June 7, 1960 P. N. SITTON 2,939,309

METHOD, APPARATUS AND PRODUCT FOR MANUFACTURING SEPARABLE STAIRS

Filed March 29, 1956 3 Sheets-Sheet 1

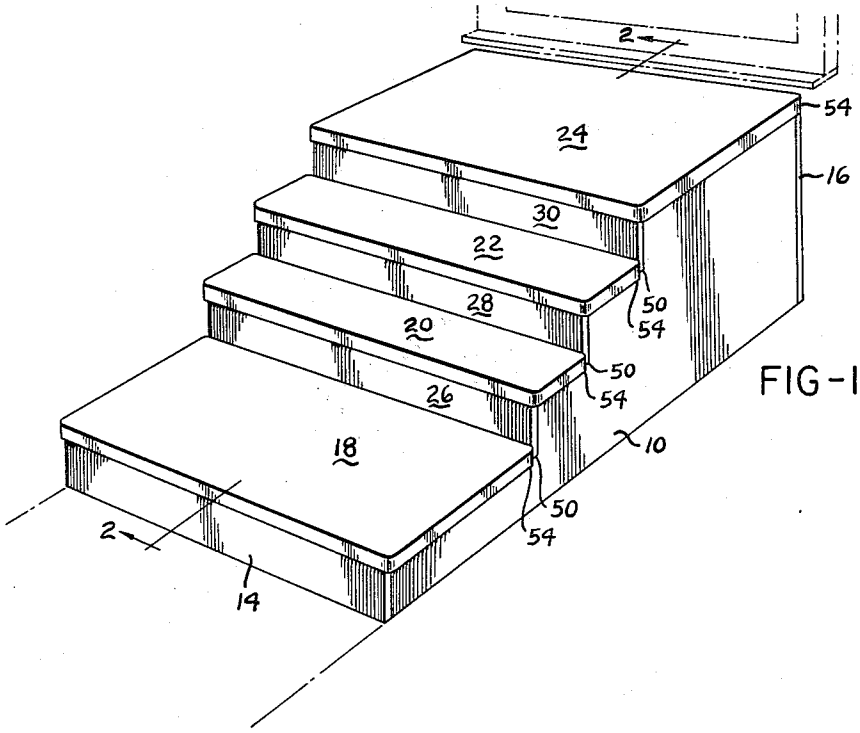


FIG-1

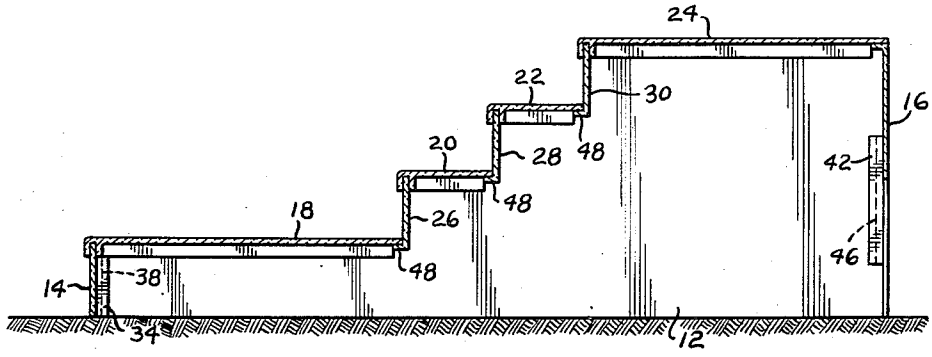


