

Dec. 5, 1961

B. PERLIN

3,011,601

BUILDING CONSTRUCTION

Filed April 29, 1958

3 Sheets-Sheet 1

Fig. 1.

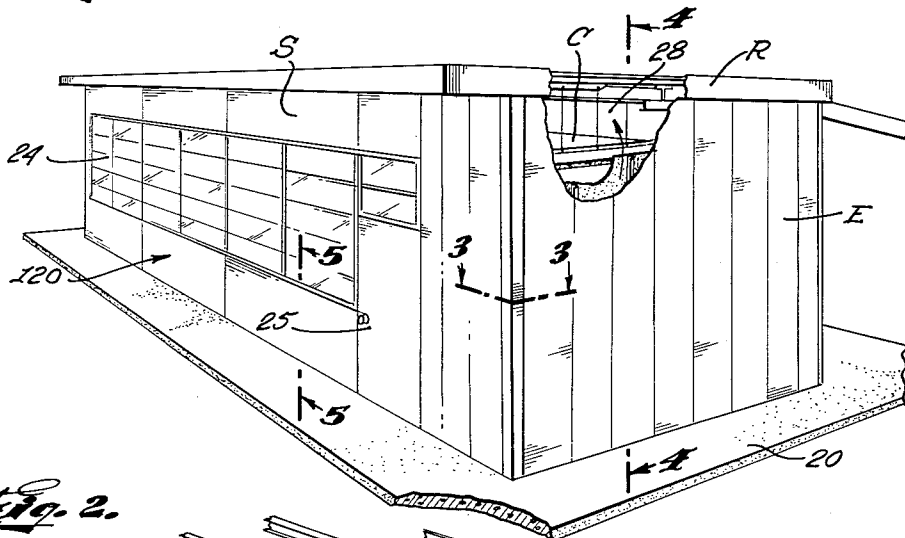


Fig. 2.

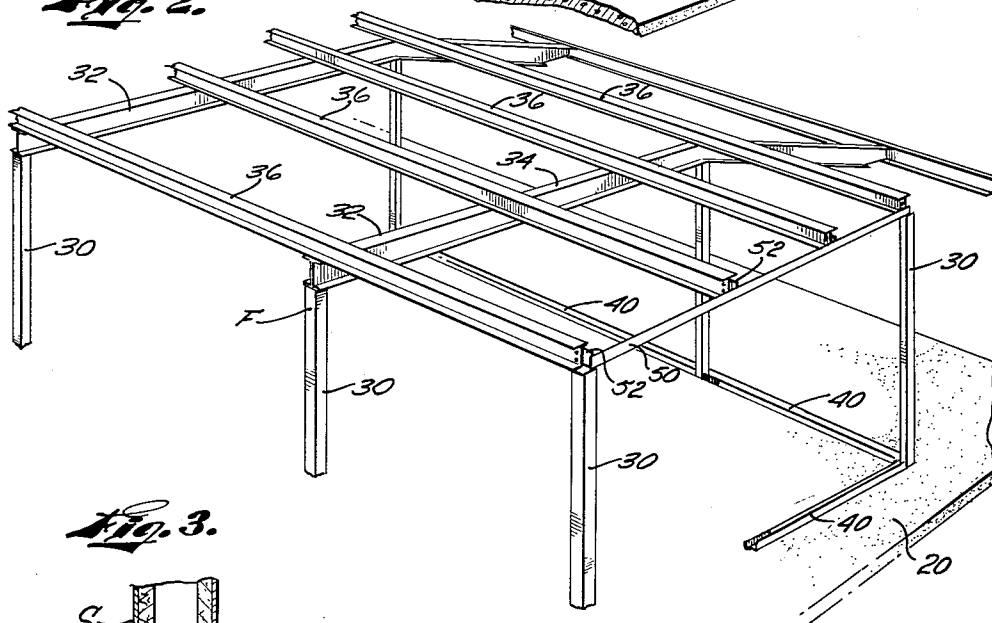
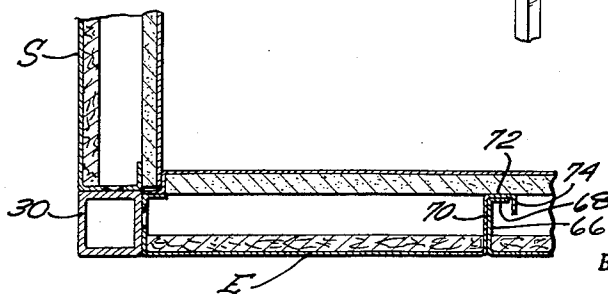


Fig. 3.



