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G. E. SAUER

3,516,213

FIREPROOFING OF STEEL COLUMNS

Filed Feb. 28, 1968

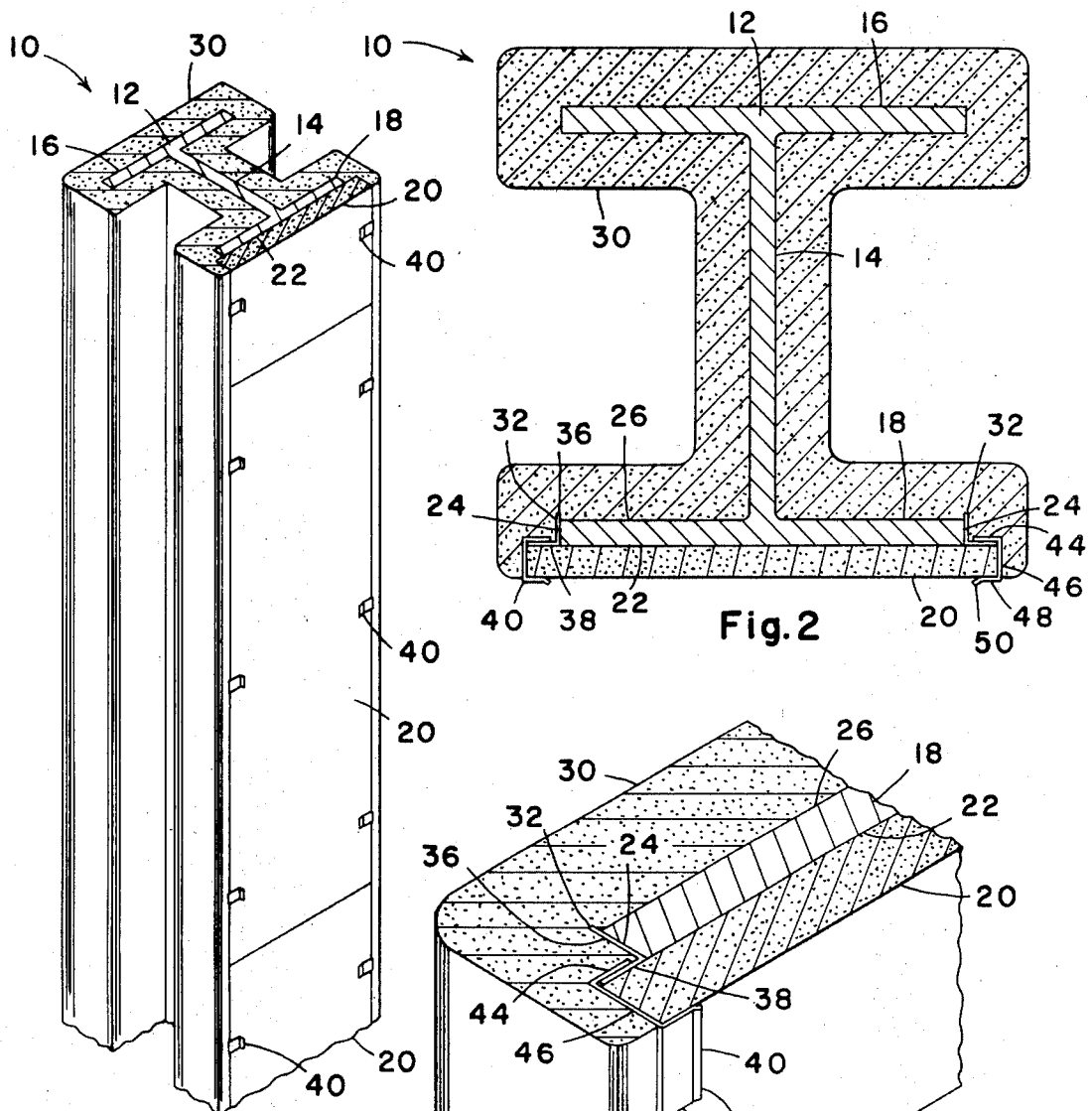


Fig. 1

Fig. 2

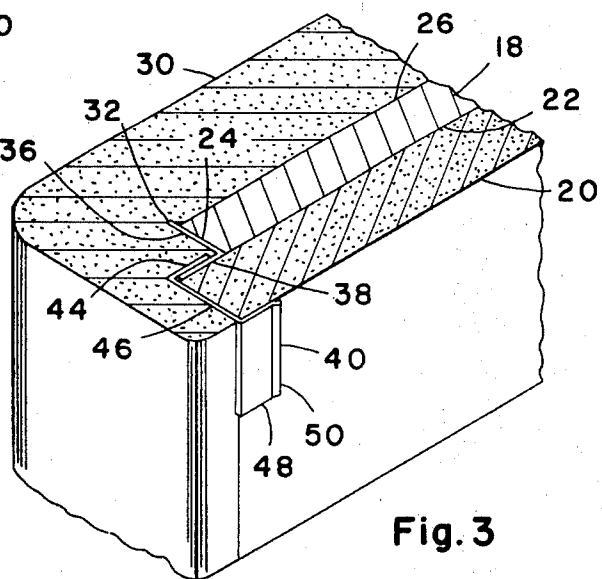


Fig. 3

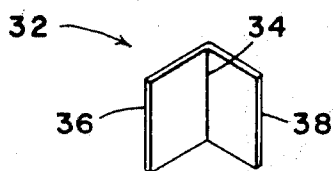


Fig. 4

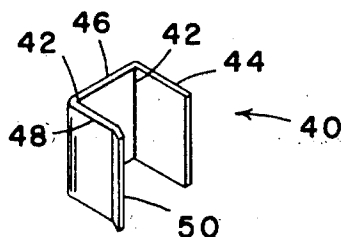


Fig. 5

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## FIREPROOFING OF STEEL COLUMNS

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9 Claims

### ABSTRACT OF THE DISCLOSURE

An exterior steel framing member having a protective covering to protect against the damage from high temperatures in case of fire, which covering includes a coating of cast-in-place fire resistant plaster on the inner side of the member and mineral fiber, ceramic-forming board attached to the outer side of the member by a pair of cooperative metal clips, one welded to the member and the other snapped around both the board edge and the welded clip.

### BACKGROUND OF THE INVENTION

It has been known to adhere or otherwise affix various protective materials around the otherwise exposed portions of steel beams and columns, commonly used in larger commercial buildings. A preferred method, for many reasons, has been the spray application of specially formulated fire resistant plaster compositions. A problem has existed in attempts to use the preferred spray plaster method on steel members on the outside face of a multi-story building, in the difficulty of spraying the outer side of such members.

### SUMMARY OF THE INVENTION

The present invention relates to the combination, on an exterior steel framing member, of a coat of fire resistant plaster on the inner surfaces of the column and fire resistant mineral fiber board attached to the outer surfaces. In the preferred form, the plaster is spray applied to the inner surface and the side surface after the mineral fiber board is affixed to the outer surface. The preferred embodiment further includes a combination of sheet metal clips, one of which is welded to the steel member and the second of which clips around both the edge of a board and the welded clip. The boards are affixed without the prior inconvenience of erecting scaffolding to fireproof the framing member. The boards are preferably attached immediately prior to installation of the exterior curtain wall which encloses the framing member and the boards, and the spray plaster applied subsequent thereto. The novel clip combination is unaffected by the wide variation in framing member dimensions.

