April 30, 1968 R. H. FERNEAU ET AL 3,380,085

MULTI-PURPOSE STRETCHER CHAIR

Filed Oct. 24, 1966 2 Sheets-Sheet 1

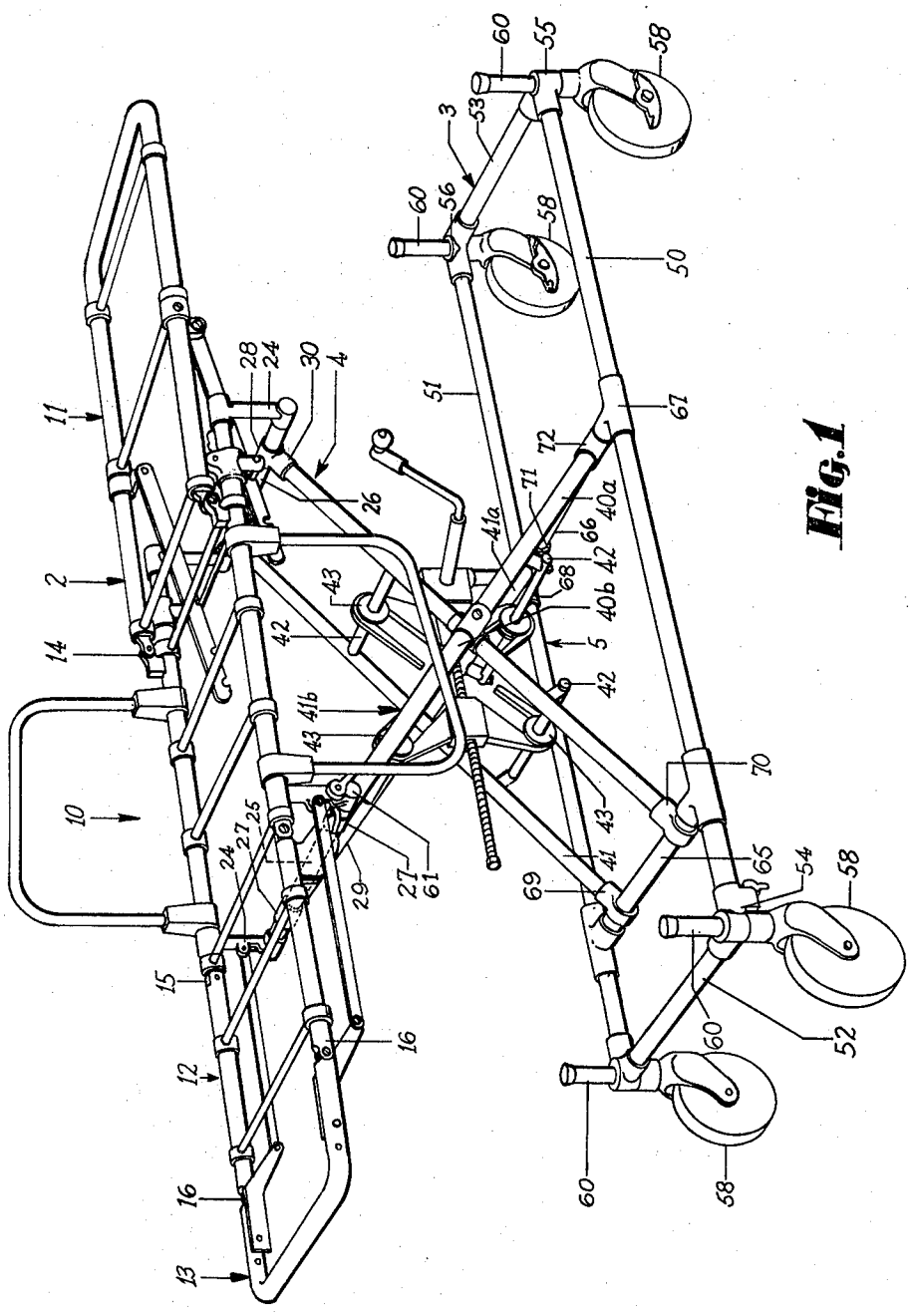


Fig. 1

INVENTOR
RICHARD H. FERNEAU &
GEORGE A. SELIG,

BY Yungblut, Melville, Strasser and Foster
ATTORNEYS

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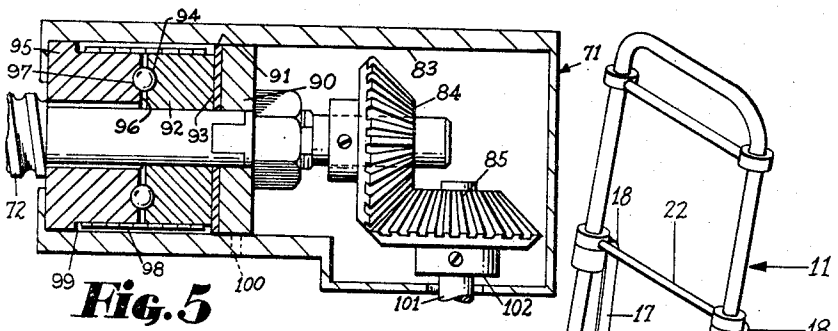


