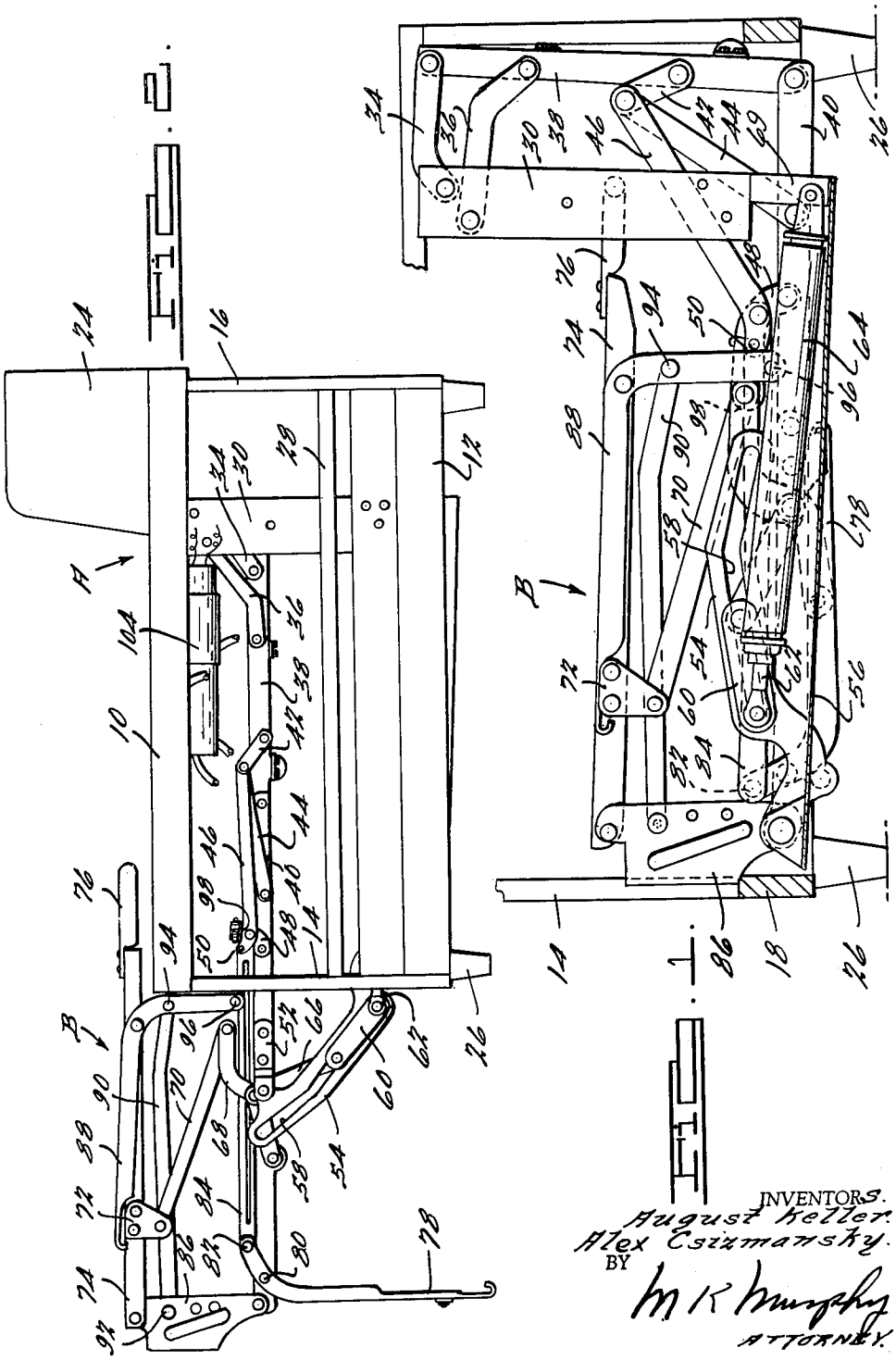
Oct. 9, 1962 A. KELLER ETAL 3,056,973

AUTOMATIC CONVERTIBLE BED

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INVENTORS.
August Keller.
Alex Csizmansky.
BY
M K Murphy
ATTORNEY.

