March 20, 1956 F. C. TORKELSON 2,738,832

CRADLED SPANNING BOARD CONSTRUCTION

Filed Aug. 1, 1950 2 Sheets-Sheet 1

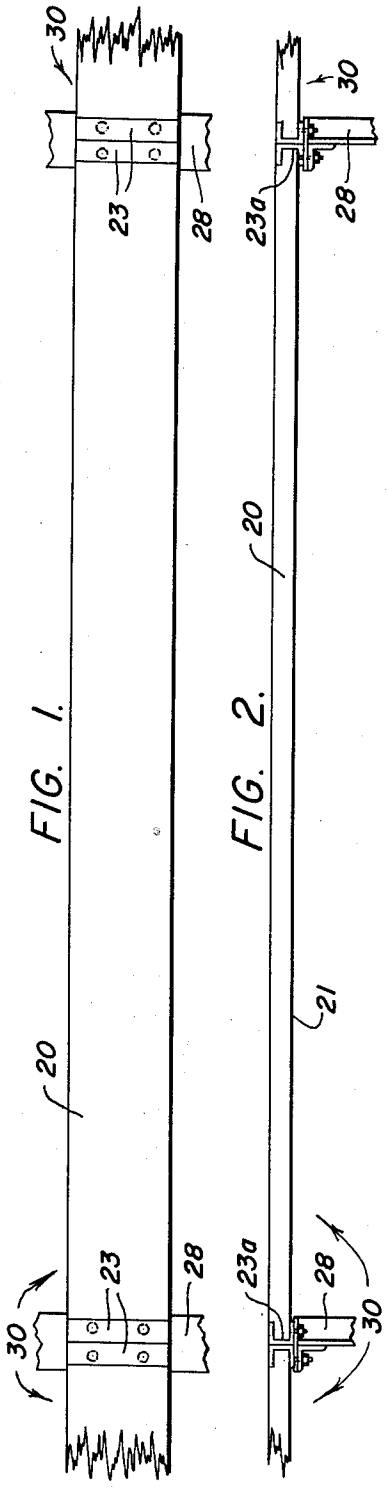


FIG. 1.

FIG. 2.

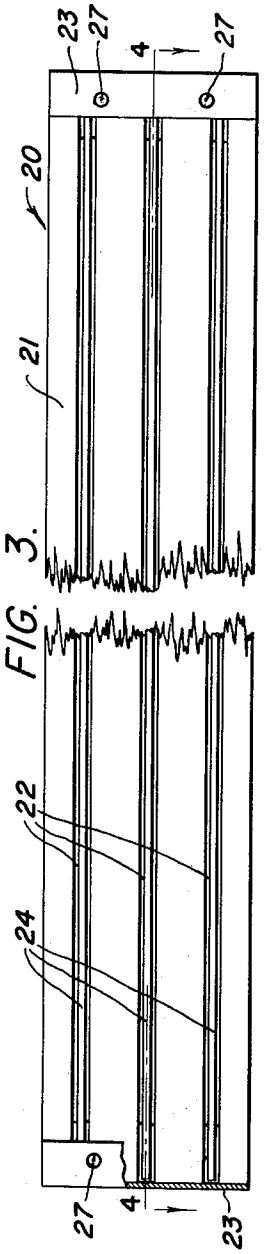


FIG. 3.

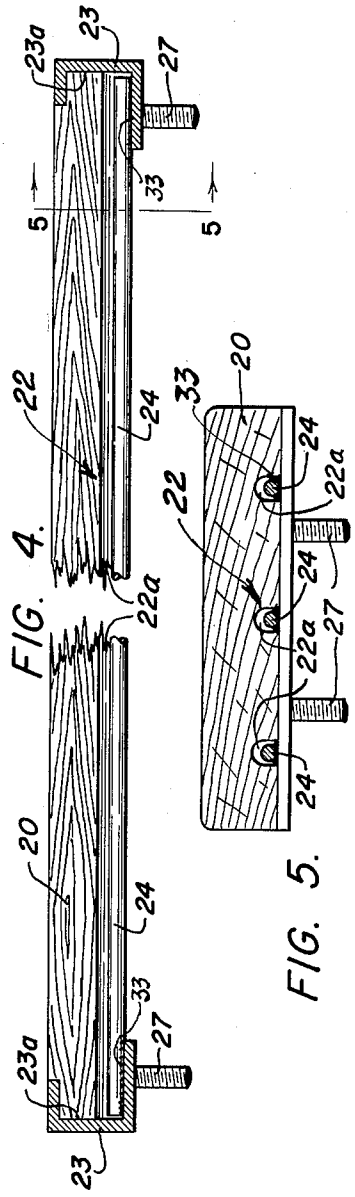


FIG. 4.