Fig. 5

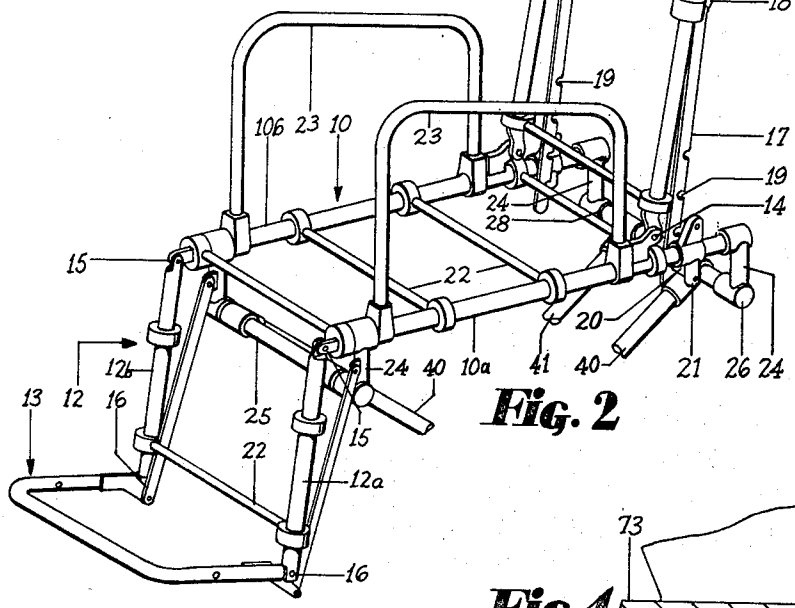


Fig. 2

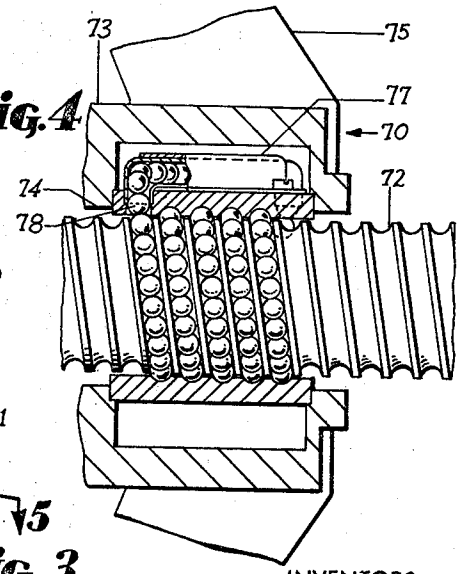


Fig. 4

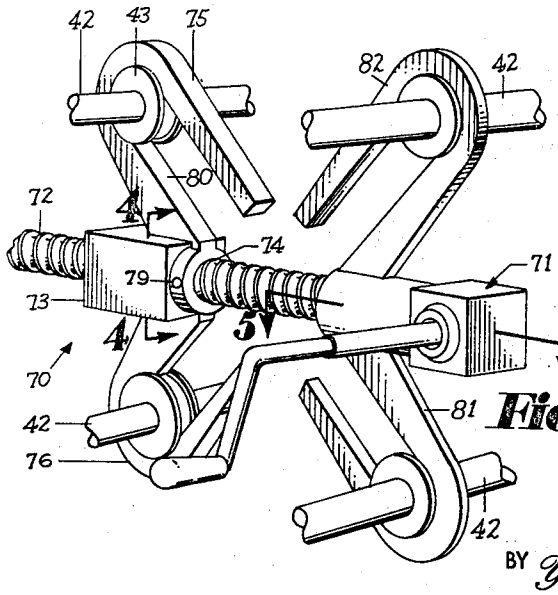


Fig. 3

INVENTORS
RICHARD H. FERNEAU &
GEORGE A. SELIG,

BY Yungblut, Melville, Strasser and Foster
ATTORNEYS

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MULTI-PURPOSE STRETCHER CHAIR

