ABSTRACT OF THE DISCLOSURE

A stairway structure and a method of providing the same in a conventional dwelling or other building which permits shop fabrication of standard size stairway parts including stringers, risers, treads, and balustrade members so that the stairway may be preassembled and installed in sections, or units, as, for example upper and lower stair sections and a balustrade, in a stairwell opening which has been framed in within predetermined dimensional limits so as to make it possible for a supply manufacturer to provide a relatively small number of premachined assemblies which are adapted to fit in the predimensioned openings and which may be packaged and delivered on the building site for installation after the building is framed in or otherwise completed with minimum adjustment to accommodate variations within the predetermined dimensional limits of the stairwell opening.

In the construction of dwellings and like structures of the multi-floor type, of which the two story house is typical, it has long been the universal practice to build the stairs on the job so that they are custom made to fit the dimensions of the house after it is framed in. The general practice has been to cut the stair members to fit on the building site. In some cases, stair components have been shop fabricated but the fabricator either had to stock a large number of different size members or he has waited for field measurements before determining the rise, run and width of the stairs to be built. While other parts, such as windows and doors in house construction have been shop fabricated in predetermined stock sizes, preassembled and installed as units, the adoption of stock sizes for stairs has been considered impractical due to the variation in floor-to-floor height in normal construction. Houses with uniform ceiling height have been built with different floor-to-floor height due to the different depth of joists and different thickness of finished floor materials. While some effort has been made to provide precut and preassembled stairs, it has generally been in connection with buildings which are entirely prefabricated and merely assembled on the site. In custom built house construction, some dimensions have become, to a large extent, standard, including some stairway parts. Some manufacturers have specialized in supplying standard size stair elements and have usually provided construction manuals for installation with dimension tables, but cutting and fitting of the individual parts on the job has been necessary in order to install the stair.

It is a general object of the present invention to provide a stairway structure and a stair building method which permits fabrication of the stair parts in a small number of pre-determined stock sizes which may be delivered to the building site for preassembly and installation in a stairwell which has been framed in accordance with predetermined measurements, with some variation, depending upon the floor-to-floor height and the type of stair it is desired to install.

It is a more specific object of the invention to provide a stairway construction and installation procedure which enables the stair parts to be factory cut and finished and delivered to the building site where sections of the stairway are preassembled and thereafter set in a stairwell which has been built with certain key dimensions held within predetermined limits.

It is a still more specific object of the invention to provide a stairway and a method of constructing the same wherein the stairwell is framed in to predetermined dimensional specifications, the stairway elements including stringers, risers, treads and balustrade elements, are shop fabricated and delivered to the building site where they are preassembled generally in two main sections or units and installed in a half-open, string stairwell with a balustrade constituting a third section or unit.

Another object of the invention is to provide a stairway construction for a half-open string stair in which the stringers, risers and balustrade elements are shop fabricated in predetermined stock sizes and delivered to the building site where upper and lower stair sections are assembled as units and thereafter secured in place, with balustrade elements forming a third section or unit which is thereafter positioned to complete the installation.

Still another object of the invention is to provide shop fabricated stairway parts adapted for preassembling in sections and installation as a half-open string stairway which includes a premachined block of special construction for positioning at the lower end of a preassembled upper stair section and adjoining the end of the uppermost stringer at the open side of the stairway when the section is installed and which connects with the open stringer on the lower stairway section so as to enable the lower section to be properly aligned with and connected to the upper section without any cutting and fitting.

A further object of the invention is to provide a prefabricated stairway parts assembly which is adapted to be preassembled in a small number of sections and the preassembled sections installed as units in a stairwell which is framed in according to predetermined dimensions and which is provided with lodger members extending from the first floor to the framing of the second floor for supporting the preassembled stairway sections and permitting the stair sections to be slid into proper position in the well.

