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Croxton

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[54] HOSPITAL BEDS

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[51] **Int. Cl.**.....**A61g 7/00**, A61g 7/10

[58] **Field of Search**.....5/63–69; 297/429, 433

[56] **References Cited**

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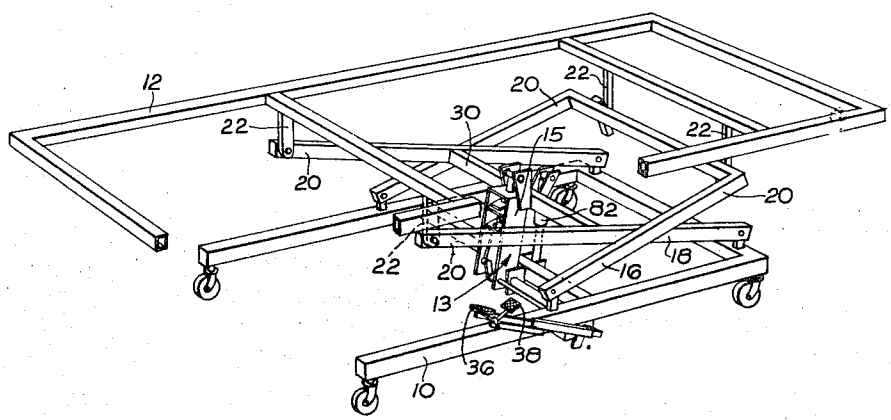
[57] **ABSTRACT**

A hospital bed having a mattress supporting element which can be elevated or lowered relative to the bed chassis through the agency of a mechanical jack is additionally provided with a hydraulic damper for controlling descent of the supporting element.

