April 22, 1958 C. EAMES 2,831,528

FOLDING SOFA

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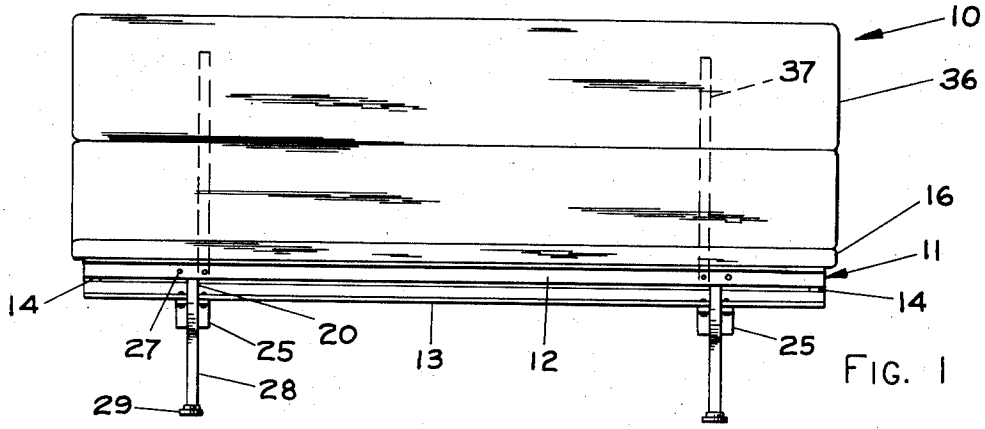


FIG. 1

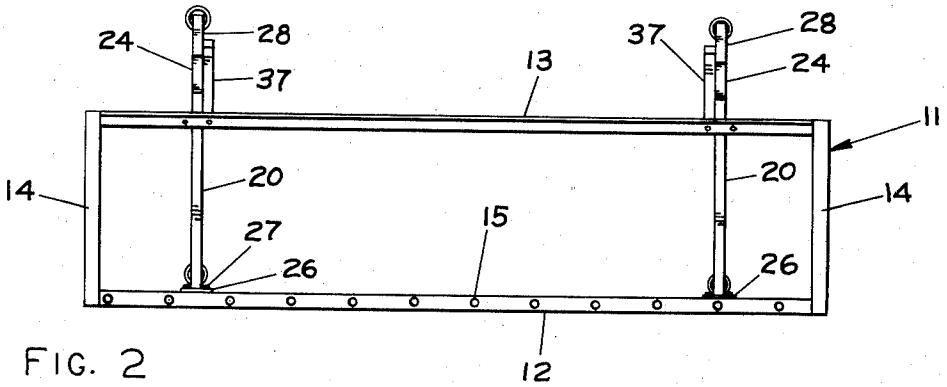


FIG. 2

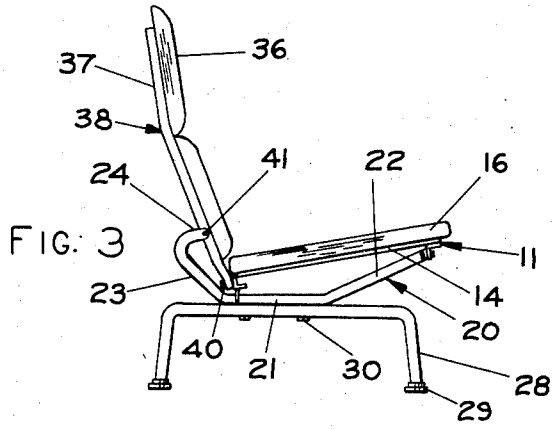
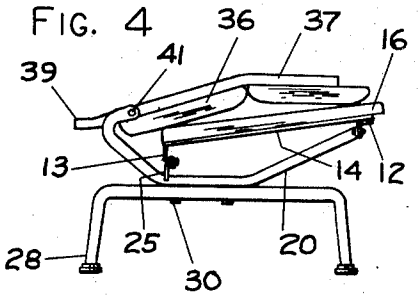


FIG. 3

FIG. 4



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FOLDING SOFA

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5 Claims. (Cl. 155—156)

This invention relates to furniture and more particularly to a sofa so constructed that it may be folded flat for either shipment or storage.

Furniture, because of its size and shape, is a bulky and thus costly item to ship. Most furniture is wasteful of shipping space because, when shipped fully assembled, the cartons are necessarily large and roomy but only a small portion is actually occupied by the goods in shipment.

