July 2, 1968 E. LONGINOTTI 3,390,497

MULTI-LEVEL BUILDING WITH MULTI-LAYERED VENTED WALLS

Filed April 13, 1966 4 Sheets-Sheet 1

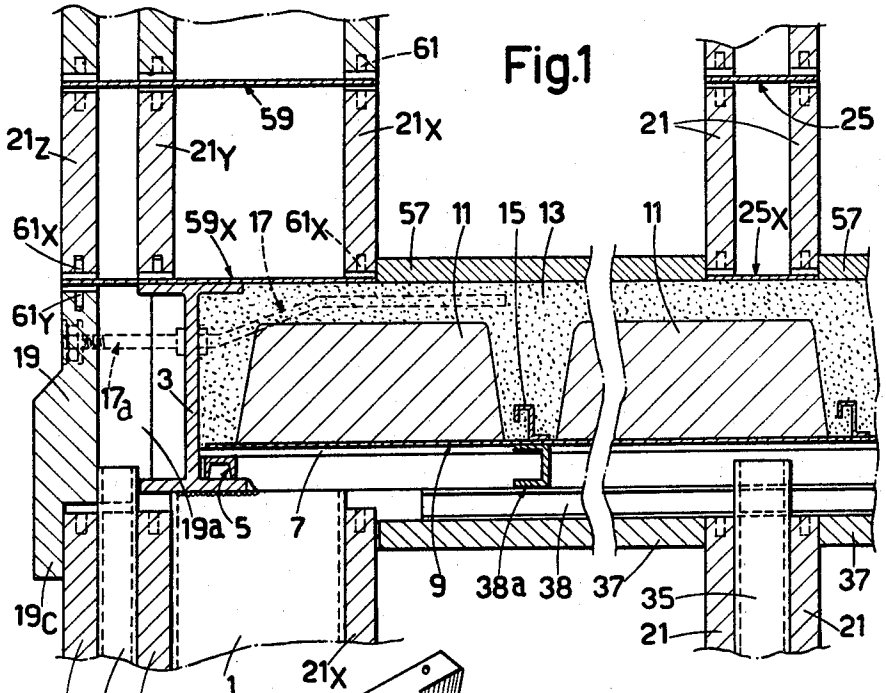


Fig.1

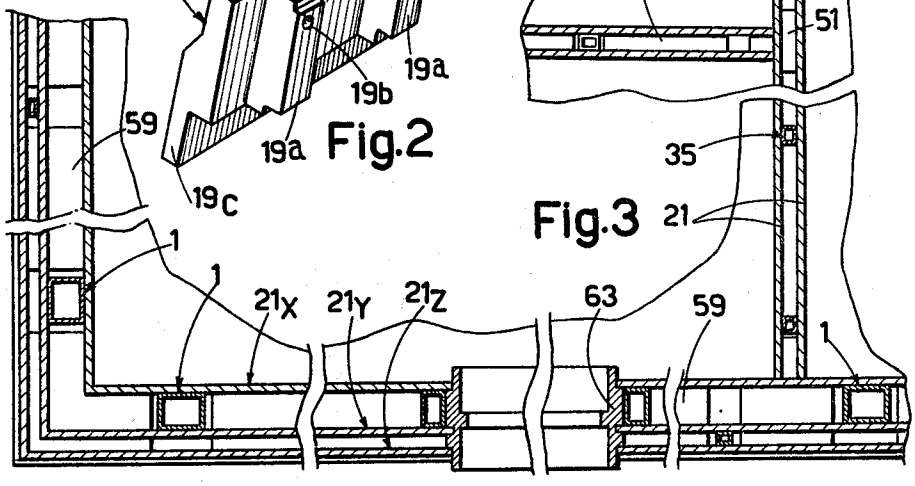


Fig.2

Fig.3

July 2, 1968 E. LONGINOTTI 3,390,497

MULTI-LEVEL BUILDING WITH MULTI-LAYERED VENTED WALLS

Filed April 13, 1966 4 Sheets-Sheet 2