FIG. 5.

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CRADLED SPANNING BOARD CONSTRUCTION

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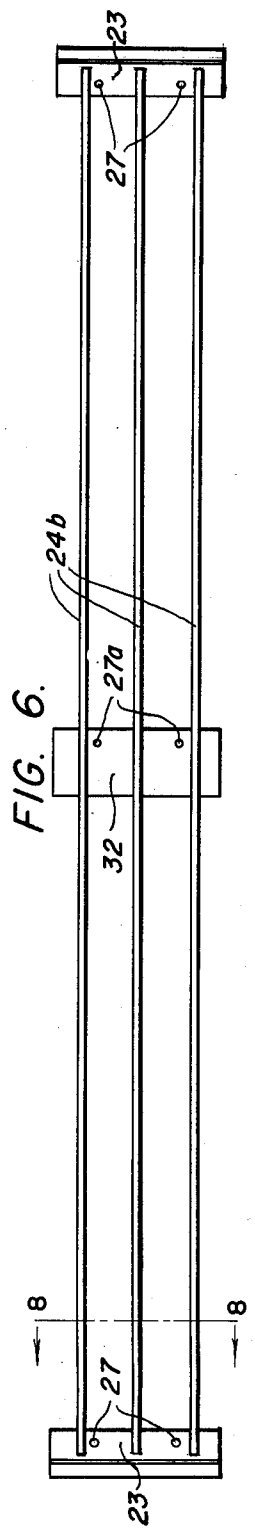


FIG. 6.

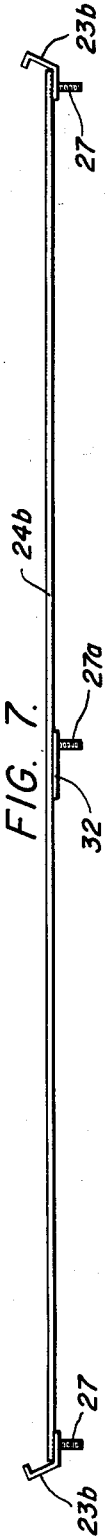


FIG. 7.

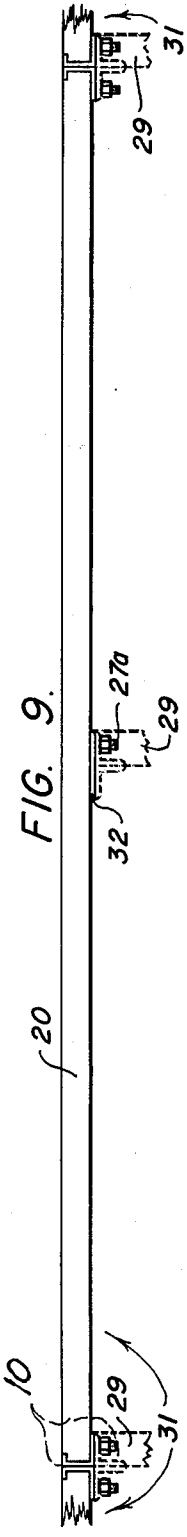


FIG. 9.

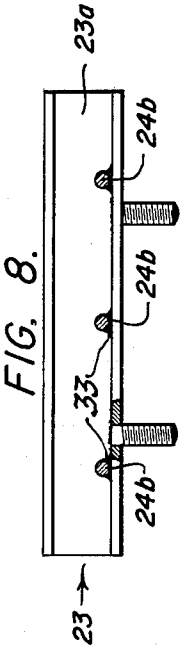


FIG. 8.

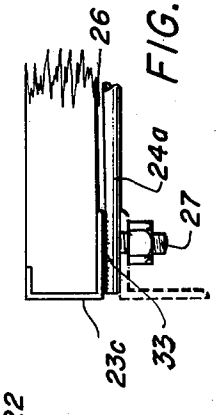


FIG. 10.

