Acoustically Stiff Wall Patent # 10,580,396

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Technology Overview

Acoustically Stiff Wall – Patent # 10,580,396

The Acoustically Stiff Wall provides a better means of attenuating acoustic transmission across barriers such as walls separating rooms by blocking transmitted noise from one room to an adjoining room. The Acoustically Stiff Wall increases sound transmission loss performance and with a high transmission-loss-to-weight ratio. The Acoustically Stiff Wall barrier includes two flat rectangular structures meeting along a vertical demarcation made of material categorized by sound transmission loss. Unlike conventional wall panels, which are rectangular and flat, the Acoustically Stiff Wall is rectangular and V-shaped.



Capabilities

• Increases sound transmission loss performance

Benefits

• Reduces sound transmission

Benchmarks

Benchmarks are unique qualities that are used to compare against existing patents, patent filings, and commercially available products in this assessment tool.

Index Number	Title	Description		
1	Increases Sound Transmission Loss Performance	Increases sound transmission loss performance with high sound transmission-loss-to-weight ratio.		
2	Reduce Sound Transmission	Set angle and the respective materials of the two flat, rectangular structures are selected to reduce sound transmission by inducing respective acoustic vibratory motions of the two structures that tend to counteract.		

Market Research

Executive Summary

This section provides insights into market size, trends, and barriers to entry for commercial applications of the technology, as well as recommendations for deeper market research. Potential markets include Highway Sound Barrier, Infrastructure Construction, Industrial Noise Control, and Airport industry.

Potential Markets	Market Insights	
Noise Barrier Any type of structure, typically a physical barrier that interrupts or absorbs	 Market Size The global Noise Barrier Market is projected to grow from \$4.5 billion in 2021 to \$8.6 billion by 2030, at a Compound Annual Growth Rate (CAGR) of 6.3%. 	
sound	Market Trends	
	 Increasing population, with an awareness of health issues linked to noise pollution, and an increasing number of vehicles on road are some key factors driving the demand. The Ground-Mounted Noise Barrier market has increased in popularity among endusers, who include construction sites, transportation routes, industrial corridors, etc. Structure-mounted noise barriers are typically used in tall buildings, (where they are fixed to building façades), highways, and other structures, such as bridges and tunnels. The global Noise Barrier Market is expected to experience moderate growth, owing to the need for increased protection against environmental and man-made sound. 	

• The construction industry is expected to be a key end user driving demand for these barriers, especially in North American and Europe.

Barriers to Entry – Medium

Key Players

 Amcon Block & Precast Incorporated, Armtec Infrastructure Incorporated, Cretex Companies Incorporated, CRH PLC., Evonik Industries

Market Research (cont.)

Potential Markets

Infrastructure Construction

Construction with a focus on infrastructure, such as road and rail

Market Insights

Market Size

- The global Infrastructure Construction market was valued at \$2,242 billion in 2021 and is expected to reach \$3,267 billion by 2027, with a growth rate of 6.48%.
- The global Infrastructure Construction market is highly fragmented and competitive.

Market Trends

- The infrastructure sector's output over the forecast period will be buoyed by projects initiated under the \$1.2 trillion Infrastructure Investment and Jobs Act (IIJA).
- The global shift to sustainable infrastructure will require interventions and collaborative action from multiple participants.
- There is also an opportunity to reduce maintenance-related capital expenses using technologies such as intelligent drones.
- More broadly, the shift to remote working arrangements across many industries has underlined the growing need for secure, resilient, cloud-based technologies and connective infrastructure.
- Pressure from reductions in capacity and rising costs may encourage asset owners and project managers to accelerate the adoption of technologies such as artificial intelligence and robotics.

Barriers to Entry – High

- Before COVID-19, infrastructure-related budget gaps were already unexpectedly large in certain regions.
- Supply chain concerns.

Key Players

 ACS Group, VINCI, China State Construction Engineering Corporation Ltd (CSCEC), Skanska, Larsen & Toubro

Market Size

• The Industrial Noise Control Market was valued at \$6.32 billion in 2022 and is expected to reach \$8.54 billion by 2029, at a CAGR of 4.4%.

