United States Patent

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[54] **SNUBBER FOR SAFETY SIDES**
5 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **5/331,**
5/92, 297/425
[51] **Int. Cl.** **A47c 7/50,**
A47c 22/00
[50] **Field of Search** 297/414–419,
425, 426; 5/12, 92, 100, 317, 331;
248/288, 289, 299

[56] **References Cited**
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ABSTRACT: A retarding device for braking the free fall of a safety side on an invalid bed or the like, comprising a wedge on at least one of two relatively rotatable members that are in sliding contact with one another and arranged so that the wedge serves to increase the pressure of the sliding contact as the safety side swings down from its erected position to its stowed position. The wedge is molded of resiliently compressible material in a form to facilitate its installation at a pivot joint, and to prevent its rotation with respect to one of the two relatively rotatable members.

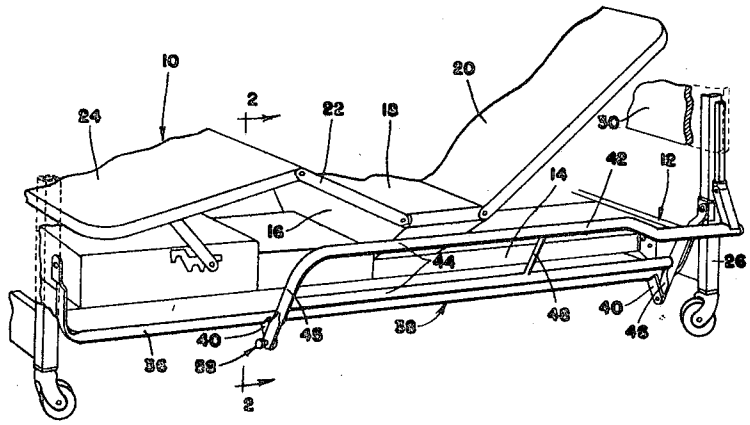


FIG.1

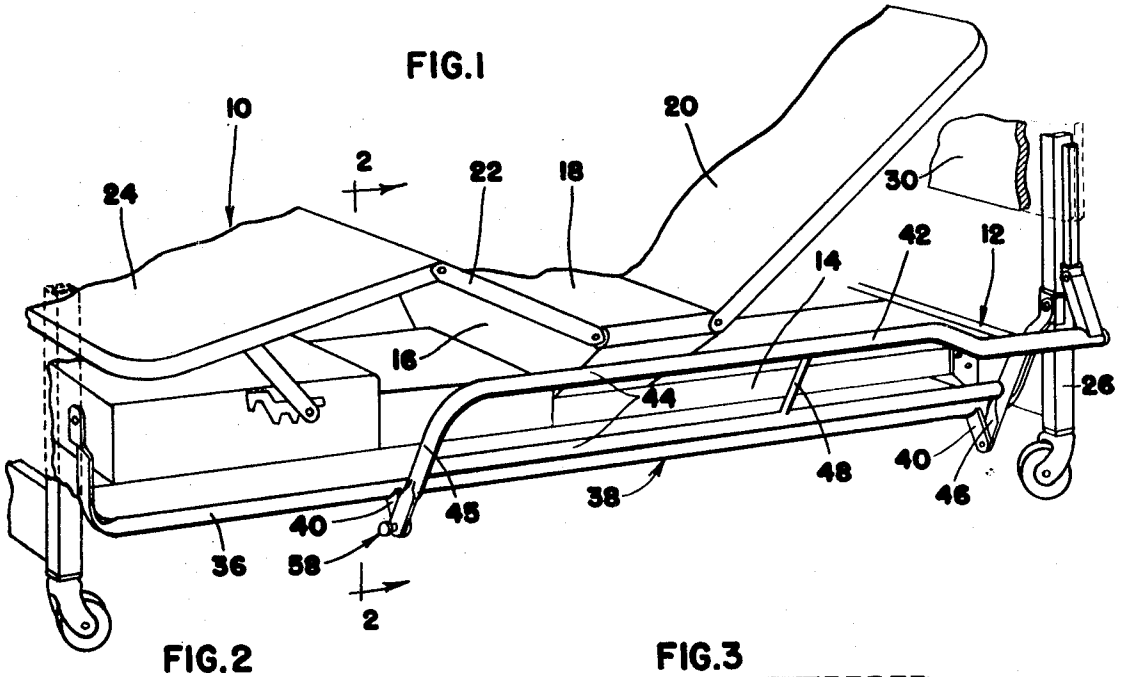


FIG.2

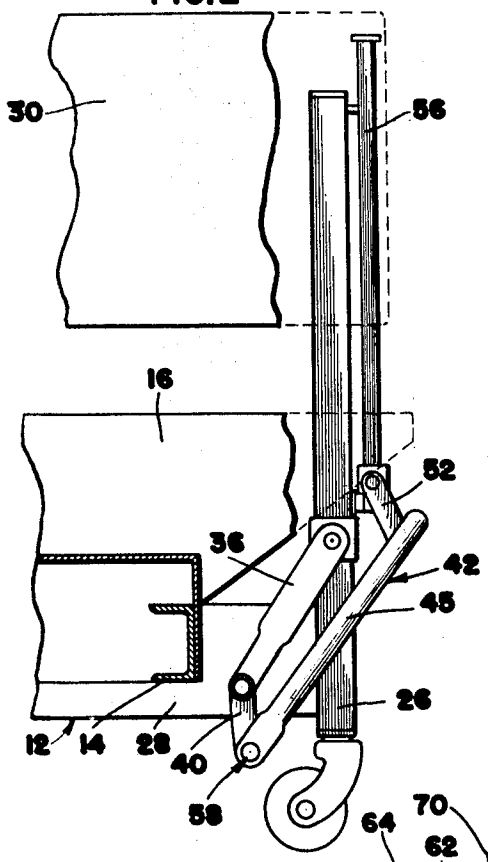
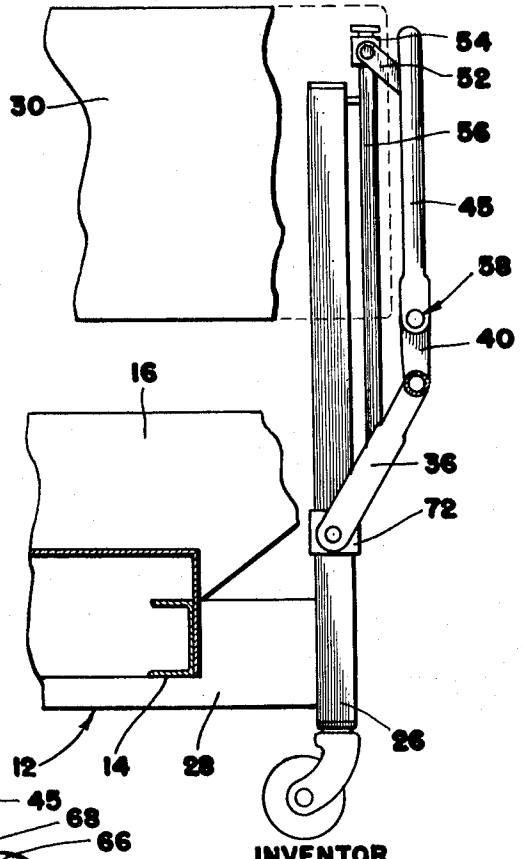