FIG-2

INVENTOR.
PHILIP N. SITTON
BY Toulmin & Toulmin
ATTORNEYS

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FIG-3

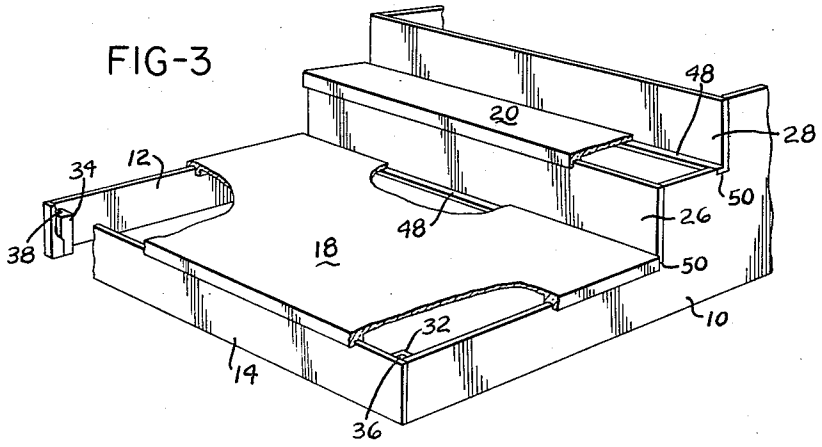
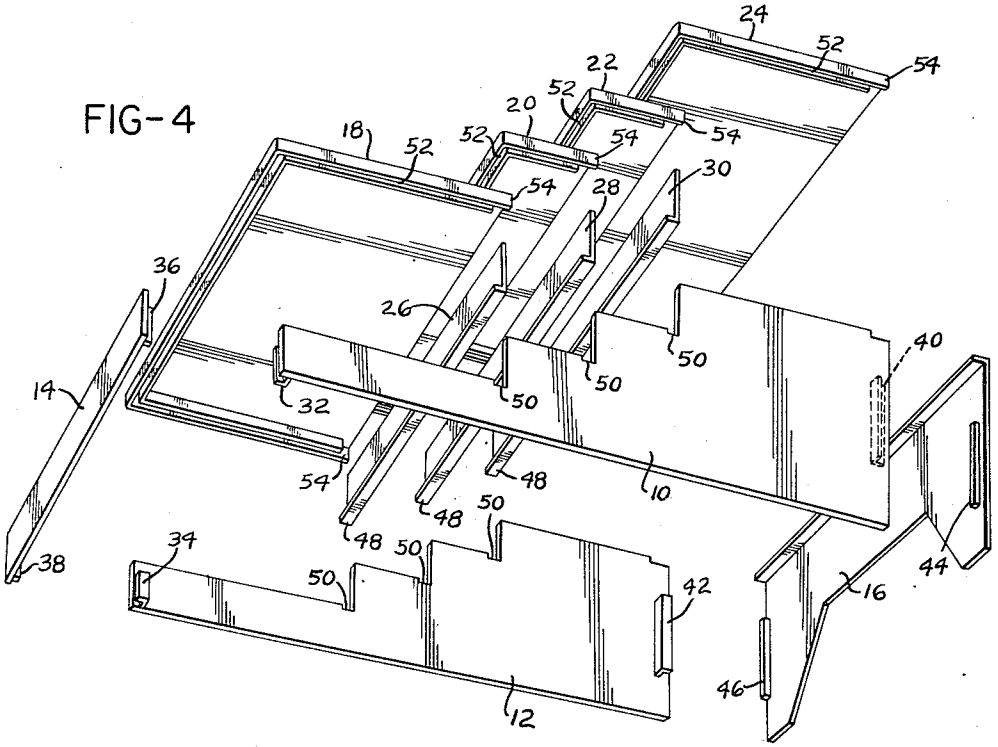


