Timeline Clarification: From Cooperation to Confrontation

On **December 8, 2023**, I wrote formally to **Eric Feder, President of LENX/Lennar**, and copied **Stephen Ross of Related Companies**. That letter, now part of the record, made one thing clear: my goal was **cooperation**. I invited Lennar and Related into the same room to revisit an arrangement contemplated years earlier, and I did so in the spirit of business, partnership, and peace.

At that point, I had no knowledge of Michael Budd's June 30, 2017 filing — a derivative provisional that repeated my Water Draining Spandrel Assembly disclosure. My December 8 letter reflects that reality: I was still trying to advance PortalWall® through constructive dialogue with two industry giants.

Everything changed on **December 27, 2023**. On that day, I obtained and reviewed a certified USPTO printout showing Budd's 2017 filing. I immediately contacted him by phone and email. While the email itself has since gone missing, I retain the **read receipt**, proving it was received.

This sequence matters. The record shows:

- **Before December 27** — My approach was cooperative. I reached out to Feder and Ross with respect, seeking a pathway forward. I was not fighting; I was building.
- **After December 27** — The Budd theft became undeniable. From that moment, my posture shifted — not out of bitterness, but out of necessity. Protecting my work meant confronting a pattern of interference I had only just uncovered.

The December 8 letter now stands as **exculpatory evidence**. It proves I was not motivated by sour grapes or hindsight, but by genuine intent to make peace and do business. Only when the theft was revealed weeks later did defense become unavoidable.

This is the root cause: a 2017 filing by Budd that set in motion years of confusion, obstruction, and escalation. My record shows I acted in good faith until the facts forced me to act otherwise.

The solutions work in single family homes, as LENNAR is known for, or multi story and high rise construction, as others such as The Related Companies are known for.

On May 2, 2019 I met Mr. Stephen Ross, and asked him to assist me in furthering an arrangement wherein his company would assist in commercialization and monetization of my IP.

In early 2018 I was introduced to Mr. Michael Trovini of The Related Companies and on April 24, 2018 I met at the offices of The Related Companies at 3 Columbus Circle, with Mr. Michael Trovini of the Related Companies, Mr. Michael Budd of New Hudson Facades and Mr. Floyd Warkol. In attendance were myself and two associates Mr. Philip Max and Mr. Aaron Bernstein.

Why am I now communicating with you ? News of recent supported by the USPTO website makes clear that LENX has a security interest in VEEV patents and news of late makes clear that there is a pending liquidation. Kudos to you for protecting your interests as in my opinion the VEEV IP is largely not original in any way, as it is stolen from my published and private work and others including EPHOCA, a mechanical system manufacturer.

> I assert that VEEV and their legal advisors either ignored prior art searches or simply attempted to steal my work when building their business and developing interest and ultimately raising funds from LENX, patents they didn't originate and security for IP they didn't invent. In the process committing multiple frauds using the USPTO a Federal agency in furtherance of a crime.

The Related Companies will certainly support my claims as my family of IP was shown to them in person and there was a business arrangement being contemplated to either license and or acquire my IP.

So that I can further mature my IP and advance its commercialization I ask for your help in concluding a transaction contemplated back in 2018 with Related and LENNAR, two giants that to my knowledge do not presently compete in their respective markets.

Yours truly,

Yonatan Margalit

Cc Mr. Stephen Ross via Ms. Keri Gilbert keri.gilbert@related.com
Certified Mail 9589 0710 5270 0746 8808 88

8594794

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

May 2, 2025

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: *62/527,694*
FILING DATE: *June 30, 2017*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US *62/527,694*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

Curtis Goffe

Curtis Goffe
Certifying Officer

Electronic Acknowledgement Receipt

EFS ID:	29670893
Application Number:	62527694
International Application Number:	
Confirmation Number:	2458
Title of Invention:	UNITIZED CURTAINWALL SYSTEMS AND METHODS
First Named Inventor/Applicant Name:	Michael Budd
Customer Number:	21186
Filer:	Joseph P. Mehrle/April Smith
Filer Authorized By:	Joseph P. Mehrle
Attorney Docket Number:	4800.001PRV
Receipt Date:	30-JUN-2017
Filing Date:	
Time Stamp:	17:04:00
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$260
RAM confirmation Number	070317INTEFSW00004926190743
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		4800001PRVApplication.pdf	21138885 60d88782d3118f5e03a202199c22016c3789fc5d	yes	42

Multipart Description/PDF files in .zip description

Document Description	Start	End
Miscellaneous Incoming Letter	1	1
Provisional Cover Sheet (SB16)	2	2
Auth or Resc of Auth to Access Appl by DAS/PDX Office	3	3
Specification	4	15
Claims	16	20
Abstract	21	21
Drawings-other than black and white line drawings	22	42

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30217 0938652f97712e6493340fac99a6136c22aae45d	no	2

Warnings:

Information:

Total Files Size (in bytes):	21169102

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)		
Given Name (first and middle [if any])	**Family Name or Surname**	**Residence (City and either State or Foreign Country)**
Michael	Budd	Devon, PA

TITLE OF THE INVENTION (500 characters max):
UNITIZED CURTAINWALL SYSTEMS AND METHODS

CORRESPONDENCE ADDRESS	
Direct all correspondence to: The address corresponding to Customer Number:	21186

ENCLOSED APPLICATION PARTS *(check all that apply)*

	Application Data Sheet. See 37 CFR 1.76		CD(s), Number of CDs: _____
X	Drawing(s) *Number of Sheets* (21) including color drawings	X	Other (specify): Authorization to Permit Access (PTO/SB/39) (1 pg.)
X	Specification *Number of Pages* (18)		

Fees Due: Filing Fee of $260 ($130 for small entity) ($65 for micro entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is $400 ($200 for small entity) ($100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT

	Applicant asserts small entity status. See 37 CFR 1.27.
	Applicant certifies micro entity status. See 37 CFR 1.29. *Applicant must attach form PTO/SB/15A or B or equivalent.*
	A check or money order made payable to the *Director of the United States Patent and Trademark Office* is enclosed to cover the filing fee and application size fee (if applicable).
	Payment by credit card. Form PTO-2038 is attached
X	The Director is hereby authorized to charge the filing fee and application size fee (if applicable), as well as any additional required fees, or credit any overpayment to Deposit Account Number: 19-0743.
	TOTAL FEE AMOUNT $ | $260.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

X	No.
	Yes, the invention was made by an agency of the U.S. Government. The U.S. Government agency name is:
	Yes, the invention was made under a contract with an agency of the U.S. Government. The name of the U.S. Government agency and Government contract number are:

SIGNATURE: /Marvin L. Beekman/ Date: June 30, 2017

TYPED or PRINTED NAME: Marvin L. Beekman REGISTRATION NO. 38,377

TELEPHONE: (612) 373-6960 DOCKET NUMBER: 4800.001PRV

UNITED STATES PROVISIONAL PATENT APPLICATION

UNITIZED CURTAINWALL SYSTEMS AND METHODS

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UNITIZED CURTAINWALL SYSTEMS AND METHODS

TECHNICAL FIELD

[0001] This document relates generally to building construction, and more particularly, but not by way of limitation, to unitized curtainwall systems and methods of installation and fabrication.

BACKGROUND

[0002] Unitized curtainwall is an exterior cladding product for buildings that is prefabricated and preassembled prior to shipment to the project site. Preassembly of this product prior to site installation improves quality, as the product can be preassembled in a clean and dry environment. Preassembly also reduces costs as the cost of factory labor is usually significantly less than field labor. Also, preassembly has scheduling advantages, as the curtainwall product can be preassembled before installation, and thus reducing installation time on site.

[0003] Unitized curtainwall systems typically have two or more lines of gasketry to form pressure equalized cavities within the framing members of the unitized system. The first line of gaskets create a "rain screen", which prohibits the majority of rain water from entering the system. The first line of gaskets are intentionally designed with "gaps" to allow for water drainage to the exterior of the building, and to allow for the pressure within the framing system to be equal to the pressure at the exterior of the building which avoids a negative pressure draw of moisture at this line to the interior of the building. In some unitized systems may include three lines of gasketry.

SUMMARY

[0004] This document discusses, among other things, unitized curtainwall system with improved venting and drainage, improved gasket seals that do not require wet seals at joints between units along the horizontal gutters of the units and at corners where multiple curtainwall units joints, and improved shadowbox assemblies.

[0005] This summary is intended to provide an overview of subject matter of the present patent application. It is not intended to provide an exclusive or exhaustive explanation of the disclosure. The detailed description is included to provide further information about the present patent application. Other aspects of the disclosure will be apparent to persons skilled in the art upon reading and understanding the following detailed description and viewing the drawings that form a part thereof, each of which are not to be taken in a limiting sense.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the drawings, which are not necessarily drawn to scale, like numerals may describe similar components in different views. Like numerals having different letter suffixes may represent different instances of similar components. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed in the present document.

[0007] FIG. 1 illustrates an example of a curtainwall system.

[0008] FIGS. 2A-2D illustrate an example of a curtainwall installation sequence. *See note on Fig. 2A*

[0009] FIGS. 3A-3D illustrate perspective view of an example of a curtain wall unit used during the installation sequence illustrated in FIGS. 2A-2D.

[0010] FIGS. 4A-4D illustrate closer views of the periphery of the curtain wall unit illustrated in FIGS. 3A-3D.

[0011] FIGS. 5A-5H illustrate an installation sequence for a four-unit region of the curtainwall system, where two units are stacked on two other units.

[0012] FIGS. 6A-6F illustrate the air and water paths within the curtain wall system.

[0013] FIG.S 7A-7B illustrate a framing connection for a curtainwall unit between a horizontal gutter on a top of the unit and a vertical mullion, thereby illustrating a relationship between the protected horizontal drainage chamber and the protected vertical drainage chamber.

[0014] FIG. 8A illustrates an exploded view of an embodiment of a shadowbox assembly with respect to a curtain wall frame, FIG. 8B illustrates a curtainwall

frame, and FIG. 8C illustrates the shadowbox assembly installed within the curtain wall unit.

[0015] FIGS. 9A-9D illustrate an assembly sequence for a shadowbox embodiment.

[0016] FIGS. 10A, 10B, 10C-1 and 10C-2, and 10D-1 and 10D-2 illustrate views of a first embodiment respectively taken along view lines H1-H1, H2-H2, V1-V1 and V2-V2 of FIG. 5H.

[0017] FIGS. 11A-11D illustrate a side sectional view of an assembly sequence for installing a shadowbox assembly into a curtainwall unit.

[0018] FIGS. 12A-12D illustrate a top sectional view of an assembly sequence for installing a shadowbox assembly into a curtainwall unit.

DETAILED DESCRIPTION

[0019] Various embodiments of the present subject matter provide a curtainwall system with improved barrier to water penetration. The perimeter framing members of a unitized system are designed with gaskets and male/female mating aluminum extrusions which fitted together create an air and water barrier between the interior and exterior without the use of wet sealants between adjacent curtain wall units. Incorporating wet sealant in the field can be problematic due to weather conditions such as cold, rain, extreme heat and the difficulty in keeping the substrates that the sealant adheres to clean. When pre-fabricated curtainwall units are joined together, they form two internal framing chambers with three lines of gaskets (see, for example, FIG. 6A and 6B) including a continuous gasket within the first chamber of the unitized system to create the air/water barrier. An overview of some of the benefits of the present subject is provided below, followed by a more detailed discussion in conjunction with the figures.

[0020] A ventilated chamber (referred to herein as a protected vertical chamber) within the vertical framing member creates a "chimney" to eliminate water penetration into the back pressure equalized chamber. A horizontal chamber at the horizontal internal gutter (referred to herein as a protected horizontal chamber) connects to the protected vertical chamber.

[0021] A silicone sponge gasket is placed at the "splice" between mating units of the curtain wall system. A spring compression clip may include an aluminum extrusion designed to elastically deform and snap into the mating gutter extrusion. This extrusion compresses the silicone sponge gasket to the proper pressure to create a weathertight "seal" between adjacent units of the curtainwall system.

[0022] When installing the units of a curtainwall system, two units are horizontally adjacent to each other, and two other units may be stacked on top of the first two units. A hole may be created at the backside of the system where the four units come together. A silicone putty plug may be placed between units at the "hole" where the four units come together at the back of the system. The putty plug may be temporally compressed within the fingers and inserted into the hole where it expands to plug the hole and maintain an air seal at the air seal gasket line of the system. The putty is made from a pliable material which create an effective air seal while allowing for the required movements (live load slab deflection, thermal, seismic, etc.). The use of the plug allows a seal to be created without the use of wet sealant.

[0023] A first line of gaskets, at the exterior of the system, allows for weeping of water and pressure equalization of the interior cavities of the system. A second, or, middle line of gaskets creates a watertight joint. A protected vertical chamber in the forward cavity allows for pressure equalization of the rear chamber of the system, without allowing for water to migrate to the rear chamber. A protected horizontal chamber in the gutter extrusion which allows for connectivity with the protected vertical chamber.

[0024] The three lines of gaskets provide three separate lines of defense to water intrusion, including two water tight lines of defense. A ventilation/pressure equalization path to the interior chamber which is protected and requires a pressure draw (head height) equal to the building floor height.

[0025] Various embodiments of the unitized curtainwall system may provide one or more of the following beneficial features: a gasket logic that creates two "watertight" lines of defense within the system, a ventilation/pressure equalization path to the interior chamber which is protected and requires a pressure draw (head

height) equal to the building floor height, a gasketed system at the back chamber of the four way intersection that does not require the use of wet sealant, a compression set silicone sponge gasket that is placed at the "splice" along the top of two adjacent curtainwall units, and a preassembled shadowbox assembly retained by the exterior glazing.

[0026] Some benefits may further include the ability to install in more weather conditions because of the ability to complete the installation of the curtainwall units without the need for wet sealant. Higher quality control may result because the gaskets/extrusions can be installed and work effectively even if the surfaces are not cleaned properly prior to installation.

[0027] The unitized curtainwall projects may be customized using new extrusions to accommodate specific requirements (floor heights, wind pressures, architectural aesthetics, etc.) for each project. However, as will be understood by one of ordinary skill in the art upon reading and comprehending this disclosure, the customized projects may still incorporate the gasketing logic and the water drainage concepts described herein.

[0028] A shadowbox is a commonly used assembly within a curtainwall system. Shadowbox assemblies are used at locations where there is a desire to create an opaque area within the curtainwall, such as at the floor slab, where there is a desire to "hide" the floor slab and perimeter structure as well as other buildings elements (mechanical system, electrical system, etc.) above the ceiling line. A shadowbox is typically made-up of the same glass type as the vision area in an effort to blend the opaque/spandrel area, which may be used to hide the floor slab, with the vision area. The same insulated glass unit is used at the vision area as is used at the opaque area. An aluminum panel is positioned a few inches behind the glass, and insulated behind the aluminum panel. In some systems, another metal panel is placed behind the insulation to create an air, water, and vapor barrier between the exterior and interior. Depending on the manufacturer and the geographic area of use, the cavity created between the glass and the metal panel may be unvented, may be vented to the exterior, or may be vented to the interior.

[0029] The air within the cavity may undergo extreme temperate changes because of the enclosed or partially enclosed (enclosed but vented) cavity of the shadowbox. In cold U.S. climates, the air cavity temperature may drop to below 0 F during cold months. Conversely, during warm months with high sun angles, the temperature within the cavity can reach in excess of 200 F. At elevated temperatures, thermal stress can lead to glass breakage. Sealants and gaskets within the shadowbox assembly can also be negatively impacted by extreme elevated temperatures. The shadowbox cavity is ventilated to reduce the heat build-up. The aluminum metal panel behind the glass expands and contracts with these temperature changes. Therefore, flexible connections between the primary framing members of the unitized curtainwall system and the shadowbox assembly are preferred to allow the aluminum panel to freely expand and contract with the temperature fluctuations.

[0030] A challenge with venting the shadowbox cavity is water/vapor accumulation within the cavity, as it is a goal to prevent or minimize such water/vapor accumulation within the shadowbox cavity. Excessive condensation may leave dirt and stains on the inside face of glass, and the condensation itself can be unsightly. It is also desirable to minimize the ability of exterior water to get to the vent holes when the cavity is vented to the exterior, and to drain any incidental water and/or condensate from the cavity through weep holes.

[0031] Some features of the present subject matter that allow the shadowbox to create an opaque area within the curtainwall while blending with the vision area include: an insulated glass unit that mimics the glass in the vision areas, a painted metal panel behind the glass to provide visual "depth" in an effort to aesthetically mimic the vision areas. Additionally, insulation behind the painted metal panel is used to meet energy code requirements, a metal backpan at the interior side of the curtainwall system is used to provide the air, vapor, and water barrier between exterior and interior, a mechanical attachment between the metal backpan and the shadowbox sub-assembly frame is used for fire containment. Further, the shadowbox assembly of the present subject matter includes ventilation and weep holes to properly vent and drain the shadowbox assembly, which uses a protected

ventilation/weep system that minimizes the water intrusion into the shadowbox cavity (ventilation and drainage occur in protected vertical chamber).

[0032] Additionally, the shadowbox assembly of the present subject matter may be a pre-assembled shadowbox assembly that allows for ease of installation during the curtainwall assembly process. Mechanical retention of the shadowbox assembly within the unitized curtainwall frame may be accomplished without rigidly constraining the shadowbox assembly edges. For example, at the horizontal edges, the base horizontal extrusion is designed with a reveal and the shadowbox frame may be designed with a lip to handle the inward load of the shadow box, and a gasket between the glass and the shadowbox frame may handle the outward load of the shadowbox assembly. Along the vertical edges between the shadowbox assembly frame and the vertical frame of the unitized curtainwall unit, an aluminum channel is fastened to the primary vertical framing members to restrict movement of the shadowbox assembly perpendicular to the glass plane, but "floats" in the pocket designed into the shadowbox subframe to allow for thermal expansion/contraction of the aluminum panel.

[0033] Some desirable features of the shadowbox include: a protected ventilation/weep system that minimizes the water intrusion into the shadowbox cavity (ventilation and drainage occur in protected vertical chamber); a pre-assembled shadowbox assembly that allows for ease of installation during the curtainwall assembly process; and mechanical retention of the shadowbox assembly without rigidly constraining the shadowbox assembly edges.

[0034] FIG. 1 illustrates an example of a curtainwall system. The curtainwall system includes a plurality of prefabricated curtainwall units that can be quickly installed to provide a building with exterior cladding. The curtainwall system provides the cladding around the building. For example, curtainwall units may be formed in rows and columns to form an array of curtainwall units. Thus, a given curtain wall unit may have other units immediately adjacent in a horizontal direction and in a vertical direction. FIGS. 2A-2D illustrate an example of a curtainwall installation sequence. The units are slid in place next to each other, and provide a sealing fit with each other. A rain screen gasket is between the units toward the front

of the curtain wall system. Also, the sealing fit includes an air seal gasket line toward the back of the curtain wall system, and a water barrier gasket line between the rain screen gasket and the air barrier gasket line. Each unit has a main frame that may formed from extruded aluminum. The vertical frame members may be referred to as vertical mullions, the bottom horizontal frame member may be referred to as a sill, and the top horizontal frame member may be referred to as gutter. The curtainwall units are attached to the building structure using brackets such as the brackets illustrated in FIGS. 2A-2D.

[0035] FIGS. 3A-3D illustrate perspective view of an example of a curtain wall unit used during the installation sequence illustrated in FIGS. 2A-2D. FIGS. 4A-4D illustrate closer views of the periphery of the curtain wall unit illustrated in FIGS. 3A-3D. The horizontal frame member may generally be referred to as a gutter, which has a channel formed between the air seal gasket line and the water barrier gasket line. As will be described in more detail below, various aspects of the present subject matter provide improved venting to equalize pressure across the water gasket line and to drain moisture from the channel behind the water gasket line out to the exterior in front of the installed curtain wall system. The path includes a protected horizontal chamber at least partially below the rear channel, and a protected vertical chamber in each vertical mullion. Apertures within the rear channel and the protected vertical chamber provide fluid communication from the rear channel at the top rear portion of the unit through the protected horizontal chamber and through the protected vertical chamber and out of the bottom of the protected vertical chamber (see FIG. 4C) to the exterior at the bottom front of the unit. This drainage is shown in more detail in FIGS. 6A-6F.

