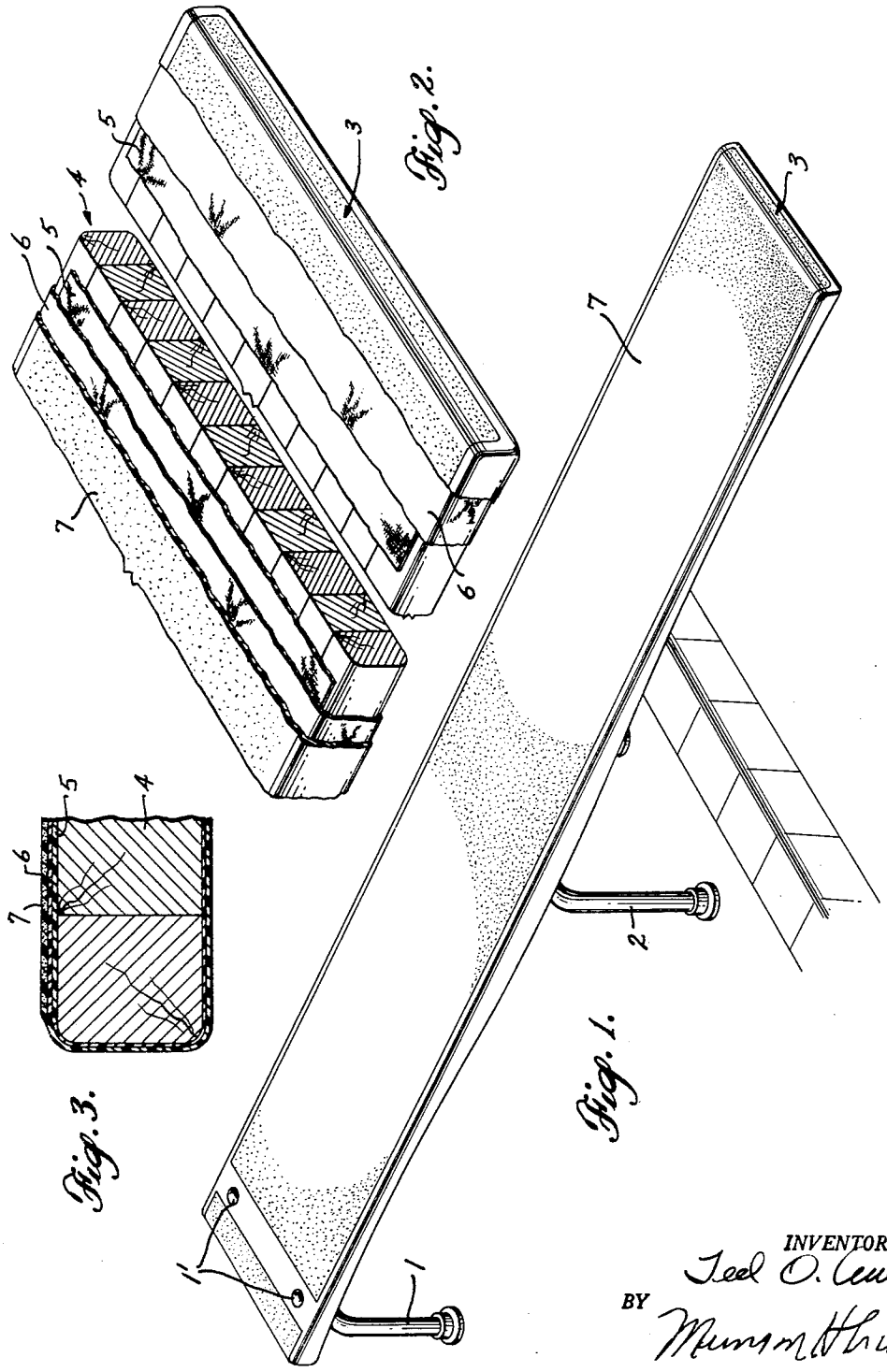
May 22, 1962 T. O. AUSTIN 3,035,837

DIVING BOARDS

Filed Oct. 14, 1960 2 Sheets-Sheet 1



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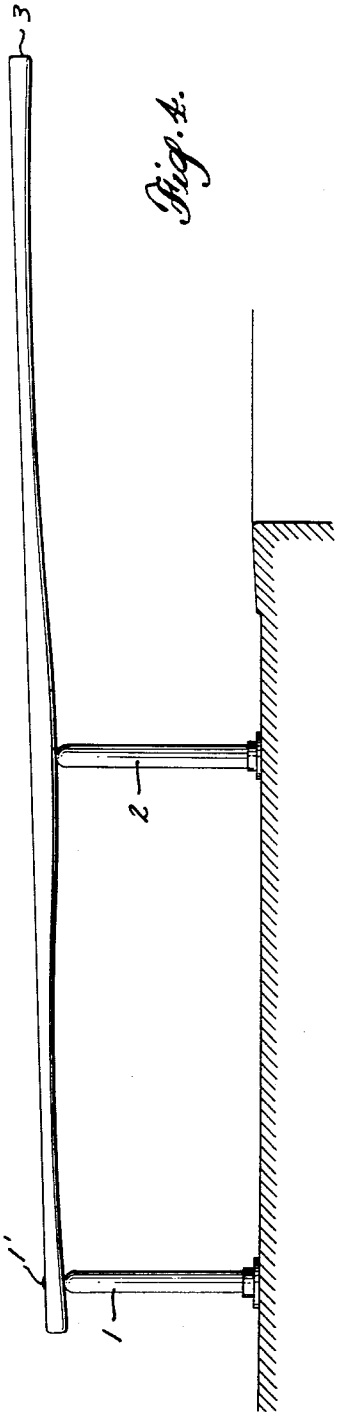


Fig. 4.

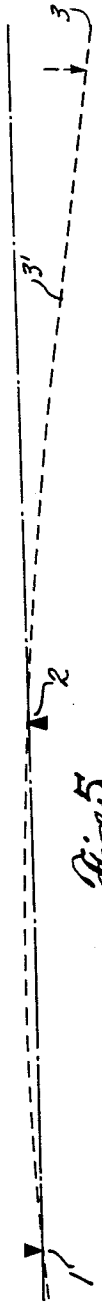


Fig. 5.

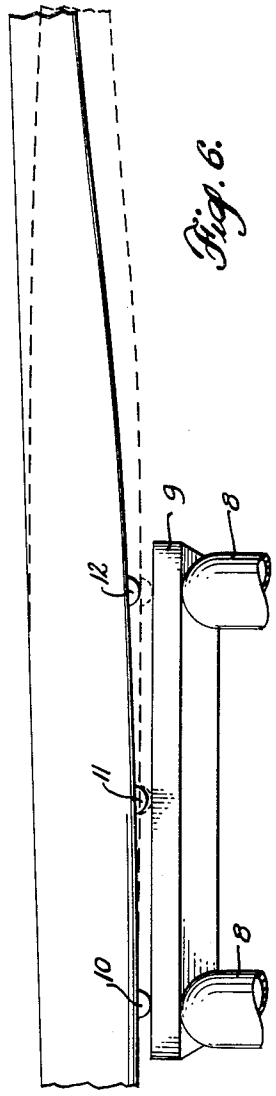


Fig. 6.

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DIVING BOARDS

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This invention is concerned with a weather-resistant wooden diving board in which a substantial portion of its length adjacent to the free end remains straight and a major portion of its length bends substantially uniformly when the board is loaded, even under varying loads.

An object of this invention is to reduce the dipping of the diving board tip when a concentrated load is placed upon it. More particularly a board is provided in which the portion away from the tip will be bent generally uniformly by a concentrated static or dynamic load applied to the tip, despite the variation in bending moment along the board's length. The tip portion has such local rigidity over a substantial portion of the board's length that it remains straight, though perhaps inclined downward, when loaded.

It is also an object to prevent lengthwise splitting of the free or tip end of a wooden diving board which is subjected to concentrated stresses at that location by the weight of a jumping diver.

A further object is to provide a diving board having a uniform amplitude of flexure and easy spring of the tip even when used by people of considerably different weights.