Oct. 9, 1962 A. KELLER ETAL 3,056,973

AUTOMATIC CONVERTIBLE BED

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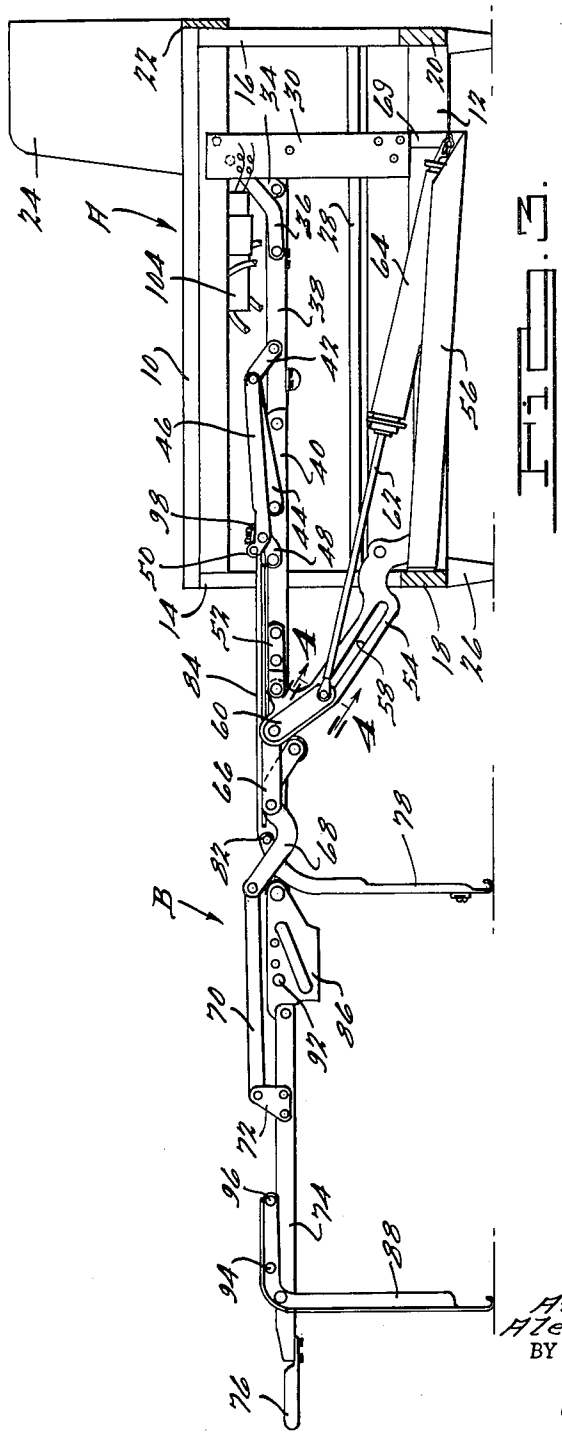


FIG. 3.

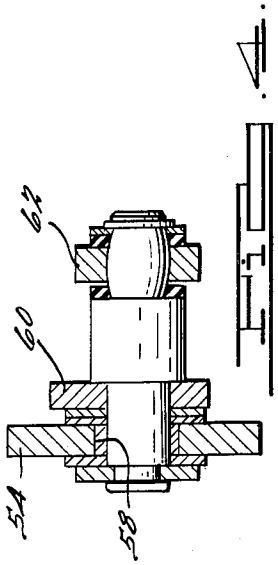


FIG. 4.