[0036] FIGS. 5A-5H illustrate an installation sequence for a four-unit region of the curtainwall system, where two units are stacked on two other units. As illustrated in FIGS. 5C and 5D, a waterproof preformed silicone gasket may be placed across the joint. Spring clips are used to provide a water and air seal with the rear channel of the unit. The silicon gasket provides a flexible seal that can flex under wind load and seismic activity, while still maintaining the seal. Also, after a four-way junction is formed, a silicon plug maybe inserted from the back where the

four units meet. This silicon plug expands to fill the gap between the units and helps maintain the air seal line at the back of the curtainwall system. Thus use of the silicon gasket and plug maintains the flexible seals at the gasket lines between the units, as well as avoids the use of wet seals during the on-site installation process. As illustrated in FIG. 5E, a water barrier gasket is shown being installed on the gutter in front of the rear channel. Splices of the water barrier gasket are made toward the center of the units, such that a water barrier is formed at the splices. Thus, water that drains down through a protected vertical chamber in the vertical mullion will drain out toward the front of the curtainwall system. The water barrier gasket functions to provide a water barrier gasket line in front of the rear channel.

[0037] FIGS. 6A-6F illustrate the air and water paths within the curtain wall system. The vertical mullions of adjacent curtainwall units form a rear cavity between the water barrier gasket line and the air seal gasket line, and further form a front cavity between the water barrier gasket line and the rain screen gasket line. Incidental water that may be present in the rear cavity of the vertical mullion drains into the rear chamber of the gutter on top of the curtainwall units below. The water drains into the protected horizontal chamber, and then into the protected vertical chambers for evacuation at the bottom of those curtainwall units. FIG. 6B shows water draining through only one of the protected vertical chambers. It is understood that water may drain into both of the illustrated protected vertical chamber from the corresponding protected horizontal chamber in their respective curtainwall unit. FIGS. 6C-6F illustrate that water draining from the rear cavity of a vertical mullion in the top unit into the rear channel of the gutter of the bottom unit, and then down through an opening into a protected horizontal chamber where it moves back toward the vertical mullion, but enters in the protected vertical chamber. As illustrated, the opening is offset from the vertical mullion. FIG. 6C also illustrates drainage from the protected vertical chamber for the top unit contacting the water barrier gasket on the joint, which causes the water exiting the protected vertical chamber to move out through the joint between the rainscreen gaskets of horizontally-adjacent units to the exterior (see FIG. 6D). This drainage pathway also serves as a venting / air pathway to equalize pressure across the water seal gasket line, to avoid water seepage that

could otherwise be drawn inward if there was a pressure differential across the water seal gasket. Assuming the water seal gasket line remains intact, exterior water would have to pass the rain screen gasket, travel up one floor through the protected vertical chamber, and enter the protected horizontal chamber before it can enter the rear portion of the frame structure between the water seal gasket line and the air seal gasket line. As this would require a very high pressure differential to draw water up to the next story, water is prevented from entering the rear potion of the curtainwall system, but yet adequate venting occurs through this same pathway to minimize or eliminate pressure differentials across the water seal gasket line.

[0038] FIGS. 7A-7B illustrate a framing connection for a curtainwall unit between a horizontal gutter on a top of the unit and a vertical mullion, thereby illustrating a relationship between the protected horizontal drainage chamber and the protected vertical drainage chamber. These figures illustrate the hole in the vertical mullion to provide fluid communication between the protected horizontal chamber and the protected vertical chamber.

[0039] FIG. 8A illustrates an exploded view of an embodiment of a shadowbox assembly with respect to a curtain wall frame, FIG. 8B illustrates a curtainwall frame, and FIG. 8C illustrates the shadowbox assembly installed within the curtain wall unit. The shadowbox assembly may be inserted into the space defined by the horizontal gutter, the head horizontal mullion, and both vertical mullions. The shadowbox assembly has a top frame member with a front lip and a bottom frame member with a front lip. The shadowbox assembly may be inserted until a rear of the shadowbox assembly contacts the reveals and the notch of the horizontal gutter contacts the lip in the top frame member, and the notch of the head horizontal mullion contacts the lip in the bottom frame member. FIG. 8B illustrates vent holes for the shadowbox assembly, which allows air and moisture to move into the protected vertical chamber. A silicone bed gasket and structural silicon are placed around a front periphery of the inserted shadowbox assembly. The installation of the insulated glass onto the frame holds the shadowbox assembly in place. Furthermore, opposing ends of the shadowbox assembly include fixed channels configured to be fastened to the vertical mullions. The shadowbox assembly

includes vertical frame members with receiving channels configured to receive the fixed channels. The receiving channels and the fixed channels cooperate to restrict movement of the shadowbox assembly perpendicular to a glass plane on a front of the shadowbox assembly, but allows the shadowbox assembly to float to allow for thermal expansion and contraction of an aluminum panel within the shadowbox assembly. FIGS. 9A-9D illustrate an assembly sequence for a shadowbox embodiment.

[0040] FIGS. 10A, 10B, 10C-1 and 10C-2, and 10D-1 and 10D-2 illustrate views of a first embodiment respectively taken along view lines H1-H1, H2-H2, V1-V1 and V2-V2 of FIG. 5H.

[0041] FIGS. 11A-11D illustrate a side sectional view of an assembly sequence for installing a shadowbox assembly into a curtainwall unit; and FIGS. 12A-12D illustrate a top sectional view of an assembly sequence for installing a shadowbox assembly into a curtainwall unit.

[0042] The above detailed description is intended to be illustrative, and not restrictive. The scope of the disclosure should, therefore, be determined with references to the appended claims, along with the full scope of equivalents to which such claims are entitled.

WHAT IS CLAIMED IS:

1. A unitized curtainwall system, comprising:

an array of curtainwall units, each of the curtain wall units having a shape with sides configured to fit with sides of adjacent curtain wall units and form at least three gasket lines including a rainscreen gasket, water barrier gasket, and an air seal gasket,

wherein a top side of the curtainwall units include a horizontal gutter with a rear channel between the water barrier gasket and the air seal gasket, wherein a horizontal drainage/equalization chamber is at least partially beneath the rear channel and a hole extends between the rear channel to the horizontal drainage /equalization chamber, thereby allowing water to drain from the rear channel of the horizontal gutter through the hole to the horizontal drainage/equalization chamber,

wherein the vertical sides for adjacent curtainwall units form a front cavity between the rainscreen gasket and the water barrier gasket and a rear cavity between the water barrier gasket and the air seal gasket, each of the vertical sides including a vertical drainage /equalization chamber isolated from the front and rear chambers, wherein each unit has a vertical mullion that defines a hole that extends between the horizontal equalization drainage chamber to the vertical drainage /equalization chamber to allow water to drain from the horizontal drainage/equalization chamber through the opening into the vertical drainage /equalization chamber,

wherein a water barrier gasket beneath the curtainwall units extends across a joint between the adjacent curtain wall units, the water barrier gasket to evacuate the water draining down the vertical drainage chamber out at a stack joint in the array of curtainwall units..

2. The unitized curtainwall system of claim 1, further comprising a water-proof silicon sponge gasket configured to fit within the rear gutter across the joint between the adjacent units and at least one spring compression clip configured to press the silicon sponge gasket into position within the rear gutter to make a waterproof seal on each side of the joint..

3. The unitized curtainwall system of claim 1, further comprising a silicone putty plug into a hole at a backside where four curtain wall units join.

4. The unitized curtainwall system of claim 1, wherein each of the curtainwall units has a head horizontal mullion extending between the vertical mullions a shadowbox assembly configured to be inserted into a space between the head horizontal mullion and the horizontal gutter, wherein the shadowbox assembly has a horizontal frame member with a forward lip configured to engage with a notch extending across a lower front portion of the horizontal gutter, and wherein a lower rear portion of the horizontal gutter has a reveal against which the shadowbox assembly engages when inserted into the curtain wall unit.

5. The unitized curtainwall system of claim 5, wherein a silicon bed gasket and structural silicone surround a periphery of the shadowbox assembly, and are sandwiched between insulated glass and the shadowbox assembly.

6. The unitized curtain wall system of claim 5, wherein the shadowbox assembly has a frame including a horizontal top frame member and a horizontal bottom frame member, wherein each of the horizontal top frame members and the horizontal bottom frame members have a horizontal channel that vents into the protected vertical drainage /equalization chamber through a hole located in the vertical mullion.

7. A curtainwall unit, comprising:

a frame including a horizontal gutter, a horizontal sill, a first vertical mullion between a first end of the horizontal gutter and a second end of the horizontal sill, and a second vertical mullion between a second end of the horizontal gutter and a second end of the horizontal sill,

wherein the horizontal gutter includes a rear channel extending across the horizontal gutter, and at least one protected horizontal channel at least partially

beneath the rear channel, the rear channel having at least one opening to the at least one horizontal gutter;

wherein each vertical mullion includes a protected vertical chamber having an opening to the at least one protected horizontal channel.

8 The curtainwall unit of claim 7, wherein a periphery of the frame includes a rainscreen gasket, a water barrier gasket, and an air seal gasket such that, in conjunction with adjacent curtainwall units in an array of curtainwall units, the rainscreen gasket forms a rainscreen gasket line, the water barrier gasket forms a water barrier gasket line, and the air seal gasket forms an air seal gasket line, wherein the water seal gasket is between the rainscreen gasket and the air seal gasket, and the rear channel is between the air seal gasket and the water seal gasket, the air seal gasket being configured to cooperate with horizontal sill of a vertically adjacent curtain wall unit to form an air seal gasket line.

9. The curtainwall unit of claim 7, wherein each of the vertical mullions is integrally formed with the protected vertical chamber.

10. The curtainwall unit of claim 7, wherein each of the vertical mullions includes tabs configured to receive a PVC component, wherein the PVC component has an elastic property for insertion over the tabs and has a shape memory to engage with the tabs to form an interior portion of the protected vertical chamber.

11. The curtainwall unit of claim 7, wherein the frame further includes a head horizontal mullion extending between the vertical mullions, the unit further comprising a shadowbox assembly configured to be inserted between the head horizontal mullion and the horizontal gutter.

12. The curtainwall unit of claim 7, wherein the horizontal gutter has a lower front portion and a lower rear portion, wherein the lower rear portion forms a reveal against which the shadowbox assembly engages when inserted, the lower front

portion has a notch, and the shadowbox assembly has a horizontal frame member with a forward lip configured to engage with the notch when the shadowbox is inserted.

13. The curtainwall unit of claim 12, wherein a silicon bed gasket and structural silicone surround a periphery of the shadowbox assembly, and are sandwiched between insulated glass and the shadowbox assembly.

14. The curtainwall unit of claim 12, wherein the shadowbox assembly has a frame including a horizontal top frame member and a horizontal bottom frame member, wherein each of the horizontal top frame members and the horizontal bottom frame members have a horizontal channel that vents into the protected vertical drainage chamber through a hole located in the vertical mullion.

15. A method for assembling a curtainwall unit, comprising:

assembling a frame including a horizontal gutter, a horizontal sill, a first vertical mullion between a first end of the horizontal gutter and a second end of the horizontal sill, a second vertical mullion between a second end of the horizontal gutter and a second end of the horizontal sill, and a head horizontal mullion extending between the first and second vertical mullions, wherein the horizontal gutter, the head horizontal mullion, and both vertical mullions have a reveal parallel to a back surface of the frame and extending inwardly toward a space defined by the horizontal gutter, the head horizontal mullion, and both vertical mullions, and wherein the horizontal gutter has a lower front notch and the head horizontal mullion has an upper front notch;

inserting a shadowbox assembly into the space defined by the horizontal gutter, the head horizontal mullion, and both vertical mullions, the shadowbox assembly having a top frame member with a front lip and a bottom frame member with a front lip, wherein inserting the shadowbox assembly incudes inserting the shadowbox assembly until a rear of the shadowbox assembly contacts the reveals and the front lip of the top frame member contacts the notch in the horizontal gutter,

and the front lip of the bottom frame member contacts the notch in the head horizontal mullion .

16. The method of claim 15, further comprising:

placing a silicone bed gasket and structural silicon around a front periphery of the shadowbox assembly, and installing insulated glass onto the frame, thereby holding the shadowbox assembly in place.

17. The method of claim 15, wherein opposing ends of the shadowbox assembly includes fixed channels configured to be fastened to the vertical mullions, and a the shadowbox assembly including vertical frame members with receiving channels configured to receive the fixed channels, wherein the receiving channels and the fixed channels cooperate to restrict movement of the shadowbox assembly perpendicular to a glass plane on a front of the shadowbox assembly, but allows shadowbox assembly to float to allow for thermal expansion and contraction of an aluminum panel within the shadowbox assembly.

18. A method for installing a unitized curtainwall system, comprising:

installing adjacent curtain wall units, thereby forming a joint between the adjacent curtain wall units, wherein each curtain wall unit has a horizontal mullion that forms a rear gutter between a water barrier gasket and an air seal gasket; and

placing a water-proof silicon sponge gasket into the rear gutter across the joint, and securing the water-proof silicon sponge gasket within the rear gutter using at least one spring clip to press the silicon sponge gasket into position within the rear gutter to make a waterproof seal on each side of the joint.

19. The method of claim 18, further comprising applying a silicone putty plug into a hole at a backside where four curtain wall units join, wherein applying the silicone putty plug includes manually compressing the plug, inserting the compressed plug in the hole at the backside, and allowing the compressed plug to expand within the hole to provide a water-proof seal in the hole.

ABSTRACT

This document discusses, among other things, unitized curtain systems and methods related to the fabrication and installation of curtainwalls. A curtainwall unit may comprises a frame including a horizontal gutter, a horizontal sill, a first vertical mullion between a first end of the horizontal gutter and a second end of the horizontal sill, and a second vertical mullion between a second end of the horizontal gutter and a second end of the horizontal sill. The horizontal gutter may include a rear channel extending across the horizontal gutter, and at least one protected horizontal channel at least partially beneath the rear channel, the rear channel having at least one opening to the at least one horizontal gutter. Each vertical mullion may include a protected vertical chamber having an opening to the at least one protected horizontal channel.