This invention overcomes this difficulty by providing a sofa or chair unit which may be readily shipped in knocked-down condition, thus making it a compact package. This constitutes a substantial saving in transportation costs, materially reducing the cost of the final article to the customer. The shipment of this unit in knocked-down condition has another advantage. The unit becomes a compact package much less subject to injury. The contents of the package are firmly held and cooperate to support each other. Thus, a number of the units may be stacked, one upon another, without danger of injury or crushing as occurs when the packages are substantially empty.

The design of knocked-down furniture involves several problems. One of these is to make the assembly of the unit by the recipient a simple procedure requiring few if any tools. The average recipient is poorly equipped with tools and has little if any skill to aid him in the assembly of the product. Accordingly, the design must be such that the article, when received, may be easily placed in operating condition with the use of only the most rudimentary of tools. This has been accomplished by this invention.

Knocked-down units of this type are also important since they result in substantial savings in storage costs. Being collapsible to a flat package, a much greater quantity of them may be stored in a given area either by the customer or by the manufacturing plant. Further, the user, if he wishes to store the furniture, may do so with ease since the amount of space required is reduced to a minimum.

This type of knock-down furniture has a still further advantage in that when folded it may easily be moved through narrow passageways and doors, thus permitting its use in rooms having restricted entrances. This construction permits a large sofa to be easily moved into a room which would otherwise be restricted to small units of furniture because of narrow doorways, passageways or stairways.

This construction not only permits the furniture to be easily disassembled for shipping or storage, it also gives the back of the sofa or chair a certain amount of resiliency. This resiliency arises from the fact that the back is supported by a hook-shaped arm which may deflect slightly when loaded. This deflection is enough to give the back a slight movement, thus eliminating the uncomfortable sensation of complete rigidity. This constitutes an important improvement in the functional characteristics of the furniture.

These and other objects and advantages will be immediately seen by those acquainted with furniture design upon reading the following specification and the accompanying drawings.

In the drawings:

Fig. 1 is a front elevation view of a sofa constructed according to this invention.

Fig. 2 is a plan view of the frame structure for this invention.

Fig. 3 is an end elevation view of the sofa with the back in erected position.

Fig. 4 is an end elevation view of the sofa with the back in folded position.

In executing the objects and purposes of this invention I have provided a pair of shallow, somewhat U-shaped, frame members to which is mounted a rectangular frame. The rearward leg of the frame members projects an appreciable distance rearward of the rectangular frame and is bent over upon itself to form a hook-shaped arm. The back of the sofa is hinged to the end of this arm with the lower portion of the back supporting structure contacting and detachably secured to the rectangular frame by bolts.

The back is pivotable about its mounting to the hook-shaped arm whereby it may be moved from erected to folded position, the latter being accumbent on the seat. The whole unit is supported by a pair of removable leg brackets. The unit is designed for shipment with the back in accumbent position and the leg brackets removed and stored within the general outline of the sofa body.

In the following description, the invention is described as embodied in the body of a sofa. It will be recognized that chairs or other units of furniture may be constructed utilizing the principles of this invention. The following description is intended to embrace all of such furniture.

In the following description, the terms "forward" and "rearward" are frequently used and are to be taken to mean "forward" toward the front of the seat, that is to the right as the invention appears in Fig. 3 and "rearward" away therefrom.

The numeral **10** indicates a sofa having a main seat or body frame **11**. The body frame **11** is made up of angle members including a front angle member **12**, a rearward member **13** and end tie members **14**. The tie members **14** are of spring steel and are secured to the tops of the front and rear members **12** and **13**. The purpose of the tie members will appear more fully under "Operation."

The back angle member **13** is mounted with its vertical leg extending upwardly and to the outside. The front angle member **12** is mounted with its vertical leg extending downwardly and the laterally extending flange extending forwardly.

The front angle member **12** is equipped with a plurality of equally spaced holes **15** in the lateral flange. The back angle member **13** is equipped with similar holes in the vertical flange. The holes **15** and the holes in the angle member **13** serve as means for anchoring the ends of the cushion springs of the seat cushion panel **16**. This is but one possible construction since the seat cushion panel **16** may be constructed as a wholly internally integrated unit designed to merely rest on the rectangular frame **11**. The particular construction of the seat panel **16** is not essential to this invention.