These and other objects and advantages of the invention will be apparent from a consideration of the stairway construction and the method of prefabricating, preassembling and installing the same which is illustrated in the accompanying drawings wherein:

FIGURE 1 is an exploded perspective view showing an assembly of stairway parts which have been prefabricated and which are adapted for preassembly in sections and installation thereafter in a half-open string stairway opening which has been built or framed in according to predetermined key dimensions;

FIGURE 2 is a perspective view showing the framing in a stairwell for a half-open string stairway which is prepared for receiving the stairway in preassembled sections;

FIGURE 3 is a vertical section taken on the line 3-3 of FIGURE 2 to a smaller scale;

FIGURE 4 is a fragmentary vertical section showing an upper pre-assembled stairway section or unit in position in the upper portion of the stairway opening;

FIGURE 5 is a perspective view of the stairway completely installed;

FIGURE 6 is a perspective view showing the joint between the upper and lower sections at the open side of the stairway;

FIGURE 7 is a perspective view of a connecting block employed in forming the joint between the upper and lower stair sections; and
FIGURE 8 is a fragmentary vertical section at the foot of the completed stairway. The invention is illustrated in the drawings in connection with the fabricating and installing of a half-open stairway. The stairway is designed so that factory made parts can be provided in the form of assemblies which are adapted to be put together or preassembled so as to form stairway sections which are thereafter installed as units in the stairwell. To enable this to be done with a minimum number of prefabricated assemblies, the stairwell opening is held within certain dimensional limits when it is framed in, the dimensions then being supplied to the builder by the manufacturer of the stairway parts. The manufacturer then supplies parts assemblies in a relatively small number of sizes so as to fit into the stairwell when preassembled and installed. The dimensions of the opening which are supplied the builder are based on currently accepted room heights and the practice which is followed in custom building stairway constructions. That is, the opening for the stairway is dimensioned to accept the stairway assembly in which the riser heights are $3\frac{3}{4}$, $4\frac{1}{4}$ or $6\frac{3}{4}$ of normal floor-to-floor height. This is the normal riser height necessary to comply with the maximum number of building codes which generally set a range for the riser height and the width of treads for given floor-to-floor heights. The width of the opening is subject to some variation but generally two widths are considered acceptable, namely, 32" and 36" for stair tread and stair face to stair face in the rough framing. The finished width will vary somewhat depending on the thickness of the wall material. The smaller width of 32" is generally provided where one handrail is to be installed while the wider width of 36" is adapted to accommodate a handrail on each side of the stairway. These widths are generally adopted since they comply with most building codes. The length of the stairwell opening in which the stairway is to be installed is related to the floor-to-floor dimension so as to keep within the limits set for the riser height and width of treads in the building codes.

In framing the opening for the stairway, as shown in FIGURE 2, the builder will set the studs on opposite sides of the well either 32" or 36" face-to-face depending upon the width of the stairway desired. The length of the opening, indicated at A in FIGURE 3, will depend upon the floor dimension. The stairway is designed to be supported on ledger forming members 10 and 11 (FIGURE 2) which are positioned diagonally or inclined from the lower to the upper floor structure. The ledger members 10 and 11 may, for example, be standard 2 x 4's and 2 x 6's. The ledger 10 includes the dimension upon which the manufacturer bases the dimensions of the wall stringers which form the supports for the treads and risers in the stairway. The upper end of the ledgers 11 and 12 will be positioned at a predetermined point below the finished floor level, indicated at D in FIGURE 3. This dimension will vary somewhat according to the nature of the floor construction, as shown in FIGURES 3 and 8, and can be indicated on the plan or table furnished by the parts supplier. At the lower end the legers 10 and 11 rest on the top of the rough framing or the finished floor if this is already installed. Cross bracing or blocking members 12 are provided to connect the ledger members 10 and 11 and a knee wall 13 is set to close the opening between the edge 14 of the partial wall 15 and the bottom of the ledgers. Blocking 16 may be used to shim the knee wall 13 so that the member of the finished wall will be aligned with the center line of the balustrade rail which is generally made to coincide with the center line of the vertical edge 14 of the partial wall 15.

The stairway parts are manufactured or premachined in the manufacturing plant or shop where it is possible to employ mass production methods. As indicated in FIGURE 1, the stairway parts are machined or fabricated and may be packaged for shipment and delivery to the job site in groups or packages, for example, three or four packages, so that they may be preassembled on the job to provide three stairway sections or units. The three sections or units comprise an upper stairway section 20 (FIGURES 1 and 3), a lower stairway section 21 and a balustrade section or assembly 22.