FIG.3



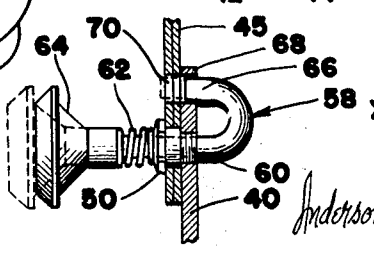


FIG.3a

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FIG.4

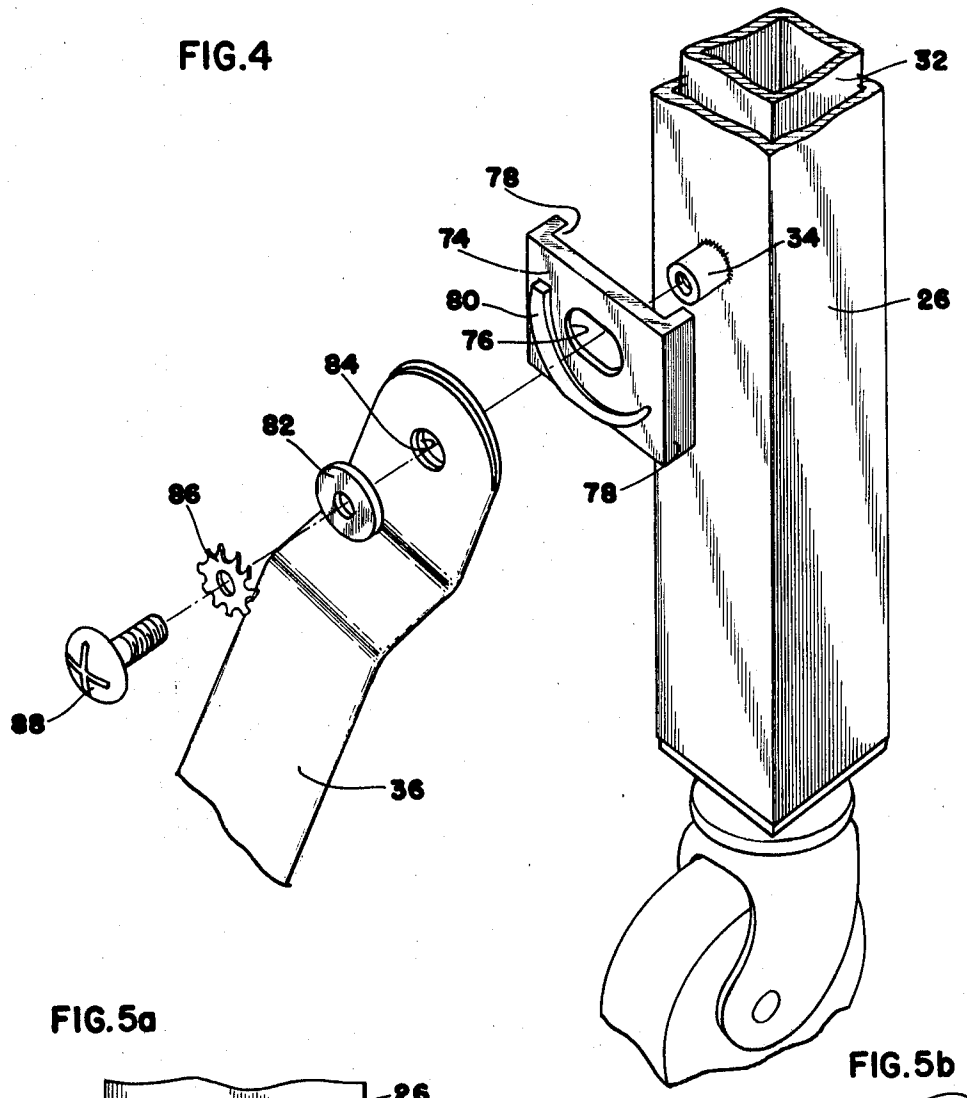

FIG.5a

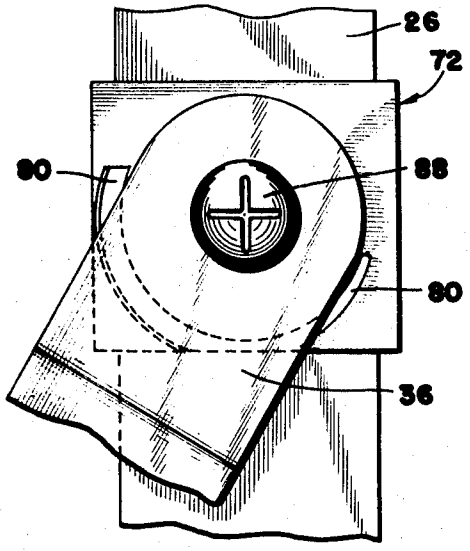

FIG.5b

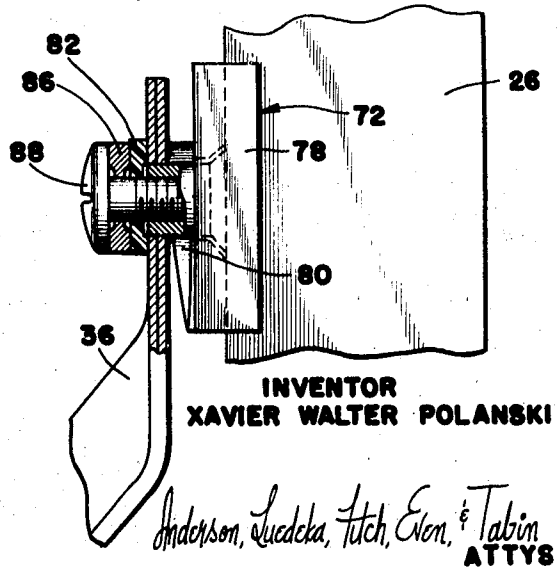

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FIG.6

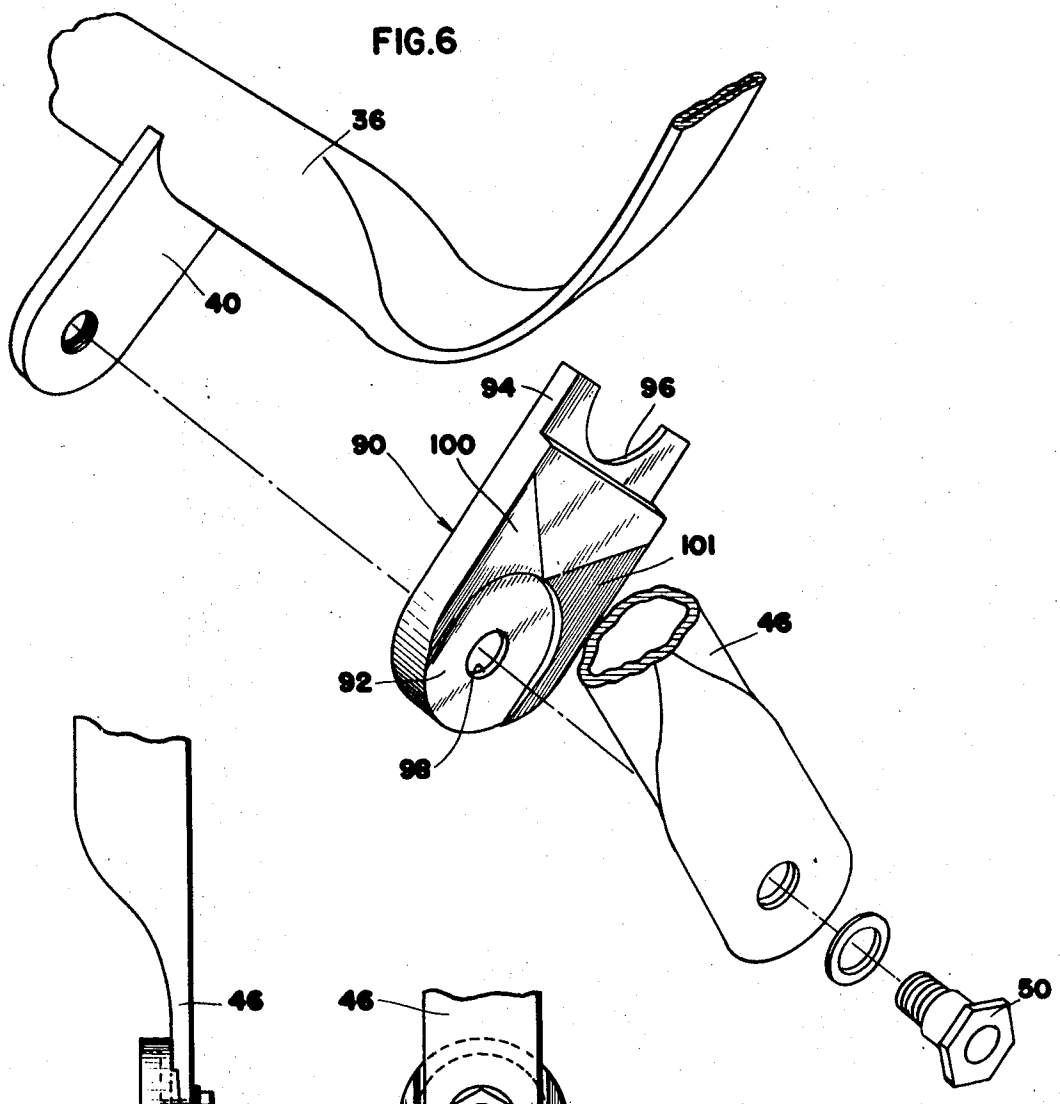

FIG.7a

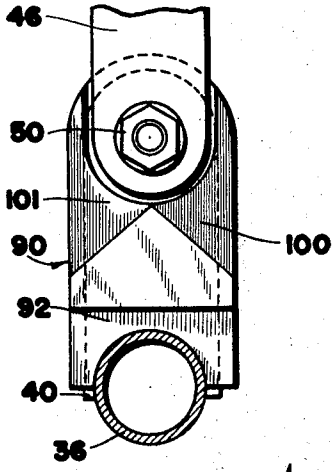

FIG.7b

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SNUBBER FOR SAFETY SIDES

This invention relates to safety sides for hospital beds or the like, and in particular to that kind of safety side whose movement between its erected and stowed positions involves a relative folding or swinging movement of its parts, or a folding or swinging movement of the safety side or a part thereof relative to the bed or the like upon which the same is mounted.