Market Trends

- The Industrial Noise Control market is expected to benefit from the rising manufacturing output in the East Asian region.
- The introduction of strict environmental regulations regarding noise pollution in industrial applications is also expected to boost market size.

Barriers to Entry – High

- The constant possibility of price fluctuations in raw materials (e.g., polymers and composites, as well as metal), is one of the most significant challenges facing players in the global market for Industrial Noise Control.
- The market is projected to be restrained by high system-production costs.

Key Players

• Saint-Gobain Ecophon AB, Gerriets GmbH, Iac Acoustics, Total Vibration Solutions Ltd., Pittsburgh Corning Europe n.v.

Industrial Noise Control Noise-reduction devices that use industrial equipment to minimize noise levels

Market Research (cont.)

Potential Markets

Airport Industry

Requires noise reduction to counteract significant amounts of foot traffic and loud machines operating on site.

Market Insights

Market Size

• The Airport Services market is projected to grow from \$97.87 billion in 2022 to \$290.23 billion by 2029, (a CAGR of 16.80%).

Market Trends

- The aviation sector is witnessing a transformation based on the emergence of Al technology-powered robots and devices at airports.
- Low-cost airlines have had a tremendous impact on the aviation industry.
- There is a growing need to expand airport infrastructure in smaller cities; airports are under continuous development to expand their infrastructure and customer experience.

Barriers to Entry – Medium

• Stringent government regulations hinder the growth of the airport and aviation-related market.

Key Players

• Beijing Capital international airport Co., Fraport AG Frankfurt Airport Services Worldwide, Air general inc., dnata, Worldwide flight services.

Conclusions

- Highway Sound Barriers remain a viable market, as the need for noise reduction related to highways and other major roadways is becoming apparent in neighborhoods near these thoroughfares.
- Infrastructure is also a viable market, since it encapsulates many large, growing industries in the global economy with a need for noise reduction.
- The Industrial Noise Control market is also attractive, with the increasing number of machines being built every year and the need to maintain quiet work environments for worker health and safety.
- The Airport Industry could also be a potential end-use area. There is a growing need for cheaper flights, and the expansion of airports to smaller cities will drive an increase in noise-reduction products.

Market Research (cont.)

Recommendations

Priority Key:

- Must: A critical and time sensitive recommendation to advance technology with respect to the area of focus.
- **Should:** An important recommendation to advance technology but is dependent upon predecessor recommendations or is not time sensitive.
- **Could:** A recommendation that will have insignificant impact on advancing the technology but could be a beneficial consideration.

Recommendations	Priority	ROM Cost	ROM Timeline
Advance TRL and MRL Plan	Should	\$15,000	4 months
Market Planning and Scouting	Should	\$35,000	6 months
License technology	Should	\$15,000	2 months
ROM Total:		\$65,000	

Level of Market Opportunity



Analyst: DVIRC



Competitor Analysis

Competitor Analysis Intent

The intent of this section is to identify potential commercially available competing technologies and provide conclusions and recommendations based on the information provided at the time of assessment. The resulting information may be used to identify technology strengths or weaknesses in features or claims as well as potential licensing partners.

Research Methods

Various resources to uncover information about different companies that perform similar functions