The parts provided for the upper or top stairway section 20 comprise right and left hand housed wall stringers 23 and 24 which are routed to provide end receiving recesses 25 and 26 for the treads and risers 27 and 28, respectively, with these recesses being of conventional form so that the treads and risers may be secured in the usual manner with wedges and a suitable adhesive, either when preassembled in the factory or on-the-job site. The stringers 23 and 24 are of a length required to bring the steps to the edge of the open or partial wall 15. The treads 27 and risers 28 are of a length for the required width of stairway and of proper width and height for the length of the stairway and the proper number are provided for assembly of the upper stairway section or unit. Also a special connecting block 30 is provided which is machined as shown in FIGURE 7.

The connecting block 30 is mitered at 31 to abut the lower edge of the wall stringer 23 on the open side of the stairway and it is routed at 32, 33, 34 and 35 to mate with the routing 35 at the lower end of the stringer 23 so as to receive the ends of the lowermost tread 27, the top riser and tread on the lower stairway section 21 and to finish off the stringer 23 at the lowermost end thereof as shown in FIGURE 6. The block 30 may be made right or left hand side depending upon which side of the lower section of the stairway is open.

The parts provided for the lower stairway section or assembly 21 comprise a housed stringer portion 36 which is adapted to form a continuation of the stringer 24 when the stairway is completely installed and is cut at its upper end at 37 to mate with the lower end edge 38 of the stringer 24. An open stringer 40 is provided for the other side of the lower stairway together with the required number of risers 41 and treads 42. A special bottom riser 43 and a bottom tread 44 is required for the bottom step which will vary according to the design of the newel post and the balustrade arrangement.

The balustrade assembly depends upon the particular design desired. The treads 41 and 44 in the lower stairway section 21 are preformed at 45 and 46 to accommodate the lower end of the baluster members 47, the number of which depends upon the size of the opening to the stairway. The balustrade assembly 21 consists of a U-shaped member 48 of newel post post 49, a rail 49, and rosette 50 for joining the end of the rail 49 to the ed producing the open side wall 15.

The lower stairway section or assembly 21 preferably includes conventional molding or trim strip members indicated at 51 and 52 in FIGURE 1. The upper stairway assembly 20 also includes the necessary trim strips 53 (FIGURE 6).

The stair parts may be preassembled or partially preassembled in the shop and shipped in assembled sections or units to the job site. Alternatively, the parts for the three units may be packaged conveniently in three separate packages, delivered to the job site and preassembled on the job site. This facilitates the handling of the parts by stores and other retail outlets where desired. The preassembled sections or units 20, 21 and 22 may be delivered after the walls and floors are completed so that there is a minimum usage of the stairway space.

Upon assembly of the parts, the upper stair section or unit 20 is installed by sliding it up the supporting ledgers 9 and 11 into position at the top of the stairway opening. It is held there by setting blocks 54 (FIGURES 1 and 4) at the bottom ends of the wall stringers 23 and 24 which setting blocks 54 may be included as part of the premachined assembly. The upper stair section 15 fits between the vertical walls and forms the closed portion of the stair. The upper section 20 may be supplied in as
little as four riser heights so as to fit left or right open stairs and a predetermined number of designs of the lower section, the selection of the proper section being determined by the dimension B in FIGURE 3.

The riser setting block 30 is next installed so as to provide the recesso or sockets 34 and 33 at the open side for that end of the top tread 41 of the lower section 21 and the top riser 42. The preassembled lower stairway section is slid into position. When the preassembled lower section 21 is properly aligned with the already installed upper section 20 its top riser 42 is fastened with a screw or otherwise to a block 55 (FIGURES 1 and 4) which is provided at the proper position on the uninstalled side of the lowermost tread 27 (FIGURES 1 and 6). The riser setting block 30 serves to close off the lower end of the wall stringer 23 on the open stair side. It also makes it possible to provide a single end upper section to accommodate all lower sections since the block 30 may be furnished left or right so as to fasten in place the free end of the upper tread 41 and riser 42 of the lower section to the wall and the upper stair section 20 from the top side of the stairway. The routed indexing feature of the block 30 and the housed wall stringer enables the preassembled lower section 21 of the stair to be readily aligned with the upper section 20.

The tread 41 and the finish or outside open stringer 40 of the lower section are pretreated or cut to fit against the end edge 14 of the wall 15. Allowance is made in this notching for job site scribing to adjust to various wall finish materials. In the preassembly of the lower stairway section 21 the newel post 48 may be positioned therein before the section 21 is slid into place. Preferably, the joins between the upper and lower sections 20 and 21 are glued in addition to nailing. After alignment the wall stringers 23 and 24, 36 are shimmed and fastened to the wall studs from the top side of the stair. The open stringer 40 is fastened into the supporting diagonal ledger 11. A base shoe 56 (FIGURE 5) is positioned and fastened at the base of the first riser serving as a closure molding and also taking some of the forward thrust of the lower section.