Beneath the body frame **11** are a pair of supporting frames **20**. The supporting frames are of shallow, U-shape with a horizontal, center portion **21**, a forward portion **22** and a rearward portion **23**. The forward portion **22** is inclined upwardly at a low angle. The rearward portion **23** is inclined upwardly at a somewhat sharper angle. The free end of the rerward portion **23** is doubled back upon itself something more than 90°,

creating a hooked arm 24. The free end of the hooked arm 24 extends towards the seat pad 16. The supporting frames 20 are of solid or tubular construction and of rectangular cross-section. The rectangular cross sectional shape provides a flat surface to facilitate attachment of the leg brackets 28.

An upstanding L-shaped mounting bracket 25 is secured to each of the supporting frames 20 for seating the rearward angle 13 of the body frame 11. The mounting bracket 25 and the rail 13 are assembled by any suitable means such as bolts.

Header plates 26 are secured to the forward end of the supporting frames 20 by suitable means such as welding. The header plates abut the vertical flange of the front rail 12 and are secured to the rail by suitable means such as bolts 27.

The supporting frames 20 are supported by leg brackets 28. The leg brackets are generally U-shaped and may be equipment with glides 29 on their free ends. The horizontal, central portion 21 of the supporting frames 20 seat upon the leg brackets 28 and the two are detachably assembled by means of bolts 30. The back panel 36 may be a single unit or, as illustrated, may consist of a pair of parallel cushions. Whether single or multiple cushions are utilized is a matter of design having no affect upon the operation and principles of this invention.

The back panel 36 is secured to a pair of back frame elements 37. The frame elements are of solid or tubular metal construction having a square or rectangular cross-section similar to the supporting frames 20. For the purpose of properly contouring the back, the frame elements 37 are bent slightly forwardly adjacent their center at 38. The lower end of the frame elements is bent outwardly to provide a stop 39 which will seat firmly against the back rail 13 of the main frame 11. Where the stop portion 39 abuts the back rail 13, the two are secured by means of a bolt 40. The lower ends of the back frame element 37 project substantially below the bottom of the back panel 36.

At a point intermediate the bottom of the back panel 36 and the mid-point of the frame elements 37, each frame element is pivotally secured by a pin 41 to the free end of one of the hooked arms 24. This provides the fixed attachment between the back of the sofa and the remainder of the sofa structure.

It will be recognized that the seat panel 16 and back panel 36 may be of any suitable design and structure. They may be upholstered or finished in leather. They may contain springs, foam rubber or other resilient elements. The design and construction of these elements is immaterial to the principle in this invention.

Operation

In erected position, the back of the sofa is pivoted into a generally upright position. Its rearward pivotal movement is limited by contact between the stops 39 and the back angle 13 of the body frame 11. When this contact has been made, the bolts 40 are installed. This positively locks the back in erected position and the unit is ready for use.

The back is, at this point, supported in part by the bolts 40. Its primary support consists of the hinge pin 41 and the hooked arm 24. Since the point of attachment of the hinge pin 41 to the hooked arm 24 is substantially removed from the point where the supporting frames 20 are secured to the legs 28, substantial forces are generated about the bolts 40. These forces are resisted by the hooked arms. This causes the hooked arms to deflect slightly. This gives the back of the sofa a limited amount of resiliency, eliminating the rigidity which is so objectionable in many types of furnitude designs. Thus, the hooked arm 24 acts to some extent like a stiff spring.

Since each supporting frame 20 is a continuous piece running from the front to the back of the sofa, the loads imposed by the back do not have to be wholly absorbed by the bolts 30 attaching the frame 20 to the legs 28. The weight of the occupant to some extent bears on the forward portion of the seat panel 16. This tends to balance to some extent the forces generated about the hinge pin 41, thus relieving some of the strain on the bolts 30.

Since the front and back member 12 and 13 are tied together at the ends by the resilient, spring strip 14 and by the supporting frames 20, a certain degree of movement toward and away from each other is possible. The long, inclined forward portions 22 of the supporting frames 20 act as stiff springs which while providing firm support for the forward member 12 permit it to move toward and away from the back member 13. This eliminates the objectionable rigidity often characteristic of this type of furniture.

The spring strips 14 provide resiliency in the ends of the seat, again eliminating the objectionable rigidity which would otherwise be present. Thus, the sofa provides a comfortable end seat as well as a comfortable main seat.

When the sofa is to be moved, stored or shipped, the bolts 40 are removed. The back may then be freely folded down against the seat panel 16. In this accumbent position, the upper surface of the seat panel 16 contacts the inner surfaces of the back panel 36. Thus, the two panels are folded against one another and to some extent protect each other from injury. Further, the resulting assembly is compact and is capable of sustaining considerable compressive loads without injury.

