IN THE INTERNATIONAL BUREAU OF WIPO

Applicant:	USG INTERIORS, LLC
International Application No.	PCT/US2017/050225
International File Date:	September 6, 2017
Title:	ACOUSTICALLY TRANSPARENT COATING
Confirmation No.:	4304
Authorized Officer:	Andreas Jung
Customer No.:	89462
Docket No.:	DPC-56500WO

SUBMISSION OF INFORMAL COMMENTS IN RESPONSE TO THE WRITTEN OPINION ISSUED BY ISA (EPO)

Via Fax: 011-41-22-338-8270

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20
SWITZERLAND

Dear Sir:

This communication is filed in response to the International Search Report and the Written Opinion by the International Searching Authority, mailed on November 27, 2017.

Applicant submits the following informal comments.

Applicant's claim 1 is directed to a formulation for an acoustically transparent coating characterized by "high pigment to volume concentration", "high viscosity", and "high shear thinning". The disclosure gives exemplary ranges of these characteristics at FIG. 4, and page 7, line 26 to page 8, line 11. Applicant's claim 8 is directed to the final structure of the inventive coating.

The characteristics of the claimed coating set out in claim 1 and claim 8 are distinguishable from the prior art D1-D4. Claims 1 and 8 provide both novelty and an inventive step over such prior art as is apparent from the following analysis.

4. Novelty and 5. Inventive Step

D1 discloses a formulation for acoustical panel not for a coating. The coatings of D1 have no disclosed formulation and no large filler particles. The coarse particles of D1 are not part of a coating formulation but are "dropped onto the prime coat 4". D1 has no mention of viscosity or high shear thinning.

D2 discloses a coating composition for the backing (rear) side of an acoustical panel. There is no mention of the coating being acoustically transparent, porous, highly viscous, or having high shear thinning attributes. The coating must be cured at 100 to 400° C which is impractical for use with a monolithic ceiling.

D3 professes to disclose an acoustically transparent paint. D3 does not disclose "high viscosity" or "high shear thinning... to enable the formulation to be sprayed in droplets that retain their identity when in mutual contact" as claimed by Applicant.

D4 has a much lower viscosity than Applicant's formulation and has no shear thinning properties as claimed by Applicant. Still further, D4's composition requires use with only compatible substrates so that it "has to have greater affinity for itself than the surface to which it is applied", page 2, lines 44, 45. The utility or performance of Applicant's claimed coating is not dependent on the characteristics of a substrate.

6. Clarity

6.1 The features of claims 1, 5 and 6 identified by the Authorized Officer are presented to provide an explanation of the results obtained from the claimed formulation and do not merely state an underlying problem.

6.2 The terms selected by the Authorized Officer are all defined and limited in Applicant's specification.

6.3 Claim 2: BBU units are Brabender Units as indicated at page 7 of the specification.

Claim 3: This objection has no merit since any conventional particle size measurement device can be utilized.

Claim 5: This limitation is explained at the bottom of page 9 of the specification.

7. Disclosure

Applicant's invention, readily distinguishable from each of D1 to D4, is entitled to broad protection. Without functional definitions Applicant would not be adequately protected in a manner commensurate with the advance in the art the invention provides.

Respectfully submitted,

By:_____
Howard G. Shimola, Reg. No. 26232

1801 East Ninth Street
Suite 1200
Cleveland, Ohio 44114-3108

(216) 579-1700

January 9, 2018

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 March 2018 (15.03.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/048865 A1

(51) International Patent Classification:
C09D 5/02 (2006.01)

(21) International Application Number:
PCT/US2017/050225

(22) International Filing Date:
06 September 2017 (06.09.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
15/258,159 07 September 2016 (07.09.2016) US

(71) Applicant: **USG INTERIORS, LLC** [US/US]; 550 West Adams Street, Chicago, IL 60661-3676 (US).

(72) Inventors: **BURY, Rafael**; 1226 Sarasota Drive, Wheeling, Illinois 60090 (US). **LI, Donghong**; 415 Chateau Drive, Buffalo Grove, IL 60089 (US). **HULKA, Samuel D.**; 103 N. Cathy Lane, Mount Prospect, Illinois 60056 (US).