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The present invention relates generally to the field of construction and more particularly to a new and improved form of wall, roof and ceiling construction for buildings.

The prefabricated panel type of building construction is meeting ever wider acceptance because of the important advantages provided by such construction over older construction methods. One of the most important advantages of the prefabricated panel building lies in its economy as compared to other types of construction. Such economy results in part from the fact that the panels and the majority of the other items used in constructing such buildings may be produced in a manufacturing plant. Accordingly, modern assembly line methods, together with the other well-known advantages of mass production, can be utilized. Additionally, the prefabricated panel type of building can be assembled using less labor than is required for the older types of building methods. The assembly of the panel building may also be accomplished in far less time than is the case with the older types of building methods. It should also be noted that the waste of construction materials which commonly results with older types of construction can be avoided. The panel building is also lighter than buildings constructed in accordance with older types of construction, notably, masonry construction, and, accordingly, a lower foundation cost results. When the panel type of building is assembled at the building site, a minimum number of labor trades are required. It should further be noted that inasmuch as the panel building is lighter in weight, it is quite possible to make it readily portable from one site to another after it is completed. This is a very attractive feature for certain types of buildings as, for example, school buildings where population shifts may make it necessary to move the classroom facilities from one neighborhood to another over a period of years. Another very important advantage of the panel building is its incombustibility. This advantage is especially important in the case of buildings used for school classrooms.

It is a major object of the present invention to provide a prefabricated panel building offering all of the advantages set forth above, together with additional important improvements.

A further object of the invention is to provide a building construction of the aforescribed nature incorporating a unique wall, roof, and ceiling arrangement.

Another advantage is to provide a building construction of the aforescribed nature wherein the roof and ceiling define an attic space having communication with the interior of hollow wall panels whereby free air circulation is obtained.

Yet another object of the invention is to provide a building construction of the aforescribed nature incorporating novel means permitting ready access to various utilities.

It is a further object to provide a building construction of the aforescribed nature wherein the roof forms a rigid support for the ceiling so as to eliminate the need for the usual independent ceiling support structure, together with a unique hanger clip used to attach ceiling hangers to the roof.

An important object of the present invention is to pro-

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vide a building construction of the aforescribed nature where the same structural shapes may be employed for the wall panels and the roof deck so as to permit added economy in the manufacture of these panels.

An additional object of the invention is to provide a building construction of the aforescribed nature wherein the roof is particularly rigid as compared to similar roofs having the same weight per unit of area.

A further object of the invention is to provide a unique interlocking-type wall panel arrangement in a building construction of the aforescribed nature.

These and other objects and advantages of the present invention will become apparent from the following detailed description when taken in conjunction with the appended drawings wherein:

FIGURE 1 is a perspective view showing a building constructed in accordance with the present invention;

FIGURE 2 is a perspective view showing part of the framework of said building prior to the time the roof, ceiling and walls have been affixed thereto;

FIGURE 2a is a fragmentary perspective view showing the manner in which the column members of said framework are anchored to the foundation;

FIGURE 3 is an enlarged horizontal sectional view taken on line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged vertical sectional view taken on line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged vertical sectional view taken on line 5—5 of FIGURE 1;

FIGURE 6 is a further enlarged vertical sectional view taken on line 6—6 of FIGURE 4;

FIGURE 7 is a vertical sectional view taken on line 7—7 of FIGURE 4;

FIGURE 8 is a fragmentary side elevational view taken along line 8—8 of FIGURE 4 and partially broken away; and

FIGURE 9 is a horizontal sectional view taken on line 9—9 of FIGURE 8.