FIG-4



INVENTOR.
PHILIP N. SITTON
BY Toulmin & Toulmin

ATTORNEYS

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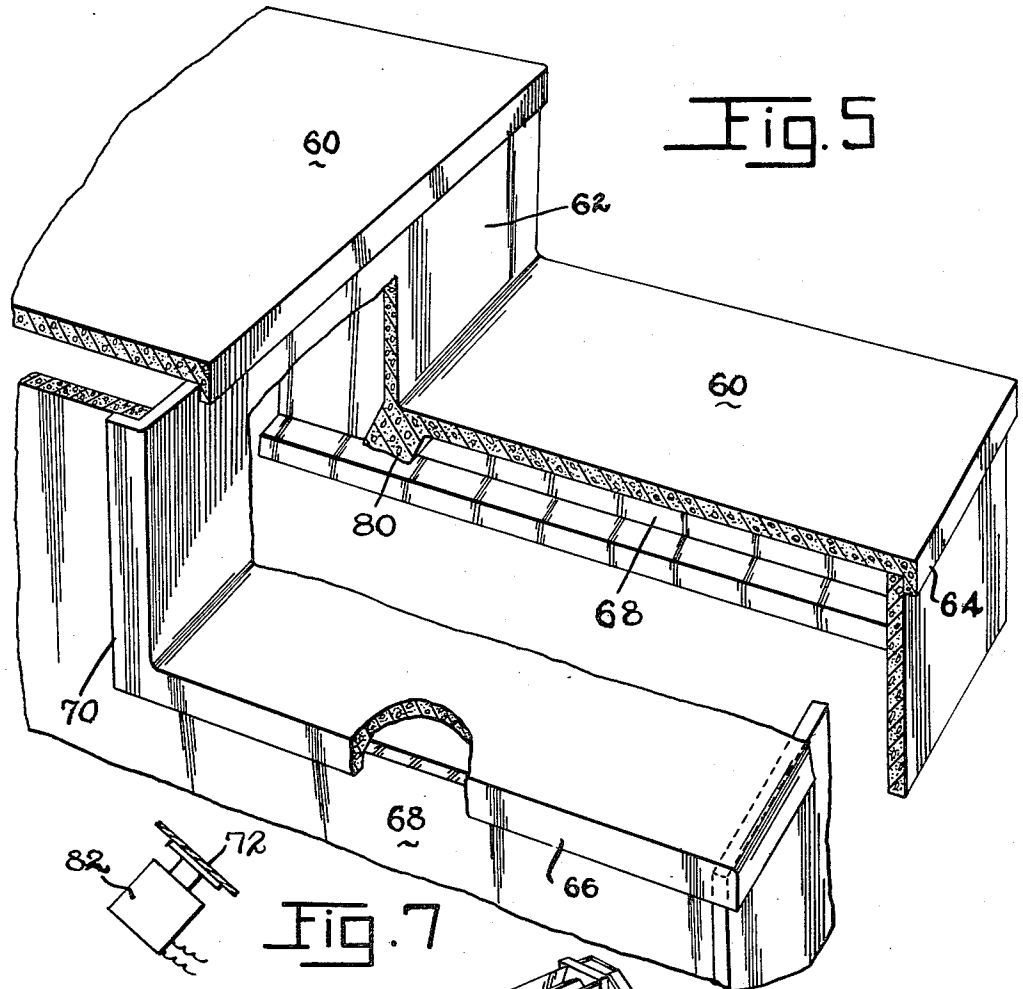