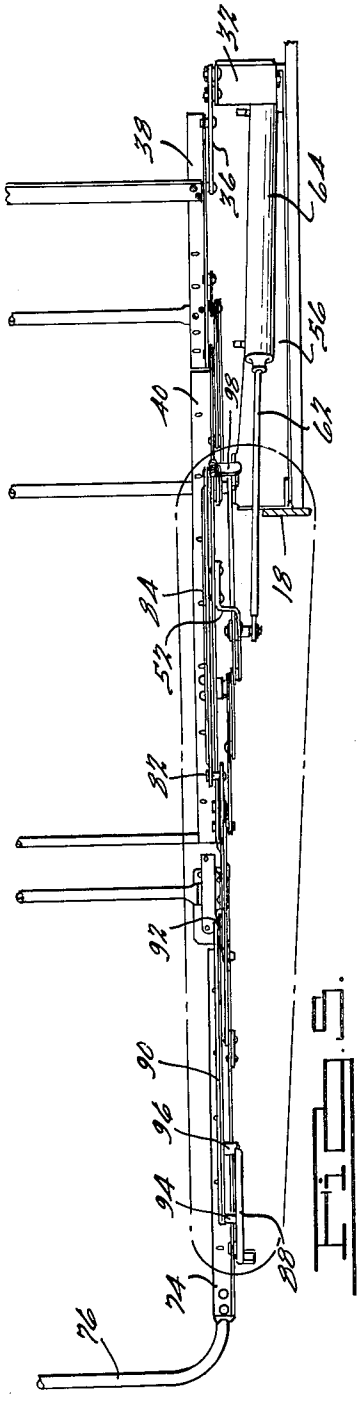
INVENTORS.
August Keller.
Alex Csizmansky.
BY
M K Murphy
ATTORNEY.

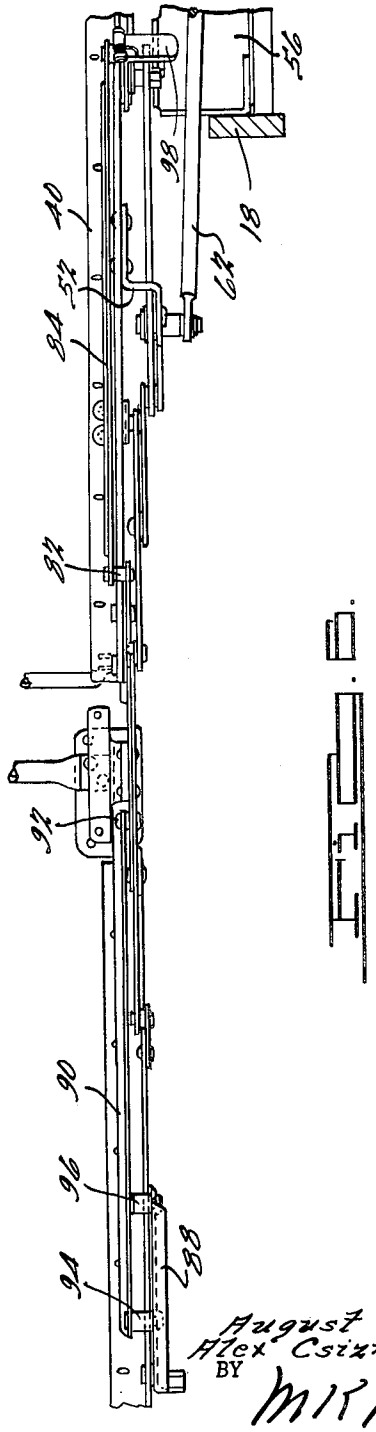
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AUTOMATIC CONVERTIBLE BED