Another object is to provide a durable wooden diving board with a weather-resistant covering and a nonskid surface.

These objects can be accomplished by providing in the central portion of the bottom of a wooden diving board a pair of concave depressions spaced lengthwise of the board. The tip portion of the board is thickened so that the board does not flex appreciably near its tip when loaded, but such tip portion will be substantially straight throughout a considerable length although it may be in or swing into a position inclined downward. By locating such recesses at opposite sides of the fulcrum the entire central portion of the board can flex substantially uniformly, thus relieving excessive strain at any one point. The thickened tip of the board's free end provides more wood to stiffen it against flexing and also to reduce and distribute stress concentrations that tend to split the board which would normally occur in a board of uniform thickness. The entire board is fabricated of laminated strips to strengthen the board and to reduce further its tendency to split at the ends. Covering the board with glass fiber impregnated with polyester resin gives further strength to the board, seals it against deteriorating moisture, and provides weather-proofing, while embedding sand, small glass beads or other granular material in the resin provides a nonskid tread on the upper surface.

The addition of a variable fulcrum composed of several parallel ribs on the underside of the board, spaced lengthwise of the board and extending transversely of its length, to contact successively a flat, supported plate as the load increases, gives the tip portion of the board progressively less leverage and more support with incrementally increased loads, either static or dynamic, thus increasing the radius of bend over that which a single fulcrum board would have, and consequently providing more uniform diving characteristics.

FIGURE 1 is a top perspective view of the diving board supported by a conventional mounting, and FIGURE 2 is an enlarged fragmentary top perspective view of the tip or free end portion of the diving board having parts broken away.

FIGURE 3 is a fragmentary transverse sectional view of an edge portion of the board.

FIGURE 4 is a side elevation view of the mounted board.

FIGURE 5 is a schematic diagram illustrating a typical deflected condition of the board.

FIGURE 6 is a detail fragmentary side elevation view of the portion of the board adjacent to a special fulcrum arrangement.

FIGURES 1 and 4 show most clearly a wooden diving board having in its bottom a pair of cylindrically concave depressions spaced lengthwise of the board. The axes of such depressions extend transversely of the board. The top of the board is a flat surface when the board is not subjected to load. The thickness of the board tapers from a central portion toward its opposite ends, and also from each end toward such central portion. Such central portion bears on a conventional fulcrum arch 2, which preferably is somewhat closer to one end of the board than the other. The end of the board closer to the fulcrum is held in fixed position on a conventional anchor arch 1 by bolts 1' extending through the board and the arch. The opposite or tip end of the board extends out over a pool edge or float edge, and is freely swingable under the weight of a diver.

Preferably the chord of the concave depression between the anchor 1 and fulcrum 2 is shorter than the chord of the concave depression at the tip side of the fulcrum, as shown in FIGURE 4. The thickness and section modulus of the board at the anchor 1, fulcrum 2 and tip 3 are substantially the same. Also the areas of the thinnest cross sectional portions at the locations of the two concave depressions preferably are substantially the same. The average length of the board, which may be from eight to ten feet, is between two and three times the distance between the fulcrum 2 and the anchor 1. The distance between the fulcrum and the anchor may vary from thirty-four inches to fifty-six inches, depending upon the length of the board and the weight of the average diver expected to use the board. The heavier the diver, the greater would be the spacing selected between the fulcrum and the anchor.

In FIGURES 2 and 3 the core 4 of the diving board is shown as being constructed of strips each approximately square in cross section and extending lengthwise of the board, bonded together in lanimated edge-to-edge relationship. Preferably these strips extend the full length of the board, but this is not essential. The top of the board is covered first with a layer of six-ounce glass fiber cloth 5, which is extended to lap over each end. Over the glass cloth layer on top of the board and covering the remainder of the core 4 is a layer of two-ounce glass fiber mat 6. Both the glass fiber cloth and the glass fiber mat are bonded to the board as well as to each other with polyester resin, which may be clear but preferably is colored. Polyester resin of a different color may be applied to the top of the board and a nonskid surface 7 formed by embedding in the top layer granular material such as white sand or small glass beads before the resin is cured. Such covering of the wood not only provides a weather-resistant protective coating, but the glass fiber reinforcement, and particularly the glass fiber cloth bonded in the resin, increases greatly the tensile strength and resistance to bending of the upper surface of the board.