(74) Agent: **SHIMOLA, Howard** et al.; Pearne Gordon, 1801 East Ninth Street, Cleveland, Ohio 44114-3108 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: ACOUSTICALLY TRANSPARENT COATING

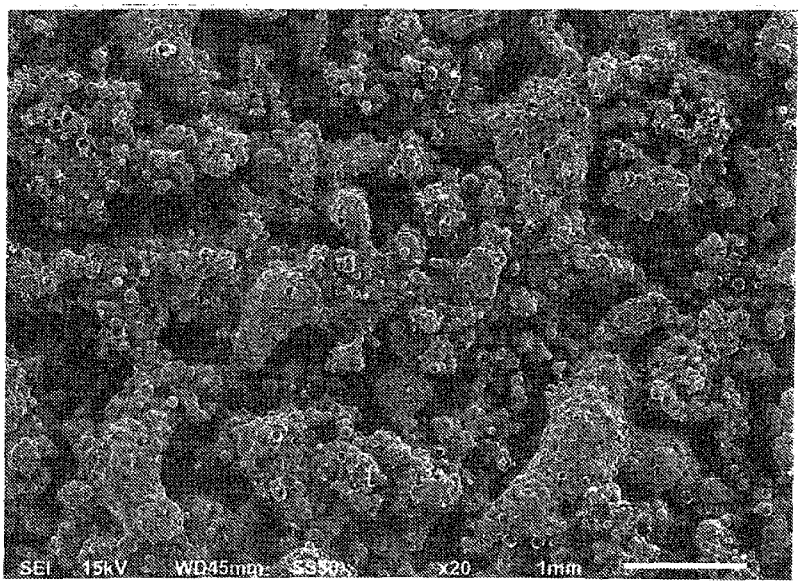

FIG. 3

(57) Abstract: A formulation for an acoustically transparent coating for use on an acoustical substrate comprising a water dispersible binder and relatively large filler particles, and characterized by a high pigment to volume concentration, high viscosity, high shear thinning, and fast drying to enable the formulation to be sprayed in droplets that retain their identity when in mutual contact.

WO 2018/048865 A1

[Continued on next page]

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

ACOUSTICALLY TRANSPARENT COATING

BACKGROUND OF THE INVENTION

The invention relates to acoustically transparent coatings useful for improving the appearance of acoustical substrates.

PRIOR ART

U.S. Patents 8,684,134, 8,770,345 and 8,925,677 disclose drywall sheets or panels used to construct monolithic acoustical ceilings. The panels are perforated and clad with a thin, porous, translucent web such as a non-woven translucent fiber glass veil or scrim. Joints between the panels can be finished with tape and joint compound in the same manner as ordinary drywall is taped per gypsum association publication GA-216-2013.

There is a need for a coating that can be applied across the drywall panels to conceal the taped joints and the perforations visible through the veil and that does not significantly diminish the sound absorption afforded by the panels. It is important that the coating can be applied without requiring excessive skill on the part of a painter or tradesman and that a full coating will dry within a limited time, preferably less than half of a single work day.

SUMMARY OF THE INVENTION

The invention provides a finish or appearance coating for an acoustical substrate that is characterized by a high porosity and a resulting high acoustical transparency. The coating is particularly useful for concealing the perforations in drywall sheets clad with a translucent or semi-transparent non-woven veil and taped

joints between such sheets in a monolithic acoustical ceiling construction.

The disclosed coating material is adapted to be sprayed in droplet form in multiple layers that are allowed to dry before a successive layer is applied. The resulting coating structure is a three dimensional matrix of residual droplets and intervening voids or pores. The coating material is characterized by relatively large filler particles, high pigment volume concentration, substantial shear thinning, and fast drying properties.