5 Claims, 6 Drawing Figures



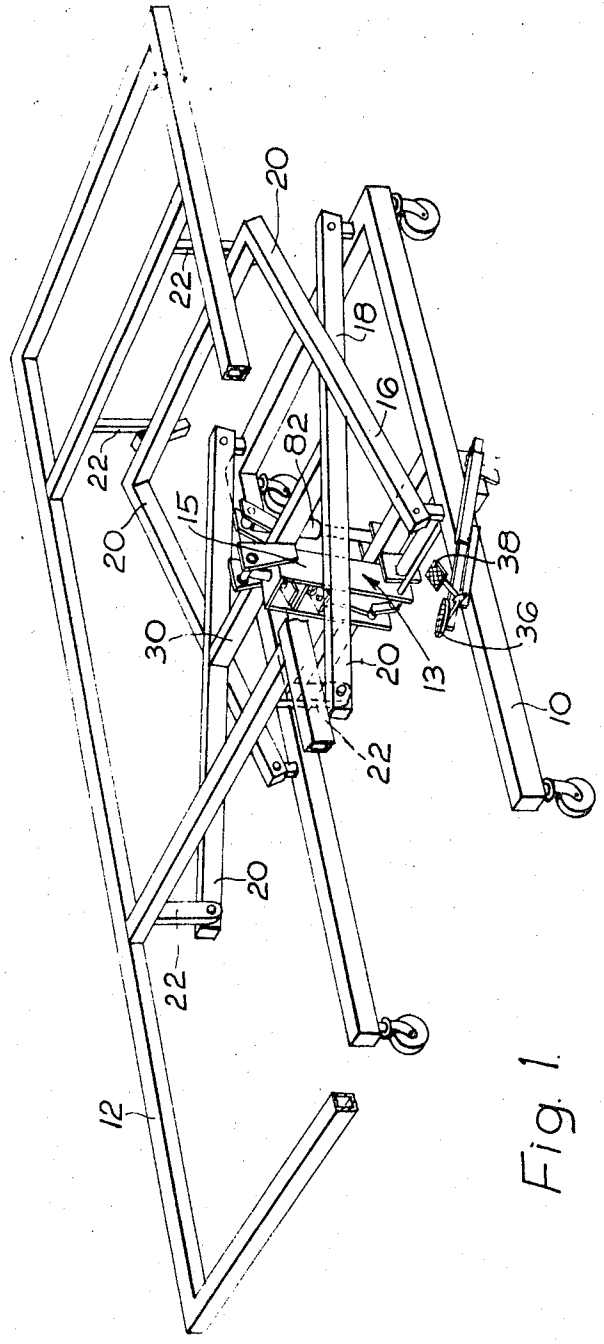


Fig. 1

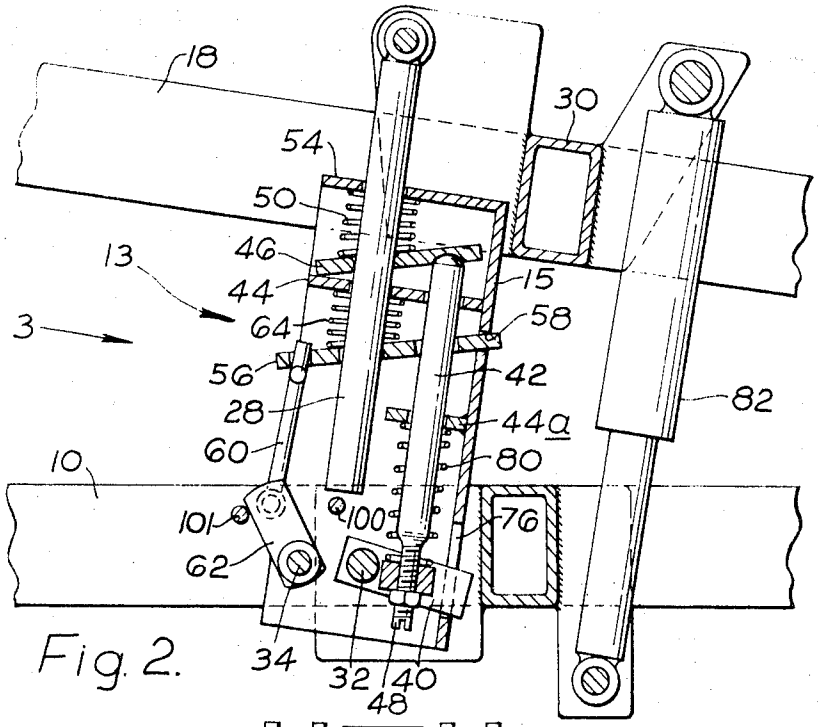

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Fig. 2.

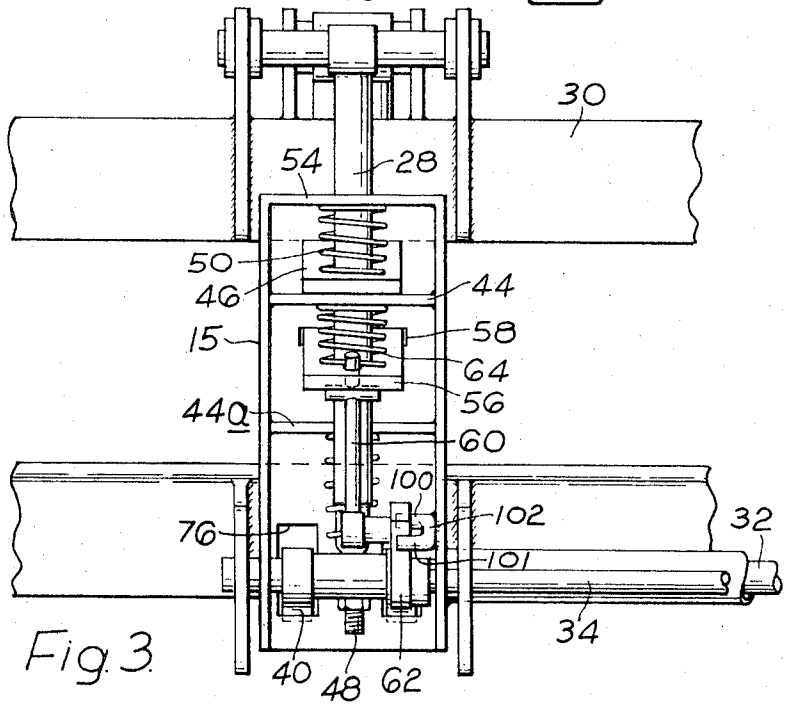
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Fig. 3.