Inasmuch as the stowing of such a safety side from its erected guard position alongside and extending upwardly from the patient-supporting surface usually involves a lowering of the center of gravity of the device, it is possible either by carelessness or mishap to permit the safety side to fall abruptly from the erected position to its lowest level. Such free fall usually ends in the noisy collision of parts.

It is accordingly the object of this invention to provide, in a safety side of the type described, a snubber or retarder for the descent of the safety side from its erected position which will function to decelerate the descending parts smoothly to a quiet stop in the stowed position.

The invention is illustrated in the accompanying drawings in connection with a safety side of the fold-under type, which is one of number of kinds that are erected and stowed, respectively, by a pivotal or swinging movement.

The fold-under safety side has usually been associated with beds having underframes of reduced width, such a bed and fold-under safety side in conjunction therewith having earlier been disclosed and claimed in U.S. Pat. No. 3,081,463, Williams et al., owned by the assignee of this invention.

In such a fold-under safety side, there are a number of relative swinging or pivoting movements to which a snubber or retarder might be applied. In the illustrated arrangement, there is the swinging movement of the lower portion of the safety side relative to the fixed frame of the bed, the relative folding movement of the two portions of the safety side, which might be thought of as the lower or mounting part and the upper or guard part, and, lastly, there is the relative swinging and sliding movement of the upper or guard portion of the safety side relative to the fixed bed frame.

In the safety side of the Williams et al., patent earlier mentioned, and others which provide no guidance for the upper or guard part other than its attachment to the pivotal mounting parts, only the first two described relative movements may be available.

In any event, at the side of one of these relative pivotal movements where two relatively rotatable parts may be found in sliding contact with each other during such relative rotation, an arrangement is provided for increasing the contact pressure, and therefore the frictional drag, between those two relatively movable parts as the safety side descends toward the stowed position.

In the specific form shown, this retarding action is accomplished by interposing, between the two relatively movable parts, a cam or wedge of molded plastic material of limited but elastic compressibility, and fixing it to one of the relatively rotatable parts of the structure so as to be in frictional contact with the other during rotation. The cam or wedge arrangement is such as to increase the contact pressure as the safety sides descends, this being accomplished in the molded form disclosed by increasing the thickness of the cam or wedge part in its dimension parallel to the axis of rotation and also in its dimension perpendicular to the axis of rotation so as to make available the compressive resistance of a larger mass of material than would be invoked merely by the incline or slope of the wedge.

Two specific forms are shown, one for interposition between the fixed frame of the bed and the lower or mounting part of the safety side, and another for interposition between two parts of the safety side at their axis of relative rotation.

The invention is described in detail in reference to the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a hospital bed having mounted thereon a safety side of the type that folds under the overhang of the patient-supporting surface in the stowed position;

FIGS. 2 and 3 are respectively sectional views taken along the line 2—2 of FIG. 1, and showing the safety side in the stowed and erected positions respectively;

FIG. 3*a* is a fragmentary sectional view taken along the line 3*a* —3*a* of FIG. 3, to illustrate the spring-loaded detent lock by means of which the safety side is secured in the erected position;

FIG. 4 is a fragmentary perspective view of the installation of the preferred form of retarder designed for installation at the pivotal axis between the stationary bed frame and the lower or mounting part of the safety side, the assembly being "exploded" along the pivot axis to illustrate more clearly the assembled relation;

FIGS. 5*a* and 5*b* are respectively fragmentary front and side views of the assembled pivot joint of FIG. 4, FIG. 5*b* being partially sectioned;

FIG. 6 is a fragmentary perspective view of the form of retarder designed for use at the folding joint between the two parts of the illustrated safety side, the assembly being "exploded" along the folding axis to better illustrate the assembled relation; and

FIGS. 7*a* and 7*b* are side and end elevational views of the assembly illustrated in FIG. 6. FIGS. 1 to 3*a* inclusive depict the environment of the invention, i.e., the mounting and operation of a safety side chosen to illustrate the invention. The bed **10** comprises a pair of castered end frames **12** which are connected together by an underframe comprising a narrow central girder structure **14** surmounted by medial cross beam **16**, the upper surface of which serves as the fixed seat section **18** of the articulated body-supporting surface. In the usual fashion, a head section **20** is hinged to the fixed seat section, and, on the edge opposite the head section, there is hinged a thigh section **22** having hinged to itself, in turn, a foot section **24**.