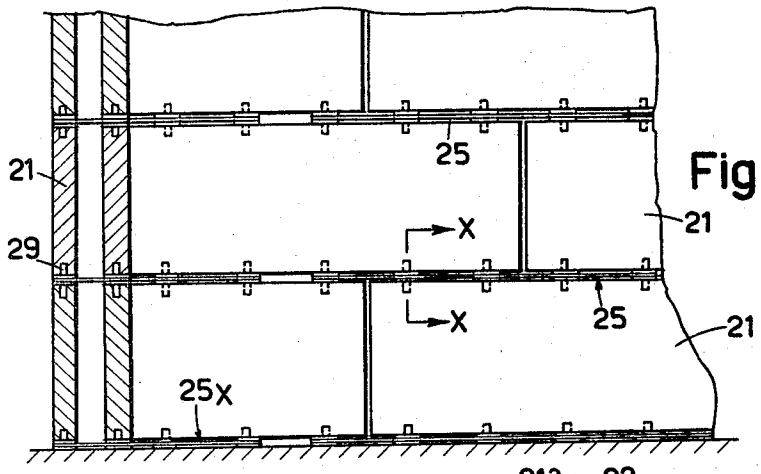


Fig.4

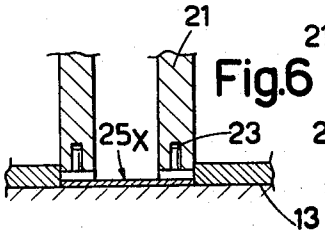


Fig.6

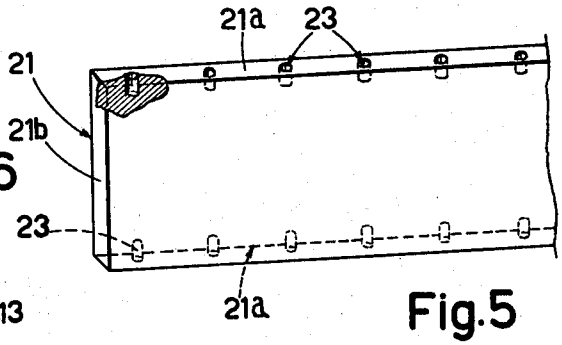


Fig.5

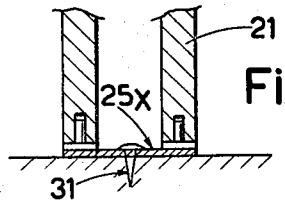


Fig.7

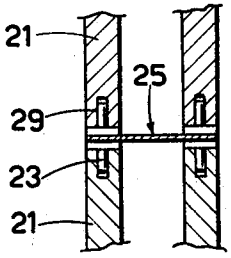


Fig.10

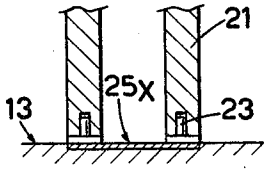
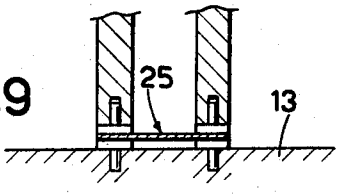