Fig. 5

Fig. 7

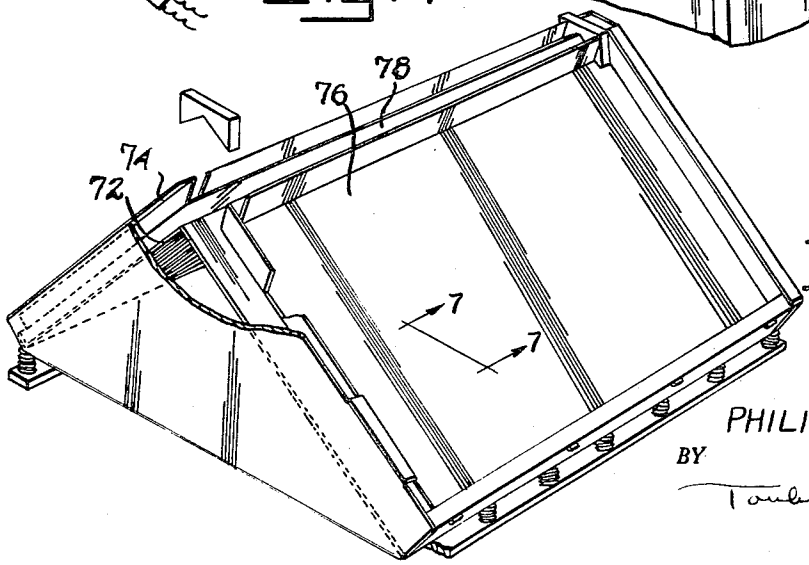


Fig. 6

INVENTOR.
PHILIP N. SITTON
BY
Toulmin & Toulmin
ATTORNEYS

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2,939,309

METHOD, APPARATUS AND PRODUCT FOR MANUFACTURING SEPARABLE STAIRS

Philip N. Sitton, Dayton, Ohio, assignor to Sanitary Plastics, Inc., Dayton, Ohio, a corporation of Delaware

Filed Mar. 29, 1956, Ser. No. 574,651

2 Claims. (Cl. 72—96)

This invention relates to prefabricated structures, and particularly to prefabricated step arrangements.

In the construction of both permanent and temporary structures it is quite often necessary to provide steps, either within the structure or at one or more other outside doors. Such step arrangements can generally be fabricated of wood if they are located inside the structure or if the structure is of a temporary nature, but permanent external steps must generally be constructed of concrete or of some other material which will withstand weather in order to give a sufficiently long life.

Concrete steps are generally satisfactory when constructed properly, but are expensive and heavy and require the setting of forms and the pouring and finishing of the concrete and are, in general, quite troublesome in many cases.

In the event of there being a fill in the region where the steps are to be placed concrete steps quite often sink into the ground because of their weight, and when this occurs it is quite difficult and sometimes practically impossible to restore the steps to their proper position.

Having the foregoing in mind, it is a primary object of the present invention to provide a prefabricated step structure which avoids the drawbacks referred to above.

A still further object of the present invention is the provision of a lightweight prefabricated step structure which can be used in substantially any location where steps are to be employed.

A particular object of the present invention is the provision of a plastic cast section step structure which can be integrally bonded together at the time of erection, thereby preventing the step from becoming disassembled for any reason.

A still further object of the present invention is the provision of a prefabricated step which has sufficient strength for all purposes, but which at the same time is light and easily installed and which has a certain amount of inherent flexibility that will prevent it from cracking should the ground supporting it shift somewhat.

These and other objects and advantages of this invention will become more apparent upon reference to the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view showing a step structure according to the present invention;

Figure 2 is a sectional view indicated by line 2—2 on Figure 1;

Figure 3 is a perspective view similar to Figure 1 but with parts of the structure broken away to show the manner in which the various parts of the step interfit;

Figure 4 is an exploded perspective view looking up from beneath the step structure showing the several parts making up a typical step assembly;

Figure 5 is a perspective view showing a modified construction wherein the tread and riser are poured as a unit;

Figure 6 is a perspective view of one type of mold

arrangement in which the steps, according to the Figure 5 structure, can be poured; and

Figure 7 is a sectional view indicated by line 7—7 on Figure 6 showing the manner in which the ends of the steps are formed in the mold, and also showing the connection to the mold of a vibrator for compacting the casting material supplied to the mold.

Referring to the drawings somewhat more in detail, a step arrangement according to the present invention comprises opposite side members **10** and **12**, a front riser member **14** and a rear member **16**. The aforementioned members form the outer framework of the assembly and serve to support the treads of the steps which are indicated at **18**, **20**, **22** and **24**. At the rear of each step, except the last, are the riser members **26**, **28** and **30**.

Reference to Figures 2, 3 and 4 will show that the side members **10** and **12** comprise the forwardly directed cleats **32** and **34**, respectively, which form pockets or slots adapted for receiving the tongues **36** and **38** that project rearwardly from the foremost riser member **14**.

Similarly, at their rear ends the members **10** and **12** comprise the backwardly facing cleats **40** and **42** that form slots or grooves to receive the forwardly facing tongues **44** and **46** formed on the back member **16**. The tongue and groove arrangements described provide means for aligning and locating the step parts and for transmitting stresses therebetween. According to a preferred form of my invention, the steps may be constructed of a resin, such as polyester resin, and when the parts of the steps are assembled, a solution of polyester resin and a solvent therefor can be utilized as an adhesive for securing the parts together.