Referring to the drawings, in FIGURE 1 there is shown a building constructed in accordance with the present invention. The building shown is generally rectangular in configuration and is constructed upon a platform such as a concrete slab 20. It includes vertically extending side walls S wherein are formed windows 24, and a door 25 and end walls E. The upper edges of these walls terminate in a sloping roof R and a horizontal ceiling C is suspended from the roof R in a manner to be fully described hereinafter so as to define an attic space 28. Referring now to FIGURE 2, there is shown a part of the framework F for the building of FIGURE 1. This framework F includes a plurality of upstanding columns 30 having their lower ends rigidly affixed to the concrete slab 20. The upper ends of the columns 30 are affixed to roof beams 32 which extend generally transversely relative to the building. These beams 32 and 34 in turn support a plurality of longitudinally-extending purlins 36. The columns 30 are preferably of hollow construction and are square in horizontal cross-section, as will be apparent by reference to FIGURE 3. The beams 32 and the purlins 36 are preferably formed of steel and may be I-beam sections.

A base channel element 40 extends between the lower ends of each of the columns 30. Referring now to FIGURE 2a the lower end of each column 30 is provided with a pair of support clips 42 and 44. These support clips are L-shaped in configuration and one of their sides is welded to the adjoining side of the column 30. Each of the anchor clips is apertured so as to receive the threaded upper end of a conventional anchor bolt 46. The lower portion of the anchor bolt 46 is embedded in the concrete slab 20 in a conventional manner. The threaded end of the anchor bolt then receives a nut 48 so as to

securely anchor each of the clips 42 and 44 in place. A similar anchor bolt 46 and nut 48 is shown in enlarged scale in FIGURE 4. The end of each of the clips remote from the column 30 is welded to the adjoining end of a base channel member 40. Referring again to FIGURE 2, the upper portions of the end columns 30 are not connected to an I-beam of the type designated 32 and 34, but instead are affixed to an edge piece or angle 50. A cross-sectional view of this angle 50 is shown in FIGURE 4. With reference thereto, it will also be seen that the angle 50 is rigidly affixed to plate 52 and the latter is in turn secured to one of the purlins 36. It should be noted that the foregoing elements of the framework F are all rigidly interconnected by welding or by suitable bolts. These framing members are preferably prefabricated at a manufacturing plant. This makes it possible to rapidly assemble them at the job site.

After the aforescribed framework F has been assembled, the wall S and E and roof R will be attached thereto. The end walls E are made up of a plurality of double panels of hollow construction. The details of these panels are particularly disclosed in FIGURES 4 and 9. Referring thereto, the exterior panel sections are each generally designated 60, and the interior or liner panel sections are each generally designated 62. The exterior panel sections 60 are identical in configuration and include a main wall 64, one side of which is bent at right angles so as to define a leg 66 with the end of the leg 66 remote from the wall 64 being bent at right angles so as to define a finger 68 parallel with wall 64 and extending toward the side of wall 64 opposite leg 66. The opposite side of the wall 64 is likewise bent at right angles so as to define a second leg 70. The end of the second leg 70 remote from the wall 64 is bent at right angles away from the wall so as to define a finger 72 parallel with the wall and extending in the same direction as finger 68. The end of the finger 72 remote from the leg 70 is bent at right angles toward the wall 64 so as to define a lip 74 parallel with the leg and extending toward the plane of wall 64. The width of the finger of each leg 66 is slightly less than the width separating the second leg 70 from the lip 74. Additionally, the first leg 66 is shorter than leg 70 by the thickness of the sheet material from which the sections are formed, whereby these members will nest, as shown clearly in FIGURE 9.

Each liner section 62 includes a main wall 78. One side of this wall 78 is bent at right angles so as to define a first leg 80. The free end of this leg 80 is formed with an arcuate female locking rib 82, the outer end of which is bent at right angles away from the leg 80 toward the opposite side of the wall 78 so as to define a lug 84. The opposite side of the wall 78 is formed with a second leg 86 which extends parallel to the first leg 80. The outer portion of this second leg 86 is formed with an arcuate male locking rib 88 which terminates in a generally L-shaped lug 90 which extends away from the leg 86 toward the adjoining liner section. It will be apparent by reference to FIGURE 9 that the locking elements of the first leg 80 of each section 62 are adapted to nest with the locking elements of second leg 86 of the liner section, such locking elements comprising the female and male ribs 82 and 88 and the lugs 84 and 90.