Fig.8

Fig.9



July 2, 1968 E. LONGINOTTI 3,390,497

MULTI-LEVEL BUILDING WITH MULTI-LAYERED VENTED WALLS

Filed April 13, 1966 4 Sheets-Sheet 3

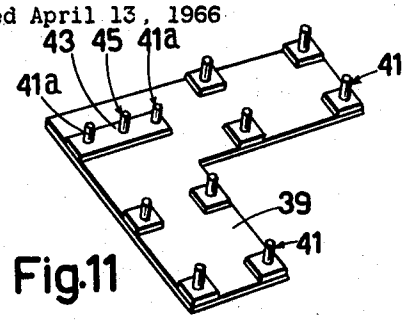


Fig.11

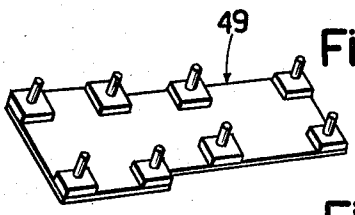


Fig.13

Fig.14

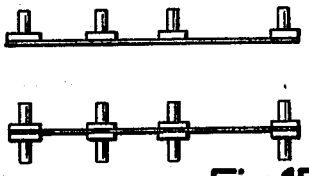


Fig.15

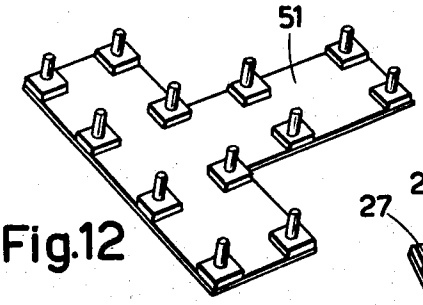


Fig.12

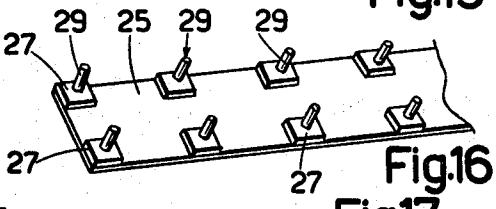


Fig.16

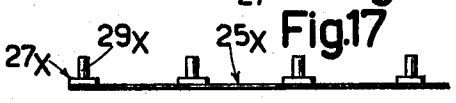


Fig.17

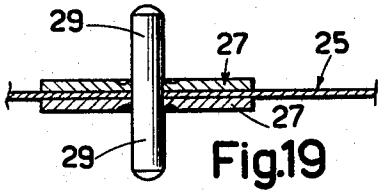


Fig.19

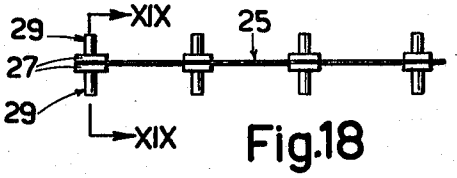


Fig.18

Fig.20

July 2, 1968 E. LONGINOTTI 3,390,497

MULTI-LEVEL BUILDING WITH MULTI-LAYERED VENTED WALLS

Filed April 13, 1966 4 Sheets-Sheet 4

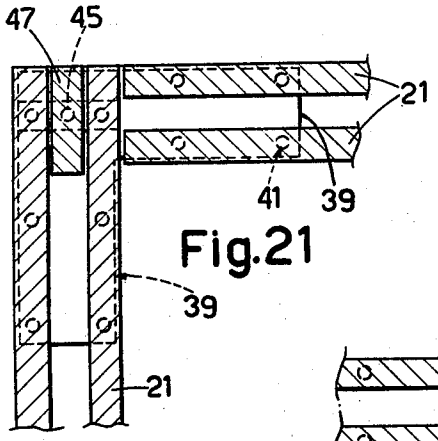


Fig.21

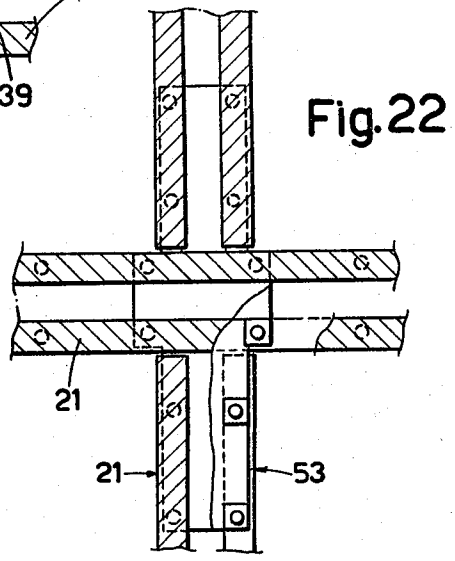


Fig.22

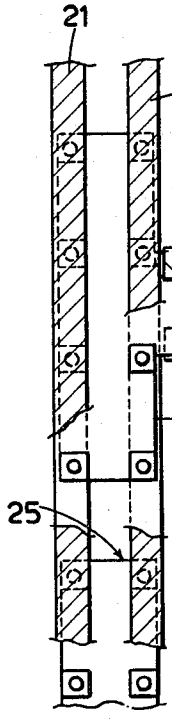
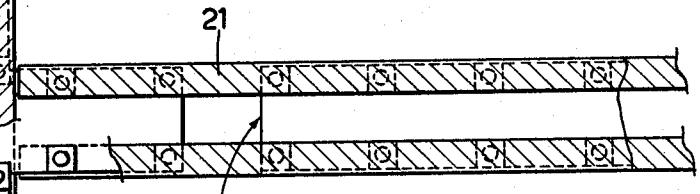