The coating material is sprayed in a form of relatively large droplets. Owing to the physical properties of the material, the droplets retain at least some of their individual character once deposited on the substrate or the previous layer of the material. The droplets, due to their viscosity and quick drying properties, do not fully merge with adjacent droplets. The droplets retain sufficient individuality to provide open spaces between the droplets of the same coating layer as well as the previous coating layer. The open spaces, which are small enough to be overlooked by the unaided eyes of a casual observer in a ceiling application, interconnect through the separate coat layers providing a porosity through the entire thickness of the coating.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, schematic, isometric view of a gypsum panel acoustical monolithic ceiling employing the invention;

FIG. 2 is a fragmentary, cross-sectional view on an enlarged scale of the monolithic acoustical ceiling of FIG. 1;

FIG. 3 is a scanning electron microphotograph of a face of the inventive coating;

FIG. 4 is a graph of the viscosity of a preferred formula of the inventive coating; and

FIG. 5 is a graph of the air flow resistivity of the inventive coating.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown a schematic partial view of an acoustical monolithic ceiling installation 10. Portions of layers of the ceiling 10 are peeled away to reveal constructional details. The ceiling 10 is a suspended system including a drywall grid 11, known in the art, comprising main tees 12 spaced on 4 ft. centers and intersecting cross tees 13 spaced on 16 in. or 2 ft. centers. Dimensions used herein are typically nominal dimensions and are intended to include industry recognized metric equivalents. The main tees 12, to which the cross tees 13 are interlocked, are suspended by wires 14 attached to a superstructure (not shown). A perimeter of the grid 11 is conventionally formed by channel molding 15 secured to respective walls 16.

Acoustical panels 20 are attached to the lower sides of the grid tees 12, 13 with self-drilling screws 21. The illustrated acoustical panels are 4 ft. by 8 ft. in their planar dimensions, but can be longer, shorter and/or of different width as desired or practical. The size of the panel 20 and spacing of the grid tees 12 and 13, allows the edges of the panel to underlie and be directly attached to a grid tee, assuring that these edges are well supported.

Referring to FIG. 2, the acoustical panel 20 is characterized with a perforated gypsum core 24. One

method of providing the core 24 is to modify a standard commercially available sheet of drywall by perforating it through a front paper face 23, the gypsum core 24, and a rear paper side or face 25. Perforations 28 can be formed by drilling, punching, or with other known hole-making techniques. The perforations 28 are preferably uniformly spaced; by way of an example, the perforations can be round holes of 8 mm diameter on 16 mm centers. This arrangement produces a total area of the perforations substantially equal to 20% of the full planar area of a panel 20. Other hole sizes, shapes, patterns and densities can be used. For example, tests have shown that a hole density of 9% of the total area can achieve good results. Marginal areas, as well as intermediate areas corresponding to centers of support grid, joists, or studs, of a sheet can be left unperforated to maintain strength at fastening points.

Sheets 29, 30 are laminated to both full sides of the perforated drywall sheet thereby at least partially closing both ends of the perforations 28. At a rear side of the drywall, the backer sheet or web 30 is preferably an acoustically absorbent non-woven fabric known in the acoustical ceiling panel art. By way of example, the backer fabric can be that marketed under the trademark SOUNDTEX® by Freudenberg Vliesstoffe KG.

At a front side of the drywall sheet 22, a sheet or web in the form of a non-woven fabric scrim layer 29 is attached with a suitable adhesive. The facing layer or sheet 29 is porous; a suitable material for this application is that used commercially as a cover or face for conventional acoustical ceiling panels. An example of this type of veil material is that marketed by Owens Corning Veil Netherlands B.V. under the product code A125 EX-CH02.

The panel 20 with other identical panels is hung on the grid 11 in the same manner as ordinary drywall is installed. Similarly, as shown in FIG. 1, joints 33 are taped in the same way as regular drywall is taped. Drywall joint compound or similar material 34 is used to adhere a tape or similar material 35 to adjacent margins of two abutting panels 20 by applying it directly to the sheets 29 and over the tape 35 to conceal the tape.

After the joint compound 34 has been sanded or sponged smooth, the front sheets 29 and remaining joint compound are painted with an acoustically transparent coating 31 of the invention. When the term monolithic is used herein, it is to denote that essentially the entire visible surface of a ceiling or wall appears to be a seamless expanse without joints.

The coating 31, in accordance with the invention, is sprayed onto the room facing side of the panels 20 clad with the scrim or veil 29 which constitute a substrate for the coating. The coating 31, ideally, has several physical properties including relatively large filler particles, high pigment volume concentration (PVC), high viscosity, shear thinning, and fast drying performance. When used as an appearance coat for ceiling structures, the coating 31 should dry white.