It should be particularly observed that the inwardly-facing surfaces of the wall 64 of each exterior pane section 60 is affixed to a mat 99 formed of suitable insulating material. In practice, glass fiber matting has proven to be very effective as an insulating material. Similarly, the inwardly-facing surface of the wall 78 of each interior section 62 is affixed to a mat 101 formed of a second suitable insulating material. In practice, gypsum board has proven satisfactory. Preferably, the mats 99 and 101 will be adhered to the walls 64 and 78, respectively, by a suitable adhesive. With this arrangement, a wall constructed in accordance with the present invention will provide the same heat and sound insulating

qualities as may be expected from the use of a masonry wall several times its thickness. With further reference to FIGURE 9, it will be observed that the surface of each finger 72 of the legs 70 of the exterior panel section 60 abuts the adjoining surface of the gypsum board mat 101, when the exterior and interior sections 60 and 62, respectively, are assembled. A plurality of self-tapping screws 100 are shown inserted through the wall 78 of each interior section 62 through the insulation mat 101 and through the nested fingers 68 and 72 of adjoining leg portions of the exterior panel sections 60. If desired the heads of the screws 100 may be countersunk in the wall 78.

Referring now to FIGURE 4, in assembling the end walls E, the exterior panel sections 60 are first attached to the framework F. More particularly, the lower portions of each exterior wall section 60 are rigidly attached to the base channel element 40 by welding or by a plurality of self-tapping screws. In a similar manner, the upper edges of the exterior panel sections 60 are affixed to the angle 50 as by bolts 104. As shown in FIGURE 3, wall panel sections adjacent a corner column 30 will be affixed to this column by welding.

With continued reference to FIGURE 4, after the exterior panel sections 60 have been affixed to the framework F, the liner sections 62 may be secured in place by means of the aforementioned self-tapping screws 100 which are driven into the fingers 68 and 72 of the exterior wall sections 60. It should be particularly noted that the lower edge of each liner section 62 is spaced above the concrete slab 20. Additionally, the upper edge of each liner section 62 terminates a distance spaced below the upper edge of the corresponding exterior wall panel 60. The vertical space separating the lower edge of the liner section 62 from the concrete slab 20 is adapted to be covered by a removable base board assembly, generally designated 110. This removable base board assembly 110 includes a closure member 112, the upper end of which is folded over upon itself so as to define a mounting lip 114. The lower end of this closure element 114 is bent at right angles so as to define a base 116. This base 116 is welded to the lower end of a clip element 118 having a hook portion 120 that is removably received by the rear web 122 of the channel member 40. A cove 124 is adhered to the inwardly-facing surface of the closure element 114. The aforescribed base board assembly 110 is normally maintained in its solid outline position of FIGURE 4 by merely hooking the clip 118 over the rear web 122 of channel member 40 and inserting a number of screws 126 through the mounting lip 114. It will be apparent that when this base board assembly 110 is withdrawn from its normal position to its dotted outline position of FIGURE 4, ready access is afforded to the lower interior portion of the walls E and accordingly to the nuts 48 used with the anchor bolts 46 and to various utilities as exemplified by the plurality of electrical conduits 128 shown in this figure. A suitable floor covering 115, such as asphalt tile, is provided for the concrete slab 20.

Referring now to FIGURE 5, the portion of the side wall S below the windows 24 varies somewhat from the construction of the end walls E. In this regard, as indicated in FIGURE 1, the side wall S above and below the windows 24 is defined by a plurality of rectangular, horizontally-extending panels, generally designated 120. A vertical sectional view taken through one of these panels 120 appears in FIGURE 5. Referring thereto, it will be observed that the panel 120A includes an exterior wall section 121 and an interior wall section 122. The exterior section 121 includes a vertical wall 123 having its upper portion bent inwardly at 90 degrees so as to define a flange 124. An inwardly extending stiffener 126 is welded to the inwardly-facing surface of the wall 123. Suitable mats 99 are adhered to the inwardly-facing surface of the wall 123. The lower edge of the wall 123