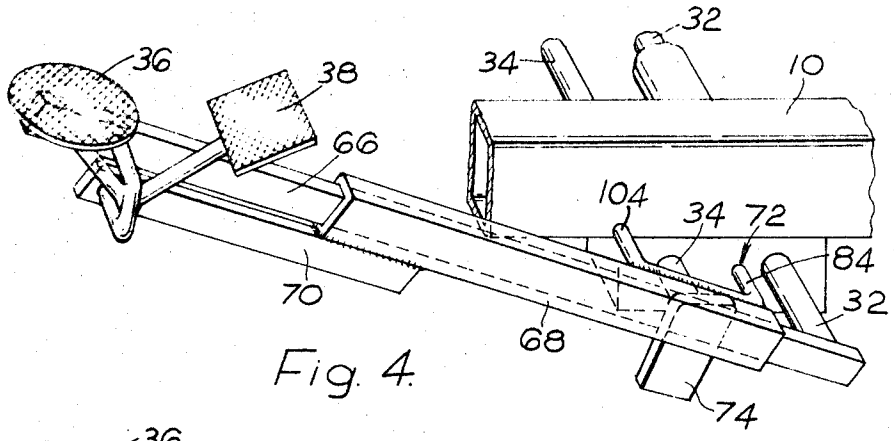

Fig. 4.

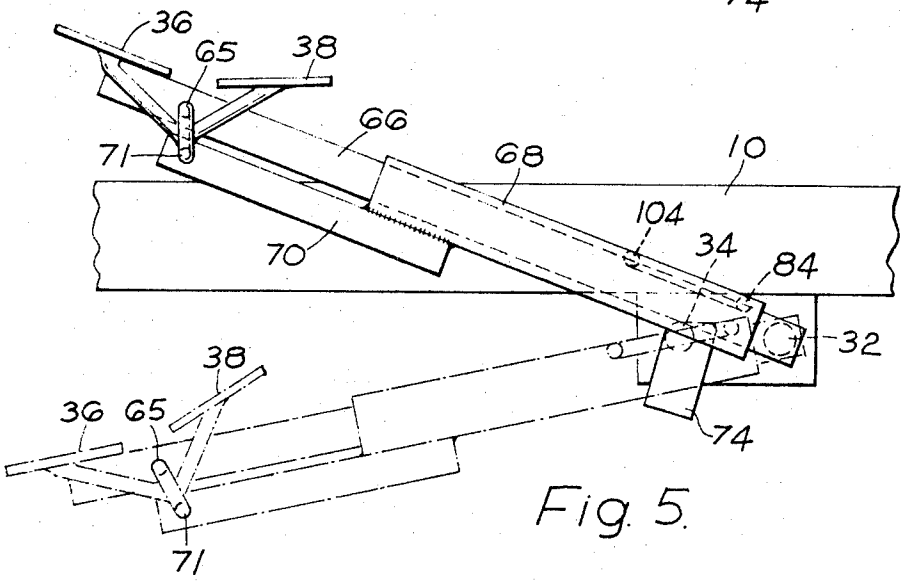

Fig. 5.

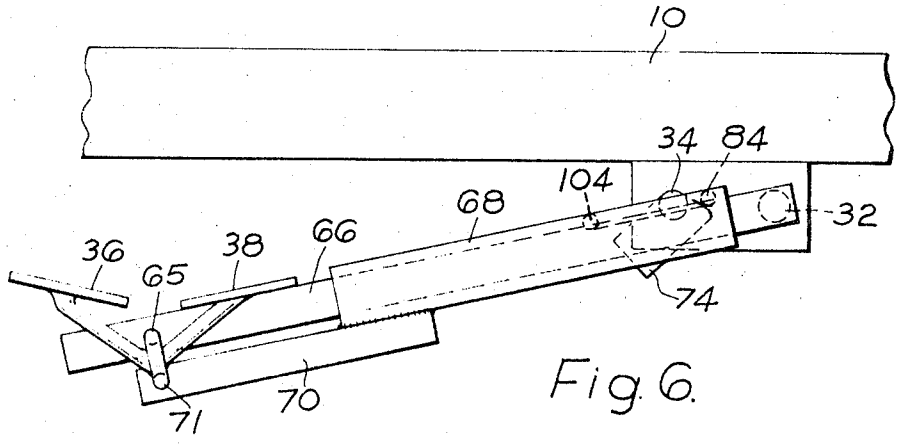

Fig. 6.