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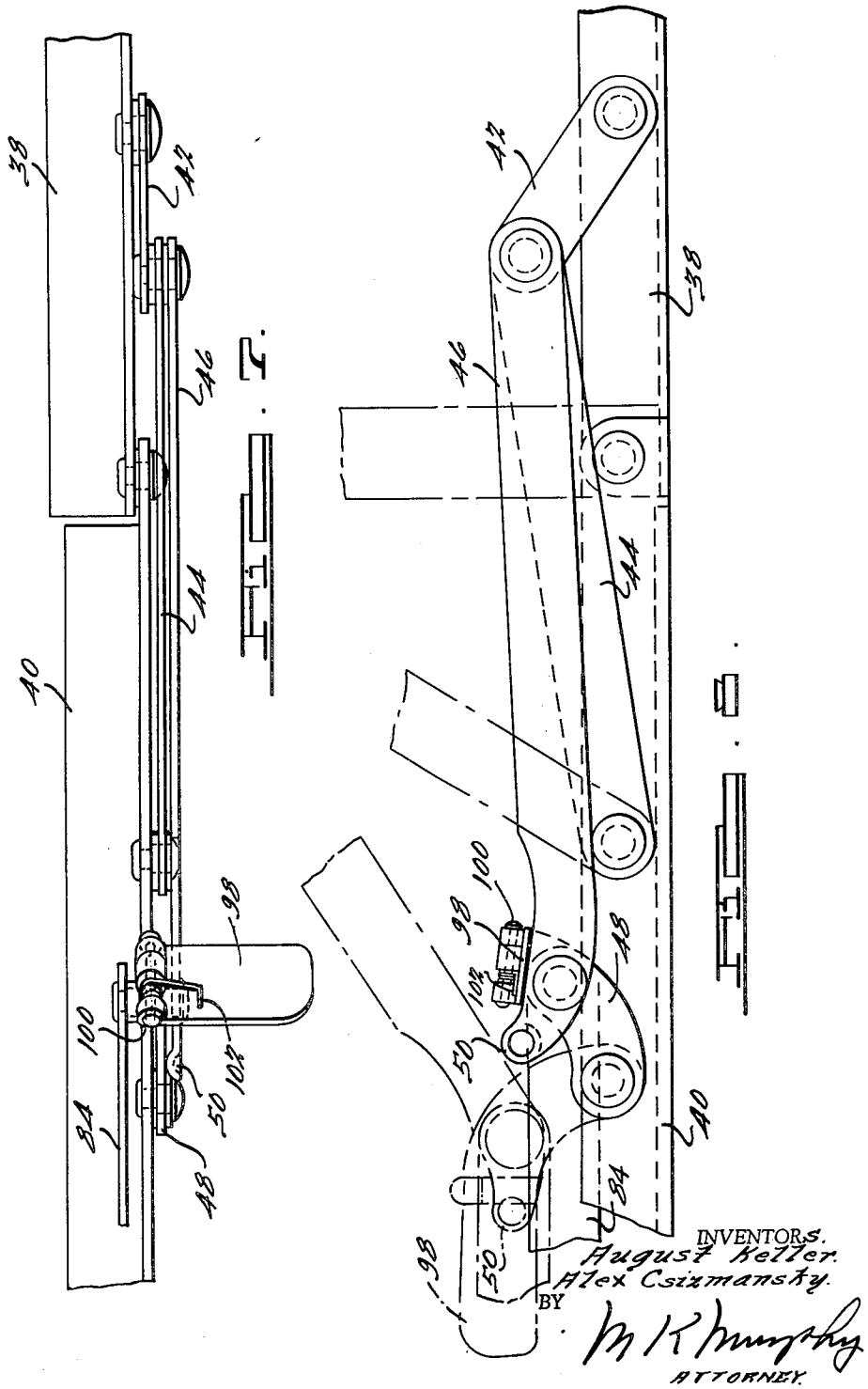


INVENTORS.
August Keller.
Alex Csizmansky.
BY
M F Murphy
ATTORNEY.

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AUTOMATIC CONVERTIBLE BED

August Keller, Commack, N.Y., and Alex Csizmansky, Dearborn, Mich., assignors to Dura Corporation, Oak Park, Mich., a corporation of Michigan

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3 Claims. (Cl. 5—13)

This invention relates to a combination sofa-bed or convertible sofa and in particular to a convertible bed adapted for power operation.

Sofa-beds have become increasingly popular in recent years and have been developed to a point where they provide a comfortable sofa of pleasing appearance during the daytime and a comfortable bed during the night. To insure good sleeping comfort, it is necessary to provide a fairly thick mattress which must be folded twice upon itself when the bed is converted to a sofa. Modern furniture designs demands that bulky appearance be avoided so the problem of providing a sofa-bed of desired comfort and appearance with ease of operation in the folding and unfolding cycle presents a difficult problem.

Attempts to operate such a bed by power have generally been unsuccessful because of the high cost and great weight of the power unit and because the units have been noisy in operation and unreliable.

The principal object of this invention, therefore, is to provide a power operated convertible sofa-bed that is economical in construction, light in weight, quiet and reliable in operation, and pleasing in appearance.

Another object is to provide an improved frame and linkage for a bed of this type which is adapted to be manually as well as power operated.

Still another object is to provide a compact power operating unit for the bed of the hydraulic type, which power unit is adapted to be easily mounted on the bed frame and is not visible when the sofa-bed is upholstered.

A further object is to provide a bed operating power unit wherein only two hydraulic cylinders are utilized to perform the unfolding and folding of the various frame sections in smooth sequence.