Markets	Competitors	
Highway Sound Barriers	 Amcon Block & Precast Incorporated: Concrete blocks are chosen for strength, economy, and design flexibility; have been used to build walls along roadways but not specifically pertaining to sound barriers. Troy Acoustics: Design and build highway sound barriers and walls in many locations; reduce the sound of highway traffic and have added a measure of aesthetic enhancement to local communities with the Troy System[™] products and installations. ArtUSA Noise Control Products: A sound wall barrier with a density of more than 4 pounds per square foot, able to withstand a considerable "wind live load" of 45 pounds per square foot, which delivers strength and noise reduction performance for multiple industrial and commercial uses. 	
Infrastructure Construction	 ACS Group: The ACS Group maintains an expansive product line, which includes size reduction equipment (granulators and shredders), material conveying equipment, metering and blending devices. All loud machines which could benefit from noise reduction. VINCI: VINCI is a world leader in concessions, energy, and construction, active in more than 120 countries. Larsen & Toubro: Heavy Civil Infrastructure business; involved in the construction of a 7.75 Km Coastal Road. 	
Industrial Section	 Saint-Gobain Ecophon AB: At forefront of acoustic innovation and unrivalled in meeting acoustically challenging environments by providing sound absorption and speech intelligibility. Total Vibration Solutions Ltd: UK's market-leading acoustics, noise, and vibration control specialists, as well as a leading national supplier and installer of acoustic floors to commercial cinemas, theaters, gyms, and residential and commercial buildings. 	
Airport Industry	 Beijing Capital international airport Co: International airport serving the city of Beijing in People's Republic of China; currently the world's busiest airport. Air general Inc: One of the largest networks of independent handling companies in the U.S., operating over 250,000 sq. feet of customs-bonded warehouse space, they handle over 548 Million lbs. of cargo annually in 21 states at some of the nation's major airports. 	

Competitor Analysis (cont.)

Markets	Competitors		
Substitutes			
High Absorption Acoustic Fabrics	 Gerriets GmbH: Acoustic curtains and fabrics not only contribute to the acoustics of a space by absorbing sound at different frequencies, but they can also be used to create temporary sound-isolated rooms. Acoustical Solutions: Acoustical fabric for wrapping acoustical wall panels without reflecting sound off the surface. FabricWall: A site-built, acoustical stretch fabric system for walls and ceilings. FabricWall's Track System accepts and fastens a variety of fabrics while using sound-absorbing cores to create beautiful, high-performance surfaces. BCI: Sound barriers that protect personnel from the impacts of noise pollution. 		
Acoustic Panels	 SoftWalls Inc.: A leader in the installation of acoustical and tackable stretch fabric systems for walls and ceilings. Acuslat Wall Panels, LLC. Acoustics America LLC: Fabric-wrapped, sound absorbing panels in a wide array of colors, sizes, and thicknesses, to absorb excess noise according to individual design and aesthetic needs. 		

Conclusions

These markets indicate the ways this invention can be used to produce improved noise-reduction results.

The primary substitutes are both very competitive products that are already in use. Although they are not exactly a complete fit for the use on highways or other valuable end use industries, the substitutes are viable in other areas where sound reduction is needed.

Technology Readiness Level – Hardware

Technology Readiness Level Intent

Current TRL

The intent of this document is to determine the level of effort required to advance the technology from its current state to a desired future state. Project tasks may be proposed to assist in technological advancement. The *Technology Readiness Level (TRL) Deskbook* version July 2009 served as the reference document for the TRL assessment. TRLs run from 1 to 10.

Research Methods

TRL determination has been conducted on applicable levels as seen below. The assessment was conducted by reviewing the following materials:

- Technology Overview
- Patents No. 10,580,396
- Q&A call with inventor

Findings

The Acoustically Stiff Wall improves acoustic performance by blocking noise from side A to side B of a wall. The Acoustically Stiff Wall has been developed, prototyped, and tested, but only in a lab environment; there has been no real-world evaluation, resulting in a TRL 5. The Acoustically Stiff Wall has also been licensed to a west coast manufacturer with limitations to certain states. The production and sales status are unknown. 100% of the of the components will be commercial off-the-shelf (COTS) parts, including the steel itself and acoustic fill (if applicable). A Technical Data Package (TDP) and Bill of Materials (BoM) have been created for the Acoustically Stiff Wall. In terms of approvals and accreditations, every panel must be tested to an ASTM standard to confirm the sound absorption claims. It may also have to meet OSHA approvals depending on its use case.

Conclusions

From the current state of the Acoustic Stiff Wall technology level, there are a few crucial next steps to advance its readiness level. The development of a cost model is needed for potential manufacturers, as well as finalization of a design for manufacturability.

Technology Readiness Level – Hardware (cont.)

Recommendations

Priority Key:

- Must: A critical and time sensitive recommendation to advance technology with respect to the area of focus.
- **Should:** An important recommendation to advance technology but is dependent upon predecessor recommendations or is not time sensitive.
- **Could:** A recommendation that will have insignificant impact on advancing the technology but could be a beneficial consideration.

