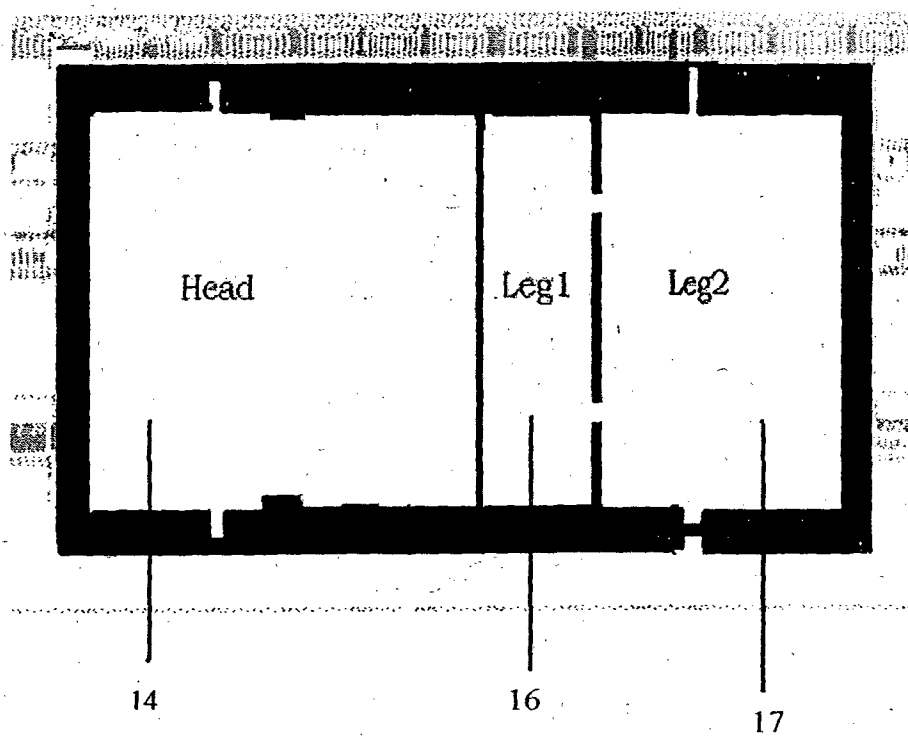


FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2011/000640

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61G1/00 A61G7/008
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)
A61G

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 practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/283492 A1 (GALLANT DENNIS J [US] ET AL) 13 December 2007 (2007-12-13)	1-4, 7-16, 19, 20
Y	paragraphs [0002], [0039] - [0045] -----	5, 6
A	WO 99/05941 A2 (HILL ROM CO INC [US]) 11 February 1999 (1999-02-11) page 6, line 21 - page 13, line 30; figures 3-5 -----	1, 2, 14, 15
X	US 2007/124858 A1 (AHLMAN SCOTT M [US]) 7 June 2007 (2007-06-07) figures 16, 17, 78, 115 -----	1, 2, 12-17, 19
X	GB 2 407 044 A (RESCU BED LTD [GB]) 20 April 2005 (2005-04-20) page 5, line 14 - page 7, line 18; figures 1, 2, 7, 8 ----- -/--	1, 12-17

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

16 February 2012

Date of mailing of the international search report

27/02/2012

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Kroeders, Marleen

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2011/000640

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 200 06 002 U1 (GOTTLEBE MATTHIAS [DE]) 3 August 2000 (2000-08-03) page 5, line 10 - page 8, line 8; figures 1-2	1,2,12, 14,16,18
Y	----- WO 2009/105293 A1 (MASSON MARCOS V [US]) 27 August 2009 (2009-08-27) paragraphs [0066] - [0084]	5,6
A	----- US 4 067 079 A (BUCHMAN ERNEST C ERNEST C BUCHMAN [US]) 10 January 1978 (1978-01-10) column 1, line 64 - column 3, line 23; figures 3,4,6	1,2, 16-19
A	----- US 3 096 529 A (ORVILLE THOMPSON) 9 July 1963 (1963-07-09) column 2, line 11 - column 4, line 3	1,12,14, 16
T	----- WO 84/03039 A1 (UTILA GERAETEBAU [DE]) 16 August 1984 (1984-08-16) page 2, line 24 - page 6, line 7; figure 1	1,19
T	----- EP 2 184 512 A1 (PARAMOUNT BED KK [JP]) 12 May 2010 (2010-05-12) paragraphs [0011] - [0019]	2,20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2011/000640

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 21
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 21

Claim 21 seeks to claim its subject-matter with respect to other parts of the application, contrary to the requirements of Rule 6.2(a) PCT. As this claim does not contain any technical features, it is excluded from search in accordance with Article 17(2)(a)(ii) PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IN2011/000640

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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