HOSPITAL BEDS

BACKGROUND OF THE INVENTION

This invention relates to hospital beds of the kind in which the top or mattress support element can be raised and lowered relative to the chassis of the bed so as to reduce effort involved in nursing, and facilitate the patient entering and leaving the bed, since for nursing a high bed is convenient and avoids stooping on the part of the nurses, and for ingress and egress a low bed is more suitable for an invalid.

Usually such beds comprise an X-frame and a jack for swinging the limbs of the X. Hydraulic jacks have been used, but problems are encountered due to leakage of fluid which cause the bed to slowly sink. Mechanical jacks avoid such difficulty, but are either of the continuous screw type in which event lowering is or may be as laborious as raising, or if a canting plate type is used the descent tends to be jerky and is not finely controlled. The objects of this invention are to provide improved means avoiding these problems.

SUMMARY OF THE INVENTION

In accordance with the invention a hospital bed of the kind referred to is provided with a canting plate mechanical jack for raising the top and for permitting descent, and with a hydraulic strut located to control descent.

The canting plate mechanical jack preferably includes a pair of canting plates which respectively act on a ram of the jack to lift the ram in one direction and brake the ram against descent in the opposite direction, the ram lifting plate being operable in response to pivoting of a lever in a first sense.

Conveniently means are provided for disengaging the braking plate to enable lowering of the top to be effected and said means is preferably operatively connectible with said lever so as to disengage the braking plate in response to pivoting of the lever in said first sense.

Preferably means are provided for holding the braking plate plate in a disengaged condition during pivoting of the lever.

By pivoting the lever in said one sense to operate the lifting plate when said holding means is operative and then gradually pivoting the lever in the opposite sense, the load presented by the platform and a patient can be transferred smoothly from the control of the mechanical jack to the control of the hydraulic strut so that the top can descend smoothly without any jerks. This facility is particularly useful where the mechanical jack is used in conjunction with a hydraulic strut which is designed to offer little initial damping resistance to descent and subsequently increasing damping resistance.

Hence the advantages of both mechanical and hydraulic systems are retained, but the disadvantages (notably the difficulties of sealing the fluid and the jerky descent) are avoided since sealing of a strut is simpler than of a jack, and the strut avoids jerkiness in descent.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective elevation of a bed;

FIG. 2 is an enlarged scale elevation of part of the same;

FIG. 3 is an elevation in the direction 3 of FIG. 2;

FIG. 4 is an enlarged scale perspective view of a foot-operated mechanism of the bed; and

FIGS. 5 and 6 are elevational views of the mechanism shown in FIG. 4 illustrating the mode of operation of the mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The bed generally comprises a wheeled chassis **10**, possibly provided with brakes or floor engaging chocks (not shown) to immobilize the bed, and a mattress support platform **12** supported for movement towards and from the chassis **10** by an X-frame. The X-frame has two limbs **16** and **18** at each side which are pivoted to the chassis **10** and support platform **12** the upper ends **20** of the limbs **16** and **18** being connected to the platform **12** by links **22.** The two limbs **16** and **18** are pivoted together on a sliding fulcrum (not shown); alternative arrangements for raising and lowering the platform **12** relative to the chassis **10** are possible using the invention.

A mechanical jack **13** acts between a strut **30** of the X-frame and the chassis, the jack comprising an enclosure **15** which is pivotally mounted on the chassis and a ram **28** which is pivoted to the strut **30** so that in jack extension and retraction the platform **12** can be respectively raised and lowered.

The enclosure **15** may conveniently be a metal casing of rectangular cross-section receiving at its lower end two rotatable shafts **32, 34** extending laterally of the chassis **10.** The shafts **32** and **34** are respectively operable by pedals **36** and **38.**

The shaft **32** is connected to a pair of cranks **40** within the enclosure **15** which cranks **40** are pivoted to a push rod **42** which extends through transverse partitions **44** and **44*a*** in the enclosure **15.** The upper end of rod **42** is domed and bears against a first canting plate **46** (FIG. 2), while the lower end **48** of rod **42** is of reduced diameter and threadedly engages in a pivot block between the cranks **40.** The lower end **48** of the rod **42** is provided with a screw slot whereby the length of the rod **42** can be adjusted, access to the slot being gained from beneath the chassis.