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is rigidly affixed to the front web 128 of the base channel element 40 by welding or by screws. The interior section 122 includes a wall 132, the lower end of which is bent forwardly at right angles so as to define a base leg 134. The exterior end of this base leg 134 is bent downwardly at right angles so as to form a lip 136. The upper end of the wall 132 is bent forwardly at right angles so as to define an upper leg 138. The free end of this leg 138 is bent downwardly at right angles and then back toward the wall 132 at right angles so as to define an upper lip 140. A mat 101 is adhered to the outwardly-facing surface of the wall 132. The lower mounting lip 136 is rigidly affixed to the lower portion of the wall 123 of the exterior section 120 by welding or by screws. The outer portion of the upper leg 138 is affixed to the flange 124 by screws 146. The intermediate portion of the wall 132 is affixed to the stiffener 126 by a plurality of screws 148. As will be apparent from FIGURE 5, the lower edge of the wall 132 of the interior panel 130 is spaced above the surface of the concrete slab 20 so as to provide a hollow space 150. Access to this space 150 is provided by means of a removable base board assembly 110 similar to that described hereinabove and shown in FIGURE 4.

Referring now to FIGURES 4, 6 and 7, the roof R includes decking formed of a plurality of deck sections each generally designated 150. Each of these deck sections 150 includes a horizontal wall 152 adapted to rest upon the stringers 36. One side of the wall 152 is formed with an upstanding leg 154. The upper end of this leg 154 is bent outwardly at 90 degrees from the leg so as to define a finger 156 that extends towards the opposite side of wall 152. The opposite side of the wall 152 is bent upwardly at right angles so as to define a second leg 158. The upper end of this second leg 158 is bent at right angles from the leg so as to define a second finger 160. The end of this second finger 160 opposite the second leg 158 is bent downwardly at right angles so as to define a lip 162 parallel with the second lip 158. In assembling the roof deck sections 150 the first leg 154 and finger 156 of one section 150 will nest within the second leg 158, finger 160 and lip 162 of the adjoining section as will be clear by reference to FIGURE 4. Interposed between the first and second legs 154 and 156, respectively, and their members, is a hanger clip member generally designated 164. This hanger clip member 164 includes a vertically extending plate 166, the upper end of which is bent at right angles so as to define a horizontal mounting flange 168. The plate 166 is shown interposed between the facing surfaces of the first and second legs 154 and 156 of adjoining deck sections 150, with the mounting flange 168 being interposed between the facing surfaces of the fingers 156 and 160 of these first and second legs.

As indicated in FIGURE 7, the lower portion of the plate 164 is formed with a plurality of apertures 170. The apertures 170 receive the upper end of a plurality of tension elements, such as ceiling support wires 172. Additionally, these apertures 170 receive attachment means, such as a bolt or screw 176, used to secure the upper end of a tension element such as a bracket 180 to the hanger 164, as shown in FIGURES 4 and 7. These brackets 180 carry utilities, such as electrical conduit 181. As indicated in FIGURE 4, this electrical conduit 181 extends downwardly through the wall panel sections 60 and 62 to intersect one of the conduits 128 disposed in the lower portion thereof.

The lower end of each of the ceiling support wires 172 extends through an aperture 182 formed in a horizontally extending latticework frame generally designated 184, as indicated in FIGURES 4 and 7. The latticework frame 184 is preferably formed of a light-weight material such as aluminum and serves to support a plurality of blocks 188 formed of a suitable insulating material. Such material is commonly employed in ceiling con-

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struction and serves not only to insulate the interior of a room from heat and sound, but additionally its lower surface is ornamental in appearance. The underside of each block 188 is visible through each of the openings 190 defined by the latticework frame 184. The latticework frame 184 includes a plurality of upstanding mounting arms 192, the upper portion of which are formed with the aforedescribed apertures 182 that receive the lower end of the ceiling support wires 172. It should be particularly noted that the insulating blocks 188 may merely rest upon the latticework frame 184. Accordingly, ready access is afforded to the attic space 28 defined between the ceiling C and the roof R.

Referring particularly to FIGURE 6, it will be noted that the wall 152 of each deck section 150 is secured to the purlins 36 by screws 194. The underside of the head of each screw 194 is formed with an annular recess 196 wherein is disposed a conventional O-ring 198. This affords a water-tight securement of the deck section 150 to the purlin 36.