Fig.23



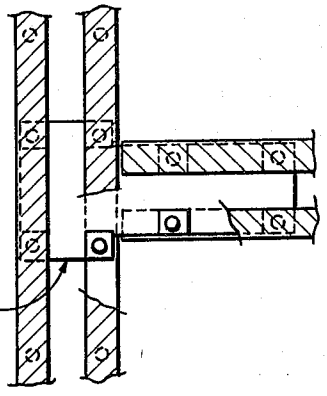


Fig.24

United States Patent Office 3,390,497 Patented July 2, 1968

3,390,497

MULTI-LEVEL BUILDING WITH MULTI-LAYERED VENTED WALLS

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Filed Apr. 13, 1966, Ser. No. 542,282
Claims priority, application Italy, Apr. 15, 1965, 8,577/65; Feb. 15, 1966, Patent 759,987
4 Claims. (Cl. 52—236)

ABSTRACT OF THE DISCLOSURE

A building structure having a framework with columns, perimetral horizontal beams, floors, and a wall construction composed of three spaced panels supported by the beams via a horizontal panel having rows of projections which engage recesses in the lower edges of the panels, the outer two panels defining a continuous vertical cavity for air circulation.

This invention relates to a building construction, applicable, for example to a metal framed building completed by concrete filling or other mouldable materials.

According to the present invention, there is provided in a building structure horizontally-extending plate means, projection means upstanding from the said plate means and arranged in a row, and a vertically-extending panel having spaced holes along one edge thereof, said holes being so spaced that each engages on one of said projection means.

For triple walls, for instance, acting as external walls, provision may be made for plate members with three rows of projections. These members may be drilled in correspondence of the inter-space between side-by-side panels arranged to ensure the continuity of an air circulation gap.

Certain building constructions in accordance with the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which

FIG. 1 is a fragmentary vertical section of an assembly including vertical walls;

FIG. 2 is a perspective view of a cornice used in the assembly of FIG. 1;

FIG. 3 is a fragmentary horizontal section of an assembly of the vertical walls of FIG. 1;

FIG. 4 is a fragmentary side view and a section of an assembly of two walls at right angles to each other;

FIG. 5 is a fragmentary perspective view of a panel;

FIGS. 6, 7, 8 and 9 are four fragmentary sections illustrating methods of assembling plate members to a ceiling or floor structure;

FIG. 10 is a section, on enlarged scale along line X—X of FIG. 4;

FIGS. 11, 12 and 13 are perspective views showing various plate members for the connection of the panels at corners and for securing fittings;

FIGS. 14 and 15 are side views of the plate member of FIG. 13 as used for abutting against a ceiling and as used for connection at an intermediate level on to a wall panel respectively;

FIG. 16 is a fragmentary perspective view of a plate member for the connection of contiguous panels;

FIGS. 17 and 18 illustrate respectively such a plate member in side view and as used for abutting against a ceiling and as used for connection at an intermediate level in a wall;

FIG. 19 illustrates a local section, on enlarged scale, along line XIX—XIX of FIG. 18;

FIG. 20 is a perspective view of a wall during course of construction; and

FIGS. 21, 22, 23 and 24 illustrate fragmentary plan views and a horizontal section of walls constructed with the members as shown in FIGS. 11, 12, 13 and 16.

Referring now to FIGS. 1 to 3, an embodiment of a floor structure and ceiling is illustrated in outline. The structure includes supporting columns **1** and one main horizontal I-section beam **3** on which subsidiary beams **7** are carried by inverted channel-section members **5**. The beams **7** are only partially visible in these figures and have a double-T section; they form a portion of the ceiling structure. The ceiling structure includes a lower plate **9** to which light-weight material projections **11** are bonded (the light-weight material is, for example, an expanded synthetic resin). The projections **11** may be hollow with the concavity facing downwardly. Between the beams **3** and **7** or between equivalent additional structures, cast concrete **13** is provided and this is arranged to withstand at least compressive forces. Profiled members **15** rigid with the plates **9** are embedded in the concrete and are intended to provide strength before the setting of the concrete. The concrete **13** may incorporate reinforcing rods or stirrups **17**, projecting portions **17***a* of which serve to support a cornice **19**, as hereinafter described.