Curtainwall Overall Isometric

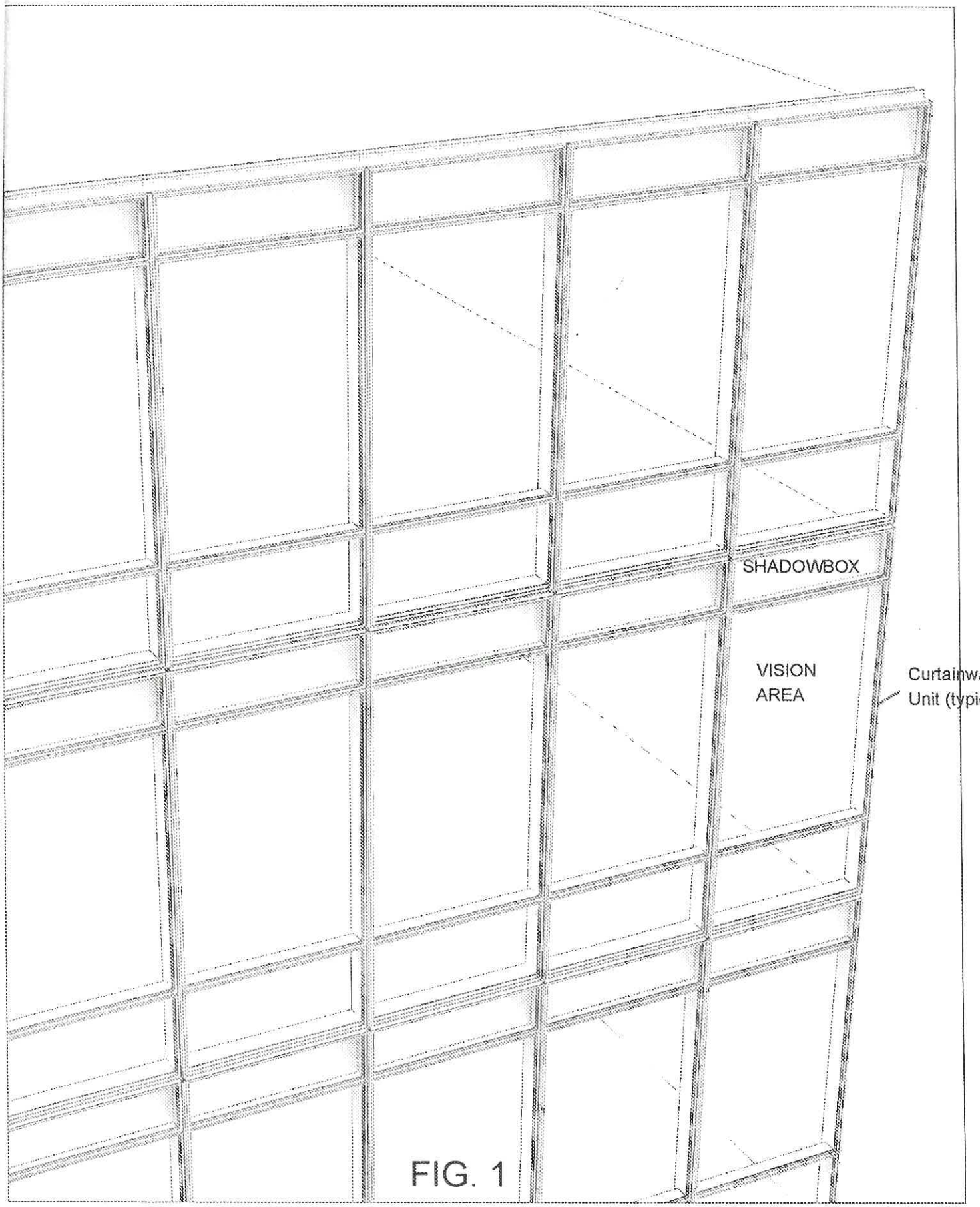


FIG. 1

Curtainwall Installation Sequence

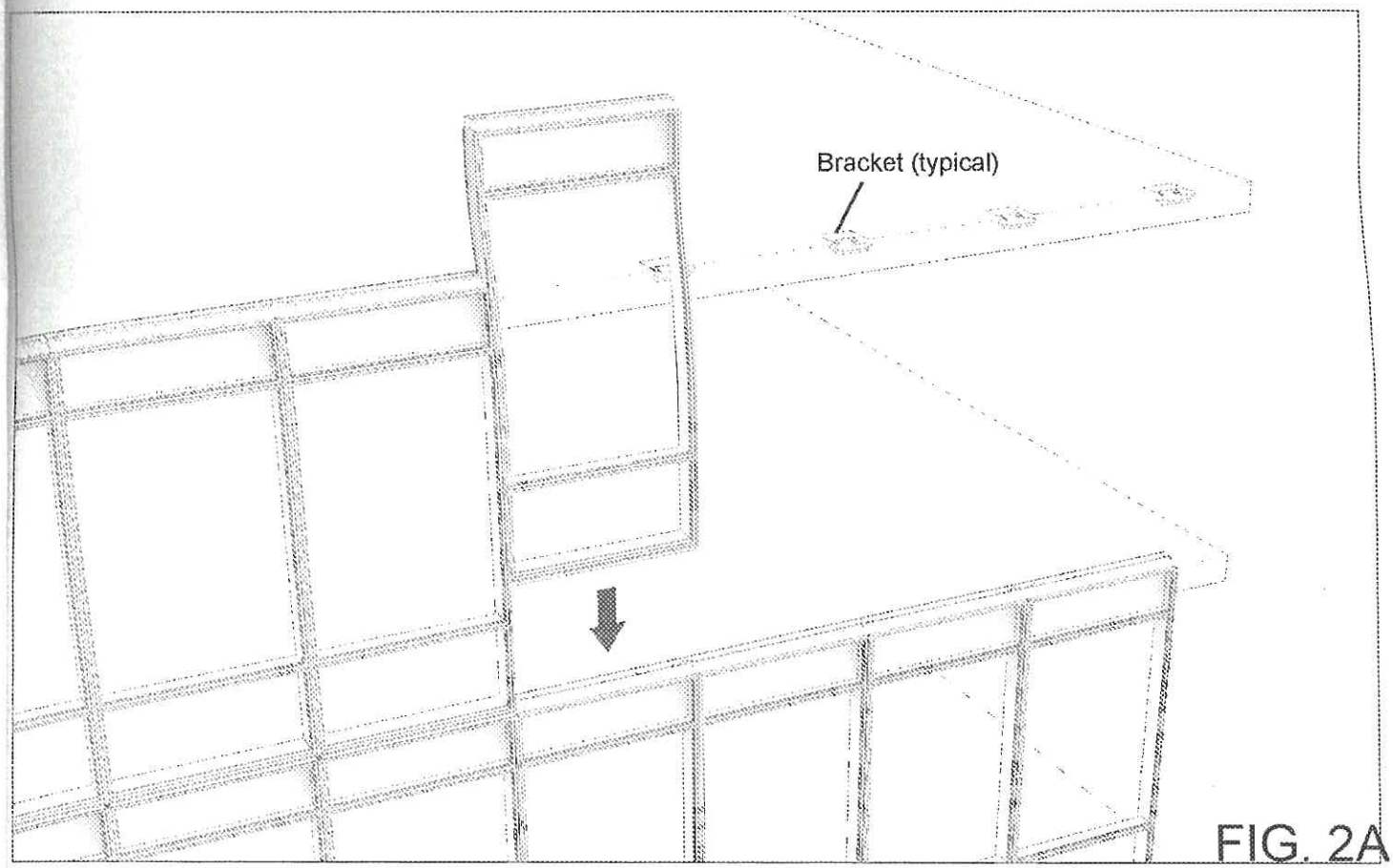


FIG. 2A

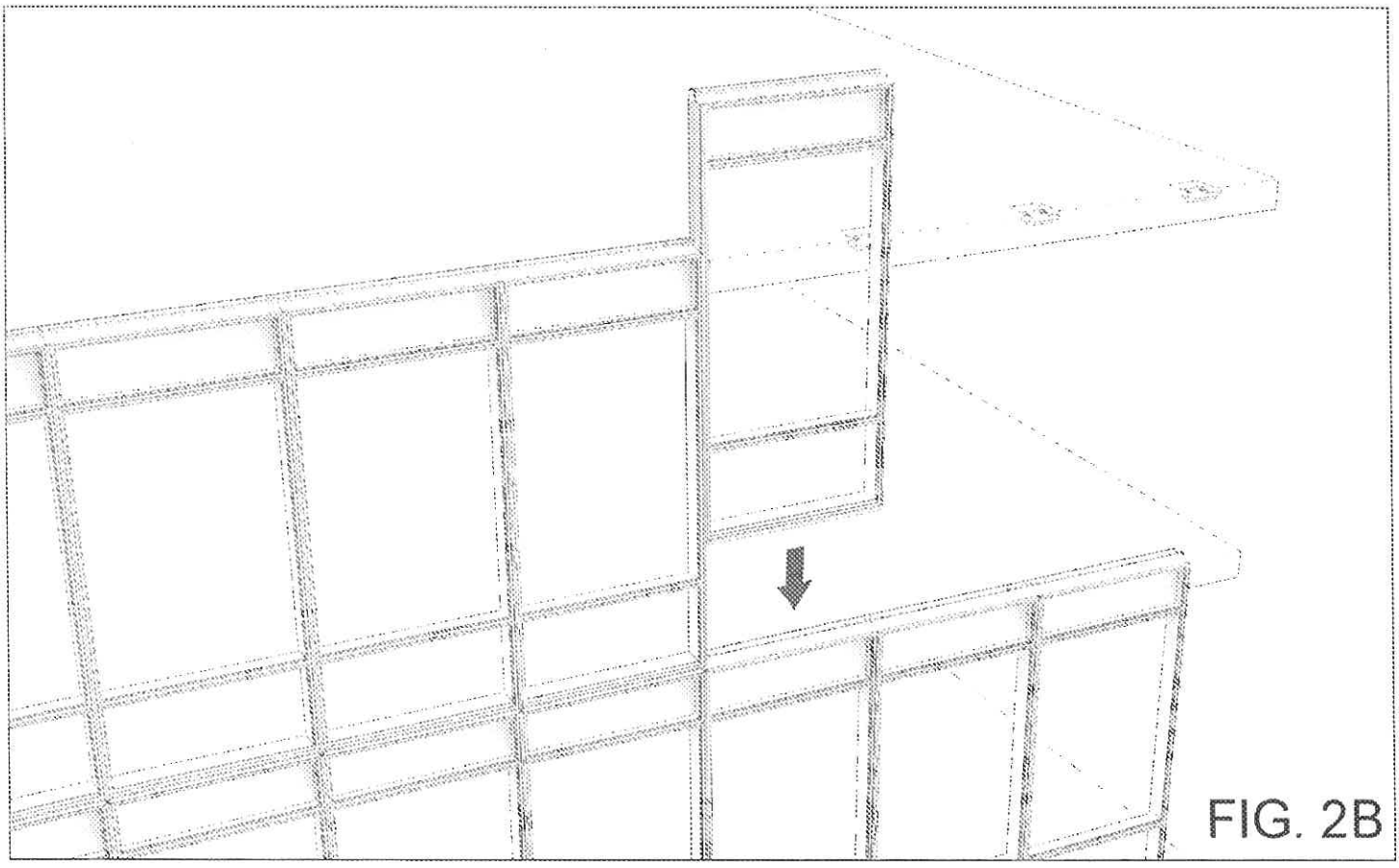


FIG. 2B

Curtainwall Installation Sequence

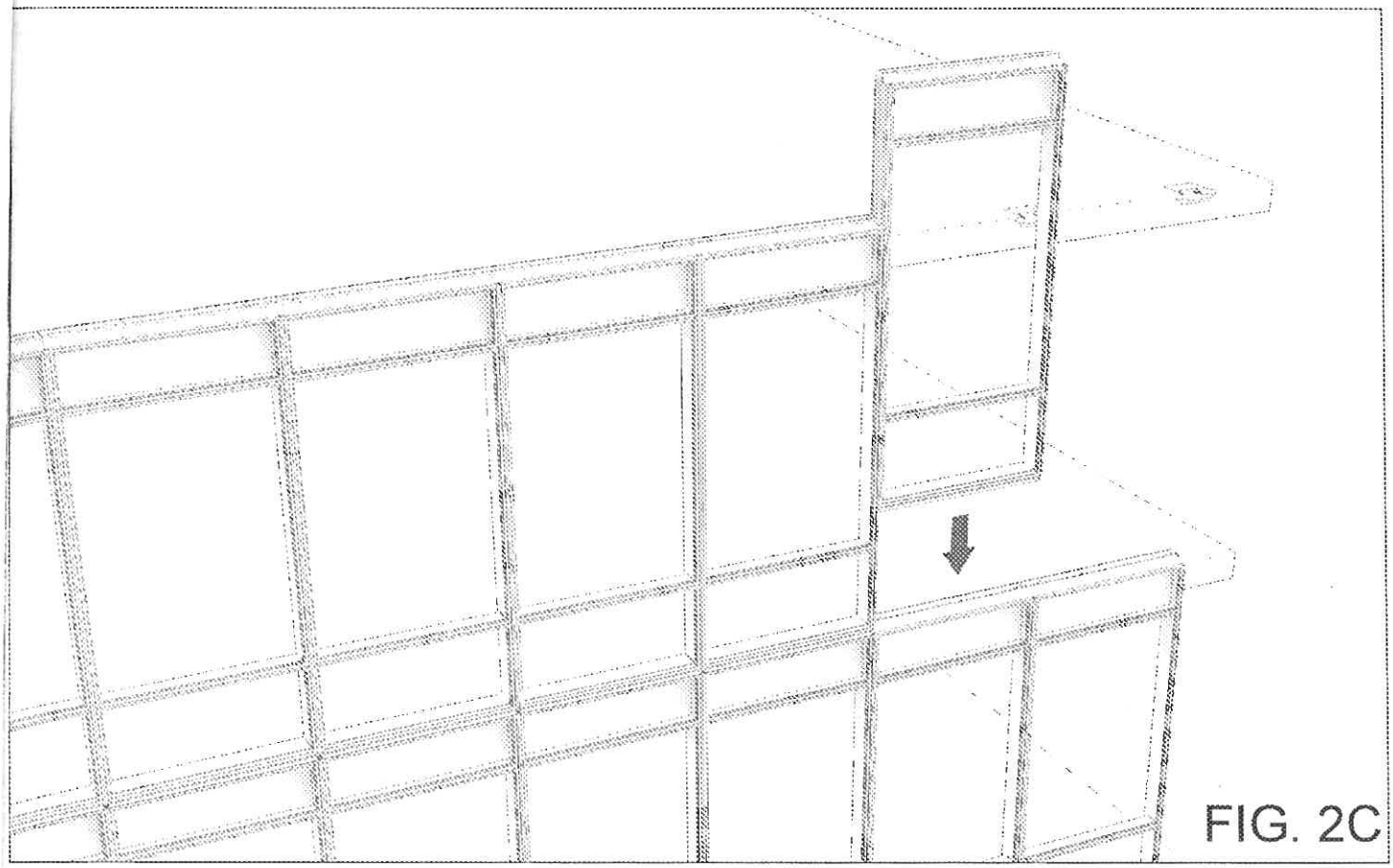


FIG. 2C

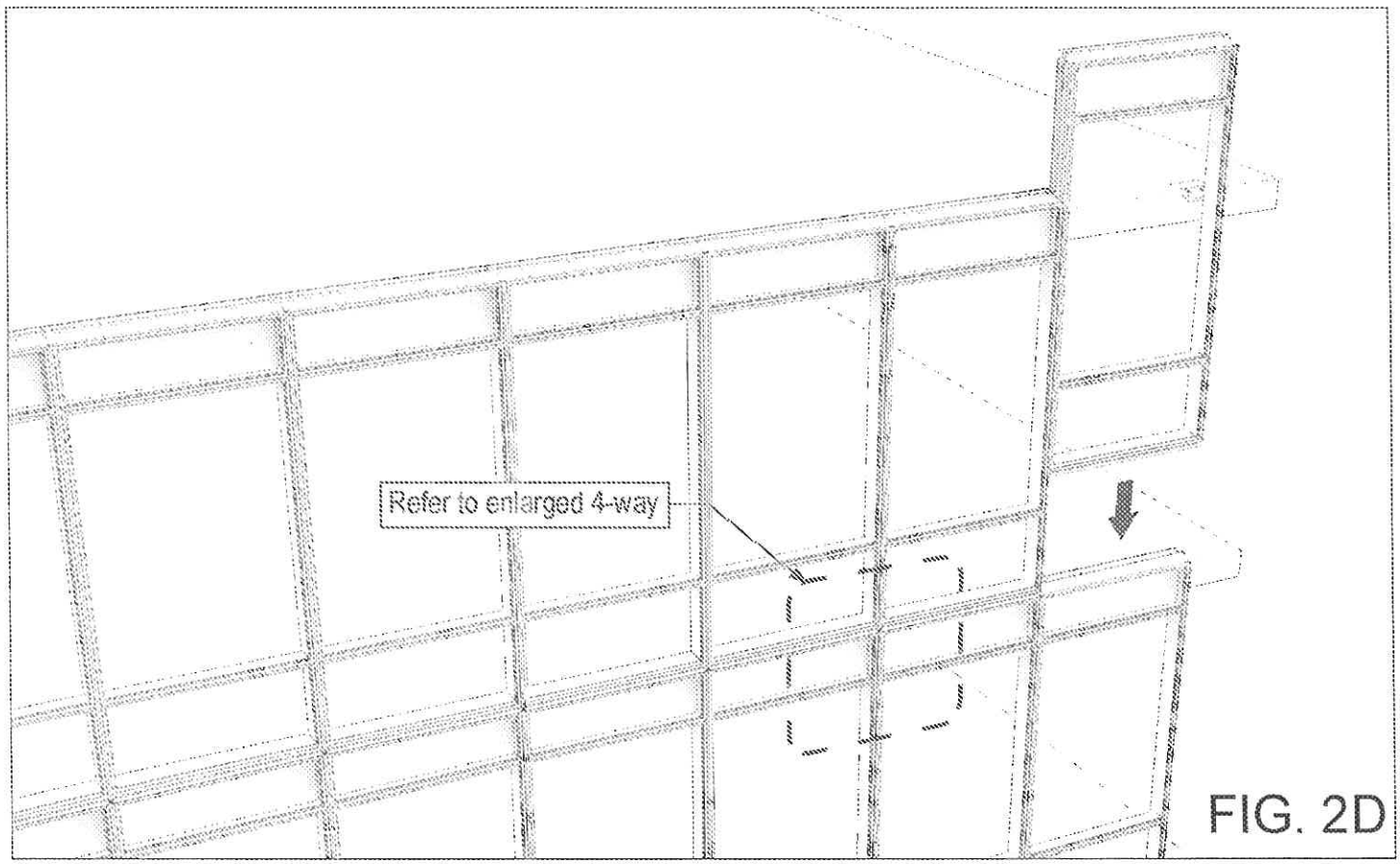


FIG. 2D

Curtainwall Unit Isometric

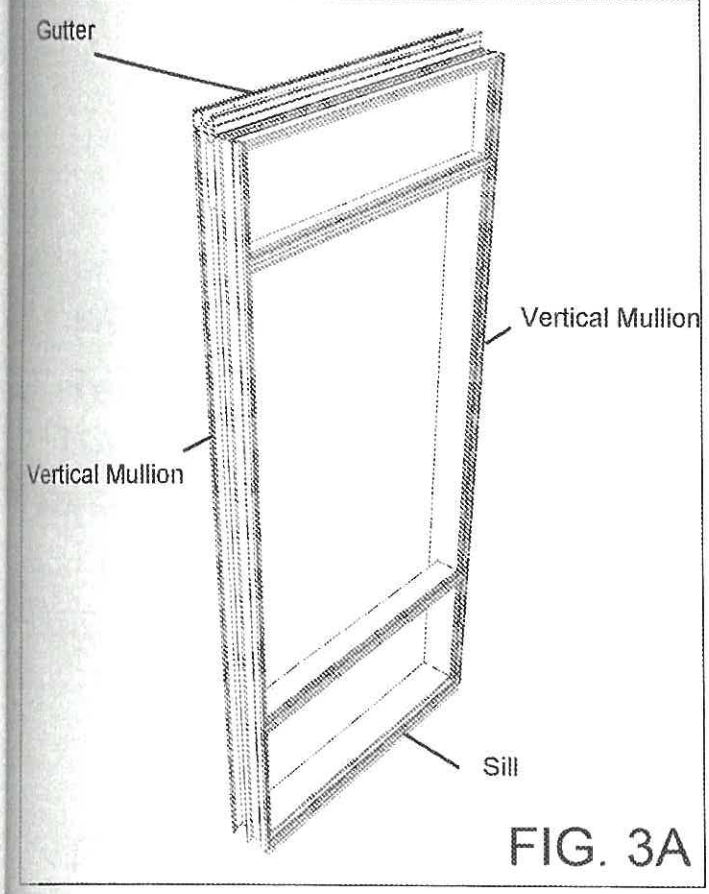


FIG. 3A

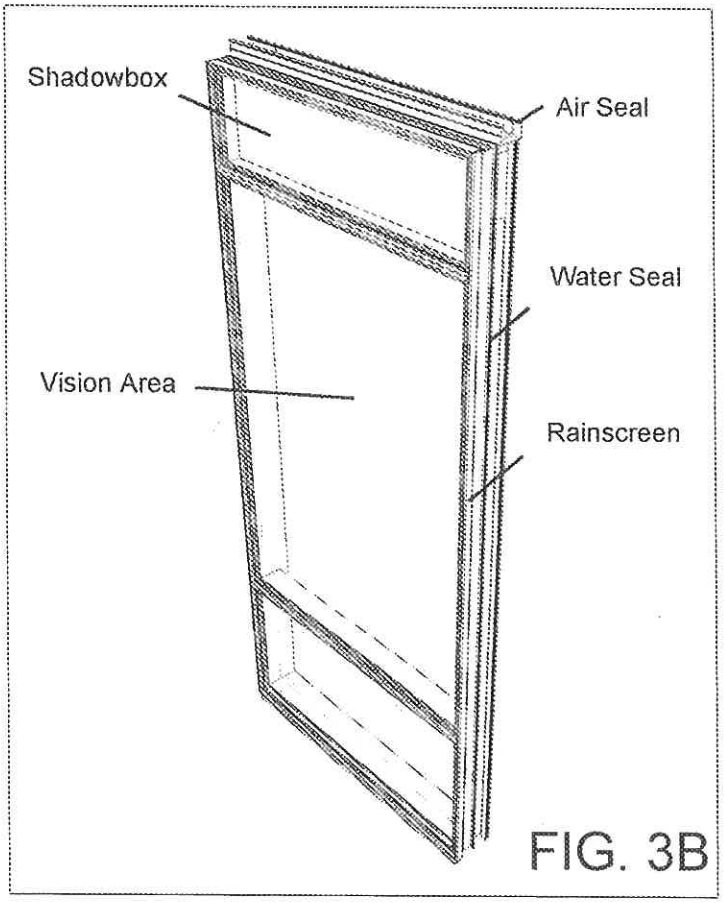


FIG. 3B