Richard H. Ferneau and George A. Selig, Washington Court House, Ohio, assignors to Ferno-Washington Inc., Greenfield, Ohio, a corporation of Ohio

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ABSTRACT OF THE DISCLOSURE

A multi-purpose stretcher chair construction wherein an elongated body supporting frame is adapted to be raised and lowered relative to an undercarriage mounted on wheels, the body supporting frame being connected to the undercarriage by means of coacting pairs of cross-forming frame members which are pivotally connected at their upper ends to the body supporting frame and pivotally and slidably connected to the undercarriage, the cross-forming frame members being movable relative to each other by means of an elevating mechanism comprising a screw shaft, a pair of housings on the screw shaft one of which is axially movable relative to the shaft and the other is fixed against axial movement, there being elongated cam tracks extending diagonally outwardly from the housings engaged by cam rollers mounted on cross members extending between the cross-forming frame members, one of the housings additionally mounting a brake means acting to automatically resist rotating movement of the screw shaft in one direction while permitting free movement thereof in the opposite direction.

This invention further constitutes an improvement over U.S. Patent No. 2,958,873, for Multiple Position Elevating Cot, issued Nov. 8, 1960, to one co-inventor of the present invention.

Heretofore, one major problem in transferring patients, particularly elderly ones, was the need to place the patient closely adjacent to the receiving cot, bed, or operating table with a minimum of effort by the attendants and strain on the patient. To this end the conventional stretcher-like ambulance cot gave way to the dual position cot, i.e., one having an "up" and "down" position achieved by the addition of collapsible legs, then to the variable incremental height cot taught by the aforementioned patent. This was a major advancement as a cot constructed in accordance with the teachings therein enabled the attendants to preselect a height dictated by the circumstances encountered. However, the latter was not the final answer—additional improvements were needed to further reduce the discomfort resulting from the necessary transfer of patients.

It is therefore, a principal object of this invention to provide a multi-purpose elevating cot which may be readily adjusted to a potentially infinite number of positions between the "lower" and extended "up" positions.

A further object of the instant invention is the provision of a multi-purpose stretcher chair in which the body frame is elevated by a system so constructed that a braking mechanism therein prevents the weight of the patient acting to lower the body frame, but readily permits easy adjustment by an attendant.

A further object of the invention is the provision of a multi-purpose stretcher chair having a body support frame which can be changed quickly and easily from the flat horizontal position to a sitting position.

Still another object of the invention is the provision of a multi-purpose stretcher chair having an undercarriage with a fixed wheel base and supporting crossed frame members, whereby the lateral extent of said frame members are confined within the area formed by the extremities of

said under carriage, thus assuring greater stability to the device.

Yet a further object of this invention is the provision of a multi-purpose stretcher chair in which the body support frame is supported by a pair of cross members, said cross members being connected by a plurality of brace members having cam followers mounted thereon to ride in a cam track in the elevating mechanism, the parts being so arranged that the actuation of the elevating mechanism will cause the cams to move smoothly in the cam track resulting in the smooth relative movement of the body support frame.

Further objects and advantages will become apparent hereinafter to those skilled in the art upon reading the specification, especially in conjunction with the drawings wherein:

FIGURE 1 is a perspective view of the stretcher chair in an extended "up" position.

FIGURE 2 is a perspective view of the stretcher chair with parts removed in a "sitting" position.

FIGURE 3 is an enlarged perspective view of the elevating mechanism.

FIGURE 4 is a sectional view of a portion of the elevating mechanism taken along line 4—4 in FIGURE 3.

FIGURE 5 is a sectional view of another portion of the elevating mechanism taken along line 5—5 in FIGURE 3.