Recommendations to advance TRL to 9	Priority	ROM Cost	ROM Timeline
Build prototypes and test in operational environment(s)	Must	\$2,500	1 month
Update TDP/BoM	Should	\$1,000	1 month
Third party TRL revision	Could	\$2,500	1 month
Integration with existing systems	Must	\$2,500	1 month
Design for Manufacturing	Should	\$2,500	1 month
ROM Total:		\$11,000	3-5 months



Analyst: DVIRC



Manufacturing Readiness Level

Manufacturing Readiness Level Intent	Current MRL
The intent of this effort is to determine the level of effort required to advance the technology from its current state to desired future state. Project tasks may be proposed to assist in the advancement of the technology. The <i>Manufacturing Readiness Level (MRL) Deskbook</i> version	4
2.0 served as the reference document for the MRL assessment. MRLs run from 1 to 10.	

Research Methods

Although a contractor has not been identified, an MRL determination has been conducted on applicable levels as seen below. The assessment was conducted with the following events and materials:

- Q&A interview with the inventor
- Patent No. 10,580,396
- · Bill of Materials and limited data package

Findings

The MRL will generally track with the TRL but be slightly lower. The following is an assessment of the technology's current MRL and reasoning for the rating.

The Acoustically Stiff Wall has been developed, prototyped, and tested in a laboratory environment, categorizing it as MRL 4. The rights were purchased and licensed to another manufacturer for manufacturing in limited states, primarily in the western U.S..

The Acoustically Stiff Wall is made from bent metal plates to achieve the correct angularity needed, then it may be filled with noise-dampening material such as fiberglass, rock, or other soft materials to further increase the noise damping of the wall. A Technical Data Package (TDP) and Bill of Materials (BoM) have been created for the Acoustically Stiff Wall, but there is not a cost model available.

The Acoustically Stiff Wall is made in a standard size so there should not be any custom manufacturing capabilities or processes needed. Having capabilities to bend sheets of steel with the use of a large industrial brake or other advanced bending tool is important to account for manufacturing of large walls. The fabrication of the Acoustically Stiff Wall is 100% commercial off-the-shelf parts (COTS) including the steel and the acoustic fill. For approvals and accreditation, every panel must be tested to an ASTM standard to confirm it absorbs what it claims it will and OSHA approvals may be required depending on its use case. There is no need for any custom software to use this invention since it is a stationary object and there are no electronics involved.

Conclusions

The Acoustic Stiff Wall exists at a MRL 4. To further this invention, licensing is needed to manufacture and sell in the states not restricted by the other licensing agreement. Completing further testing in operational environments to prove the effectiveness of the invention would be essential. A more thorough MRL assessment should be completed when a supplier is identified, and an evaluation can be made in a production environment.

Manufacturing Readiness Level (cont.)

Recommendations

Priority Key:

- Must: A critical and time sensitive recommendation to advance technology with respect to the area of focus.
- **Should:** An important recommendation to advance technology but is dependent upon predecessor recommendations or is not time sensitive.
- **Could:** A recommendation that will have insignificant impact on advancing the technology but could be a beneficial consideration.

Recommendations to advance MLR	Priority	ROM Cost	ROM Timeline
Finalize Cost Model	Should	\$1,000	1 month
Scout assembly/COTS suppliers	Must	\$2,000	1 month
Produce system in a relevant environment (mfg. line, production line)	Must	\$6,500	2 months
Finalize manufacturer search	Must	\$2,500	1 month
Perform a Critical Design Review (CDR)	Should	\$2,000	1 month
Third party MRL revision	Could	\$3,500	2 months
Progress toward full-rate production	Should	\$2,500	2 months
Complete Design for Manufacturing	Should	\$2,500	1 month
ROM Total:		\$22,500	9-11 mos



Analyst: DVIRC



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DVIRC



2905 Southampton Road Philadelphia, PA 19154

> 215-464-8550 info@dvirc.org www.dvirc.org



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