The adjusting mechanism for placing and maintaining the movable sections in their selected positions of adjustment is omitted for clearer illustration of the safety side itself.

Each end frame comprises a pair of spaced corner posts **26** which are connected together near the lower ends by a cross beam **28** to which the central or spinal girder of the underframe is secured. Mounted to the corner posts on one face of each end frame is a decorative board, of which only the headboard **30** is illustrated.

The cornerposts are tubes of rectangular section having housed therein a telescoped leg **32** (FIG. 4) which may be extended by suitable elevating mechanism to adjust the height of the patient-supporting surface. An internally threaded mounting stud **34** projects as a trunnion from the wall of each cornerpost facing the opposite end of the bed to serve as a pivot for the lower or mounting portion **36** of the safety side **38**. The mounting portion of the safety side is essentially a tubular bow, the ends of which are flattened, punched to receive the mounting studs **34** on the posts **26**, and offset to provide swinging clearance for the arms at the ends of the bow **36**. A pair of lugs **40** welded to the bow at an angle to the plane of the bow provide the points of pivotal attachment of the upper or guard portion **42** thereto.

The upper or guard portion **42** of the safety side is likewise of welded tubular construction comprising a pair of longitudinal upper and lower rails **44** connected together by end members **45** and **46** and one or more intermediate filler members **48**, depending upon the length of the safety side. In the particular design illustrated, the end member **45** closest the foot of the bed is made integral with the upper longitudinal rail, whereas the end member **46** nearest the head of the bed is fabricated, like the filler members, as a separate part welded thereto. Both tubular end members are flattened at their lower ends, and punched to receive hollow shoulder screws **50** mounted in the pivot lugs **40** secured to the bottom bow **36**.

The upper longitudinal rail **44** of the safety side is extended to a point opposite the cornerpost **26** at the head of the bed

and has welded thereto an arm 52 of channel-shaped cross section, the opposed flange portions thereof extending as lugs from its end, and flanking a molded slide shoe 54 which is confined for vertical movement on a vertical guide rod 56 attached to the corner frame. The slide shoe has trunnions molded integral therewith, the same being received in suitable round apertures in the end lugs of the mounting arm 52.

The guide rod 56 is mounted on the cornerpost of the head end frame, being spaced from sidewall thereof by a mounting stud at the upper end and by a lateral extension of the rod itself at its lower end. The guide rod is preferably tubular, and as shown here is of square cross section.

It will be seen by comparison of the several FIGS. 1 to 3, inclusive, that the safety side 38 follows a fixed path of movement from its erected guard position alongside the patient-supporting surface and extending thereabove, to its folded stowed position beneath the overhang of the patient-supporting surface, the lower mounting bow 36 travelling in a fixed arc, and the upper or guard portion 42 having a compound swinging an translating movement.

A detent 58 for locking the safety side 38 in the erected position is positioned conveniently at the folding joint nearest the foot of the bed, its construction being shown in detail in FIG. 3*a*. The locking detent 58 is a U-shaped plunger 60 mounted for axial movement within the hollow shoulder screw 50 upon which end member 45 of the upper portion of the safety side is pivoted to the lug 40 of the bottom bow, and is loaded by a compression spring 62 which surrounds the plunger between the head of the screw 50 and the handle 64 of the plunger so as to urge the end of the return portion 66 of the plunger against the flattened face of the end member 45 of the upper or guard portion of the safety side. The detent is keyed against rotation by the receipt of the return portion 66 of the plunger in a central notch 68 in the end of the pivot lug 40 of the mounting bow. A hole 70 in the flattened end portion of the end member 45 of the upper guard portion is positioned for alignment with the return portion of the detent when the safety side is erected, as in FIG. 3, at which position the return portion 66 of the spring-loaded plunger snaps into the hole and locks the two relatively foldable parts of the safety side together as one until subsequently withdrawn against the force of the spring 62.

The retarder 72 (FIGS. 4 and 5) for breaking the free fall of the safety side from the erected to the stowed position is preferably molded of a plastic material such as nylon or the like which is quite dense and has a good compression strength, but is of a somewhat elastic character.

In its preferred form, illustrated in FIGS. 4 and 5, it comprises a body plate 74 on the cornerpost 26 having a central hole 76 to receive the pivot stud 34, and a pair of oppose side flanges 78 to embrace the sidewalls of the cornerpost and thus to lock the retarder against rotation when assembled with the post.