The diagram of FIGURE 5 illustrates the bending characteristics of the board under load. As shown by the dot-dash line, the upper surface of the board is flat when it is not subjected to load. Application of a concentrated load to the free end or tip of the board by the weight of a diver, indicated by the arrow at the right of FIGURE 5, will cause the board to flex. The degree of flexure will depend upon the weight of the diver and whether he is standing still on the board or jumping. The variable dy-

namic load of a jumping diver will, of course, cause the degree of flexure of the board to vary. The important consideration of the present board, however, is the type of flexure which occurs when the board is loaded.

Application of the concentrated load to the tip of the diving board will produce a progressively increasing bending moment from the location of the load application toward the fulcrum, and the bending moment will decrease progressively from the fulcrum toward the anchor 1. In order to obtain substantially uniform flexure over the central portion of the diving board the thickness of the board was selected to vary generally corresponding to the expected variation in bending moment. For that reason the board is tapered from the central portion toward the opposite ends of the board. Such board taper tends to match the section modulus of the board to the bending moment over a predetermined length each side of the fulcrum, so that for each increment of board length the degree of bend would be virtually the same. Stress and strain concentrations are thus minimized.

The technique of matching the cross-sectional area of the board to the bending moment at various locations along the length of the board is followed only to a point, however. Another consideration is the design of the board to deter failure from localized stresses. At the anchored end of the board the holes receiving the anchor bolts 1' produce stress concentration areas, both because of the holes themselves and because the reaction load is transmitted to the board at the localized areas of the bolts.

At the tip end 3 of the board stress concentrations also occur because the load is applied to the board by two feet, or perhaps one foot, of the diver, and the load is not evenly distributed over the entire foot. In order to deter failure from such load and reaction concentrations, therefore, the anchor end and tip end of the board are made thicker than the minimum thickness of the board. Consequently the deflection of increments of the board over the portions tapered from the ends of the board toward the center will be progressively less toward the board ends. From about the location 3', indicated in FIGURE 5, to the tip 3 of the board, therefore, there will be no appreciable incremental deflection of the board, and virtually the entire bending of the board will occur behind the location 3'.

It is preferred that the distance between the location 3' and the free end of the board 3 will be approximately 20% of the length of the board. As the board bends under the load of a jumping diver, therefore, this tip portion of the board will simply swing up and down as the portion of the board behind the location 3' bends, but such tip portion itself will not bend. For that reason the dip angle of such tip portion will be less than it otherwise would be. The central portion of the board will bend in approximately a circular arcuate configuration. Because of such substantially uniform flexure the spring of the tip portion of the board will be easy, even though the portion of the board which projects beyond the fulcrum arch 2 is rather short.

Splitting of the tip portion of the board on which the diver stands is deterred, first, by providing such a thickened end, which both gives greater strength to the board and resists its bending; second, by the laminated structure of the board; and third, by the protection of the board core by the glass fiber reinforced resin coating.

A diving board having a fixed fulcrum can be designed ideally for use by divers who are all of approximately the same weight. Actually, however, the weight of most divers will fall within a wide range of about one hundred pounds to two hundred pounds. In FIGURE 6 a modified fulcrum arrangement is shown which will preserve generally the same spring characteristics for the dive when used by divers of considerably different weights. In this construction two fulcrum arches 8 are located in positions spaced lengthwise of the board and support a fulcrum plate 9 mounted on them. A plurality of fulcrum projections 10, 11 and 12 are provided on the underside of the board, spaced lengthwise of the board within the width of the plate 9. Such projections are somewhat rounded and may be ribs extending transversely of the board having arcuate cross sections, or may be convex knobs.

As shown in FIGURE 6 in solid lines, the height of the anchor arch 1 will be below the plane of the top of plate 9 sufficiently so that when the board is not subjected to load only projection 10 will bear on the fulcrum plate 9. Alternatively, the fulcrum plate could be curved somewhat so that its surface at the locations of projections 10 and 11 would be spaced from such projections. Also it is important that the spacing of projection 12 from the plate 9 be greater than the spacing of projection 11 from such plate when the board is not under load.