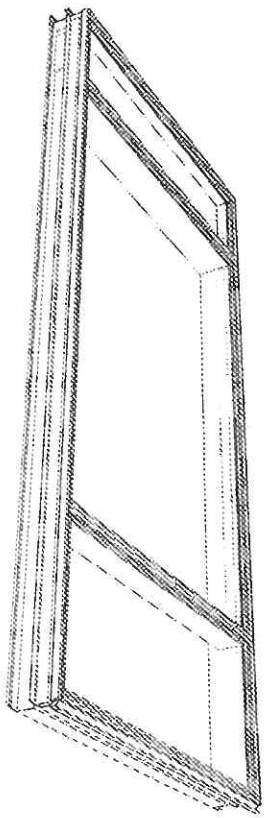


FIG. 3C

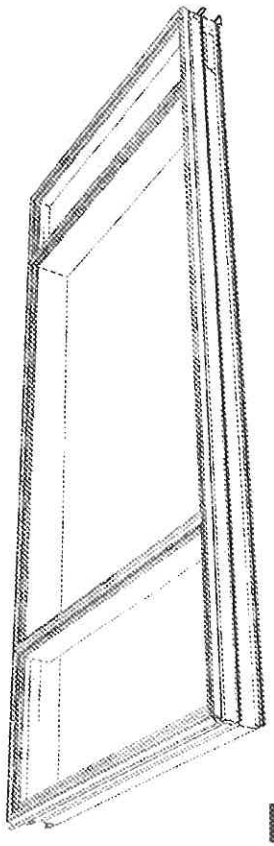


FIG. 3D

Curtainwall Unit Close-Up

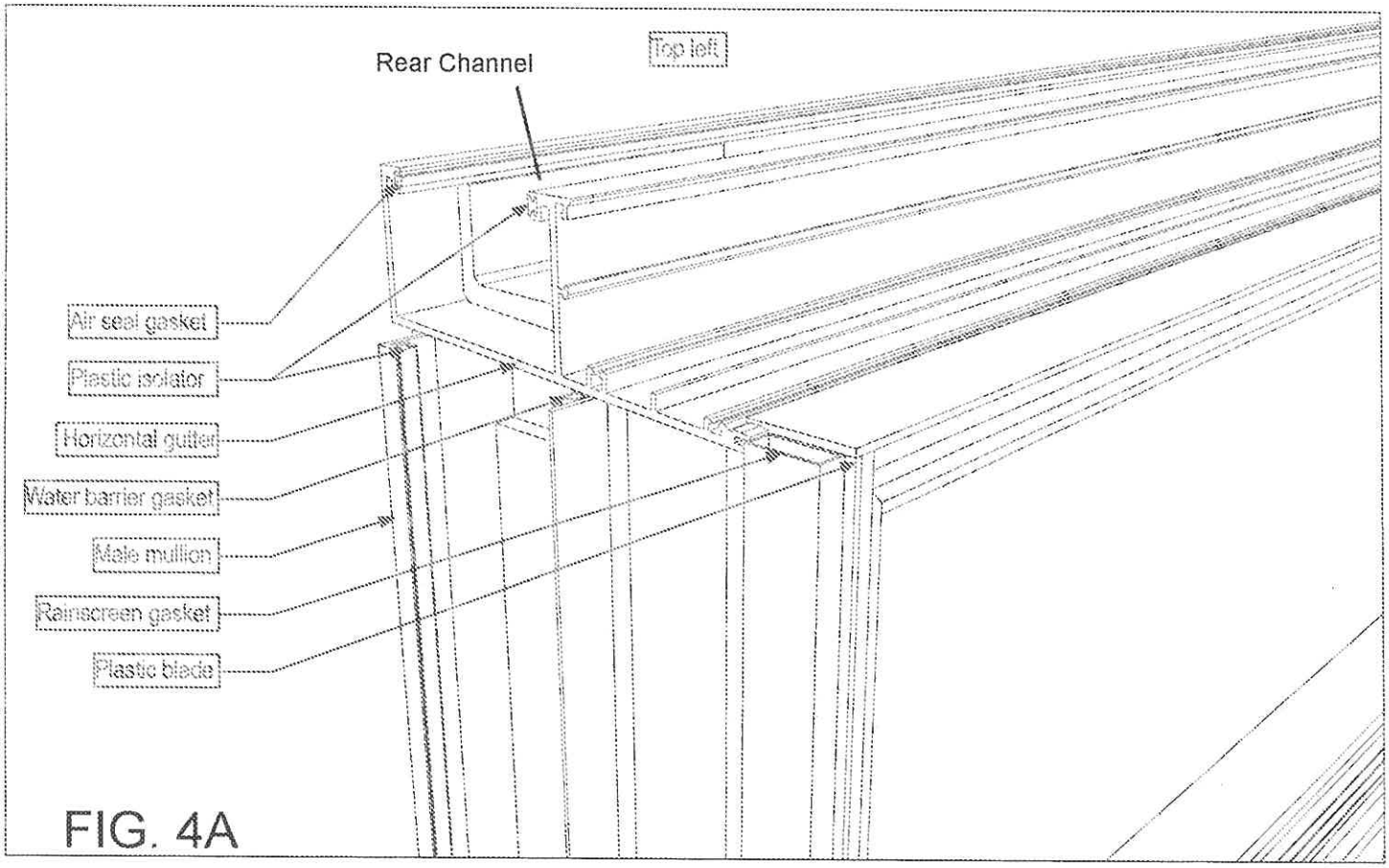


FIG. 4A

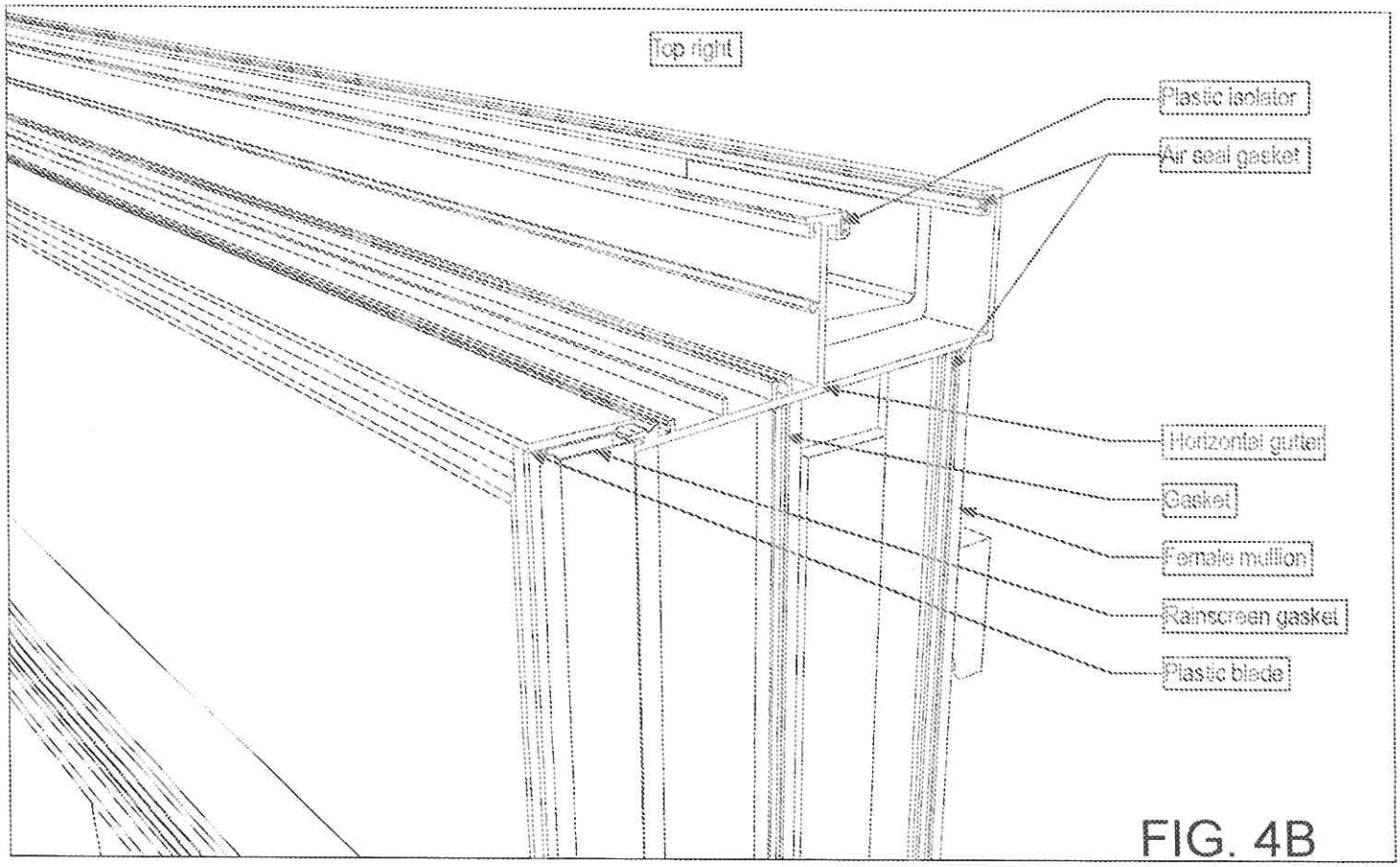


FIG. 4B

Curtainwall Unit Close-Up

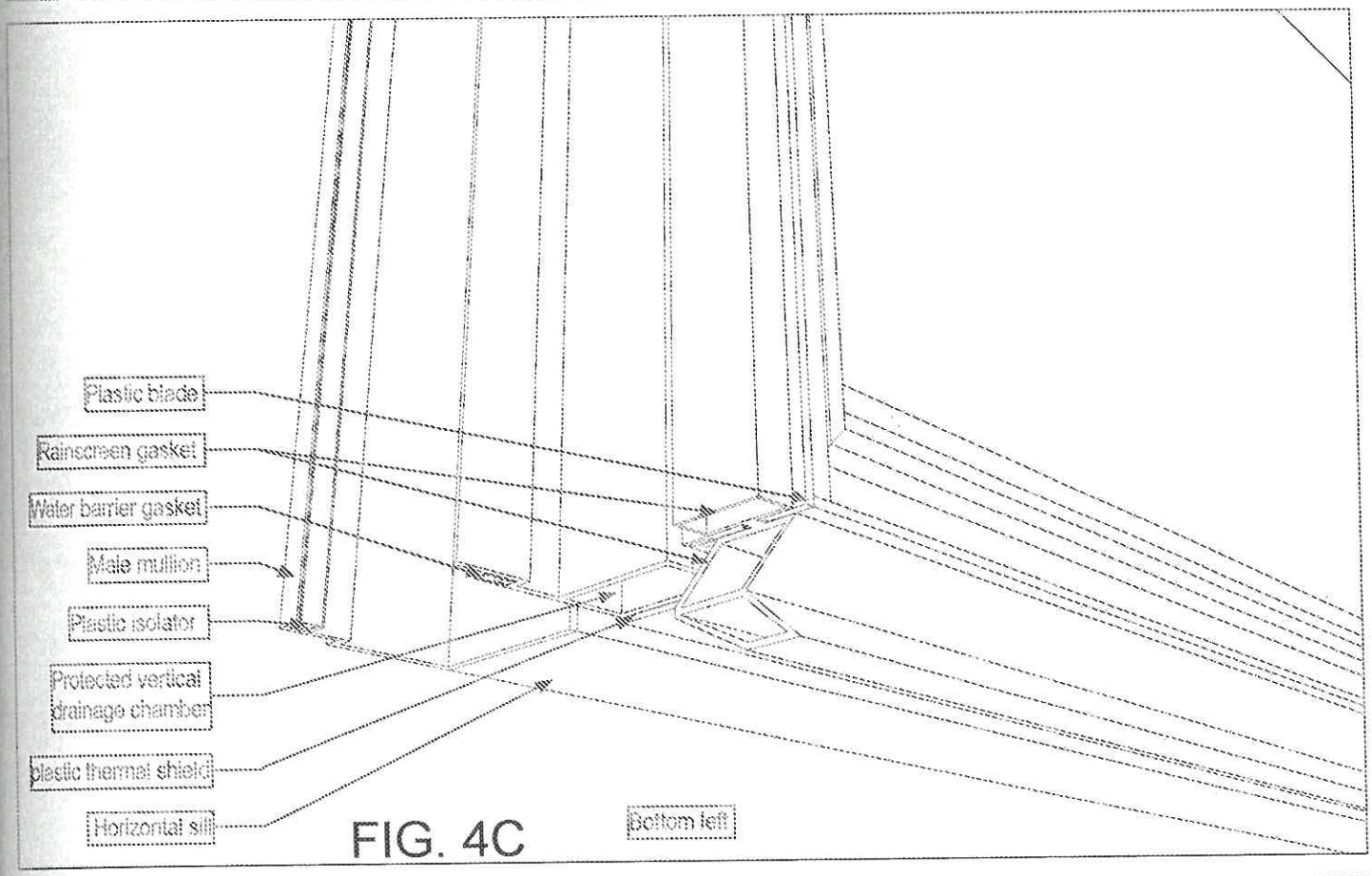


FIG. 4C

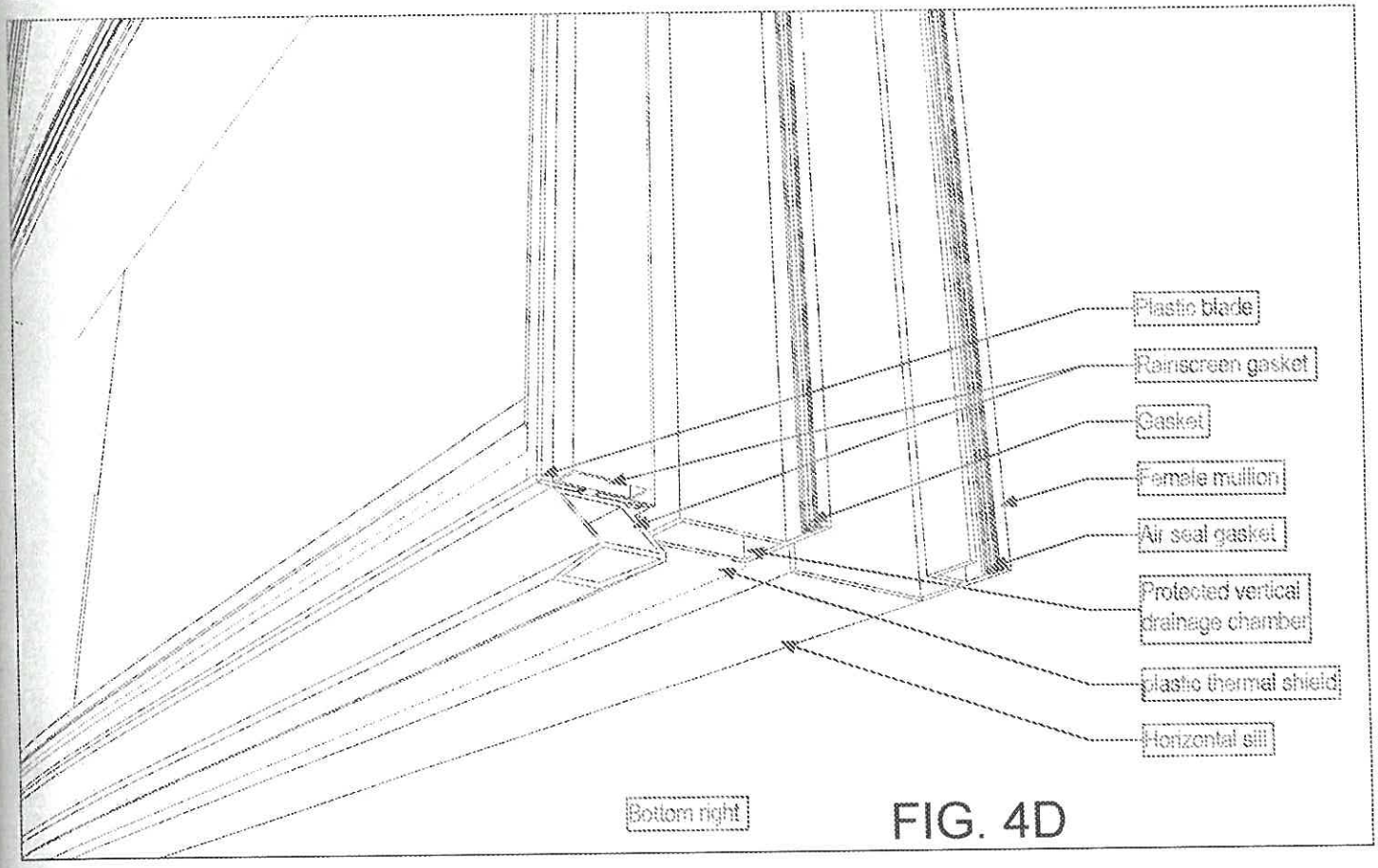


FIG. 4D

Curtainwall 4-Way Sequence

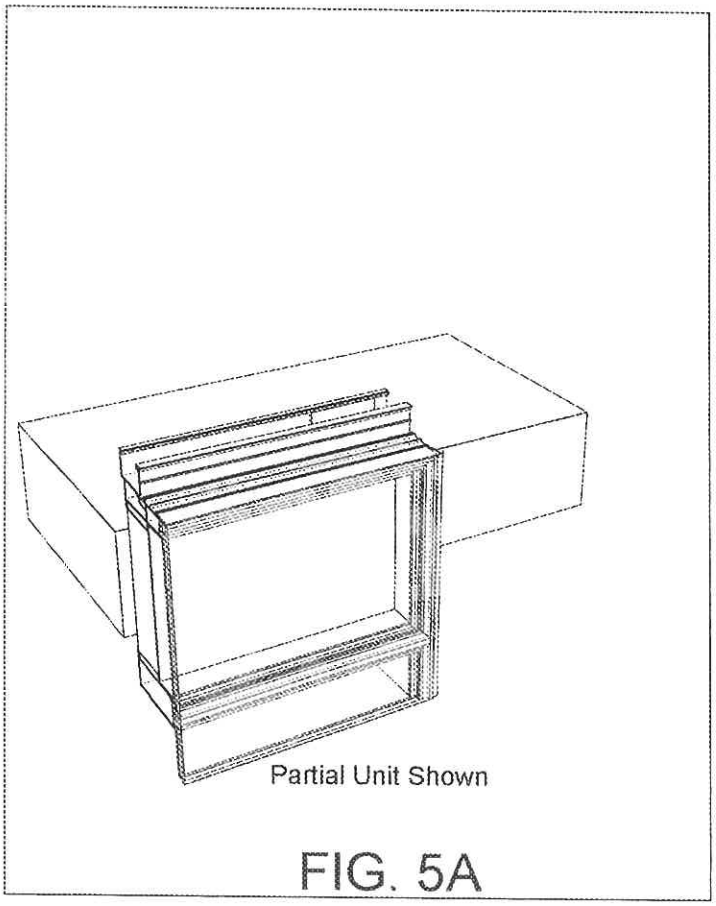


FIG. 5A

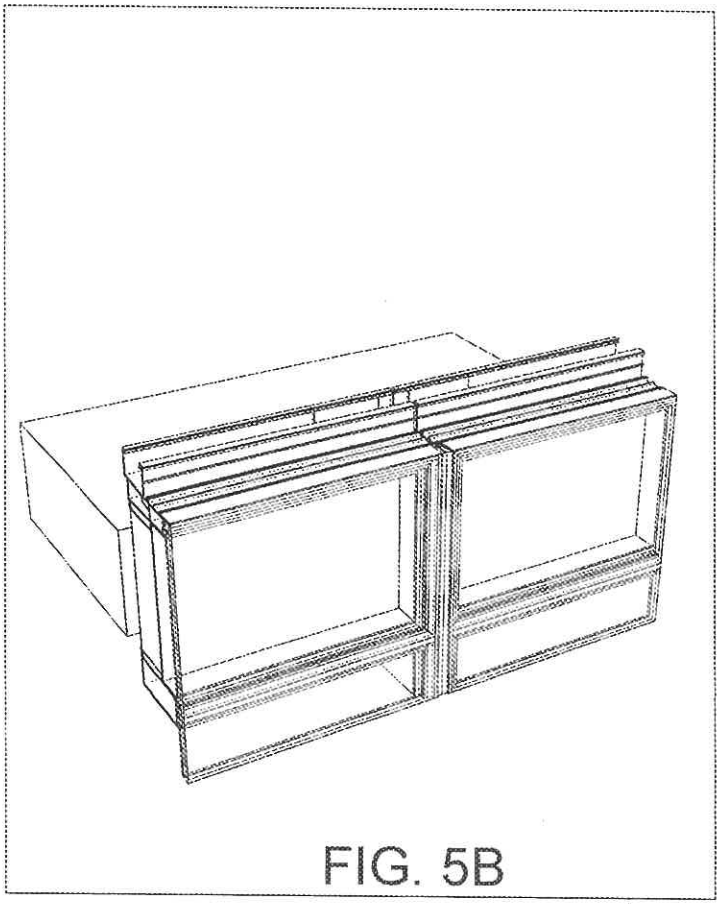


FIG. 5B