A compression spring **50** is located between the plate **46** and the top **54** of the enclosure **15** and tends to urge the plate **46** into facial contact with the partition **44.** The ram **28** is a tube or rod which extends upwardly along the enclosure **15** and through the top **54** thereof, and passes through apertures in the plate **46,** the partition **44** and a second or lower canting plate **56** located below the partition **44.** The rod **42** also passes with clearance through the lower plate **56,** and the partitions **44** and **44*a***.

The second plate **56** is fulcrummed in a slot **58** in the enclosure **15** and is coupled by a rod **60** to a crank **62** fast with shaft **34.** A spring **64** is located between the partition **44** and lower plate **56** and tends to urge the plate **56** to a downwardly canted position about its fulcrum, as seen in FIG. **2.** The crank **62** is straddled by the limbs **100** and **101** of a U-shaped member **102** secured to one of the side walls of the enclosure **15** which serve to limit pivoting of the crank **62** and hence the shaft **34,** the limb **100** being arranged so that when the crank **62** abuts the limb **100** the pivotal connection between the rod **60** and the crank **62** is just past its top dead-center position and can be maintained in this position by the biassing action of the spring **64.**

The raise and lower pedals **36** and **38** are rigidly interconnected and have a first common pivotal connection **65** with a lever **66** fast with the shaft **32** (FIGS. **4** to **6**), the lever **66** being received in a sleeve **68** which can slide relative thereto towards and from the pivotal connection **65.** The sleeve **68** is provided with an arm **70** which extends towards the pedals **36** and **38,** and is connected thereto by a second pivotal connection **71** so that pivoting of the pedals **36** and **38** about the pivotal connection **65** serves to reciprocate the sleeve **68** along the lever **66.**

The sleeve **68** carries a cam member **72** of U-shape having limbs **84** and **104** which are operable with a cam follower **74** in the form of a crank fast with shaft **34.** The lever **66** can be pivoted between an upper position, seen in full outline in FIG. **5,** and a lower position, seen in broken outline in FIG. **5,** pivoting beyond these positions being prevented by engagement of the free ends of the cranks **40** with upper and lower ends of slots **76** in the casing **15** in which said free ends are received. A compression spring **80** acting between the pivot block and the partition **44***a* biases the lever **66** into its upper position. With lever **66** in its upper position and sleeve **68** remote from the pivotal connection **65,** the rod **42** permits the plate **46** to lie in a slightly canted position, seen in FIG. **2,** in which it offers little, if any, resistance to movement of the ram **28** through the corresponding aperture in the plate **46.** At the same time, the lower plate **56** is canted and wedges on the ram **28.** The weight of the mattress frame and the patient urges the ram **28** downwardly and increases the wedging action exerted by the plate **56.**

If the raise pedal **36** is depressed to pivot the lever **66** towards it lower position the plate **46** is lifted away from the partition **44** by the link rod **42** and cants further (against the spring **50** which holds the one end down) so as to wedge on the ram **28.** Lifting of the plate **46** lifts the ram **28** and hence raises the platform **12.** The lifting action pulls the ram **28** through the lower plate **56,** the wedging action exerted by the latter being disabled by upward travel of the ram but becoming effective upon termination of said upward travel to act as a brake and prevent descent when the raise pedal completes its travel.

As the raise pedal stroke is completed and the lever **66** returns to its upper position under the action of springs **80,** the plate **46** is returned by the spring **50** towards the partition **44.** Hence by effecting an appropriate number of strokes of the lever **66,** the mattress platform **12** may be elevated to a desired position.

The plates **46** and **56** are designed to exert a wedging action on the ram **28** at the appropriate points during operation of the lever **66,** the size of the apertures in the plates **46** and **56** relative to the ram diameter, and the degree of canting allowable in any particular construction being chief design considerations.

Adjacent the jack **13,** and generally parallel to the ram **28** thereof, is a closed hydraulic damper strut **82** acting between the strut **30** and chassis **10.** The damper strut **82** comprises a telescopic body and ram and a piston provided with, e.g., restricted apertures so that in extension and contraction, oil flows from one side of the piston to the other. Alternatively the arrangement may include one-way acting restriction valves so that flow on extension is unimpeded but is restricted on contraction.