The assembly of the parts forming partition walls or external walls cooperates with a vertical support structure as illustrated, or alternatively with another equivalent continuous structure or a column structure and with a horizontal structure as illustrated, or with any suitable ceiling and floor structure.

For the construction of the vertical walls, plane panels **21** (FIG. 5) of any appropriate and desired material are used and along the upper and lower edges **21***a* of these panels (when located in situ) holes **23** are spaced at appropriate modular distances, said holes being made during the formation of each panel, or, if desired, after the formation of the panel. The end one of each row of holes, i.e., adjacent the vertical end face **21***b* when in situ, is spaced from said face **21***b* by a distance equal to one half of the modular spacing between the other holes **23** of the row.

Elongated plate members **25** having a width equal to the total thickness of a given wall to be constructed are used as bases for the formation of plane walls. Pins **29** or other projections are upstanding from each surface of each plate **25** and are secured to each plate **25** by their plates **27** (see FIG. 18) and the pins **29** are arranged, as are the thin plates **27**, in pairs adjacent the longitudinal edges of each plate **25**.

In FIG. 17 plate member **25***x* is shown similar to the plate **25**, but with thin plates **27***x* and pins **29***x* provided only on one face. The spacing of the adjacent pins **29** along a single edge of the strip plate member **25** corresponds to the spacing between the holes **23** of the panels.

A set of the plate members **25** can engage a ceiling by the downwardly-extending pins, the ceiling structure being formed, for instance, by the concrete **13**, as shown in FIG. 9. Alternatively strip plate members **25***x* can be secured by adhesive to the ceiling (FIG. 6), or secured by rivets **31** (see FIG. 7), or even embedded partly in the ceiling (see FIG. 8), or in any other manner engaged to the horizontal structure on which a partition wall is to be erected.

A combination of two or more of these securing methods may be employed. A set of these plate members **25** or **25***x*, suitably spaced, are arranged on the ceiling, in such a manner that the longitudinal spacing between the end pins of two adjacent plate members is equal to the pitch or a multiple of the pitch between the

holes **23** of the panels. It is thus possible to locate a first horizontal row of pairs of panels **21** on the two longitudinal rows of pins **29** or **29***x*, a common panel at least being related to two contiguous strip plate members, and the side-by-side panels being spaced from each other according to the spacing between the pairs of transversely aligned pins in each plate member **25** or **25***x*; the two adjacent panels may be longitudinally aligned or off-set relative to one another.

Other strip plate members (see especially FIGS. 4 and 20) are arranged above the first series of the pairs of panels, so that the downwardly-extending pins **29** penetrate into the upper recesses or holes of the underlying panels. Then a second series of pairs of panels **21** is located, each panel being off-set with respect to the underlying ones and each engaging at least two contiguous plate members. Continuing the assembly, a double-skinned wall is obtained and its panels are connected to one another in vertical and horizontal directions. The connection also takes place with the aid of an adhesive or binding material for the connection of the pins **29** and **29***x* to the walls having the holes **23**.

For additional stiffening, provisions may be made for vertical reinforcing members **35** (FIGS. 1 and 3), inserted in the gap between the panels and interposed between contiguous strip plate members **25**. At the upper end of the walls thus formed beneath an overlying ceiling, the said walls are extended between ceiling panels **37**, which are carried by a grid formed by channel section members **38** and **38***a* (see FIG. 1), supported by the overlying ceiling structure.

For the construction of corners or of angled walls, special strip plate members **39** (see FIGS. 11 and 21) are used. These members are arranged to engage the panels **21** in pairs at right angles to each other, with the aid of pins **41** mounted similarly to pins **29**. A small plate or shim **43** carries pins **41***a* having the same function as the pins **41** and a central pin **45** serves to engage a spacer **47** (see FIG. 21) arranged to close the gap formed between the pairs of panels. The position of the pins **41**, **41***a*, and **45**, in relation to the modular spacing, is such as to allow assembly alternatively in the arrangement shown in FIG. 21 and in a symmetrical arrangement, obtained by assuming an inversion of FIG. 21 about the diagonal of the corner shown in FIG. 1 in the plane of the drawing.

A plate member **49** of FIG. 13 can be used in the manner illustrated in FIG. 24, to set up T junctions between the walls, or plate member **51** of FIG. 12 in the manner shown in the left-hand portion of FIG. 23. For cross-over junctions between two walls, a cross-shaped plate **53** element is used (FIG. 22).