When the load of a light diver is applied to the tip portion of the diving board the flexure of the board may be insufficient to bend it so that projection 11 will engage plate 9. If a heavier diver uses the board or if the light diver jumps more vigorously on the board so that the projection 11 contacts plate 9, the effective length of the swinging portion of the board will be shortened automatically by the distance between projections 10 and 11, thus stiffening the board. Projection 11 will then constitute the effective fulcrum point of the board. If a still heavier diver uses the board, or a lighter diver jumps on it more vigorously, the board can flex into the broken line position of FIGURE 6 so that the projection 12 engages the upper surface of the plate 9. Immediately the effective length of the swinging portion of the board is shortened still further by the distance between projections 11 and 12, and the board is consequently stiffened to a greater extent.

The result of such progressive stiffening of the board as it is deflected downward is that the extent of downward deflection of the board, when used by a heavy diver, is much less than it would be if the fulcrum were located at the projection 10. At the same time, however, the board will have much more spring when used by a light diver than it would if the fulcrum of the board were located at the projection 12. Thus the position of the fulcrum will be changed automatically, generally in accordance with the weight of the diver using the board or the vigor of the diver's jumping. While only three projections 10, 11 and 12 are shown in FIGURE 6, it will be understood that additional projections disposed at other locations lengthwise of the board could be provided, and the spacing between the projections can be varied depending upon the wish of the designer. Alternatively, the projections could be mounted on the plate 9 instead of on the diving board bottom at locations corresponding to the locations of the projections 10, 11 and 12 shown.

I claim as my invention:

1. In a diving board, the combination of an elongated strip-like body member, anchor means provided at one end of said body member, and fulcrum means engaging the intermediate portion of the body member, the other end of the body member being free, a portion of said body member between said intermediate portion and the free end portion being of a lesser thickness than said intermediate and free end portions, and said free end portion being of substantially the same thickness as said intermediate portion, whereby the free end portion when under load may depress but remain substantially straight while deflection of the body member occurs in said portion of lesser thickness.

2. The device as defined in claim 1 wherein said portion of lesser thickness of said body member has a longitudinally concave bottom surface but is of a uniform thickness in any given transverse plane.

3. The device as defined in claim 1 wherein a portion of said body member between said intermediate portion

and the anchored end portion is of a lesser thickness than said intermediate and anchored end portions, said intermediate and anchored end portions being of substantially the same thickness, and said portion of lesser thickness between the intermediate and anchored end portions having a longitudinally concave bottom surface but being of a uniform thickness in any given transverse plane.

4. The device as defined in claim 1 wherein said fulcrum means comprise a flat and substantially horizontal plate disposed in spaced relation below said intermediate portion of said body member, and a plurality of fulcrum elements provided at the underside of said intermediate portion in spaced relation longitudinally of the body member, one of said fulcrum elements most remote from the free end of the body member constantly resting on said plate and the other fulcrum elements progressively closer to the free end of the body member being spaced from the plate by progressively greater distances whereby they may progressively engage the plate under progressively greater forces acting on the free end portion of said body member.

5. In a diving board, the combination of an elongated strip-like body member, anchor means provided at one end of said body member, and fulcrum means engaging the intermediate portion of the body member, the other end of the body member being free, a portion of said body member between said intermediate portion and the

free end portion being of a lesser thickness than said intermediate and free end portions, and said free end portion being of substantially the same thickness as said intermediate portion, whereby the free end portion, when under load, may depress but remain substantially straight while deflection of the body member occurs in said portion of lesser thickness, said fulcrum means comprising a flat and substantially horizontal plate disposed in spaced relation below said intermediate portion, and a plurality of fulcrum elements provided at the underside of said intermediate portion in spaced relation longitudinally of said body member, one of said fulcrum elements most remote from the free end of the body member constantly resting on said plate and the other fulcrum elements progressively closer to the free end being spaced from the plate by progressively greater distances whereby they may progressively engage the plate under progressively greater forces acting on the free end portion of the body member.

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