Turning now to the invention as illustrated in FIGURE 1, it is to be observed that the stretcher chair **1** made in accordance with the teachings hereinafter is a combination of essentially four major portions, indicated generally as body support frame **2**, undercarriage **3**, intermediate movable frame **4**, and elevating mechanism **5**.

The body support frame **2** is of generally rectangular shape in the extended position whereby support is provided for a patient's body in the prone position. FIGURE 2 illustrates one of several alternative positions for the body support frame. To facilitate such changes, the body support frame **2** is comprised of at least three segments, preferably four. The middle portion **10** is fixed, while the end portions **11**, **12** and **13** are pivotally mounted thereto at **14**, **15** and **16**, respectively. When it is desirable to support a patient in a sitting position, end portion **11** is rotated about pivots **14** and held in the desired position by the braces **17**. One end of each brace **17** is hinged at **18** to the side member **11***a* or **11***b* of end portion **11**. The opposite end of each brace **17** is provided with a series of teeth **19** arranged to selectively engage frame member **20** projecting below and transverse the middle portion **10**. Frame member **20** may be attached to the middle frame portion by projections **21**.

Since it also may be desirable to collapse the opposite end of the support frame **2** to permit reclining of the patient's legs, appropriate locks and attending releases may be provided at the pivot points **15** to accomplish such adjustment.

It should be apparent that the stretcher chair will be provided with a suitable mattress (not shown) intermediate the body support frame **2** and the patient. Therefore, cross members **22** are selectively placed between opposing side rails **10***a*–**10***b*, **11***a*–**11***b*, and **12***a*–**12***b*, or in the alternative, perpendicular thereto. While the frame and support members may be formed of aluminum tubing, stainless or chrome plated steel tubing, it should be understood that the construction of the frame as such does not constitute a limitation of this invention and any standard frame may be employed, inclusive of frames having appurtenances such as the arm support rails **23**, and others such as stirrups and head elevating frame.

Projecting downward from the four corners of the middle portion **10** are fittings **24***a*, **24***b*, **24***c* and **24***d*, pairs of

said opposed fittings mounting horizontally disposed rods 25 and 26, which extend parallel to one another below the plane of the middle portion 10. The fittings 24c and 24d are mounted on extensions 10c and 10d of the side rails 10a–10b, the extensions being telescopically received within the said side rail and extensible relative thereto. Sleeve-like fittings 27 and 28 surround rods 25 and 26 respectively, the fittings including sockets 29 and 30 which receive support members of intermediate movable frame 4, another major portion of the structure which will now be described.

The intermediate movable frame 4 is the means by which support is given to the frame 2, and relative movement between frame 2 and undercarriage 3 is accomplished. Intermediate frame member 4 comprises a pair of cross-forming frame members 40 and 41, the upper ends of which are received in sockets 29 and 30. The lower ends are similarly mounted in a manner to be described hereinafter. Coacting cross-forming frame members 40a and 41a are pivotally connected to the cross-forming frame members 40 and 41 intermediate their ends at the pivot point 40b and 41b, respectively, said coacting members forming scissor-like elevating supports for the body support frame. Braces 42 are provided for connecting the corresponding legs of the cross members 40, 41 and 40a, 41a. These braces are spaced between the pivot points 40b, 41b, and the outermost ends of the legs, and may be mounted in the plane formed by the corresponding legs or juxtaposed to their upper and lower surfaces in the manner illustrated. Cam followers 43 are rotatively mounted on the braces 42 centrally thereof; and it will be shown later how said cam followers are adapted to ride in cam tracks which form an integral part of the elevating mechanism 5. By actuation of said mechanism, the opposing pairs of braces 42 will be caused to move relative to one another, thereby elevating or lowering the body support frame 2.

One important feature incorporated into the undercarriage 3 of the instant structure is that it is provided with a fixed wheel base. The undercarriage 3 comprises a generally rectangular frame composed of side frame members 50 and 51 connected together at their ends by the end frame members 52 and 53. Suitable corner joints 54, 55, 56 and 57 are used to effect this connection, plus also serving to mount caster wheels 58. These corner joints may be further provided with vertical projections 60 which afford additional support to the body support frame 2 when in the fully "down" position—contact being made with the under surfaces of the fittings 24a–24d.