A formulation for a suitable coating includes a binder and relatively large particles serving as a pigment or filler of a size larger than that ordinarily used in conventional paint-like coatings. The binder can be a resin or polymer binder in or useable as an aqueous dispersion such as, but not limited to, acrylic, styrene, or vinyl polymer latex or oil-based media such as an alkyd, polyurethane, polyester, or epoxy and combinations thereof.

The relatively large particles include, but are not limited to, glass spheres, perlite, ceramic, fly ash, polymeric spheres, borosilicate, coarse sand, silica, and coarse carbonate. The relatively large particles are spherical or three-dimensional in shape without a prominent plate-like character or without a primarily columnar shape. The size of the large particles can range between 20 and 900 microns.

Table 1 below sets out an example of a suitable formula for the inventive acoustically transparent coating 31.

TABLE 1

MATERIALS	SOURCE	WEIGHT %	WEIGHT % RANGE	FUNCTION
Water		37.49	(10-70)	Solvent
Natrosol HHXR	DOW Chemical	0.41	(0-2)	Thickener
Tamol 1254	DOW Chemical	0.29		Dispersant
Titanium Dioxide	Tioxide	6.11		Filler
Haltech HP 42-296	Haltech	15.97	(0.05-80)	Latex Binder
Calcium Carbonate	Omya	29.60	(0-60)	Filler
Mica P80F	USG	3.70		Filler
Troykyd D01	Troy Chemical	0.19		Defoamer
Texanol	Eastman Chemical Co.	0.37		Coalescent
Mergal 174 II	Troy Chemical	0.16	(0-0.3)	Biocide
3M K1	3M	5.70	(1-25)	Filler
		100.00		

The function or role of the various constituents is noted in the column on the far right. Water, thickener, binder and large particle filler are essential and the

biocide is essential while the formula resides in a can. The remaining constituents can be considered optional. For reference purposes, the titanium dioxide has an average particle size of about 0.6 microns; the calcium carbonate can have an average particle size of about 12 microns, and the plate-like mica can have major dimensions of about 20 microns.

The 3M K1 material is glass bubbles (hollow spheres) of soda-lime borosilicate with a reported true density of typically 0.125 grams/cc. and an average particle size of 65 microns. The 3M K1 material is particularly useful in practice of the invention. This material occupies much of the volume of the formulation owing to its relatively low density resulting from its hollow sphere structure. The K1 material, additionally, has a relatively low oil absorption of 0.2 - 0.6 grams oil/cc of product per ASTM D281-84. Still further, the K1 material has a natural white color which is useful in ceiling applications. The titanium dioxide serves as an opacity improving filler and whitening pigment. The calcium carbonate increases the solids and density of the coating to further improve drying time and hardness of the dried coating.

The pigment volume concentration (PVC) of the coating formulation, based on all the solids, is relatively high and ideally is between 75% and 95% while alternative formulations will fall in a wider range of about 50% to about 99%. Generally, there is insufficient binder when the coating is dry to fill the voids between the particles in the coating allowing air gaps in the coating. The ratio of the volume of relatively large particle fillers to fillers of more conventional lesser size can range between about 0.1 to about 10.

The coating formulation of Table 1 has a relatively high viscosity of about 190 BBU (Brabender Units) to

about 265 BBU at room temperature. Alternative formulations can have a viscosity of between about 66 BBU to about 1450 BBU at room temperature.

The coating formulation of Table 1 is, and alternative formulations should be, characterized by a high rate of shear thinning. The shear thinning characteristics of the Table 1 formulation is shown in FIG. 4 where by the measured viscosity drops more than 40:1. The viscosity, in part, is contributed by the thickener component of the formulation. The listed thickener is cellulosic, but known synthetic and natural thickeners can be used. The thickener also serves to keep the constituents in suspension. The viscosity chart of FIG. 4 was measured on a Brookfield HA viscometer using a T-bar:C spindle. Alternative coating formulations should have a high shear thinning property so that the viscosity can reduce by a factor of at least 10 to 1 under shear conditions.