In lowering the mattress, the pedal **38** is depressed to draw the sleeve **68** towards the pivotal connection **65** so that camming action can take place between the cam follower **74** and the limb **84** of the cam member **72.** As the lever **66** pivots downwardly, the limb **84** engages the followers **74** and turns the latter in a clockwise sense as viewed in FIGS. **4** to **6.** This turning serves to rotate the shaft **34** in a clockwise sense, in FIG. **2,** to push the lower plate **56** upwardly through the agency of crank **62** and link **60** so as to disengage the wedging action exerted thereby on the ram **28.** The lower plate is maintained in this position as the spring **64** holds the crank **62** in its over top dead center position.

At the same time, the rod **42** is operated to move the plate **46** into wedging engagement with the ram **28** and lift the same slightly. By allowing the lever **66** to pivot slightly away from its lower position the wedging action on the ram **28** can be released sufficiently to allow the operator to control transfer of the load of the platform **12** and patient to the hydraulic damper **82** smoothly without permitting the plate **56** to exert a wedging action on the ram **28** which would otherwise prevent lowering of the platform **12.**

The platform **12** then begins its descent, and the damper **82** checks this so that it is controlled and smooth. For example, the restriction may be such that the mattress frame takes of the order of ten seconds to descend through a distance of twenty inches. While the pedal **38** is depressed the wedging action exerted by the lower plate **56** is disabled. To arrest descent of the platform **12** the pedal **36** is depressed to return the sleeve **68** towards the shaft **34** so that the limb **104** of the member **72** engages the follower **74** and turns the same counterclockwise. This results in the crank **62** and the rod **60** being returned towards the position shown in FIG. **2,** wherein the braking action of the lower plate **56** is effective.

The smooth transfer of the load from the mechanical jack **13** to the damper **82** is particularly important where the design of the damper is such that on the start of descent of the platform **12** the initial descent rate is rapid until the damper is operating fully. This is because such rapid initial descent may give rise to a jerk.

The invention has been described above in relation to an embodiment in which the braking plate, constituted by the plate **56,** and the lifting plate **46** are operatively connected with a common lever **66.** However, it is within the ambit of the invention to provide separate levers one for each canting plate **46, 56.** In this case, the shaft **34** could be connected directly to a second lever extending in a direction generally opposite to the lever **66** so that downward pivoting of the second lever rotates the shaft **34** in the clockwise sense required to disable the wedging action of plate **56** with the ram **28.** In such an embodiment although it would be possible to effect a smooth transfer of load from the mechanical jack **13** to the hydraulic strut **82,** it would be necessary to operate both levers simultaneously.

I claim:

1. A hospital bed of the kind referred to, provided with a canting plate mechanical jack for raising the top and for permitting descent, including a pair of canting plates which respectively act on a ram of the jack to lift the ram in one direction and brake the ram against descent in the opposite direction, the lifting plate being operable in response to pivoting of a lever in a first

sense, wherein the improvement comprises a hydraulic damper strut located to control descent.

2. A hospital bed as claimed in claim 1 in which means are provided for disengaging the braking plate to permit lowering of the top under control of the damper strut, said means being operatively connectible with said lever so as to disengage the braking plate in response to pivoting of the lever in said first sense.

3. A hospital bed as claimed in claim 1 which includes means for holding the braking plate in a disengaged condition during pivoting of said lever.

4. A hospital bed as claimed in claim 1 which includes means for rendering the lever operable to simultaneously disengage the braking plate and operate the ram lifting plate.

5. A hospital bed of the kind referred to, provided with a canting plate mechanical jack for raising the top and for permitting descent, including a pair of canting plates which respectively act on a ram of the jack to lift the ram in one direction and brake the ram against descent in the opposite direction, the lifting plate being operable in response to pivoting of a lever in a first sense, wherein the improvement comprises a hydraulic damper strut located to control descent, and means for rendering the lever operable to simultaneously disengage the braking plate and operate the ram lifting plate, including a sleeve slidable on the lever and movable to a position in which a cam carried thereby cams with a cam follower associated with the braking plate to disable the latter.

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