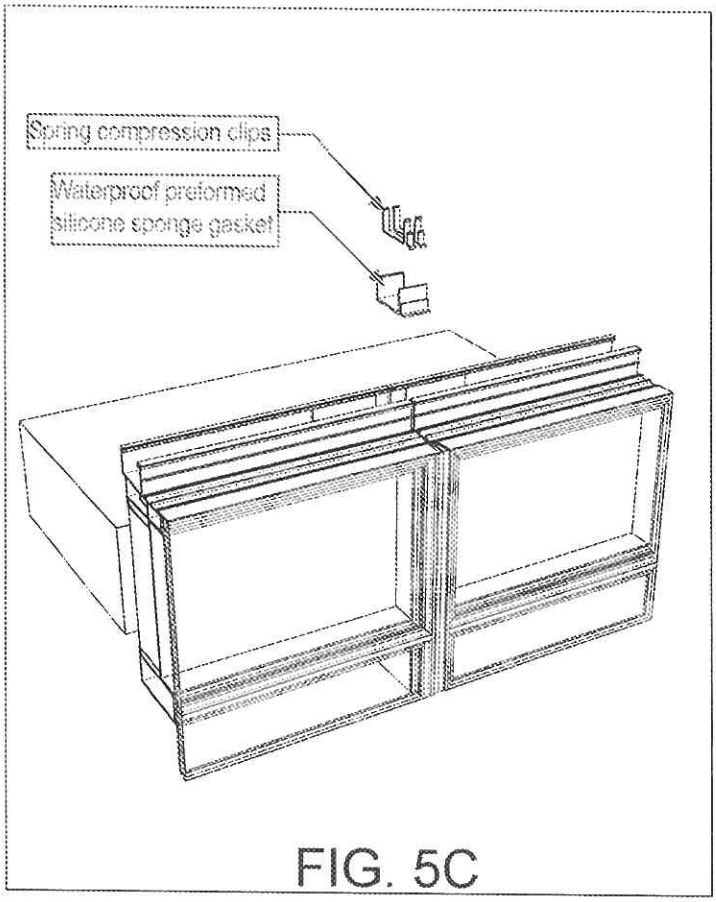


FIG. 5C

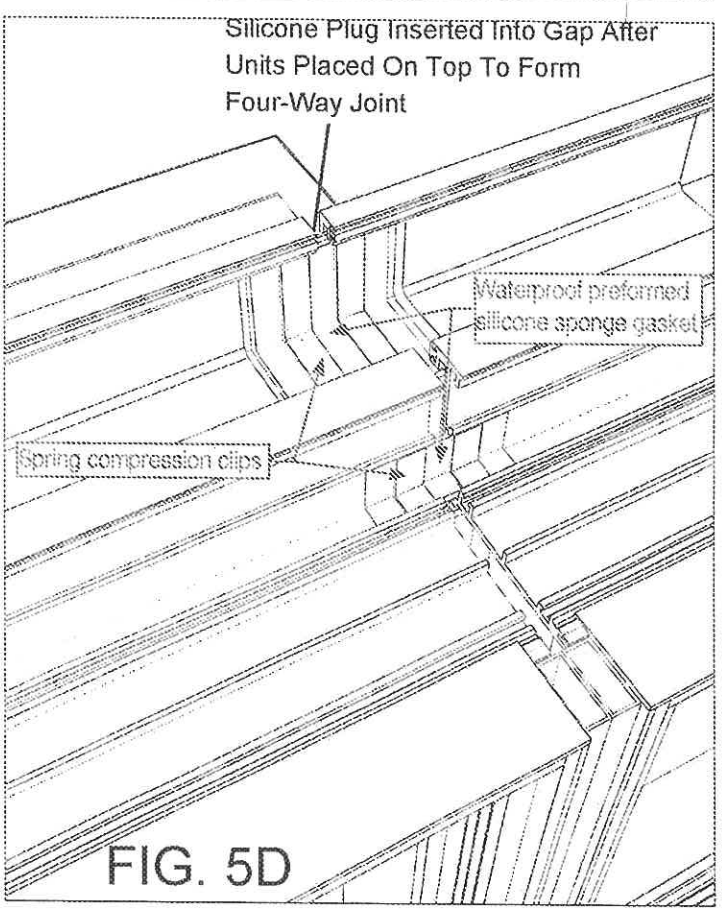


FIG. 5D

Curtainwall 4-Way Sequence

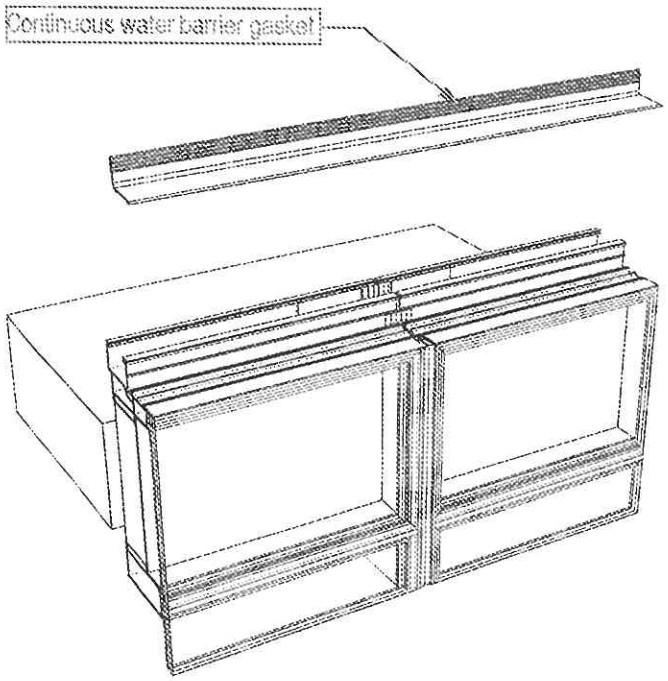


FIG. 5E

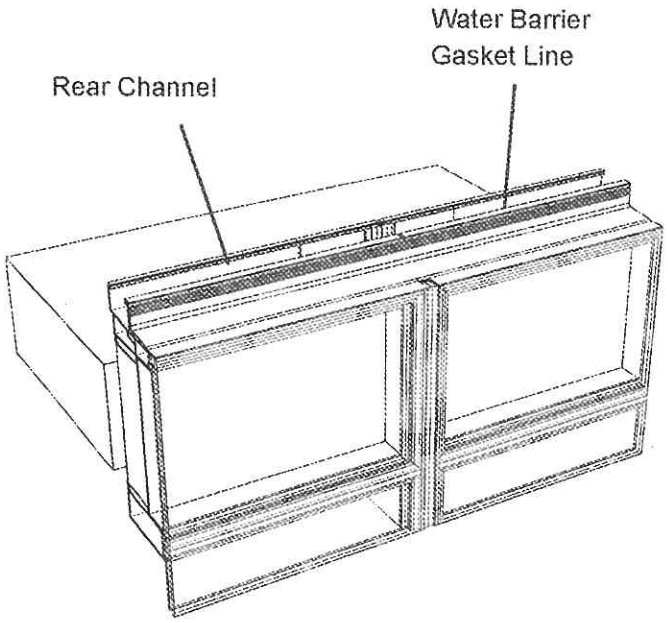


FIG. 5F

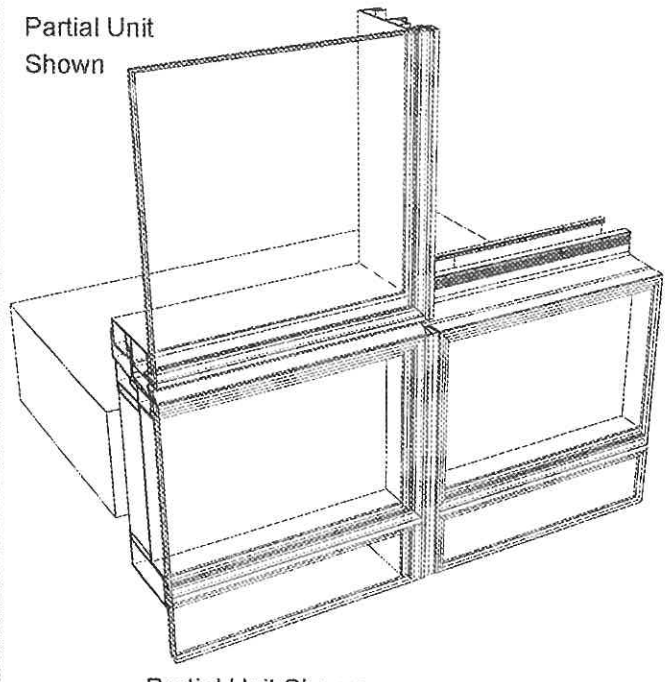


FIG. 5G

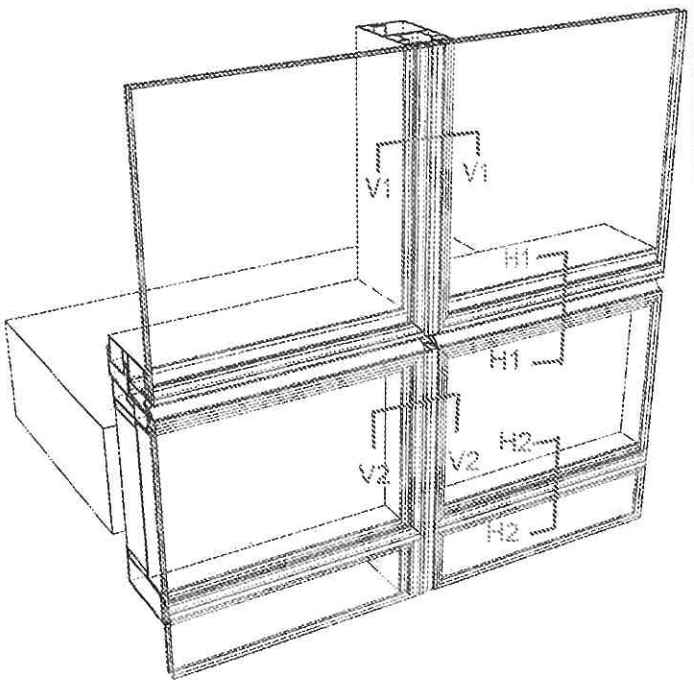


FIG. 5H

Curtainwall Air & Water Path

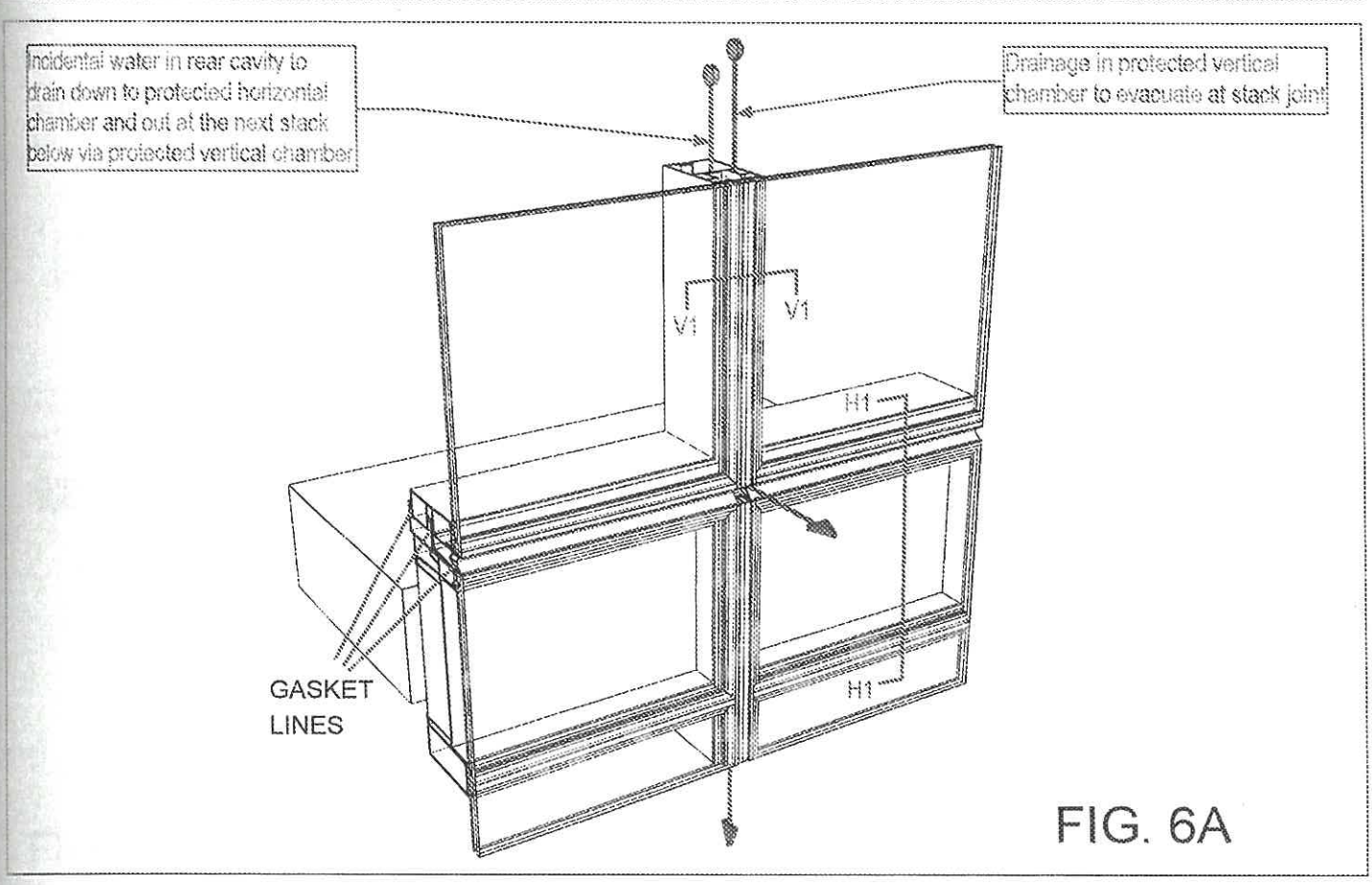


FIG. 6A

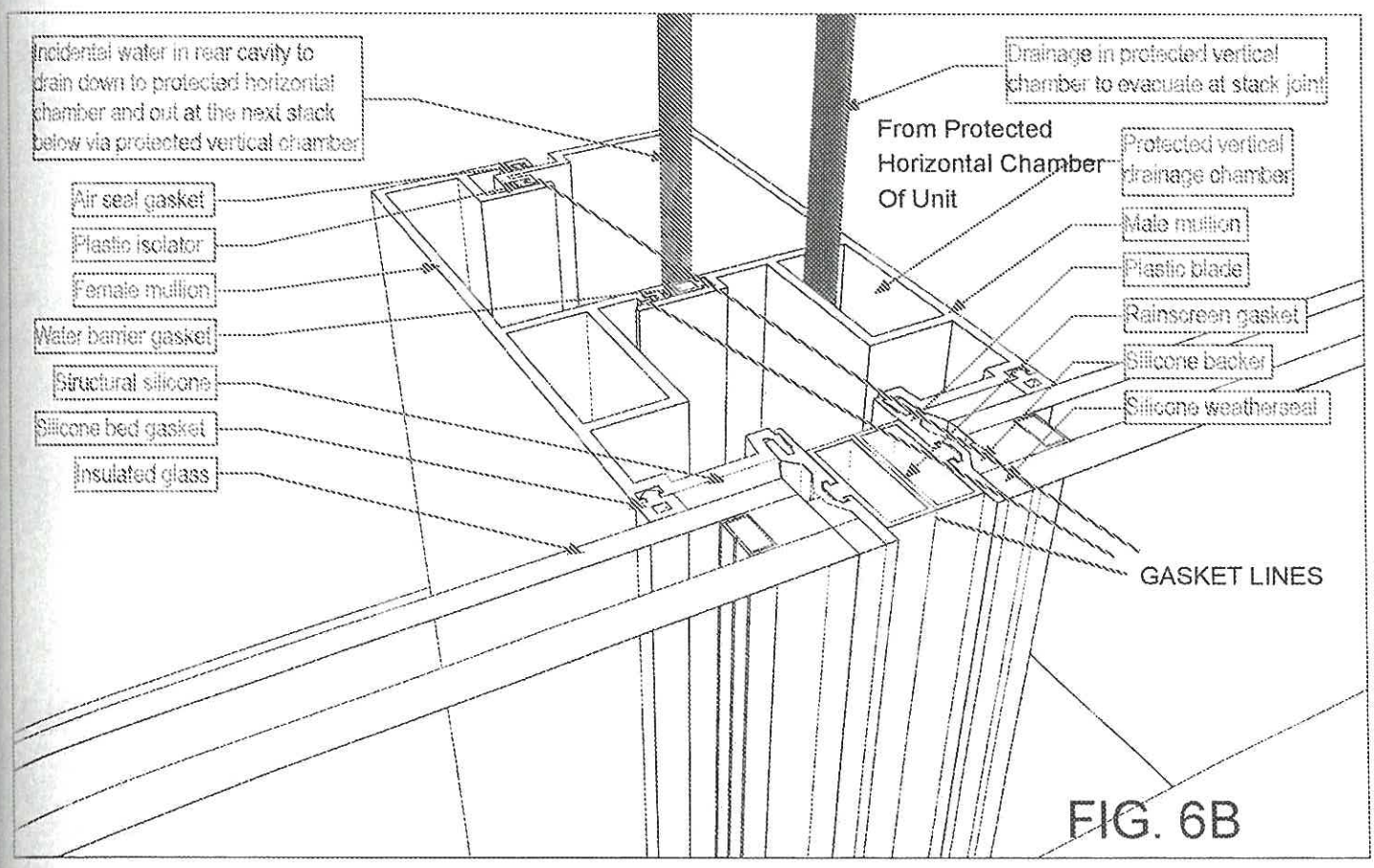


FIG. 6B

Curtainwall Air & Water Path