On the front face of the body plate 74 there is a rising and widening ridge or wedge 80 which is arrayed circumferentially about the central hole 76, which is preferably elongated laterally of the body plate so as to receive the mounting stud 34 on the cornerpost with adequate tolerance for its location. In a given case, therefore, depending upon the tolerance with which the mounting stud is positioned on the cornerpost, the rising ridge or wedge or "inclined plane" 80 of the retarder is disposed more or less circumferentially of the pivot axis of the lower mounting bow 36 of the safety side.

In FIG. 4, which shows the assembly "exploded" the end of the lower mounting bow 36 is positioned as when the safety side is stowed. The retarder 72 is positioned on the post 26 with the mounting stud 34 protruding through the central hole 76 in the body plate 74 of the retarder. The adjacent face of the flattened end of the mounting bow 36 is held tightly against the ridge 80 of the retarder by a nylon washer 82 which covers the face of the mounting stud 34 and extends outwardly over the opposite face of the flattened end of the mounting bow surrounding the pivot hole 84 therein. The assembly is maintained by a lock washer 86 and screw 88 threaded into the tapped central hole of the mounting stud.

As seen best in FIG. 5*b*, the nylon washer 82 is counterbored to a shallow depth at a diameter slightly larger than the outer diameter of the mounting stud 34 in order to assure contact between the washer and the face of the flattened end of the bow 36.

By comparison of FIGS. 4 and 5, it may be seen that, when the safety side is in the stowed position, one face of the flattened end of the mounting bow 36 is engaged with highest and thickest portion of the ridge or wedge 80 of the retarder, and the opposite face of the flattened end of the bow is engaged by the nylon washer 82.

Conversely, by reference to FIG. 3, and to the broken-line position of FIG. 5*a*, it will be seen that when the safety side is in the erected position, the flattened end of the bow 36 is entirely free of the wedge 80 of the retarder, the radius of the end of the bow being slightly less than that of the inside radius of the wedge. Thus, in the course of the travel of the safety side from the erected to the stowed position, the flattened end of the bow 36 first contacts the ridge 80 of the retarder after having moved free through a relatively small arc, and then proceeds to ride up the inclined face of the wedge which, as already noted, is increasing in width as well as in height as the stowing movement proceeds. The end of the bow is thus "squeezed" between the wedge 80 of the retarder on the one side and the nylon washer 82 on the other, the height of the mounting stud 34 being such as to cause contact between the ridge 80 on the retarder and the adjacent face of the flattened safety side bow 36 at a point preferably within the first 90° of the ridge 80, allowing for the manufacturing tolerances encountered in the welding of the mounting stud to the wall of the corner post.

As the stowing action proceeds, the leading edge of the flattened tube end rides up the wedge, which together with the nylon washer, yields resiliently while increasing the contact pressure between the surfaces of the relatively moving parts, i.e., the wedge 80 itself, which deforms into flattened surface contact with the adjacent face of the tube end, and the nylon washer 82, which is held stationary by the lockwasher 86 on its opposite face.

It is recognized that this arrangement suggests the possibility of more complete surface contact between the flattened end of the mounting bow 36 and the rising wedge 80 of the retarder, as by the employment of a complementary cam surface on the end of the bow, and the utilization either of deformable materials, as here, for the cam surfaces, or of resiliently deformable backup for the opposite face of the bow end if a relatively incompressible material be used for the sloping surface or surfaces.

With some tolerance for the relative heights of the mounting stud 34 and the contacting face of the ridge 80 on the retarder, those dimensions, relative to the thickness of the flattened tube end, are preferably such that the minimum available retarding action will stop the safety side from a free fall before it "bottoms" either by contact of the slide shoe 54 with the bottom of the guide rod 56, or by the mounting bow 36 of the safety side striking the underframe of the bed. On the one hand, this may necessitate the application of slight force in some assemblies to place the safety side 38 fully into the retracted position, and on the other may necessitate the backing of the nylon washer 82 with a flat steel washer to restrain its tendency to dish as the stowing action proceeds, and thus to intensify the normal increase in contact pressure.

The retarder 72 of FIGS. 4 and 5 requires oppositely oriented ridges for opposite sides of the bed, i.e., "rights" and "lefts," and may be employed at either or both ends of the safety side.

The modified form of FIGS. 6 and 7 applies the same principles to a retarder 90 interposed between the pivot lug 40 of the mounting bow 36 and the flattened end of the tubular end member 46 of the upper or guard portion of the safety side.