A transverse member 65 extends parallel to the end member 52 and is secured to side frame members 50 and 51. Toward the opposite end of the undercarriage, a second transverse member 66 is provided. The last named member is secured at its opposite ends to sleeve-like members or collars 67 and 68 which slidably engage side frame members 50 and 51, respectively. Mounted for rotational movement on transverse members 65 and 66 are four T-shaped sleeve-like members 69, 70, 71 and 72 which receive the four lower ends of cross forming members 40, 40a, 41 and 41a. Therefore, it should be apparent that as the elevation of the body support frame is changed, sleeves 67 and 68 are caused to traverse at least a portion of the contained side frame members 50 and 51. Such movement corresponds to the telescoping movement of the side rail extensions 10c and 10d which permit movement of the upper ends of cross-forming frame members 40 and 51. Hence, throughout these changes the wheel base is constant.

Turning now to the elevating mechanism 5, illustrated in detail in FIGURES 3–5, it will be observed that the mechanism comprises two housings, 70 and 71, joined together by a threaded shaft 72 While it is not intended to be a limitation on this invention, said housings may be cast aluminum or other suitable material, or may be fabricated by known metal working operations. Though in appearance they may seem identical, each will be described separately for their distinguishing features. Housing 70, adapted to move axially along shaft 72 upon rotation thereof, is composed of three portions: a central portion 73 having a bore 74 therethrough, and identical goose-neck cam tracks 75 and 76 extending above and below the central portion. Received in said bore is a ball bearing nut 77, containing a plurality of recirculating ball bearings 78 which ride in the circular grooves of shaft 72. The shaft and ball bearing combination is known per se, being manufactured by Saginaw Steering Gear Division, General Motors Corporation. By rotating shaft 72, housing 70, secured to the ball bearing nut by set screws 79, is caused to move axially of the shaft with a minimum of friction thereagainst. The cam tracks are angled substantially 45° to the horizontal and receive the cam followers or rollers. For convenience and added insurance against misalignment of parts, the track surface 80 may be beveled to fit into the corresponding concave edge of roller 43.

Housing 71 mounts the goose-neck cam tracks 81 and 82, which are substantially identical to cam tracks 75 and 76. Attached to the end of shaft 72 and received in the bore 83 is a bevel gear 84, angled to receive a companion bevel gear 85 and to be driven thereby. By this arrangement of parts, elevation of the stretcher chair may be conveniently effected from the side. With the adoption of the substantially friction free ball bearing nut, the problem of back-lash was amplified, That is, the weight of the patient's body, without a lock, resulted in the premature lowering of the body support frame. In place of the conventional ratchet arm for securing the support frame, such as illustrated in the aforementioned patent, it was discovered that by utilizing a brake such as shown in FIGURE 5, all back-lash was virtually eliminated with the result that an infinite number of sustained elevated positions were possible.

The brake assembly employed herein comprises a first washer 90 to receive a reduced unthreaded extension of shaft 72, slip washer 91 adjacent thereto, an inner race 92 force fitted to shaft 72 and contiguous with washer 91 at one edge 93, and having an annular channel 94 on the opposite edge, and an outer race 95. While outer race 95 surrounds shaft 72, it is spaced a slight distance therefrom. The inner edge 96 contains an annular channel 97, coacting with channel 94 to form a continuous circular channel for the reception of ball bearings. A final element of the brake assembly is the flat coiled spring brake 98 surrounding the respective races 92 and 95. The lateral movements of spring brake 98 are restricted by the flanged edge 99 on outer race 95 and slip washer 91. Thus, it should be apparent from the arrangement of the parts as shown, the brake is rendered operative only when a force is exerted through the assembly to turn the shaft in a direction which will cause the spring to be tightened with respect to the races. The brake is oriented so that the spring will be tightened under the influence of forces acting to lower the supporting frame members. Yet positive movement of the shaft, as when turned by its crank handle, will readily overcome the holding force of the brake and the frame can be lowered by an attendant. The brake assembly is secured to the housing 71 by set screw 100 in contact with washer 90.

A further element noted particularly in FIGURE 5 is the handle assembly used to effect rotation of shaft 72. At the end of said shaft extending through the brake assembly is secured a bevel gear 84. Angled 90° from shaft 72 is handle 101 projecting through opening 102 in housing 71. Mounted at the end of handle 101 is a second bevel gear 85 which drives gear 84 to cause rotation thereof. If should be understood at this point that any desirable or convenient gear ratio may be utilized to achieve the desired results, although a 2 to 1 reduction has

been found suitable. A further modification, still within the spirit of this invention, is the provision of a slip gear in the handle assembly whereby the handle **101** may be secured in a retracted position when not in use.