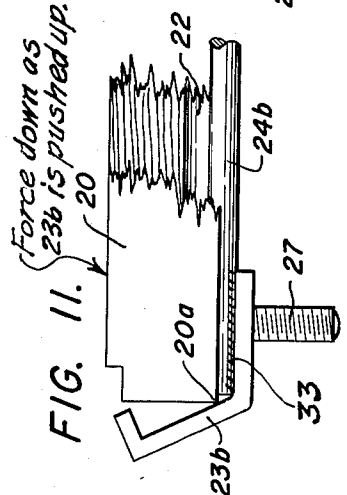


FIG. 11.

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CRADLED SPANNING BOARD CONSTRUCTION

Frank C. Torkelson, Salt Lake City, Utah

Application August 1, 1950, Serial No. 176,952

6 Claims. (Cl. 155—130)

This invention relates to spanning boards provided with safety cradles, for use as seat boards and footways, and more especially for seat boards and footways used in structures such as a bleacher for accommodating spectators at athletic or other exhibitions.

The principal objects of the invention are to provide: strength and durability; comfort and safety for spectators; simplicity of fabrication and erection; facility of shipping.

The use of wooden boards for seats and footways in structures such as bleachers or grandstands has certain inherent advantages over the use of other materials. Among such advantages are low heat conductivity and moderate impact resistance. Wood naturally has no uniform constitution so that a desired safety factor cannot be applied to predetermine the required strength. According to the invention, the desired safety factor is provided by the use of a cradle preferably made of steel, which serves as a safeguard against defects that often exist in wooden material.

Another feature of the invention is that the wood need not be as carefully selected as would otherwise be required, this reducing the initial cost of bleacher construction and at the same time lessening the liability hazard with respect to accidents. This frequently results in lowering liability insurance rates.

The unique feature of the invention is that one or more steel rods are spaced apart from the bearing surface of the seat board or footboard and that the ends of such steel rods are securely anchored in steel end-shoes so that even if rupture in the board should tend to take place at any point between the end-shoes, the board will always be sustained by the steel rod or rods before actual occurrence of such anticipated rupture.

In the accompanying drawing, which illustrates one embodiment of the invention:

Fig. 1 represents a top plan of a board as built into a supporting steel structure;

Fig. 2, a front elevation;

Fig. 3, a bottom plan, drawn to an enlarged scale;

Fig. 4, a longitudinal section taken on the line **4—4** in Fig. 3, portions being broken away for convenience and the scale being further enlarged;

Fig. 5, a cross-section taken on the line **5—5** in Fig. 4;

Fig. 6, a top plan of a self-contained steel cradle assembly alone, the seat board being omitted;

Fig. 7, a front elevation corresponding to Fig. 6;

Fig. 8, a cross-section taken on the line **8—8** in Fig. 6;

Fig. 9, a front elevation of a spanning board of another construction as built into a supporting steel structure after the manner of Fig. 2;

Fig. 10, a fragmentary end portion, approximately as enclosed by the broken line **10** in Fig. 9, drawn to an enlarged scale;

Fig. 11, a fragmentary end portion of a seat board illustrating the manner of pre-stressing the steel cradle during the process of forming the complete assembly.

Referring to the drawing: the numeral **20** indicates an ordinary wooden plank having a suitable thickness, for example, about two inches and of any suitable length. In the construction of Figs. 1 to 5, the bottom surface **21** of the plank **20** is grooved or rabbeted as indicated at **22**, there being in this instance, three grooves spaced apart from one another across the plank. The ends of plank **20** are snugly fitted each into a respective end-shoe **23**.

Loosely disposed in the grooves **22** are cradle rods **24** assumed in the present instance to be made of steel having the requisite strength. The rods **24** are welded or otherwise integrally connected to the respective end-shoes **23** before these are applied to a board.

The snug fit aforesaid, between the shoes **23** and the respective ends of the plank **20** is brought about by pre-stressing the rods **24**. This pre-stressing is accomplished by fabricating the cradle assembly so the distance between the inner faces **23*a*** of the end shoes in the finished plank assembly is a little less than the overall length of the plank. One way of creating the pre-stress is to fabricate the cradle assembly so either one or both of the end shoes have an outwardly extending, angular, initial position **23*b*** as illustrated in Fig. 7, which may be termed the open position. The readied plank is placed in the open cradle and the end shoes bent up into position under hydraulic or other pressure. Afterwards screws **25** or other suitable fastening means, are applied.

It is to be noted in Figs. 4 and 5 that the depth of grooves **22** provides a space **22*a*** between the rods **24** and the bottom of a respective groove, the purpose of which will presently appear.