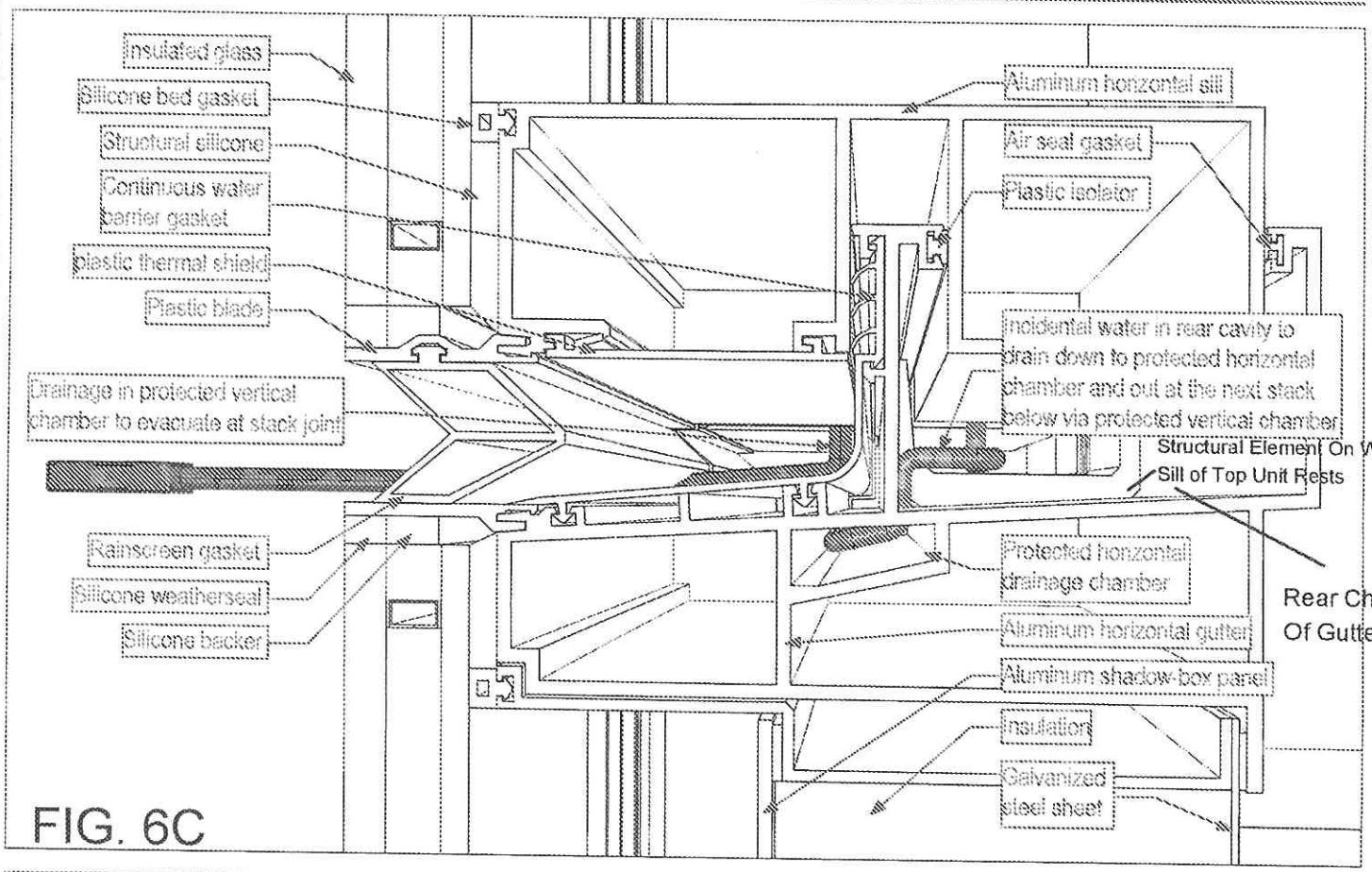


FIG. 6C

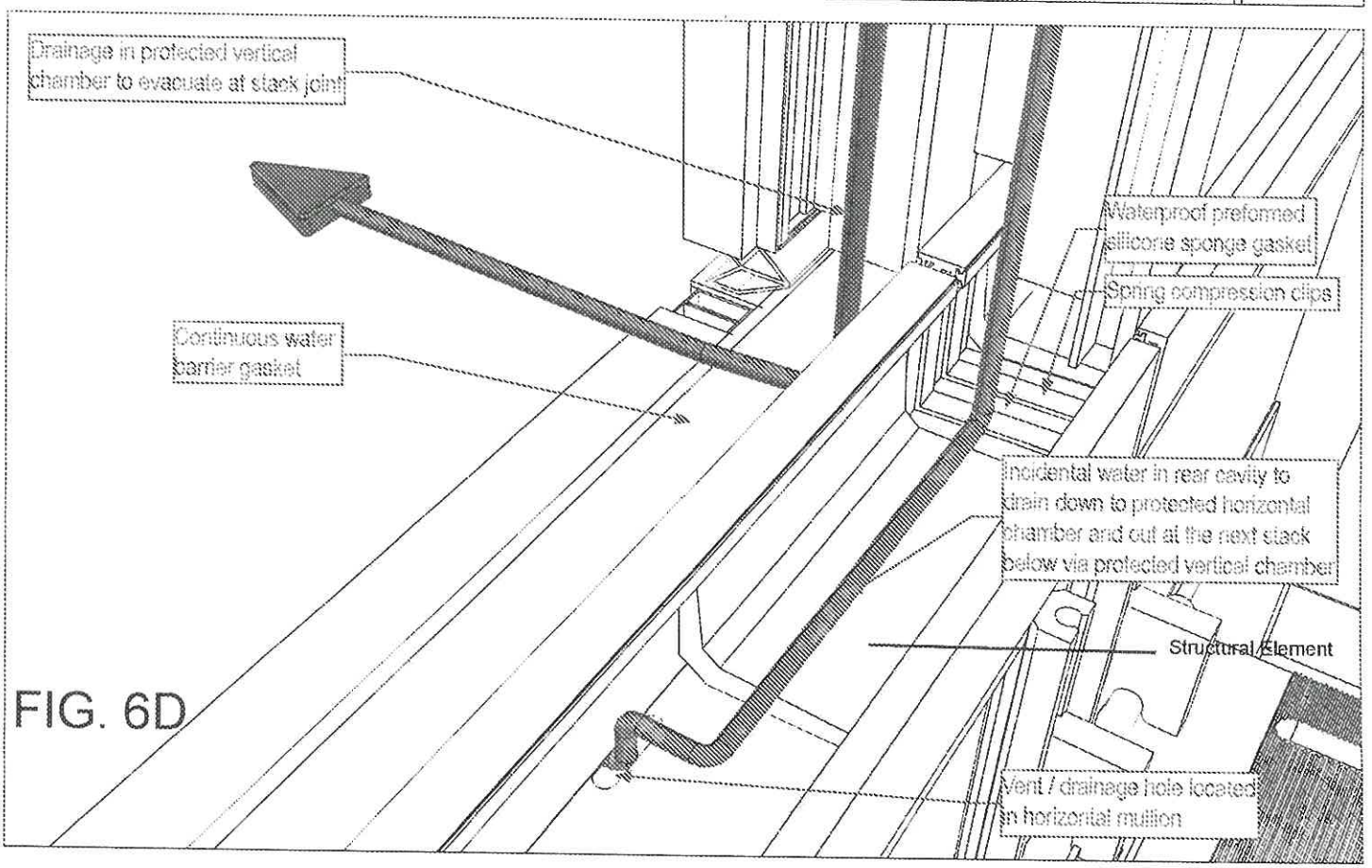


FIG. 6D

Curtainwall Air & Water Path

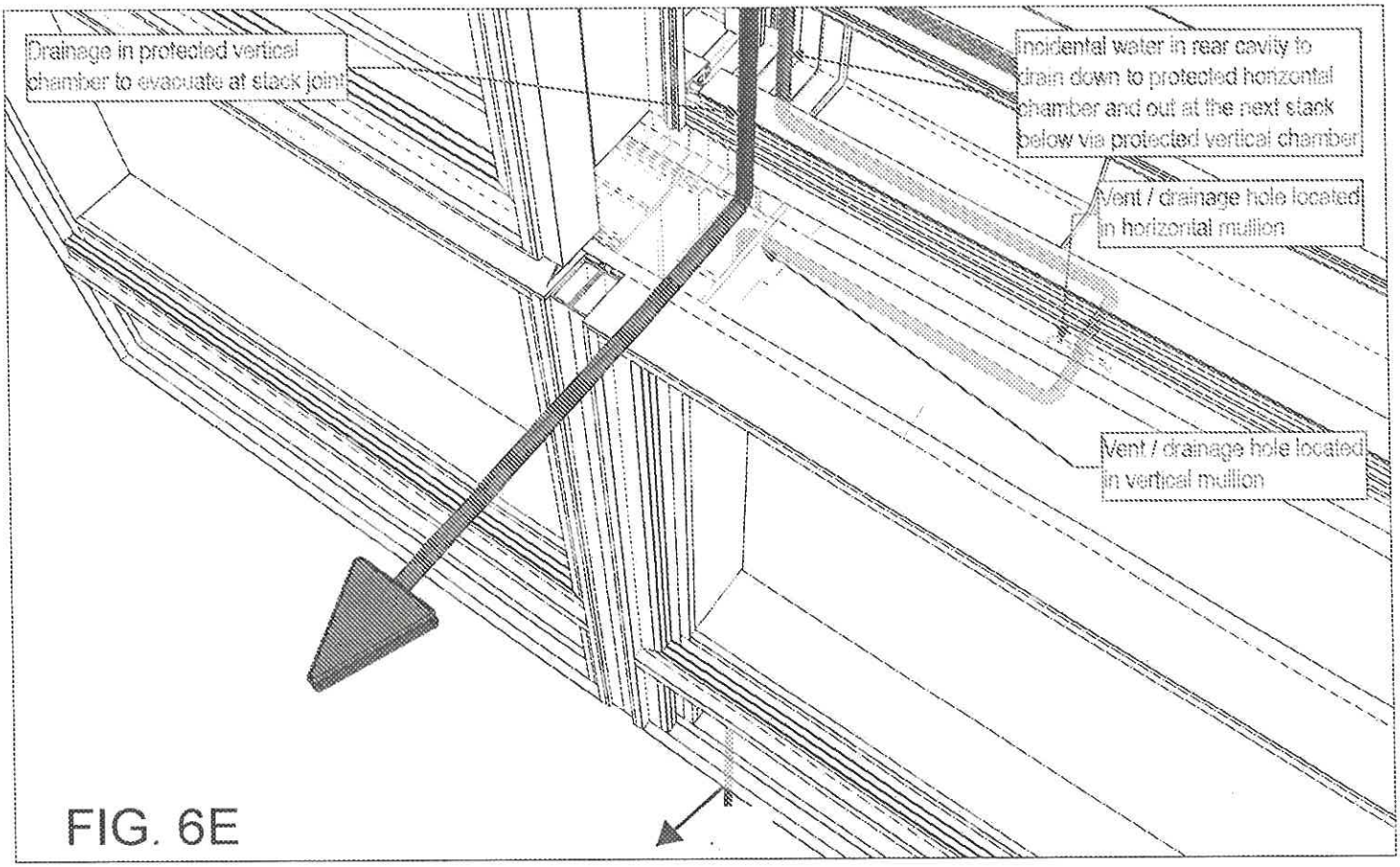


FIG. 6E

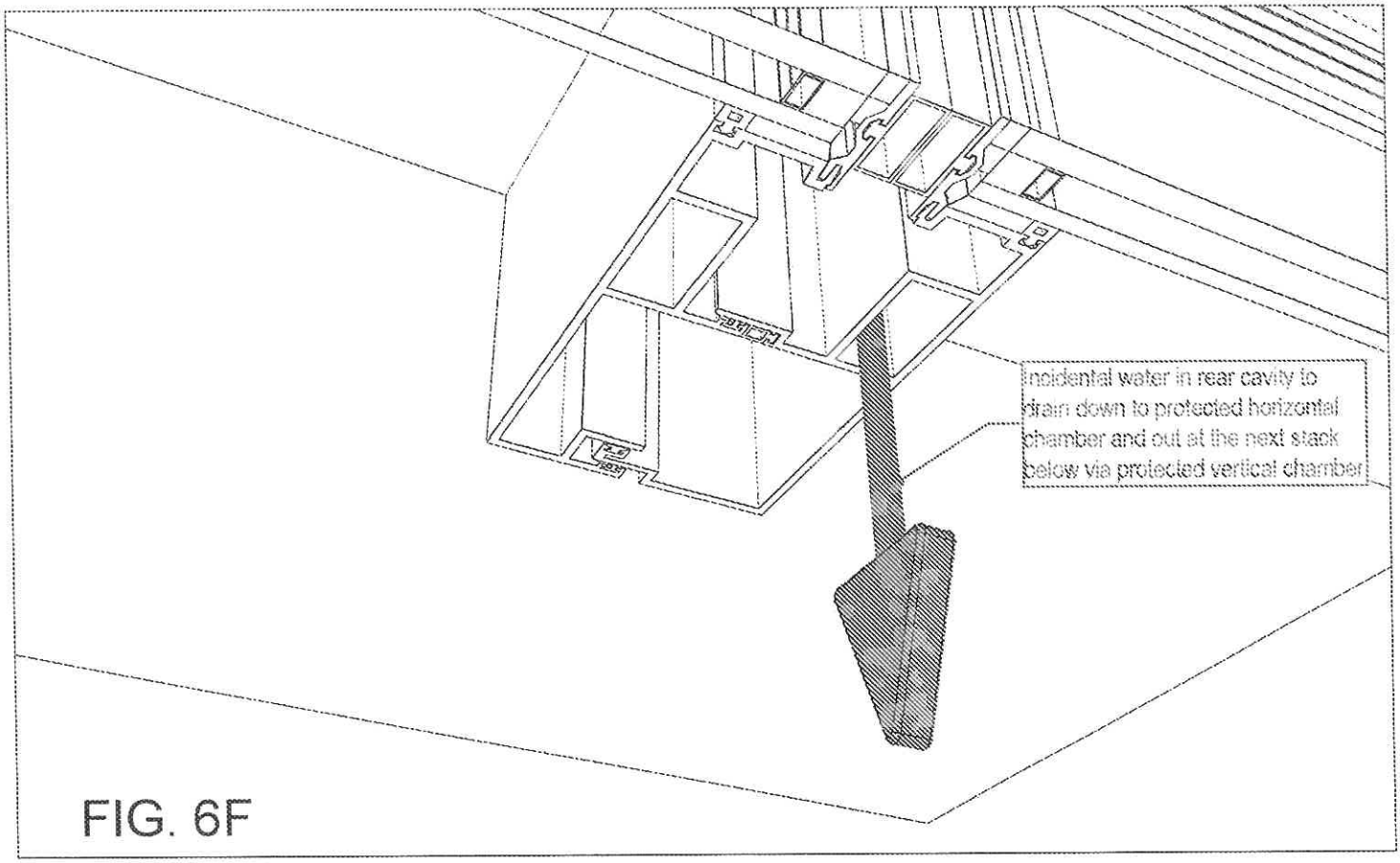


FIG. 6F

Curtainwall Framing Connection

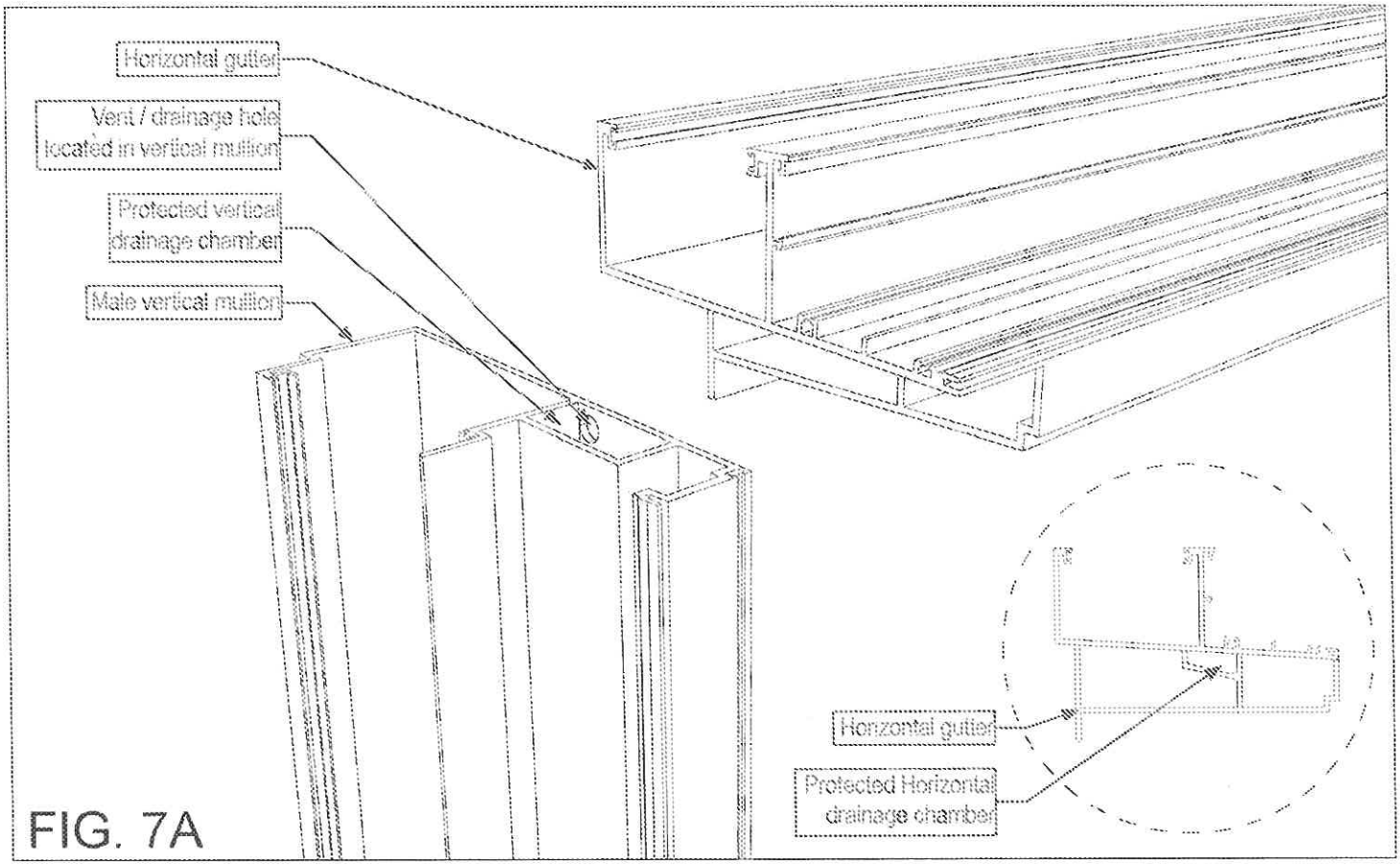


FIG. 7A

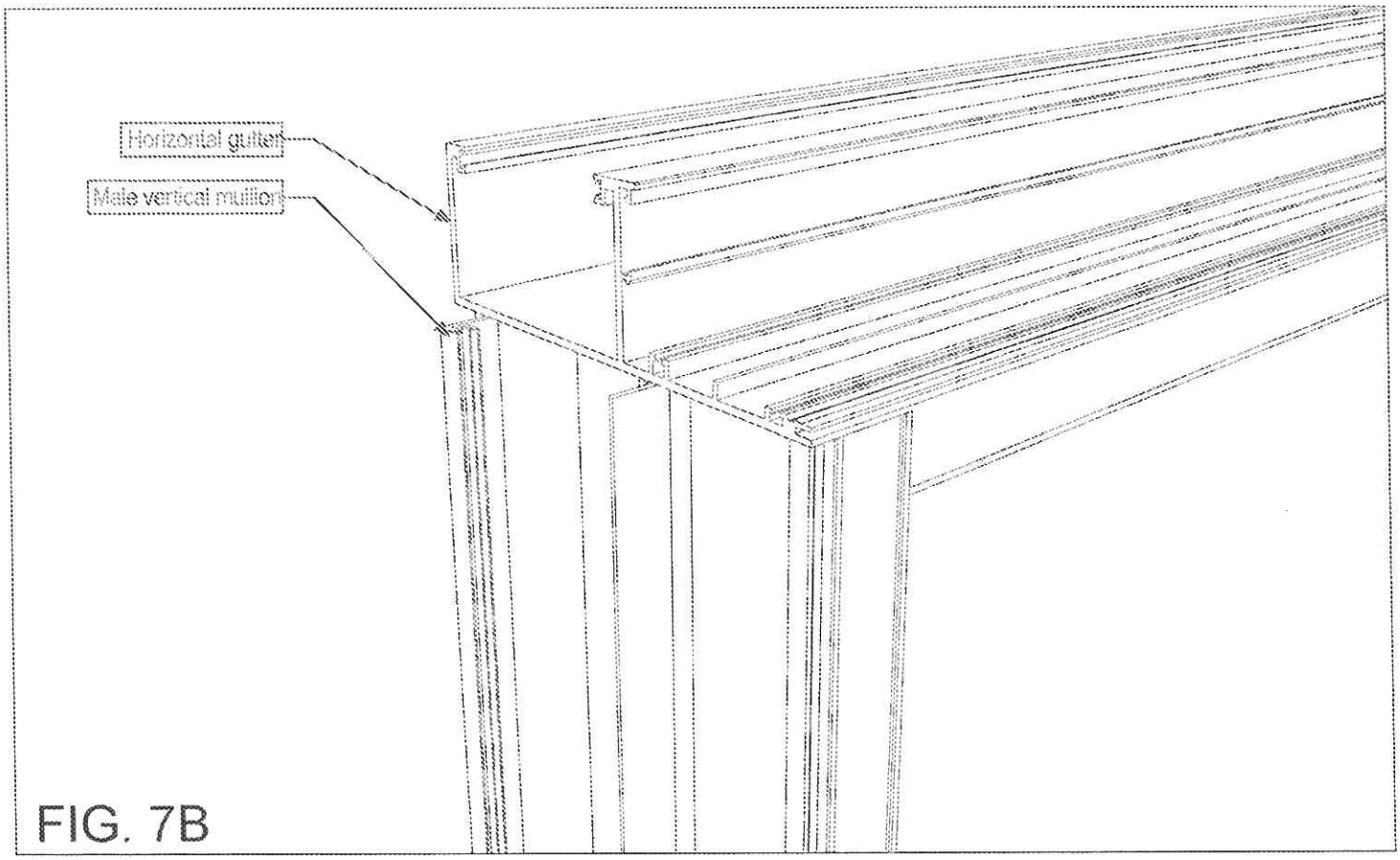


FIG. 7B

Shadow-Box Assembly Sequence

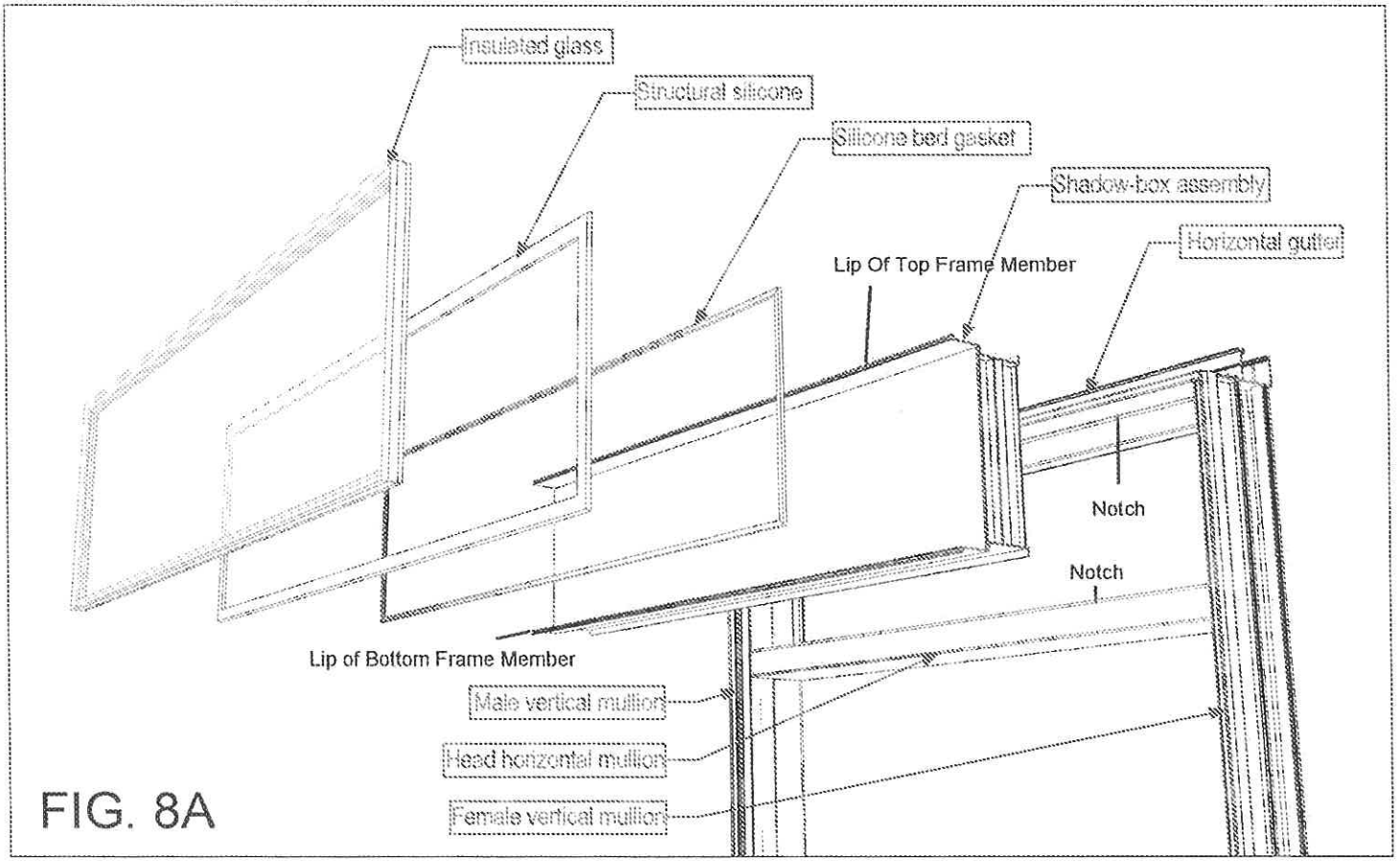


FIG. 8A

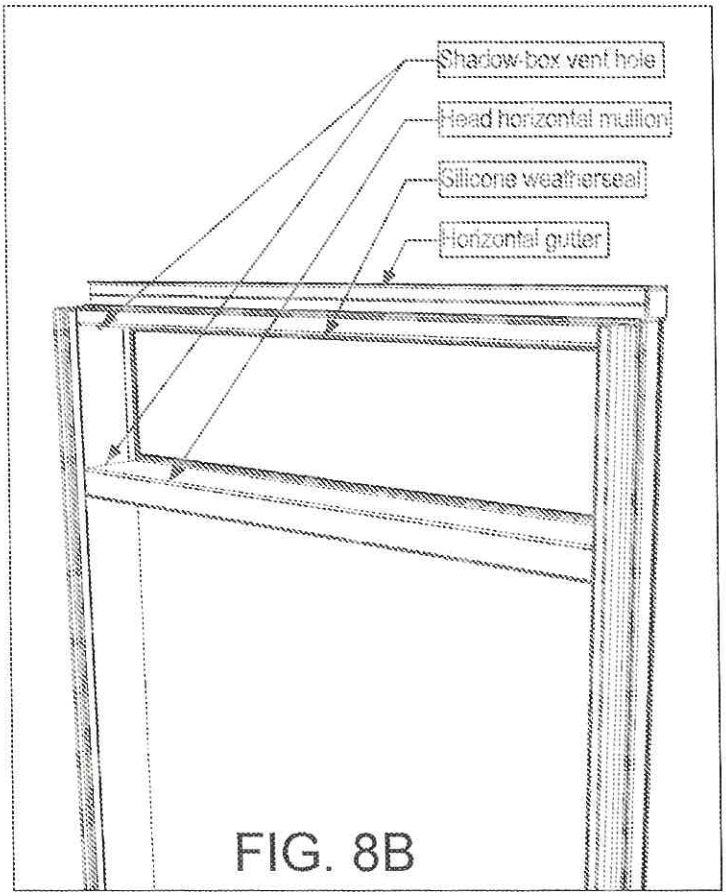


FIG. 8B