### DRAWINGS AND DESCRIPTION

FIG. 1 is a perspective view of a column having a fire protective exterior thereon in accordance with the present invention.

FIG. 2 is a cross-sectional plan view of the column of FIG. 1 taken along section 2—2.

FIG. 3 is a perspective view of the attachment clips in place on cross-sectioned portions of the mineral fiber board and of the column.

FIG. 4 is a perspective view of the weld affixed clip of FIG. 3.

FIG. 5 is a perspective view of the snap-around clip of FIG. 3.

Referring to FIGS. 1 and 2 there is shown a fireproofed column 10 including a wide flange steel section 12 having a central web 14 and an inside flange 16 dis-

posed on the side of the section 12 toward the building interior and an outside flange 18 facing the building outside. The column 10, in this embodiment, is an exterior column of a building. Wide flange sections for such exterior columns vary dimensionally up to flange thicknesses of about five inches and flange widths of over three feet.

The section 12 is covered throughout its surfaces with fire resistant materials capable of protecting the steel from the high temperatures created if there is a fire. The outside flange 18 has a plurality of mineral fiber boards 20 held firmly against the entire outside surface 22. The edges 24 and the inside surfaces 26 of flange 18 and the entire surface of web 14 and inside flange 16 are covered with a set and dried fireproofing spray plaster 30.

The fire resistant materials are put on the steel section 12 after the sections are affixed in place in the building structure.

L-clips 32, formed of a small rectangular sheet of metal with a 90° fold 34 forming two legs 36, 38 are welded to flange 18 with the weld leg 36 of the two legs abutting and welded to the edge 24 of flange 18 and the protruding leg 38 disposed in the plane of the flange outside surface 22, directed outwardly from the edge 24. The mineral fiber boards 20, preferably four feet long, are cut to a width equal the width of flange 18 plus the outward extent of two clip protruding legs 38 affixed to the two edges 24 of flange 18.