Referring again to FIGURE 4, the roof R will preferably intersect a cornice member 200. This cornice member is secured to the end deck section 150 by a plurality of screws 202 which extend through the finger 160 of the deck section. The lower portion of the hollow cornice 200 is affixed to the upper portion of the exterior wall panel section 60 by a plurality of screws 204.

Referring again to FIGURE 4, it should be particularly observed that the aforedescribed wall and ceiling construction affords communication between the hollow interiors of the wall panel sections 60 and 62 with the attic space 28. Accordingly, free air circulation is thereby obtained. This feature assures adequate heat insulation even in hot climates. This is especially true where the upper surfaces of the roof deck sections 150 are coated with a suitable heat reflecting material such as an aluminum and asbestos compound. This feature additionally is important in preventing condensation. Referring now to FIGURE 9, it should be noted that the wall panel sections 60 and 62 interlock so as to provide shear-wall action capable of resisting earthquakes and high wind forces without requiring any additional structure. Should it become necessary to move the aforedescribed building, the base board assembly 110 may be easily withdrawn from its normal position to its phantom outline position of FIGURE 4 so as to permit access to the nuts 48 of the anchor bolts 46. The removability of the base board assembly 110 also permits ready access to the utilities such as the electrical conduits 128 disposed in the lower portion of the wall. Similarly the attic space 28 is at all times readily accessible simply by lifting the ceiling blocks 188 from the latticework frame 184. All of the materials used in the aforedescribed building may be incombustible and additionally they require little or no maintenance.

While there has been shown and described hereinabove what is presently considered to be the preferred embodiment of the present invention, it will be apparent that various modifications and changes may be made thereto without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a building construction, a hollow wall, comprising: a plurality of exterior panel sections, each having a main wall, one side of which is formed with a first leg normal to said wall, the free end of said leg being formed with a finger parallel with said main wall and extending towards the opposite side of said main wall, the opposite side of said main wall being formed with a second leg parallel with but longer than said first leg and having its free end formed with a second finger parallel with and extending in the same direction as the finger of said first leg, and the free end of said second finger being formed with a lip parallel with said second leg and extending toward the plane of said wall; a plurality of liner panel sections, each having a main

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wall parallel with but spaced from the main walls of said exterior panel sections, one side of which is formed with a first leg that includes a female locking rib, the opposite side of said main wall being formed with a second leg parallel with said first leg and including a male locking rib, the legs of said exterior panel sections extending toward the main walls of said liner panel sections and the legs of said liner panel sections extending toward the main walls of said exterior panel sections with the first and second legs of adjoining exterior panel sections nesting with one another and the first and second legs of adjoining liner panel sections likewise nesting with one another when said sections are assembled so as to provide a shear-wall action; and fastening means extending directly from the main walls of said liner panel sections and the nested legs of said exterior panel sections.

2. A construction as set forth in claim 1 wherein said panel sections are integrally formed from sheet metal.

3. A construction as set forth in claim 2 wherein the main walls of said liner panel sections are twice the width of the main walls of said exterior panel sections.

4. A construction as set forth in claim 1 wherein insulation matting is positioned upon the facing surfaces of said main walls.

5. A construction as set forth in claim 4 wherein said matting includes glass fiber material adhered to the main

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walls of said exterior panel sections and gypsum board adhered to the main walls of said lined panel sections.

6. A construction as set forth in claim 4 wherein said attachment means comprise self-tapping metal screws extending through the main walls of said liner panel sections into the fingers of said exterior panel sections.

7. A construction as set forth in claim 4 wherein the matting of said liner panel sections is abutted by the fingers of the second legs of said exterior panel sections.

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Disclaimer

3,011,601.—*Bernard Perlin*, Los Angeles, Calif. BUILDING CONSTRUCTION. Patent dated Dec. 5, 1961. Disclaimer filed Nov. 13, 1968, by the assignee, *Rheem Manufacturing Company*.

Hereby enters this disclaimer to the terminal portion of the term of the patent subsequent to Dec. 5, 1978.

[*Official Gazette April 8, 1969.*]