Other objects and advantages of the invention will become apparent from the following specification which, taken in conjunction with the accompanying drawings, illustrates preferred embodiments of the invention.

In the drawings:

FIG. 1 is a longitudinal sectional view through the sofa-bed frame showing the linkages and power cylinder of one side of the bed in elevation as they appear in folded position.

FIG. 2 is a side elevation of the bed frame with the linkages in an intermediate stage of folding or unfolding.

FIG. 3 is a side elevation of the bed frame with the parts in unfolded or "bed" position.

FIG. 4 is a detail section taken on line 4—4 of FIG. 3.

FIG. 5 is a plan view of the linkage on one side in unfolded position.

FIG. 6 is a similar view on an enlarged scale of that part of the linkage enclosed in the broken line in FIG. 5.

FIG. 7 is a fragmentary detail plan view on an enlarged scale of a portion of the linkage; and

FIG. 8 is an elevation of the linkage shown in FIG. 7.

Referring to the drawings, it may be seen that the sofa bed comprises a stationary sofa frame generally designated by A and a folding bed frame B. The stationary frame A is preferably of wood and includes horizontally disposed members 10, 12, and vertically disposed members 14, 16. It will be understood that the opposite side of the bed has similar members and these are joined together by horizontal transversely disposed members 18, 20 and 22. Upright members 24, suitably braced, are provided for supporting the divan back cushion, etc., and legs 26 are provided at each corner.

Only the linkage for one side will be described, it being understood that the other side of the bed is provided with duplicate linkage and power cylinder.

A reinforcing bar 28 is fastened at its ends to the members 14, 16, to stiffen the frame structure and prevent distortion due to stress imparted by the power cylinders. A relatively heavy-section upright 30 is bolted to the members 10 and 12. The power cylinder is pivotally mounted on this member at the bottom thereof, and the folding linkage is pivoted to the member at the top and intermediate portions thereof, as will be more fully described.

The upright 30 carries a bracket 32 (FIG. 5) which extends inwardly of the frame and pivotally mounts the links 34, 36. The latter are pivotally connected at their outer ends at spaced points to a rail 38. The rail 38 is of angle iron for purpose of strength and is pivotally connected at its outer end to a similar elongated rail 40.

Pivoted to rail 38 intermediate the ends thereof is a short actuating link 42. The latter, in turn, pivotally connects with the actuating link 44, which has a connection with the rail 40, and with actuating link 46 which is also connected with rail 40 through the intermediary of a short link 48. The link 46 has a turned-up end 50, the purpose of which will be described below.

The elongated rail 40 is pivotally connected, by means of an offset bracket 52, with the main pivot arm 54. The latter is of irregular shape and is pivotally mounted in the outer end of a generally horizontally disposed frame member 56 which is rigidly fixed in the frame A. (See FIGS. 1 and 3.) The arm 54 has an elongated slot 58 in which is disposed a slide 60.

One end of the slide 60 is pivotally connected to the outer end of a piston rod 62 carried by a hydraulic cylinder 64. The latter is pivotally mounted at its inner end on a frame bar 69 which, in turn, is rigidly secured to frame members 30 and 56.

The other end of slide 60 is pivotally connected by means of a link 66 with the intermediate portion of a link 68. The latter is of S-shape and is pivoted at one end to a link 70 and at its other end to the rail 40. The link 70 is pivotally connected at its outer end to a bracket 72 rigidly carried by the rail 74. The latter carries a footpiece rail 76 which is of U-shaped and extends transversely as shown in FIG. 5.

The rail 40 carries an intermediate leg 78, pivoted thereto at 80, and the latter extends beyond the rail to a connection 82 with an actuating link 84, the rear end of which is pivotally connected to the rail 40. Rails 40 and 74 are interconnected by means of a plate 86 which is embossed for strength.

The rail 74 pivotally carries an outer angular leg 88. An actuating link 90 interconnects plate 86 and leg 88 at points 92, 94, respectively. The leg 88 has a stop 96 at the rear end of its short angular portion as shown.

Referring now to FIGS. 7 and 8, it will be seen that the short link 48 carries a lock member 98. The latter is pivotally carried on the link 48 by means of a rivet 100 which also carries a coil spring 102 having a leg extending outwardly into engagement with a surface of the member 98 as clearly shown in FIG. 7. The spring 102 urges the lock member into folded position as shown. In this folded position, the member lies flat and is not in a position to be engaged by the arm or body of a person lying on the bed or getting into or out of the bed.