After alignment and fastening of the upper and lower sections 20 and 21, a cap scribe molding 57 (FIGURES 4 to 6) is fitted and fastened on the top edge of the wall stringers 23 and 24, 36 closing the fitting and shimming space between the walls and the stringers. This molding is mitered down to the floor on the lower end of the full wall stringer (FIGURE 5) and the top tread on the lower section on the partial wall stringer (FIGURE 6). The upper end of the stringer 24 may be joined by a plinth block 58 (FIGURE 4) to the base molding 59 on the second floor with the stringer cap molding 57 finished off against the same.

The balustrade can now be set by placing the rail 49 on the newel dowel 60 (FIGURE 1) and holding the same in place at the proper slope by temporarily inserting the uppermost precut baluster 47 so that the upper end of the rail 49 may be scribed to properly meet the end 14 of the wall 15. The rail rosette 50 may be used to get the proper amount of fit for the scribing cut. After the rail 49 is properly cut the rosette 50 is glued and fastened to the end. The balusters 47 are glued and placed in the prebored holes in the treads. The rail 47 is assembled to the newel 48 and balusters 47 with glue and the rosette end is fastened to the wall by toe nailing through the rosette 50. This completes the installation of the stairway.

In the manufacture of the risers and treads for both sections 20 and 21 provision may be made for tongue and groove joints so as to insure that the stairway sections are solid when preassembled and installed. The finish moldings may be included in each of the assemblies.

 Provision may be made for a landing in the upper section of the stairway by cutting the stringers 23 and 24 at any even riser height. The upper section will then be preassembled in two units for installation in the same manner. The total run of the stringers can be readily reduced by cutting back to the same indexing point on any adjacent tread before assembly. Thus an assembly for the maximum run of the stringers can be cut down far enough for a smaller run of the stringers be cut down for a preassembly with very little waste in labor and materials.

The two section construction of the stairway permits installation with a minimum of labor and also enables the installation to be made in areas where there is insufficient space for installation of a fully preassembled stairway. It permits some fitting at the open and closed portion to the wall end which would not be possible in many cases with a fully preassembled stairway. It enables the supplier to satisfy the demand for a substantial number of different designs of stairs with a relatively small number of different assemblies required to be kept in stock.

While particular materials and specific details of construction have been referred to in describing the stairway which is shown in the drawings and the method constructing the same, it will be understood that other suitable materials and equivalent structural details may be selected to within the spirit of the invention.

1. Claim 1:

1. A half-open string stairway construction for installation in a stairway opening of predetermined size comprising laterally spaced ledger members of predetermined length adapted to be connected at the upper ends to upper floor joists which define the end of the stairway opening and to rest at the lower ends on the lower floor, a preassembled upper stairway section comprising housed stringer members with treads and risers extending between the same, said stairway section being of a width and length sufficient to pass the stringers being of a length to fit within the portion of the stairway opening between the vertical walls with the stringer members resting on the top edges of said ledger members, and a preassembled lower stairway section comprising a housed stringer member on the wall side thereof and an open stringer member on the open side thereof with treads and risers extending between the same, said upper and lower stairway sections having matching tread and riser dimensions, the lower stairway section being of a length to fit within the portion of the stairway opening having the open side with the stringer members resting on the top edges of said ledger members and the upper end of the housed string member of said lower section mating with the lower end of the housed stringer member of said upper stairway section so as to form a continuation thereof extending to the top of the lower floor at the foot of the stairway, and a connecting block member adapted to be positioned at the lower end of the housed stringer member which is on the open side of the stairway, which connecting block member is precut to fit on the end of said housed stringer member and to join the same in aligned relation with the open stringer member of said lower stairway section.

2. A half-open string stairway construction as recited in claim 1, and said connecting block being routed to receive the ends of the uppermost tread and riser on the lower stairway section so as to connect the upper and lower stairway sections together.

3. A half-open string stairway construction as recited in claim 1, and a balustrade adapted to be positioned at the open side of lower stairway section and connected to the end of the wall at said open side.