After the frame comprising members **10**, **12**, **14** and **16** having been assembled on a suitable flat support and with the said members preferably supported until the adhesive sets, the treads and risers can be put in place. As will be seen in Figure 4, each of the risers **26**, **28** and **30** has a foot portion thereon as at **48** adapted for being received in the notches **50** in the side members **10** and **12**. As shown in Figure 3, these notches or recesses are of a size and shape as snugly to receive the ends of the foot portions. Thus, the lower edge of each riser is firmly but detachably locked in position to increase the rigidity of the stair construction as a whole.

Each riser, with the adjacent portion of the side members **10** and **12** forms a three-sided upstanding edge configuration for engaging beneath the periphery of the tread thereabove while the foot portion **48** of each riser supportingly engages beneath the rear edge of the next preceding step.

For locating the treads on the said upstanding edge, each step is formed with a downwardly opening groove **52** extending across the front edge and down the sides of the pertaining step. When this groove is engaged by the upstanding edge previously referred to, the treads and frame are interlocked in a fixed position. The rear edges of the dependent original portions of the treads, indicated at **54**, overlie the ends of the feet **48** on the bottoms of the risers and thus the risers also are fixedly located in the assembly when the treads are put in position.

When the treads and risers are constructed of a resinous material, they may be cemented in position so that when the cement sets, the entire structure will be integrally bonded together.

It will be apparent that the structure can also be constructed of other materials than plastic and concrete is one of the materials which would be satisfactory for this purpose. Due to the greater rigidity of concrete and the lower tensile strength thereof, it would be preferable

for all of the sections to be considerably thicker than illustrated in the drawings if this material is employed.

For concrete it might also be advantageous to provide some metallic reinforcing according to well-known practices, if so desired. With concrete the cementing together of the various parts could be dispensed with, if so desired, since all of the parts interlock to form a unitary structure. However, for any permanent installation, even if the steps were made of concrete, a thin grout could be employed to seal interengaging or abutting surfaces, and in this manner a substantially fluid-tight structure would result.

In any case, regardless of the material used, and whether or not the parts of the assembly are cemented together, a light but extremely strong step assembly is had which can be cast under controlled factory conditions and then quickly and easily assembled on the job site.

It will be apparent that the particular size and style of the assembly is subject to modification according to individual preference, and it will, therefore, be appreciated that the showings in the drawings are purely by way of example and are intended only to represent one modified form which the present invention can take.

The stair structure shown in Figure 5 comprises integral treads and risers. The tread portion **60** and riser portion **62** are cast integrally together with a flange **64** at the front edge of the step extending across the front of the preceding riser and with a dependent flange **66** along the sides of each tread embracing the top outside edge of the side members **68**. Each tread-riser combination may also have a flange **70** along the rear edge engaging the sides of the side members **68**.

According to the modification of Figure 5 the treads and risers are advantageously cast as a single element in one operation by availing of a mold of the nature illustrated in Figures 6 and 7. This mold comprises a lower portion **72** having hinged thereto the cover portions **74** and **76** that define the confines within which the treads and risers are cast. These portions of the mold meet while leaving a pouring opening of substantial size, as at **78**, in which the material can be cast in the mold.

The advantage of casting the treads and risers in the inverted manner illustrated in Figure 6 is for the purpose of eliminating all air bubbles and the like on the exposed surfaces of the treated steps or risers so that a perfectly smooth finish will be had; or, in case one of the surfaces is figured, a surface that will correspond exactly with the corresponding surface of the mold.

The arrangement of the mold riser at **78**, when the mold is supplied with a slight exess of material, results in a stiffening rib **80** across the rear edge of the tread **60**, thereby making for an extremely strong construction. As will be seen in Figure 7 the rib **80** is interrupted adjacent the side edges of the tread so as not to interfere with the interfitting of the tread with the side members **68**.