The legs 28 are removed by removing the bolts 30. The legs, together with the bolts 30, may then, for shipping purposes, be placed in the space defined between the bottom of the supporting frame members 20 and the bottom surface of the seat panel 16. In this manner the entire unit may be shipped in a compact, substantially flat, rectangular box in which there is little waste space. At the same time, the unit may easily be moved through narrow passageways and doorways since it is in effect a thin slab which may be tilted up on end or moved around corners with a minimum of difficulty.

While I have described a preferred embodiment of my invention, it will be recognized that various modifications of this invention may be made, without departing from the principle thereof. Each of these modifications is to be considered as included in the hereinafter appended claims unless these claims by their language expressly state otherwise.

I claim:

1. In a seat, the combination comprising: a seat frame; a seat member mounted on said seat frame; said seat frame having a pair of rearwardly projecting cantilever arms; said arms being bent upwardly and forwardly toward said seat member to form a generally U-shaped resilient hook, the free end of each of said arms extending upwardly and toward said seat member; a back member; frame elements on said back member; means pivotally securing said frame elements to the free ends of said arms for free pivotal movement except as limited by said seat member whereby said back member may be pivoted from a substantially upright position to an accumbent position against said seat member and said seat member limiting the rearward pivotal movement of said back member.

2. In a seat, the combination comprising: a seat frame; a seat member mounted on said seat frame; said seat frame having a pair of rearwardly projecting cantilever arms; said arms being bent upwardly and rearwardly toward said seat member to form a generally U-shaped resilient hook, the free end of each of said arms extending upward and toward said seat member; a back member; frame elements fixedly secured to said back member; said frame elements projecting below said back member and said seat member; means pivotally securing said frame elements to the free ends of said arms for free pivotal movement except as limited by

said seat member, the location of said means being at a point intermediate the top and bottom of said back member whereby said back member may be pivoted from a substantially upright position to an accumbent position against said seat member and said back member limiting the rearward pivotal movement of said back member; and means detachably securing the bottom ends of said frame elements to said seat member.

3. In a seat, the combination comprising: a pair of frame members, each of said frame members having a rearwardly and upwardly extending leg portion; the free end of each of said leg portions being doubled back to form a resilient cantilever hinge arm; said free end extending upwardly and forwardly; a support bracket secured to each of said frame members; a front rail and a back rail, said rails being normal to and rigidly secured to each of said frame members; a seat member mounted on said frame members; a back member; means pivotally securing said back member to the free ends of said hinge arms for free pivotal movement except as limited by said back rail, the location of said means being intermediate the top and bottom of said back member whereby the back of said seat may be pivoted from a substantially upright position to an accumbent position against said seat member and said seat member limiting the rearward pivotal movement of said back member; and means for detachably securing the lower end of said back member to said back rail.

4. In a seat, the combination comprising: a pair of frame members, each of said frame members having a rearwardly and upwardly extending leg portion; the free end of each of said leg portions being doubled back to form a hinge arm; a support bracket secured to each of said frame members; said frame members each having an upward and forwardly inclined arm portion; a front rail and a back rail, said rails being normal to said frame members; said back rail being firmly secured to said

frame members adjacent the base of said leg portion; said front rail being firmly secured to the free end of said forward arm portions of said frame members; resilient end members secured to the ends of said front and back rails and extending between them whereby the spacing between said front and back rails may vary upon flexing of said frame members and said end members; a seat member mounted on said frame members; a back member; means pivotally securing said back member to the free ends of said hinge arms intermediate the top and bottom of said back member; means for detachably securing the lower end of said back member to said back rail, whereby the back of said seat may be pivoted from a substantially upright position to an accumbent position against said seat member.

5. In a seat, the combination comprising: a pair of frame members; a support bracket secured to each of said frame members; said frame members each having a base portion and an upward and forwardly inclined arm portion; a front rail and a back rail, said rails being normal to said frame members; said back rail being firmly secured to said base portion; said front rail being firmly secured to the free end of said forward arm portions of said frame members; resilient end members secured to the ends of said front and back rails and extending between them whereby the spacing between said front and back rails may vary upon flexing of said frame members and said end members; and a seat member mounted on said frame members.

References Cited in the file of this patent

UNITED STATES PATENTS

512,862	Chatfield	Jan. 16, 1894
2,300,561	Ferreira	Nov. 3, 1942
2,508,607	Hill	May 23, 1950