In this instance, the retarder comprises a body plate **92** which is semicircular at one end to conform to the pivot lug **40** of the safety side mounting bow **36**, and is likewise provided with a surrounding flange **94** which embraces the side edges and end of the lug **40** to secure the retarder against rotation relative thereto. For the same purpose, the opposite end of the retarder is provided with a semicircular notch **96** to conform to the tubular contour of the bow at the base of the pivot lug **40**. The body plate has a suitable hole **98** at the pivot axis to receive that portion of the shoulder screw **50** which serves as the trunnion or journal for the flattened end of the tubular end member **46** of the upper or guard portion of the safety side.

Inasmuch as the relatively rotation of the two parts of the safety side of the fold-under type illustrated is considerably less during the stowing movement than the rotation of the lower mounting bow **36** relative to the corner posts **26** of the bed, and further inasmuch as it was desired to employ a retarder **90** at only one of the folding joints because of the locking detent **58** at the other, the cam or wedge **100** of the retarder **90** of modified form in FIGS. **6** and **7** is designed to have a more rapidly increasing area of contact between the face of the wedge and the flattened end of the tube **46**. In addition, therefore, to increasing the amount of compressible material in the wedge **100** as the relative turning movement progresses, the center of contact of the areas in contact with each other becomes more distant from the pivot axis, thus increasing the retarding effect by increasing the frictional drag and also its moment arm about the pivot axis.

In the modified form illustrated in FIGS. **6** and **7**, two inclined surfaces or wedges **100** and **101** are molded on the body plate **96** of the retarder so that a single retarder form would serve the safety sides on opposite sides of the bed and thus avoid the necessity for separately molded "rights" and "lefts."

The edge of the cams or wedges **100** and **101** which faces the central hole **98** of the retarder is circular, and, as is the case with the cam of the preferred form of FIGS. **4** and **5**, that edge has a radius slightly larger than the radius of the flattened end of the tube **46** so that the rounded end of the tube fits freely within the interior of the wedge when the safety side is in the erected position. (See FIG. **7***b*).

It will be apparent from the foregoing that in each of the two specific forms shown, the safety side, as it first departs from the erected or upper position, is retarded in its movement essentially only by such initial frictional resistance as may be inherent in the system, until the wedging action of the snubber or retarder comes into play. However, as the relatively moving part traverses the inclined face of the wedge or ridge, the pressure between it and the wedge on the one side, and the backup surface on the opposite side, begins gradually to increase and preferably to intensify the frictional drag at a rate greater than the increase in the angular displacement of the relatively movable part. This is accomplished in both the preferred and modified forms by increasing the width, as well as the height, of the wedge which not only increases the mass of compressible material brought into play but also increases the moment arm of the frictional drag.

In either case the energy expended in the fall of the safety side is smoothly and effectively absorbed and the safety side decelerated to a smooth stop in the stowed position.

The features of the invention believed patentable are set forth in the appended claims.

1. In a safety side on an invalid bed or the like in which the safety side is movable by a swinging movement between a stowed position below the level of the patient-supporting surface and an erected guard position alongside the patient-supporting surface extending above the normal level thereof, a snubber for retarding the stowing movement of the safety side comprising two members that are rotated relative to each other by said swinging movement, said members being in sliding contact with each other, and means for increasing the contact pressure between said members when rotated by the stowing movement and decreasing the contact pressure by the erecting movement.

2. The arrangement of claim **1** wherein said pressure-increasing means is an inclined plane traversed by one of the relatively rotatable members in the course of said swinging movement.

3. The arrangement of claim **1** wherein one of said two members is a circular cam arrayed about the axis of relative rotation of said two members and traversed by the other in the course of said rotation, the cam being made of an elastically compressible material and constituting said pressure-increasing means.

4. In a safety side on an invalid bed or the like in which the safety side is movable by a swinging movement between a stowed position below the level of the patient-supporting surface and an erected guard position alongside the patient-supporting surface extending above the normal level thereof, a snubber for retarding the stowing movement of the safety side comprising a cam block interposed between two members that are rotated relative to one another by said swinging movement, said cam block being secured to one of said members and in contact with the other along the slope of a wedge portion of the block that tends to increase the separation of the two members along the axis of their relative rotation as the safety side is stowed.

5. The arrangement of claim **4** wherein the block is made of material having a resilient compressibility greater than that of the two members and wherein the cross-sectional area of the wedge portion increases faster than its slope.