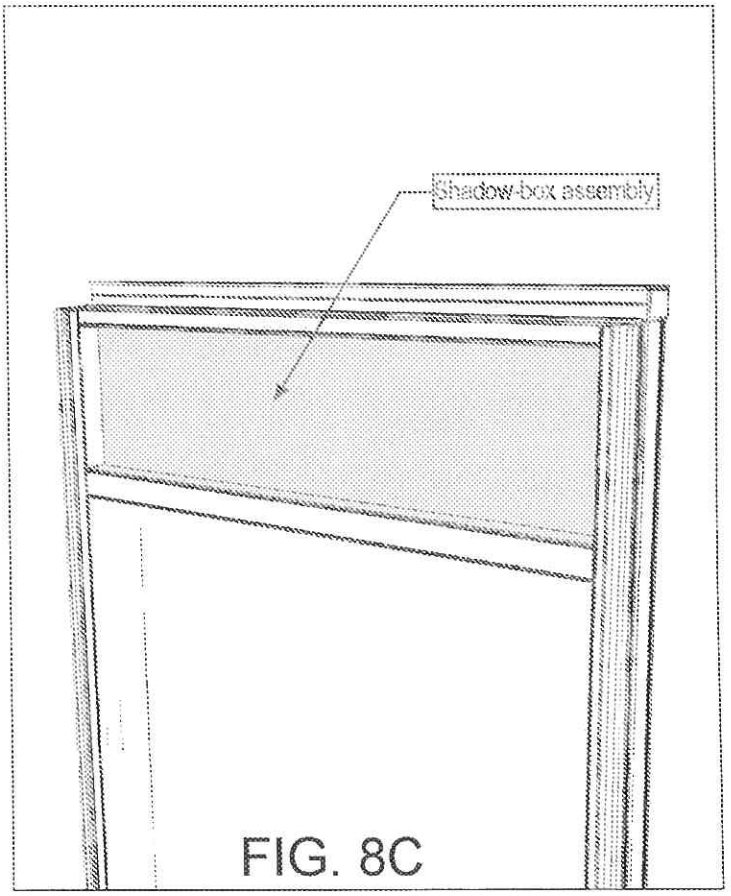


FIG. 8C

Shadow-Box Assembly Sequence

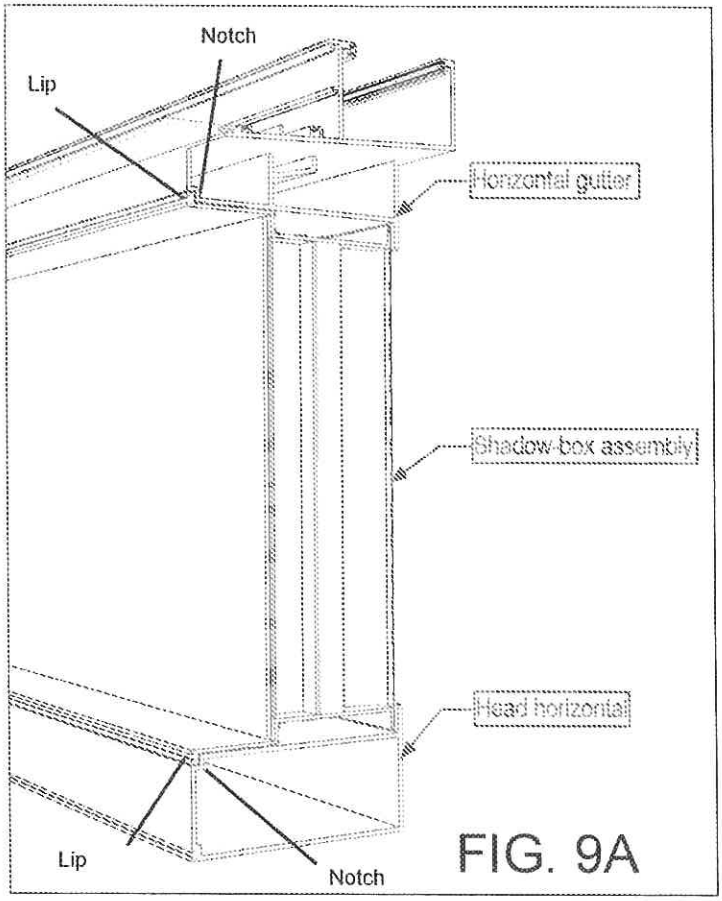


FIG. 9A

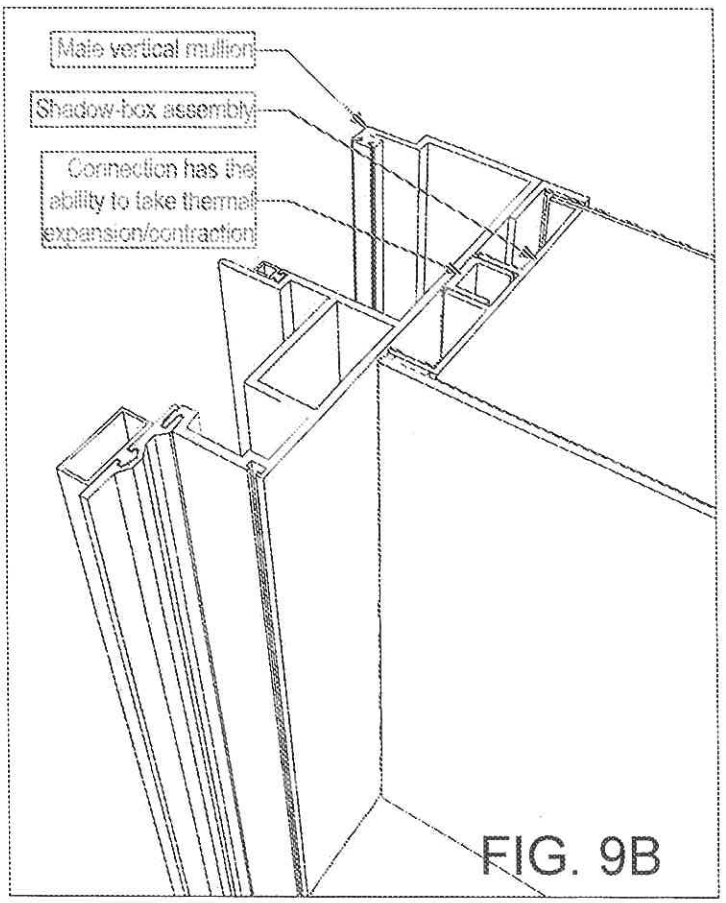


FIG. 9B

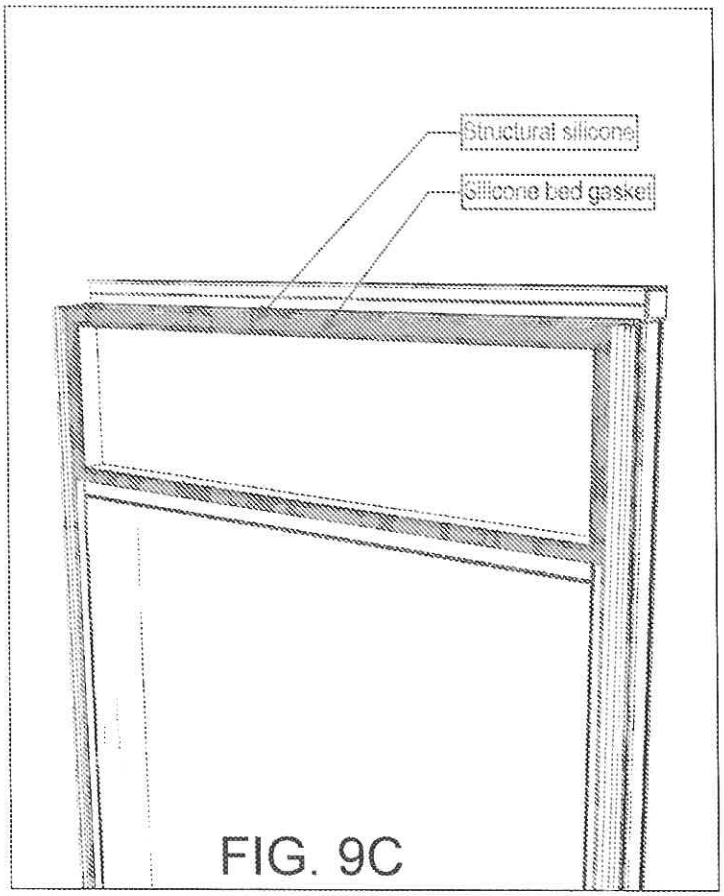


FIG. 9C

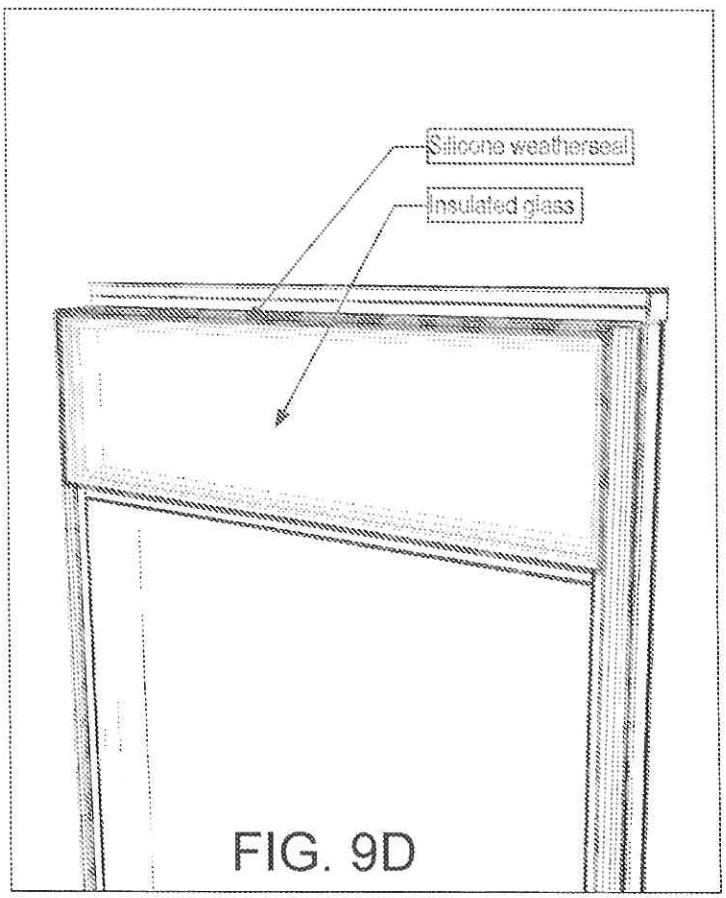


FIG. 9D

Curtainwall Details - Horizontal Section 1

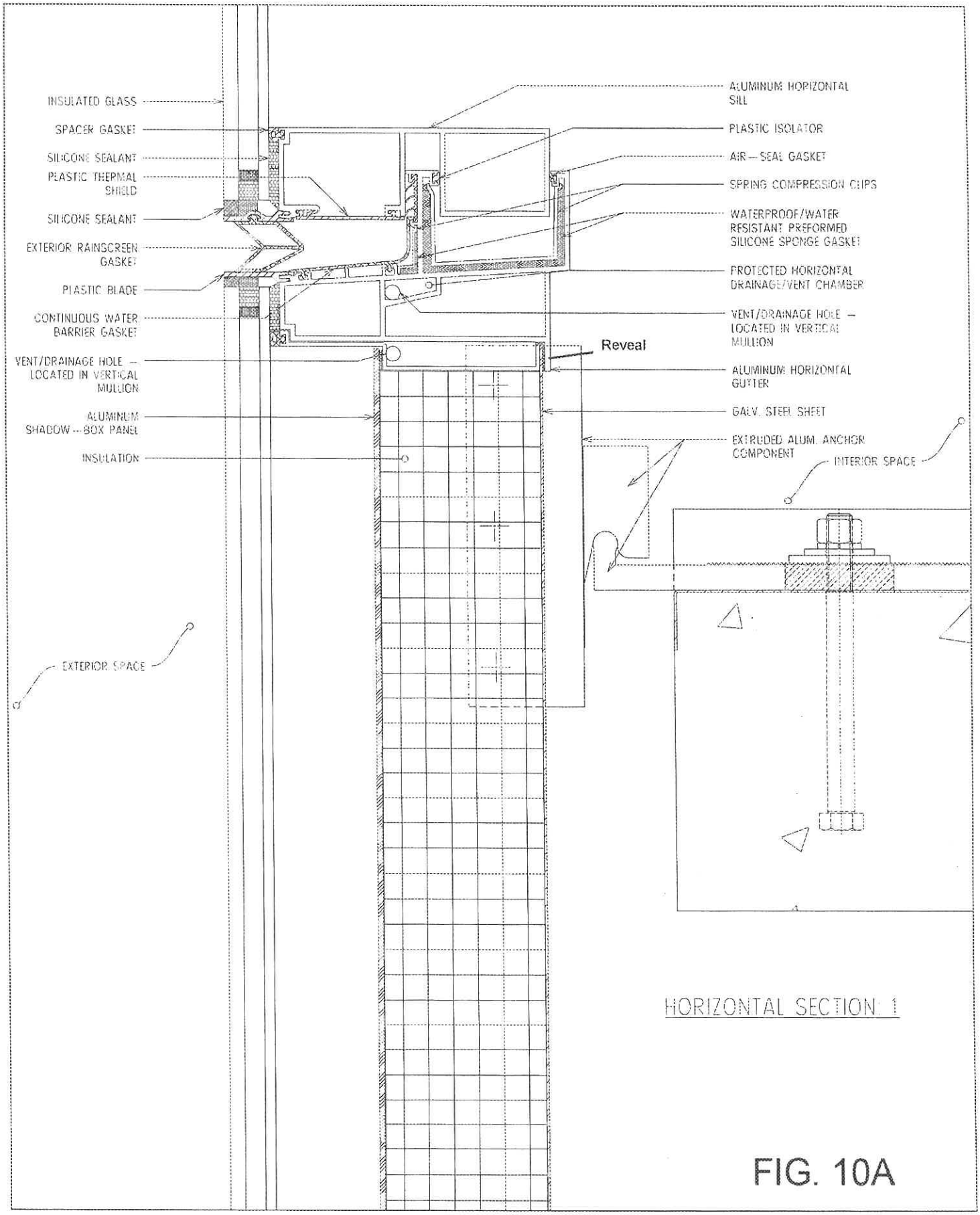
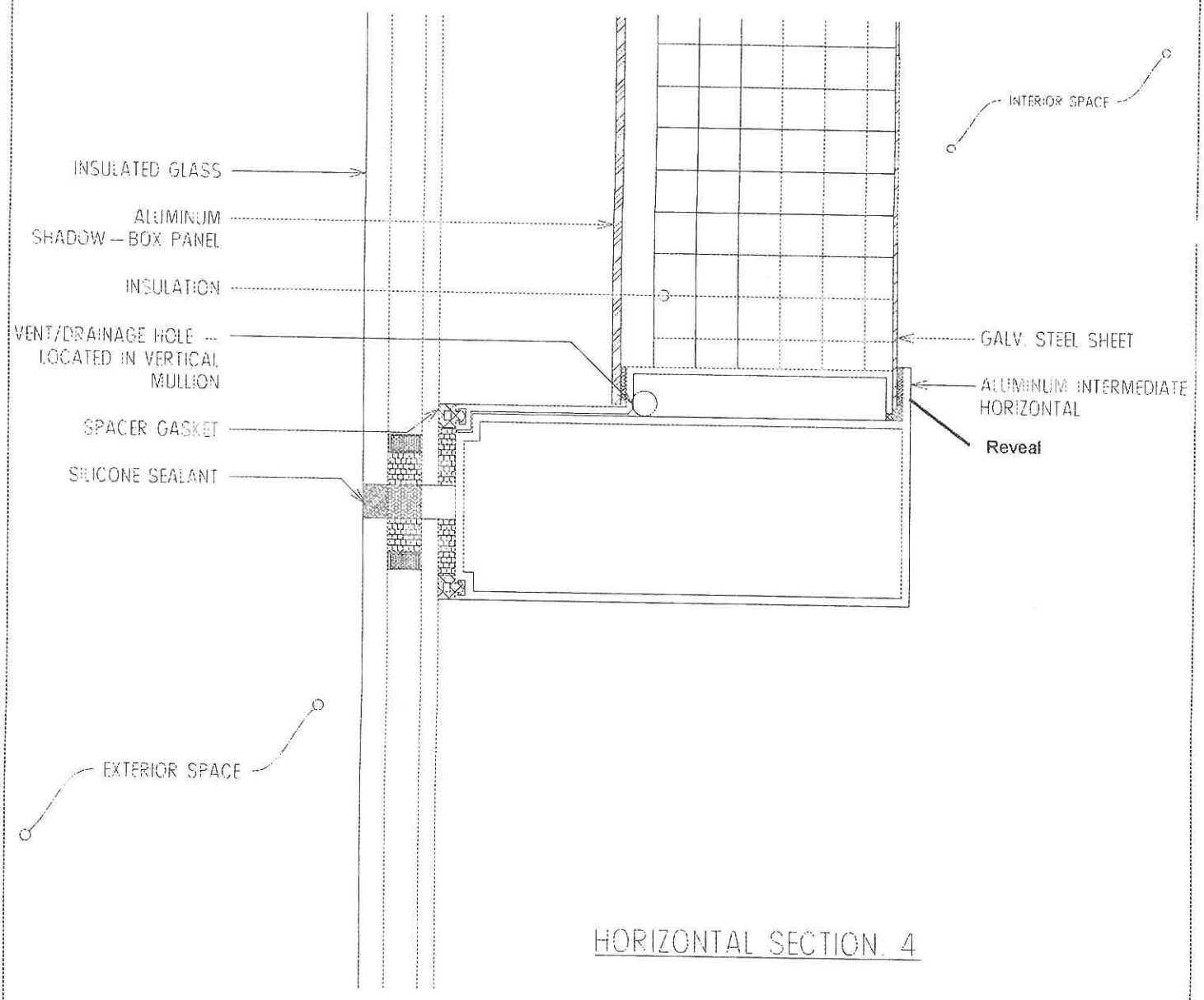


FIG. 10A

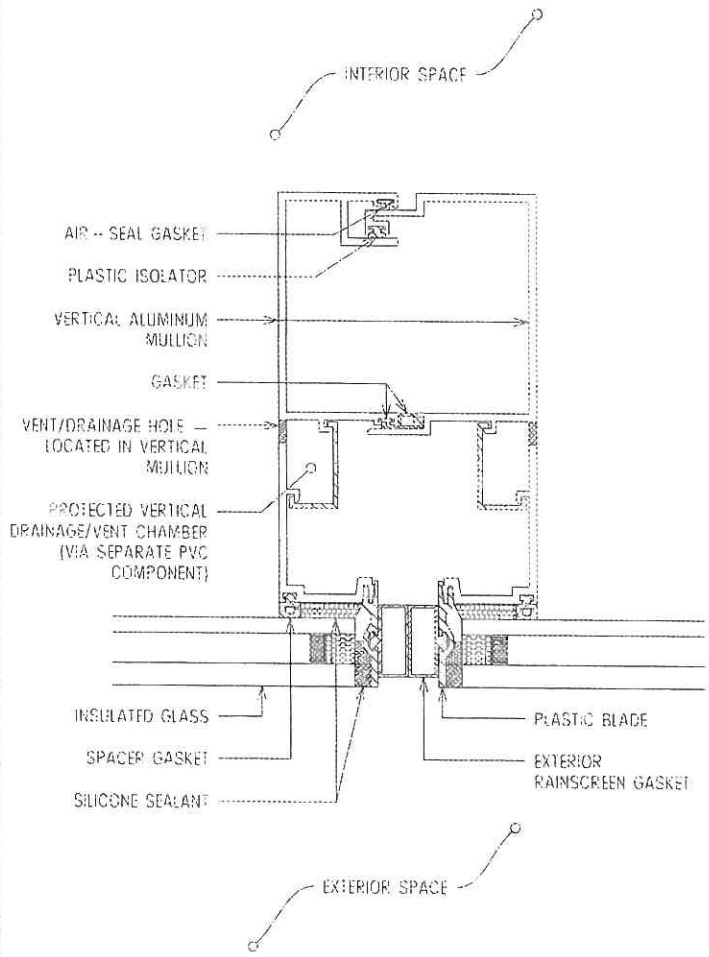
Curtainwall Details - Horizontal Section 4