These and other modifications may be made in the structure without departing from the spirit and scope of this invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a stretcher chair construction wherein coacting cross-forming frame members are pivotally secured together intermediate their opposite ends and serve to raise and lower a body support frame relative to an undercarriage, the improvement which comprises elevating means for raising and lowering said cross-forming frame members relative to each other, said elevating means comprising a screw shaft, a pair of housings on said screw shaft, a first of said housings being axially movable along said screw shaft upon rotation thereof, the second of said housings being at one end of said screw shaft with said shaft journaled therein and fixed against axial movement relative thereto, a crank arm projecting laterally from said second housing at right angles to said screw shaft and gear means within said second housing connecting said crank arm to said screw shaft, brake means also mounted within said second housing in engagement with said screw shaft, said brake means acting to automatically resist rotating movement of said screw shaft in one direction while permitting free movement thereof in the opposite direction, cam means of gooseneck configuration having inner and outer cam surfaces projecting from each of said housings, and cam following rollers mounted on cross members extending between said cross-forming frame members, said rollers riding between said inner and outer cam surfaces, said cam means and said rollers being arranged in opposing pairs and serving as the sole means for mounting said elevating mechanism relative to said frame members.

2. In a stretcher chair construction wherein coacting pairs of cross-forming frame members are pivotally securing together intermediate their opposite ends and act to raise and lower a body support frame relative to an undercarriage, the improvement which comprises elevating means for raising and lowering said cross-forming frame members relative to each other, said elevating means comprising a screw shaft, a pair of housings on said screw shaft, a first of said housings being axially movable along said screw shaft upon rotation thereof, the second of said housings being at one end of said screw shaft with said shaft journaled therein and fixed against axial movement relative thereto, a crank arm operatively connected to said screw shaft for rotation thereof, brake means in said second housing in engagement with said screw shaft, said brake means acting to automatically resist rotating movement of said screw shaft in one direction while permitting free movement thereof in the opposite direction, elongated cam tracks extending diagonally outwardly from said housings, said cam tracks being arranged in oppositely extending pairs, cross members extending between the corresponding upper and lower portions of said pairs of cross-forming frame members, there being two upper cross members and two lower cross members lying in spaced relation to the pivot points of said cross-forming frame members, cam rollers mounted on said cross members in engagement with said cam tracks, each pair of cam tracks contacting the rollers on corresponding upper and lower frame members, said cam tracks being positioned so that movement of said housings toward each other will act to expand said cross-forming frame members and movement away from each other will act to contract said cross-forming frame members, whereby to selectively raise and lower said body support frame relative to said undercarriage.

3. The structure claimed in claim **2** wherein said screw shaft has an extension at one end in engagement with said brake means, said brake means including a first race force fitted to said shaft extension, a second race adjacent said first race but mounted for rotational movement about said shaft extension, and a coiled compression spring contiguous with and substantially surrounding said first and second races.

4. The structure claimed in claim **2** wherein said first housing mounts a ball bearing nut containing a plurality of recirculating ball bearings engageable with said screw shaft.

5. The structure claimed in claim **2** wherein said cam tracks are of gooseneck configuration having inner and outer cam surfaces engageable with opposite peripheral portions of said cam rollers.

6. The structure claimed in claim **2** in combination with an elongated body support frame having three segments pivotally connected together in end-to-end relation, the upper ends of said cross-forming frame members being pivotally connected to said center segment, whereby said outlying segments are free to move relative to said cross-forming frame members.

7. The structure claimed in claim **6** wherein said undercarriage is of fixed length, wherein the corresponding lowermost ends of one of the cross-forming frame members in each pair are pivotally connected to said undercarriage toward one end thereof, and wherein the remaining lowermost ends of said cross-forming frame members are slidably mounted on said undercarriage toward the opposite end thereof.

8. The structure claimed in claim **7** wherein vertical projections extend upwardly from the corners of said undercarriage in alignment with said body support frame, thereby providing support for said body support frame when in its lowermost position.

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CASMIR A. NUNBERG, *Primary Examiner.*