Figure 7 will also reveal a vibrator **82** for vibrating the mold during the filling thereof which greatly facilitates the compacting of the material within the mold and eliminates air bubbles and distributes the material in the mold.

It has been mentioned that various materials can be used according to this invention and among these materials is concrete, also polyester resin having various fillers therein, such as ground organic material, crushed or powdered stone and the like.

It will be understood that the composition from which the steps are constructed is inherently of an acid-resisting nature, particularly when constructed of polyester resin, and it has good weather-resisting properties. The steps, when made of plastic material, would have still further characteristics of merit because salt and like de-icing materials could be put on the steps without damaging them.

The vibrator **82** referred to above and illustrated in Figure 7, and which has been described as vibrating the mold, can be a device that varies considerably in frequency. For relatively heavy viscous materials that flow only slowly it is conceivable that satisfactory results might be obtained from merely "bumping" the mold at fairly infrequent intervals, say, once every half minute, which would promote the flow of the material into the far reaches of the mold cavity.

On the other hand, certain other matters, such as those which might tend to permit air bubbles to cling to the surface, probably would be preferable to increase the frequency of the vibration substantially even up to three hundred thousand cycles per second, which is about the limit of what is generally considered to be the supersonic range.

The preferred material has been described as consisting of polyester resin having various fillers therein. It will be understood that, in addition to the ground organic material which has been mentioned, inorganic material as well could be employed or a combination thereof. In any case, this material would either be ground or granulated to a sufficient degree such that the mixture thereof with the resinous material would form a readily flowable composition. The material could also include dyes or pigments in order to impart color to the finished product, if so desired.

It has been mentioned above that one portion of the mold might have a pattern thereon. This pattern would probably occur on the face of the tread, thereby to impart non-skid properties thereto. It is to be understood that such a configuration could be imparted to the tread surface within the mold, or there could be such a surface provided on the tread after the molding thereof was completed, either by machining the tread surface, or by otherwise forming the said surface, or by adhering thereto by a suitable cement, a thin sheet of suitably wear-resistant material having the desired configuration thereon.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and accordingly it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. In a prefabricated stair structure; side members, front and back members, riser members and tread members all preformed of castable material, said side members and front and back members having interengageable elements of a tongue and groove interlock thereon, said side members being notched to form stringer means, said riser members being fitted against the vertical portions of the notches in the side members, said riser members extending from the outside limit of one side member to the outside limit of the other thereof and each riser member having a forwardly projecting foot extending across the entire width thereof at the bottom, said notches in the side members being notched at their bottom corners snugly to receive the said feet, and each tread member having an outer dependent peripheral flange extending across the front and down the sides to fit outside the next preceding riser member and along the sides of the side members and to embrace the ends of the foot on the next succeeding riser member, each tread portion also comprising a second dependent flange located inwardly of said peripheral flange and engaging the inside surfaces of the preceding riser member and the said side members.

2. In a prefabricated stair structure, side members, front and back members, riser members and tread members, all of said members being precast and comprising substantially flat members whereby the knock down stair structure can readily be packaged in small space for storage or shipment, said side and front and back members being adapted for being placed in a vertical position with their ends thereof in engagement, there being inter-engageable elements of a tongue and groove interlock on

said side and front and back members so the side members are prevented from moving laterally, said side members being notched to form stringers, said riser members fitting against the vertical portions of the notches and extending from the outside limit of one side member to the outside limit of the other and each riser member having a forwardly projecting foot at the bottom, recesses formed at the rear ends of the horizontal portions of the notches snugly to receive said feet, each tread member engaging the top edge of the riser therebeneath and the top edges of the side member at the end of the tread member and the foot of the next riser member, each tread member having an outer dependent flange extending across the front and down the sides engaging the outside of the riser member therebeneath and the outsides of the side members and embracing the ends of the foot of the next riser member, each tread portion also having a second flange engaging the inside surfaces of the preceding riser member and the insides of the said side members.

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