HORIZONTAL SECTION 4

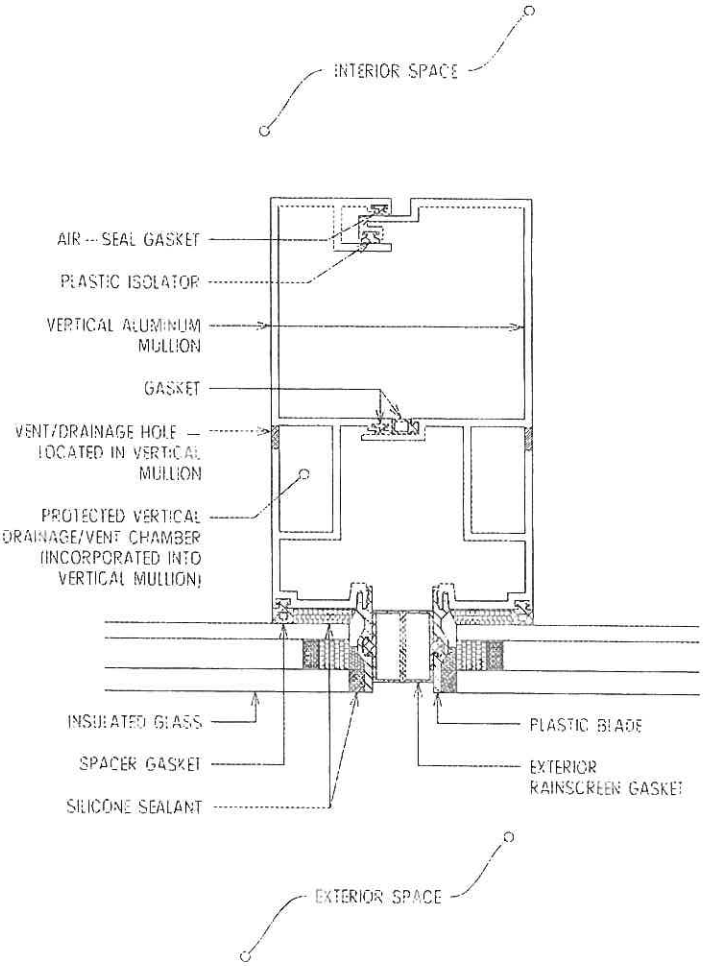
FIG. 10B

Curtainwall Details - Vertical Section 1



VERTICAL SECTION: 1A

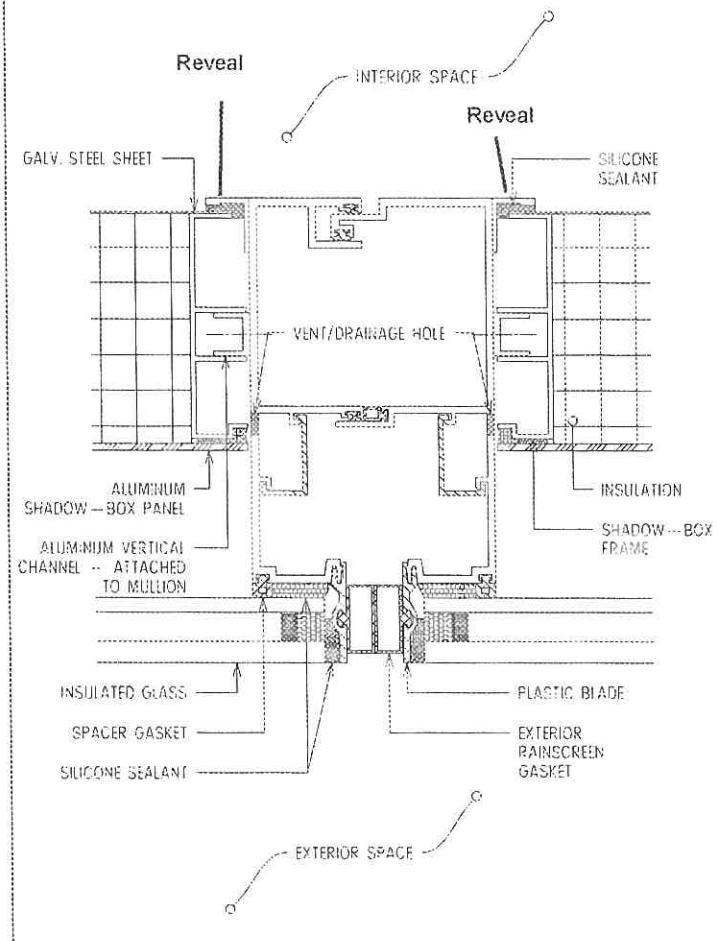
FIG. 10C-1



VERTICAL SECTION: 1B

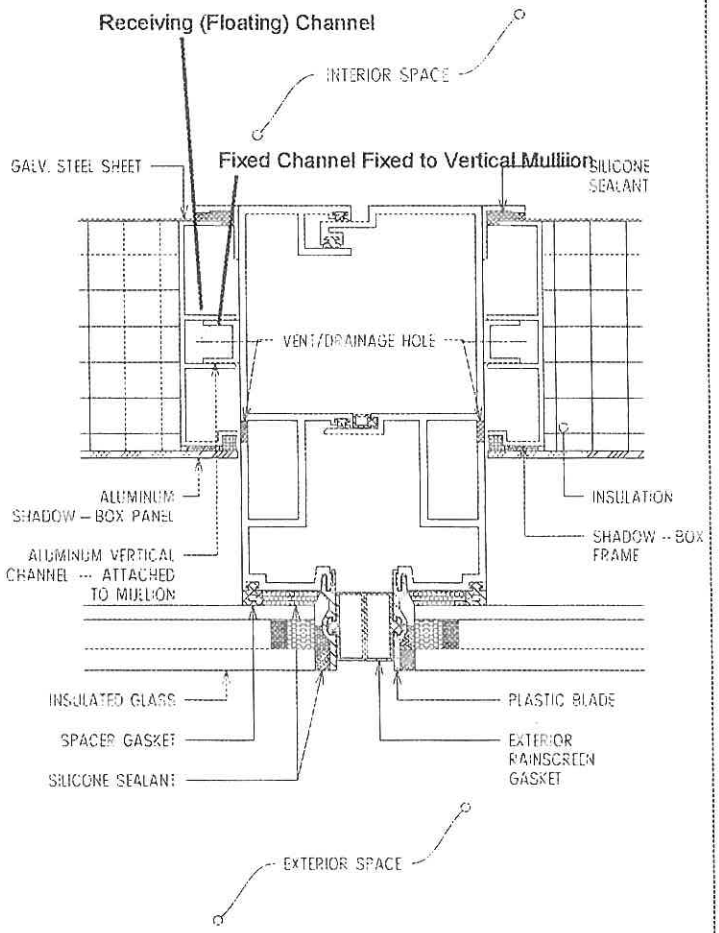
FIG. 10C-2

Curtainwall Details - Vertical Section 4



VERTICAL SECTION 4A

FIG. 10D-1



VERTICAL SECTION 4B

FIG. 10D-2

Curtainwall Details - Shadow-Box Assembly

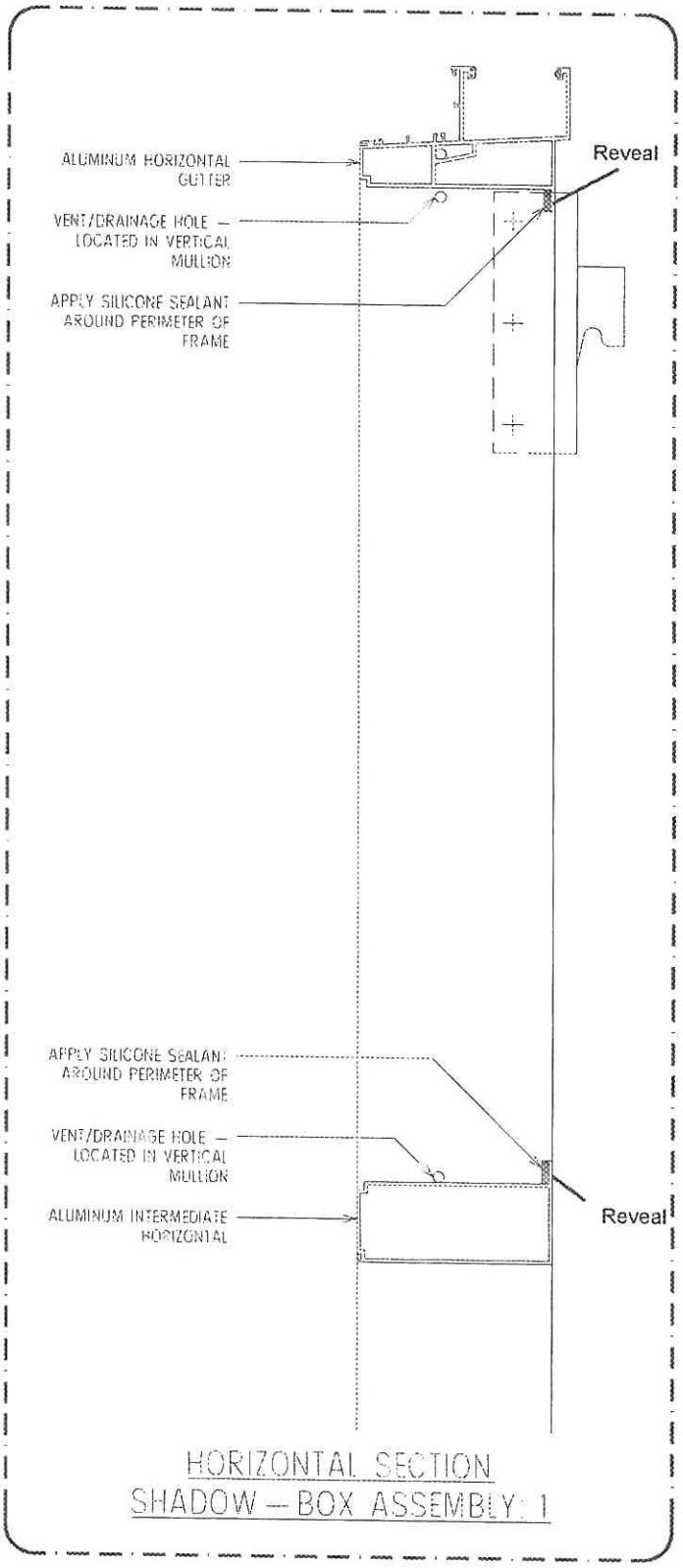


FIG. 11A

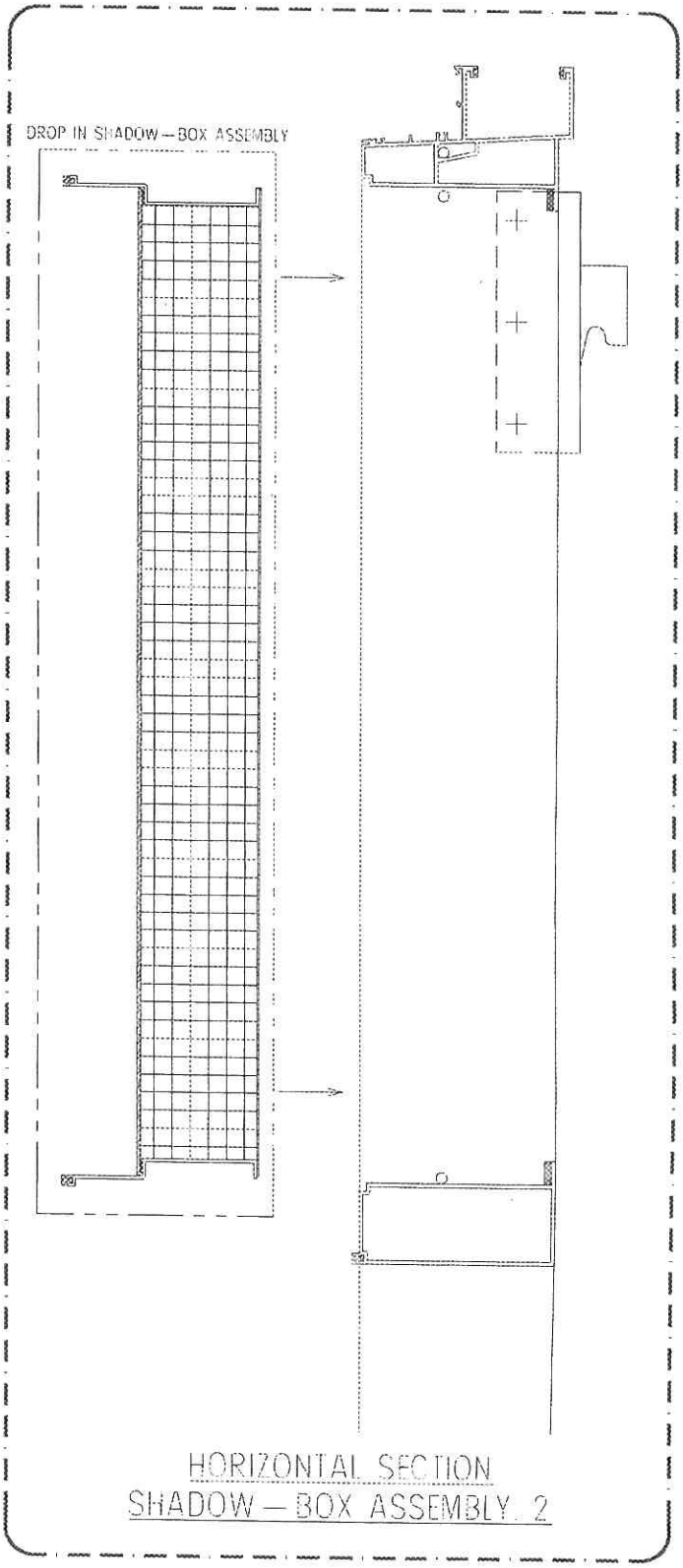


FIG. 11B

Curtainwall Details - Shadow-Box Assembly

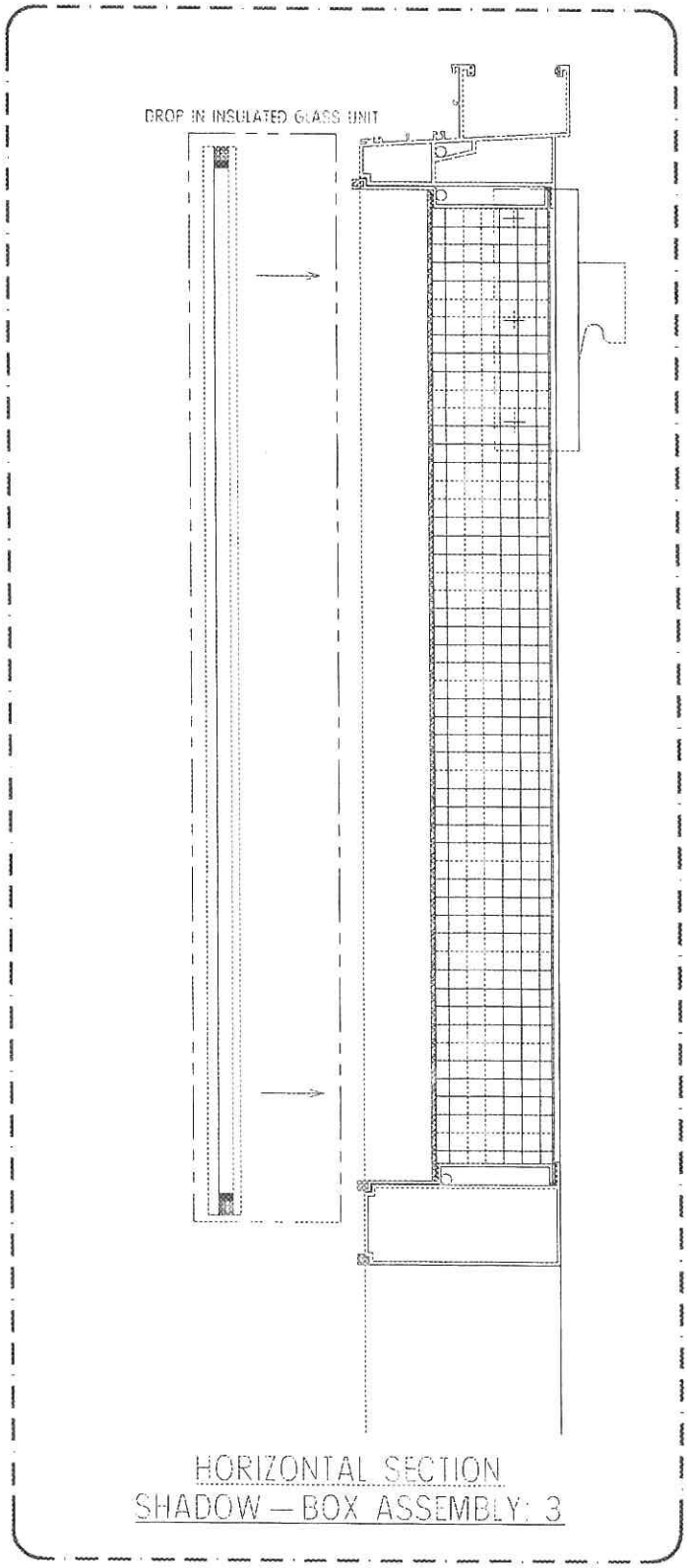


FIG. 11C

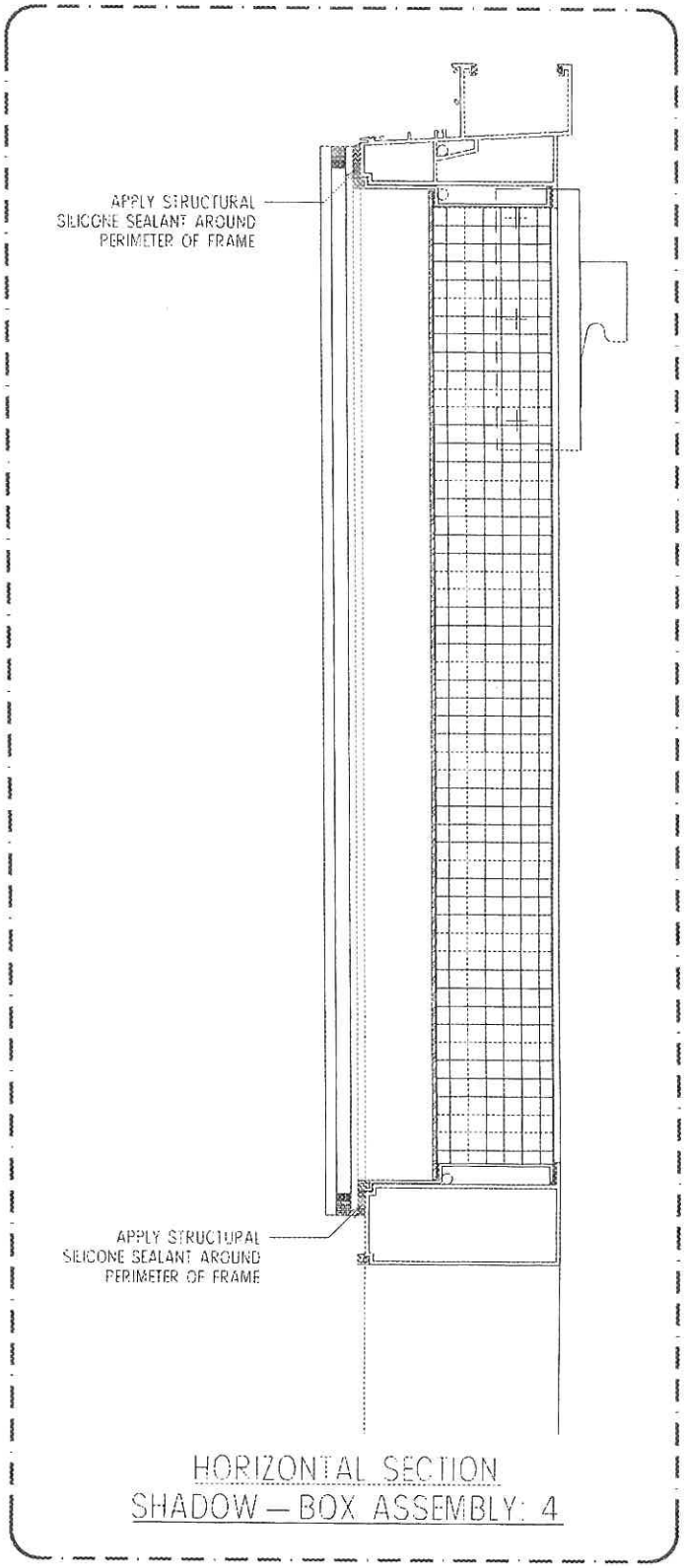


FIG. 11D