Between the juxtaposed panels, narrow gaps are formed correpsonding to the sum of the thickness of the parts **27**, **25**, **27**, and these gaps are relatively thin but suited to receive a stucco (plaster) lining. Floor slabs **57** (see FIG. 1) may cover the flooring junction lines, the ceiling **37** forms an upper finishing.

For the construction of the external walls, three sets of panels are used and indicated respectively from the outside to the inside by **21***x*, **21***y*, **21***z* (FIG. 1). For the construction of the external walls, strip or laminar plate members **59** and **59***x* are used and are provided with three rows of upper and lower pins **61** on the strips **59** and **61***x*, arranged above the strip members **59***x*. At the outer edges, the plate members **59***x* have an additional row of downwardly-directed pins **61***y*. The cornice **19** has projecting shoulders **19***a* (FIG. 2) arranged to rest on the flanges of the beam **3**. Holes **19***b* in the shoulders **19***a* engage the projecting portions **17***a* of the rods **17**, and are thereby secured to the structure. The cornice **19** has a lower edge portion **19***c*, which engages the upper edges of panels **21***z* of the wall underlying the ceiling to which the cornice is applied. The cornice has moreover, at the upper edge thereof, holes **19***d*, in which the pins **61***y* of the plate members **59***x* engage. The elements **59***x* rest on the ceiling structure, on the beam **3** and on the cornice.

The assembly of the external panels is effected substantially as that of the internal panels, with the use of the members **59**, **59***x* instead of the members **25** and **25***x*. Strip plate members, similar to those denoted by **49** or **51**, are used for the joints between external walls and the internal partition walls as shown in FIGS. 23 and 24.

It is to be noted that with the use of the cornice as described and with the structure illustrated particularly in FIG. 1, between the panels **21***y* and **21***z*, a continuous gap is formed between the walls in different planes. The shoulders **19***a* allow the passage of air betwen the cornice **19** and the beam **3**, and the spacing between the contiguous plate members **59** and the presence of the holes in the same plates **59** in alignment with the gap between the panels **21***y*–**21***z* establish the continuity of a gap, which ensures thermal insulation of the external wall. In the gap between the panels **21***y* and **21***z*, reinforcing section members, such as those denoted by **35**, may be inserted and said reinforcing section member may be retained between the beam **3** and the cornice **19**.

Members such as these denoted by **63** in FIG. 3 may serve to define the vertical sides of windows and/or of doors.

The construction hereinbefore particularly described is readily assembled and dismantled regardless of location and can be used to form vertical partition walls and outer walls.

I claim:

1. In a multi-level building structure, a framework including supporting columns and perimetral horizontal beams at the floor levels thereof, floors extending between said perimetral beams, two spaced walls resting perimetrally on said floors adjacent the outer edges thereof, each wall including a plurality of vertical panel elements having a set of recesses spaced along two horizontal edges thereof, horizontally extending flat plate members positioned between said edges of adjacent panel elements, said plate members including outer extensions projecting beyond the outer wall, two rows of spaced projections projecting from said flat members from above and below, said projections penetrating into said recesses of the vertical panel elements for mutual engagement; said outer extensions having a further row of spaced projections; cornice elements including projecting shoulders engaging said beams and maintaining said cornice elements spaced from said beams; a third outer wall superposed on said cornice elements, said third wall including panels having spaced recesses on the horizontal edges thereof engaging said spaced projections of said further row of projections of the flat plate members; said third wall and said cornice elements cooperating to define, with the outer of the spaced walls and the horizontal beams, a continuous gap for air circulation.

2. A structure as claimed in claim **1**, wherein said horizontal perimetral beams are I-beams, each said cornice element having two vertical shoulders disposed between the horizontal flanges of said beams; said structure further including anchoring means extending from said beams and engaging said cornice elements.

3. A structure as claimed in claim **1**, wherein said cornice elements include depending outer lower extensions externally overlapping the upper edge of a third outer wall therebelow.

4. A structure according to claim **1** further comprising an auxiliary projection lying between two of said rows of projections on the plate at the angular intersection of two external walls, and obturating means engaging said auxiliary projection and serving to close the space locally between said panels.

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HENRY C. SUTHERLAND, *Primary Examiner.*