The aforementioned pre-stressing of the cradle rods occurs because the lower corners **20*a*** of plank **20**, Fig. 11, act as fulcrums for the end shoes distorted as at **23*b*** when pressure is applied to force the end shoes up into the final position. This forcing creates a tensile stress in rods **24** opposed to the reactive force that is set up in the bottom fibers of plank **20**. Thus pre-stressing of the rods is brought about.

In the form shown Figs. 3 to 8 and 11, rods **24** are welded to the inside surface of the bottom flange of each end shoe as particularly shown in Fig. 8. In the form shown Fig. 10, rods **24*a*** are welded to the outside surface of the bottom flange of each end shoe **23*c***. In the construction of Fig. 10 it is not necessary to groove the plank since the desired spacing-apart **26** of the rods from the bearing surface of the plank is inherent in the end shoes **23*c***. Welds between the stressing rods and the end shoes or other items are indicated at **33**.

For the purpose of fastening the seat board assemblies in place in the finished bleacher or other structures, stud bolts **27** are welded or otherwise held substantially integrally in place in the various end shoes. For illustration, such stud bolts extend through the flanges of steel trusses **28** in Figs. 1 and 2, or steel trusses **29** in Fig. 9, of the finished bleachers.

In Figs. 1 and 2 the successive seat board assemblies **30**, each extends across a single span, while in Fig. 9, each of such assemblies **31**, extends across two spands. In the latter, a plate **32**, Figs. 6, 7 and 9, is welded to the cradle rods **24*b***, the plate being provided with stud bolts **27*a*** to serve a purpose similar to that of stud bolts **27**.

The utility of spacing the cradle rods apart from their ultimate bearing surfaces against the spanning seat boards, is that the initial resiliency of the boards is maintained until a load imposed on the boards becomes sufficient to cause them to deflect and settle down on the cradle rods. Thus only a moderate impact resistance is present in a seat board before it settles down upon its cradle rods.

Also, considering that it is desirable to make the finished distance between the end faces **23*a*** less than the neat

length of the plank, as aforesaid, the plank normally is slightly bowed or deflected upwardly or downwardly as the case may be, to compensate for the difference in length. If and when such deflection is upwardly, the axial spacing of the stressed rods is apparent.

While the foregoing description is necessarily somewhat specific, the spirit thereof is to not limit the scope of the invention excepting as is justified by the following claims.

What is claimed is:

1. A cradled spanning board assembly, comprising a plank having longitudinal grooves; end shoes having flanges in contact with the grooved surface of the plank; and cradle rods disposed in said longitudinal grooves, said cradle rods being fixed to said contacting surfaces of said flanges.

2. A cradled spanning board assembly according to claim 1, wherein each stressed cradle rod normally, is spaced apart axially from the bottom of the respective groove.

3. A cradled spanning board assembly comprising a longitudinally grooved plank; flange elements extending across the ends of the grooved plank; and cradle rods disposed in said grooves; the cradle rods being fixed to the inside surfaces of each said flange elements, and the depth of the grooves being such as to provide a space between the rods and the bottoms of the grooves.

4. The method of stressing a cradled spanning board assembly, said assembly including a spanning plank having a lower surface lying in a plane, end shoes, and stress rods extending between said end shoes, said stress rods lying wholly in and above the said lower surface, which method comprises making the overall length of said plank somewhat greater than the neat distance between said end shoes in the final position thereof; fulcruming the end shoes on the lower portions of said plank, and subjecting the fulcrumed assembly to endwise compression, thereby imposing a tensile stress on said rods.

5. A cradled spanning board assembly, which includes a plank having a grooved, lower surface and spaced-apart end portions; shoes having each a flange extending crosswise of, and below, said end portions of the plank; and a plurality of stressed rods fixed by welded means to the respective shoes, the said stressed rods throughout the lengths thereof, lying wholly within the grooves of the grooved portion, in a manner such as to provide a space between the rods and the bottoms of the grooves.

6. A spanning board cradle adapted to be included in an assembly with a plank element, said spanning board cradle comprising end shoes having upstanding portions with laterally extending lower flanges disposed to engage the ends of said plank element; stressing rods extending longitudinally of the cradle, said stressing rods having end portions extending across the upper surface of said lower flanges and a welded joint connecting said end portions to said upper surfaces.

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