The coating of Table 1 or an equivalent is preferably applied to the taped veil clad, perforated drywall panels or other substrate in a spray process of separately sprayed layers. Each layer or coat is allowed to substantially dry before a subsequent coat is applied. Preferably, the wet coating material is sprayed in large droplets using, for example, a conventional hopper texture sprayer such as that marketed by Graco. Ideally, the gun and/or its air supply is adjusted so that the droplets are about 1 to about 4 mm. in size and, preferably, about 2 mm. in size. The shear thinning property, demonstrated in FIG. 4, of the wet coating allows it to be readily sprayed in droplet form despite its high viscosity. A single coating layer should involve spraying the substrate in two perpendicular directions or passes so that a uniform covering by the

layer is achieved. Two to seven layers can be applied, with four layers being preferred, to conceal the perforations and taped joints of the ceiling. Coverage by the total coating layers can be between 15 to 35 square foot per gallon, with 25 square foot being preferred. The formulation of Table 1 or a like formulation has a density of 4 to 11 lbs. per gallon with a preferred range of 5 to 6.5 lbs. per gallon.

FIG. 3 demonstrates the porous nature of the inventive coating when applied to an acoustical substrate. Inspection of FIG. 3 shows that the droplets retain an individual nature while the binder bonds the solids to the substrate at the first layer and to adjacent droplets between and among layers. The scale on the lower right-hand corner of FIG. 3 indicates a measure of 1 mm. and droplets can be observed in the FIG. measuring more or less than 1 mm. Preferably, the dried droplets range between 1/2 and 2-1/2 mm. The original droplet size will shrink when the water content evaporates.

As layers of the coating are deposited, a three-dimensional matrix of droplets is built-up. Voids, dark areas in FIG. 3, can be observed between the residual droplet forms. These voids are interconnected through the thickness of the coating resulting in a porous and acoustically transparent coating. Voids or pores in FIG. 3 are generally less than 0.5 mm in size so that at ceiling height they are not readily observable by a person standing on the associated floor. The low absorption rate of the major solids volume of the coating, in the Table 1 formula afforded by the 3M K1 large particles, assures that the coating will be fast-drying. The shear thinning property of the wet coating allows it to be readily sprayed in droplet form.

The combination of high viscosity and fast drying properties enables the droplets to beneficially retain their individuality and avoid completely merging with adjacent droplets. The disclosed formulation of Table 1 applied in the specified layers dries to the extent that it will not transfer to a finger, i.e. is dry to the touch, most preferably after 20 minutes for a first coat and 30 minutes on subsequent coats in an environment of 75 degrees F. and 50% relative humidity. Preferably, alternative formulations with fast drying properties will dry to the touch in 60 minutes in a first coat. This fast drying property of the coating is also important since it enables a painter to complete a job on the same day.

FIG. 5 illustrates the airflow resistivity as measured separately for each successive dry coat of the Table 1 material. The resistivity was determined with an air flow of 2 liters per minute through a surface area of 3.14 square inches. The total dry thickness of the coating tested in FIG. 5 was 0.031 inch. The initial resistivity reading at "0 coats" is a measure of the resistivity of the veil 29. The dry coating is preferably between 0.03 and 0.15 inches thick.

It should be evident that this disclosure is by way of example and that various changes may be made by adding, modifying or eliminating details without departing from the fair scope of the teaching contained in this disclosure. The invention is therefore not limited to particular details of this disclosure except to the extent that the following claims are necessarily so limited.

WHAT IS CLAIMED IS:

1. A formulation for an acoustically transparent coating for use on an acoustical substrate comprising a water dispersible binder and relatively large filler particles, and characterized by a high pigment to volume concentration, high viscosity, high shear thinning, and fast drying to enable the formulation to be sprayed in droplets that retain their identity when in mutual contact.

2. A formulation as set forth in claim 1,that exhibits a viscosity at room temperature of between 66 and 1450 BBU.

3. A formulation as set forth in claim 1, wherein the large filler particles have a size of between 20 and 900 microns.

4. A formulation as set forth in claim 1, wherein the pigment to volume concentration is between 40% and 99%.

5. A formulation as set forth in claim 1, wherein a sprayed layer of the formulation deposited at a rate of one-quarter gallon per 25 square feet in an environment of 75 degrees F. and 50% relative humidity is dry to the touch in 30 minutes.