Starting from the bottom and working upwardly, the boards 20 are disposed against the flange outer surface 22 and the clip protruding legs 38. U-clips 40, each formed of a small rectangular sheet of metal with two 90° folds 42, 42, forming a back leg 44, a bottom 46, and a front leg 48, are positioned around the edge of board 20 and the clip protruding legs 38, holding the boards 20 against the clip protruding legs 38 and thus against the flange outer surfaces 22. An edge portion 50 of front leg 48, remote from bottom 46, is angled outward slightly to facilitate positioning U-clip 40 onto the board edge and the clip protruding leg.

L-clips 32 and U-clips 40 are about one inch in most dimensions and are preferably positioned about every sixteen inches along the length of the section 12, thus affixing a four foot long board 20 at six points. Alternatively, clip spacing may be greater between clips holding one board with clips adjacent joints between boards being more closely spaced to hold board ends more firmly.

The dimension of U-clip bottom 46 will be determined by the thickness of board 20. Preferably, board 20 is about 3/8 inch thick. The composition of board 20 includes a major portion of mineral wool fibers and minor portions of clay, starch and wood fiber. Board 20 that has been approved by Underwriters Laboratories tests for use in structures in accordance with the invention is further defined as having a maximum loss on ignition of 16.5%, and a maximum shrinkage in a fire test of 4 1/2%. Board 20 is preferably of about 25#/cu. ft. density. Under fire test conditions, board 20, as described above, loses the starch and wood fiber content, while the mineral wool fiber and the clay portions remain and become converted into an essentially vitreous type of heat-insulating board.

A suitable spray plaster 30 is described in U.S. Pat. No. 3,369,929, issued Feb. 20, 1968, and the thickness may be varied in accordance with the degree of fireproofing sought. A preferable thickness, for example, may be 1 1/8 inches, uniformly covering all surfaces to which it is applied.

Although the preferred embodiment of the invention has boards 20 disposed against a flange outside surface 22 of a vertical column, it will be apparent that a column or horizontal beam could be disposed with the flanges extending perpendicular to the building outer surface in ac-

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cordance with the invention, in which case boards 20 would be affixed across the ends of a pair of flanges, and the other surfaces of the column or beam are covered with a set and dried fireproofing spray plaster.

Having completed a detailed disclosure of the preferred embodiment of my invention, so that others may practice the same, I contemplate that variations may be made without departing from the essence of the invention or the scope of the appended claims.

I claim:

1. In combination, a building exterior elongate steel framing member and a fireproof covering, said framing member including a vertically disposed outer side facing the outside of said building, a vertically disposed flat, preformed board of fire-resistant and heat-insulating composition mechanically attached to cover said vertically disposed outer side, the remaining sides of said framing member being covered by a cast-in-place fire-resistant and heat-insulating coating.

2. The combination of claim 1, wherein said coating is of a substantially uniform thickness therethroughout.

3. The combination of claim 1 wherein said board composition comprises mineral fiber and clay and said board has a weight loss on ignition no greater than 16.5%.

4. The combination of claim 2, wherein said coating is of a substantially uniform thickness therethroughout.

5. The combination of claim 1, wherein said boards are attached to said framing member by a plurality of pairs of clips, each said pair including one sheet metal clip welded to said framing member and having a protruding leg and a second sheet metal clip disposed around both said board and said protruding leg, thereby holding said board relative to said protruding leg.

6. The combination of claim 5 wherein said board composition has a characteristic of converting to a vitre-

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ous-type board with no more than 4½% shrinkage when subjected to a fire.

7. The combination of claim 5 wherein said board composition comprises mineral fiber and clay and said board has a weight loss on ignition no greater than 16.5%.

8. The combination of claim 7 wherein said board composition has a characteristic of converting to a vitreous-type board with no more than 4½% shrinkage when subjected to a fire.

9. The combination of claim 8 wherein said cast-in-place coating comprises plaster.

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30 FRANK L. ABBOTT, Primary Examiner

J. L. RIDGILL, JR., Assistant Examiner

U.S. Cl. X.R.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,516,213 Dated June 23, 1970

Inventor(s) Gale E. Sauer

It is certified that error appears in the above-identified patent  
and that said Letters Patent are hereby corrected as shown below:

Column 1, line 41, 9th word "surface" should be ---surfaces---.

Claim 4, first line, "2" should be ---3---.

SIGNED AND  
SEALED  
SEP 15 1970

(SEAL)

Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.  
Commissioner of Patents