4. A half-open string stairway construction as recited in claim 1, and means for rigidly connecting the uppermost riser of the lower stairway section with the lowermost tread of the upper stairway section.

5. A half-open string stairway construction as recited in claim 1, and means for blocking the lower ends of the stringer members after the upper stairway section is properly positioned between said vertical walls so as to resist the downward thrust of said stairway section,
6. In a half-open string stairway structure which is formed of upper and lower stairway sections having housed stringers extending along the vertical walls for connecting thereto the ends of the treads and risers which form the stairway steps, a connecting block for positioning at the bottom end of the housed stringer of the upper stairway section which is disposed at the open site of the stairway, said connecting block being cut to form an end extension on said stringer and being routed to receive the end portions of the top riser and top tread of the lower stairway section so as to connect said riser and tread with the upper stairway section.

7. In a half-open string stairway structure as recited in claim 4, and said connecting block being routed at adjoining margins so as to mate with the routing for the tread at the bottom end of the housed stringer and trap the ends of the top riser and top tread of the lower section in the recesses formed by said routing and connect the same with the upper stairway section.

8. A method of fabricating and installing stairways which comprises precutting housed string members, treads and risers to predetermined dimensions for preassembly into upper and lower stairway sections having treads and risers with matching dimensions for setting in a stairway opening having dimensions within predetermined limits, framing in the stairway opening according to predetermined dimensions which will accommodate said stairway sections, installing laterally spaced ledger members of predetermined length in the stairway opening so as to form an inclined support for receiving the preassembled stairway sections, the length of said ledger members being selected to accommodate the stairway sections when preassembled, preassembling the upper and lower stairway sections, sliding the preassembled upper stairway section into position on the top edges of the ledger members and securing the same, sliding the preassembled lower stairway section into position with the stringer members thereof resting on the top edges of the ledger members and aligning the stringer members of the lower stairway section with the stringer members in the upper stairway section so that they form a continuation thereof with the treads and risers in the upper and lower stairway sections having matching width and height, and securing the lower stairway section in aligned relation with the upper stairway section.

9. A method of fabricating and installing stairways as recited in claim 8, and precutting the stringer members, treads and risers with dimensions which enable them to be preassembled into two stairway sections and installed in an opening which is framed in with the width, length and floor-to-floor dimension held within dimensional limits which have determined the cutting dimensions of the stringer, tread and riser members, cutting like members for use in preassembling a lower stairway section which will mate with said upper stairway section when installed in alignment with the upper stairway section, and packaging the members for the upper and lower stairway sections in separate units for delivery to an assembly site where the upper and lower sections are preassembled for subsequent installation in the stairwell.

10. In a method of fabricating and installing half-open string stairways in a dwelling or the like, the steps of cutting to predetermined dimensions right and left hand housed stringer members and connecting tread and riser members for use in preassembling an upper section of a stairway which will fit within a stairwell which is framed in with the width, length and floor-to-floor dimension held within dimensional limits which are determined according to the dimensions of the precut stringer, tread and riser members, cutting like members for use in preassembling a lower stairway section which will fit within the stairwell and mate with said upper stairway section when installed, cutting balustrade members for association with said lower section and packaging the members for the upper and lower stairway sections and the balustrade in separate units so that the upper stairway section may be preassembled and installed in combination with lower stairway sections and balustrades incorporating different design features.

11. In a method of constructing a stairway in a building, the steps of framing in a stairwell to a predetermined width and a length determined by the floor-to-floor dimension and the desired tread width and riser height, installing in the stairwell laterally spaced supporting ledger members which are of a length determined according to the running length of the stair to be installed and which are spaced according to the width of the stair to be installed, preassembling separate upper and lower stairway sections from assemblies of treads, risers and stringer members which are precut to the size required to form, when assembled, a two section stairway of the desired width and having the desired tread width and riser height, installing the preassembled upper stairway section in the stairwell by sliding it upwardly into position with the stringer members resting on the ledger members and securing the same in position on the ledger members, installing the lower stairway section by sliding it into position in alignment with the upper stairway section and securing the lower section in position on the ledger members with the two sections mating at their juncture.

12. In a method of constructing a stairway in a building as recited in claim 11, and providing members for connecting the upper portion of said lower stairway section to the lower portion of said upper stairway section.

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