When the frame B is folded from intermediate position (FIG. 2) to folded or sitting position (FIG. 1), the turned-up end 50 of the link 46 engages the lock member 98 and forces it into upright position whereby it overlies the stop 96 of the leg 88 when the frame members are in

the FIG. 1 folded positions. This compresses the linkage (and the mattress which has then been folded upon itself in two layers) and prevents the linkage from springing upwardly due to compression of the mattress. The folding lock just described is very important to the functiong of the bed linkage as a whole because it permits the power cylinders to firmly lock the entire linkage in seat position and yet does not protrude when the linkage is in bed position such that a person sleeping on the bed is liable to injure himself.

The power unit for supplying fluid under pressure to the cylinders **64** is shown in FIGS. 1 and 2 and is generally designated by the reference numeral **104**. This unit comprises a pump, reservoir and electric motor for driving the pump. The motor is of the 110 volt type and is reversible. A switch is mounted on the divan at some convenient spot and flexible conduits are connected to the pump-reservoir and to each end of the cylinders such that the fluid will be pumped to one end of each of the cylinders and withdrawn from the other ends thereof in accordance with the direction of motor rotation. For purposes of simplification of the drawing and because the power unit details are well known in the art, the switch, conduits, etc., have been omitted from the drawing.

The operation of the bed in unfolding from the FIG. 1 position is as follows:

It will be understood that the seat cushions usually provided in upholstered furniture will be removed before it is attempted to unfold the bed. With the bed in the FIG. 1 (folded) position, operation of the power unit **104** with the pump turning in such direction that fluid will be pumped into the right end of cylinder **64** (and into its counterpart on the opposite side of the bed) and withdrawn from the left end of the cylinder will cause the piston rod **62** to move outwardly of the cylinder and swing arm **54** about its pivot on the member **56**.

Arm **54** will swing counterclockwise through the limit of its movement, at which time the linkage will be in the position shown in FIG. 2, the leg **78** resting on the floor and the rails **38** and **40** being in alignment. Initial unfolding movement of the linkage immediately moves stop **96** from underneath lock tab **98** and as links **46** and **48** move relatively, tab **98** folds over under the influence of spring **102**.

Continued outward travel of rod **62** beyond its FIG. 2 position will cause slide **60** to move upwardly in slot **58** of arm **54** and the accompanying movement of links **66**, **68**, **70**, etc., will swing the member **86** and rail **74** counter-

clockwise until the parts are in the positions shown in FIGS. 3, 5 and 6, whereupon the leg **88** will be in contact with the floor with the stop **96** resting on the top of the flange of rail **74**.

The bed is now fully open with the mattress (not shown) ready for sleeping. Operation of the control switch in reverse direction will cause piston rod **62** to travel into the cylinder **64** and the bed will be folded from the FIG. 3 position to the FIG. 2 position, then to the the FIG. 1 position in reverse order. The whole assembly will be locked by engagement of the tab **98** with stop **96**, and replacement of the seat cushions (not shown) makes a divan suitable for seating.

We claim:

1. In a convertible sofa bed having a sofa frame and a sectional bed frame foldable into and out of the sofa frame, said bed frame comprising articulated sections constructed and arranged for movement between folded sofa position and planar bed position, power operated means for folding and unfolding the bed frame comprising a reciprocable member, a pivot arm swingably mounted on the sofa frame, a slot in said pivot arm, a slide mounted in said slot for sliding movement with respect to said arm and having a folded position in the bottom of said slot, a pivoted connection between said arm and the bed frame, a link connection between said slide and the bed frame, a pivotal connection between said reciprocable member and said slide operable in response to initial movement of said reciprocable member from its folded position to swing said arm about its pivot to cause partial unfolding of the bed frame, and upon further movement of said reciprocable member to cause movement of said slide in said slot and thereby complete unfolding of the bed frame.

2. The combination set forth in claim 1 wherein said reciprocable member is a piston rod.

3. The combination set forth in claim 1 wherein said reciprocable member is a piston rod and the power operated means includes a hydraulic motor for reciprocating said piston rod.

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