6. A method of coating an acoustical substrate with an acoustically transparent material comprising the steps of spraying the formulation of claim 1 on the substrate in droplet form at a rate that permits the droplets to dry by evaporation of water before the droplets merge substantially fully together whereby voids remain between the dried droplets.

7. A method as set forth in claim 6, wherein the droplets are sprayed with a droplet size greater than 1 mm.

8. An acoustically transparent coating on an acoustical substrate comprising multiple layers of dried droplets bound to the substrate and to adjacent droplets, the droplets having sufficient portions free of contact with adjacent droplets to provide interconnected pores that extend through a full thickness of the coating.

9. An acoustically transparent coating as set forth in claim 8, wherein the dried droplets have an average size between about 1/2 and 2-1/2 mm.

10. An acoustically transparent coating as set forth in claim 8, wherein the coating is between 0.03 inches and 0.15 inches thick.

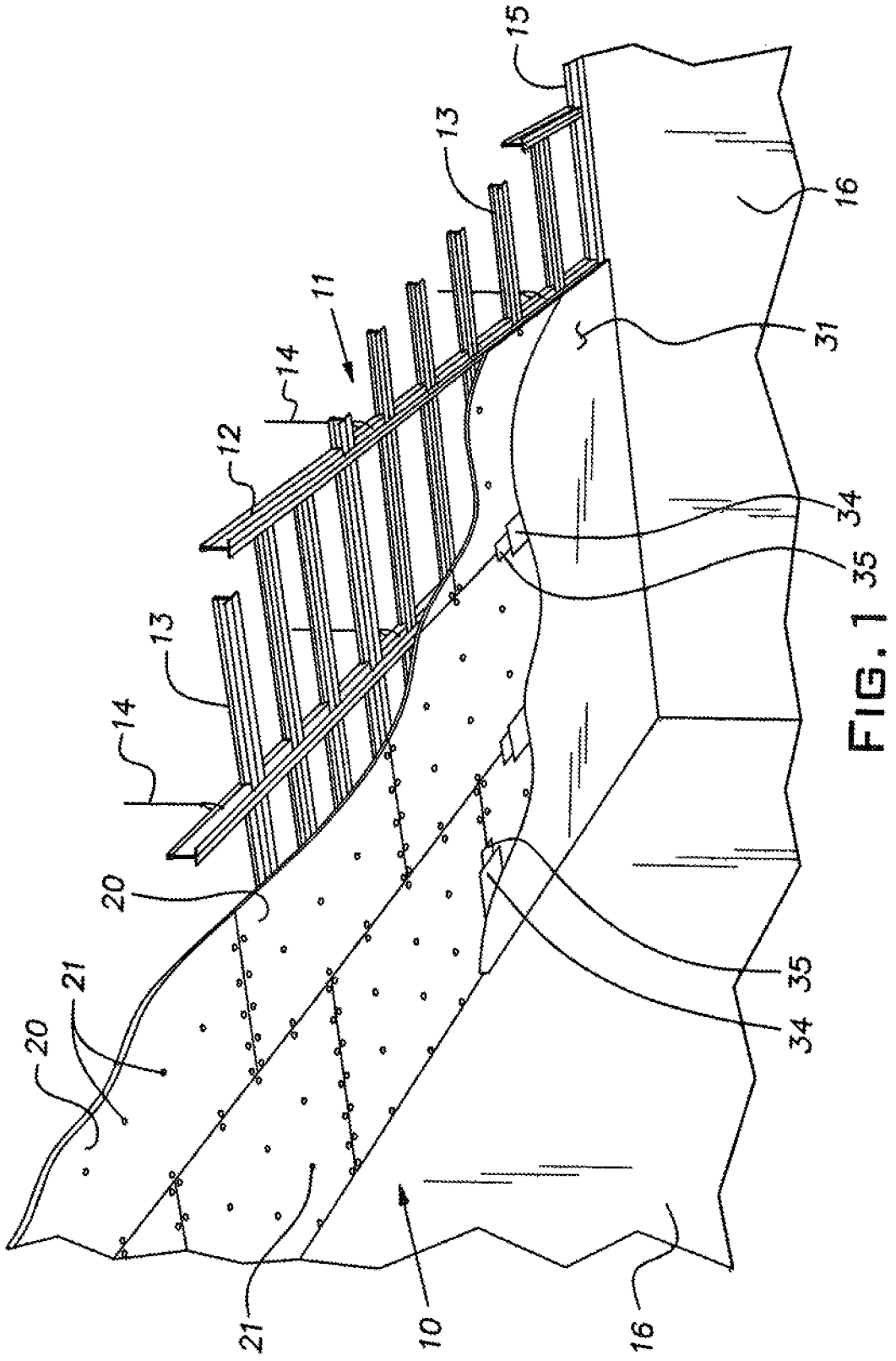

FIG. 1

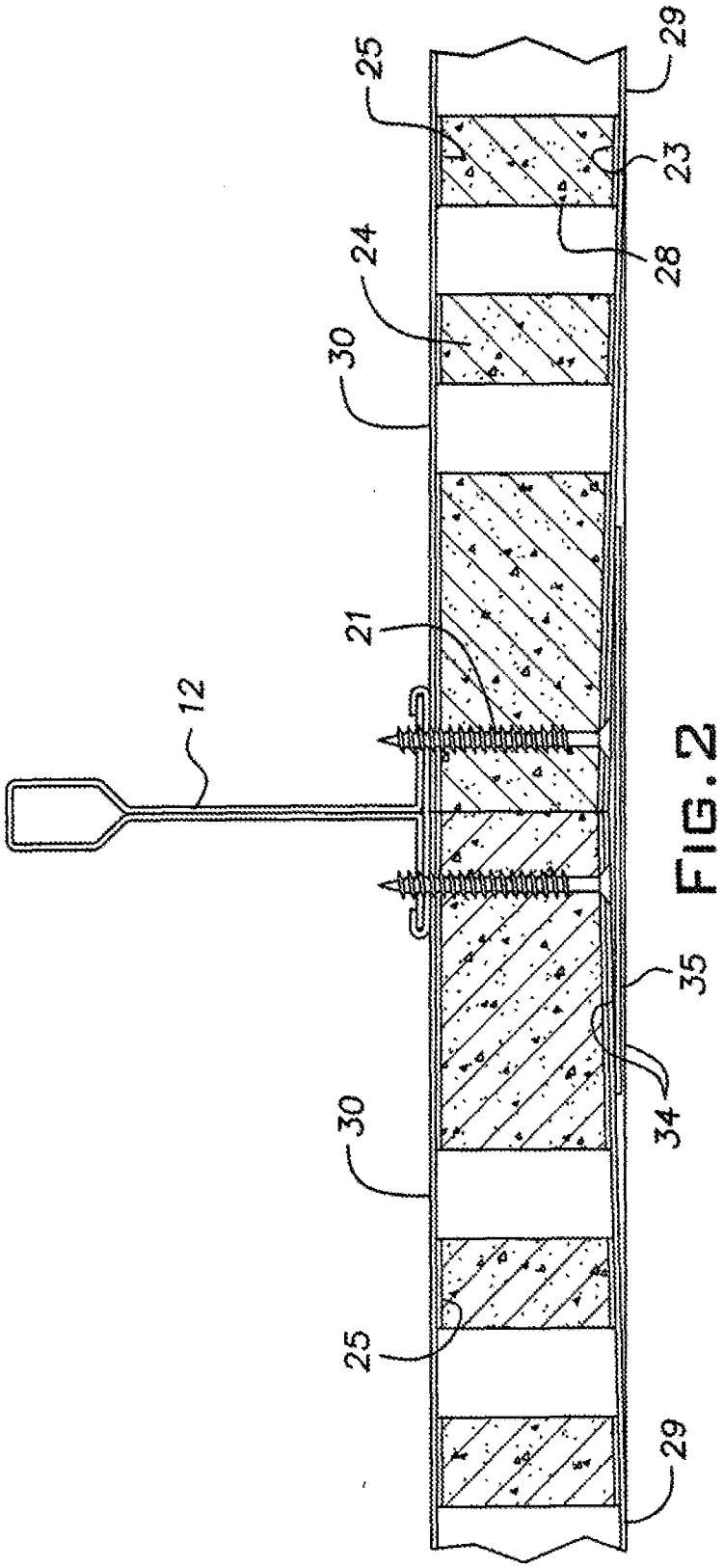

FIG. 2

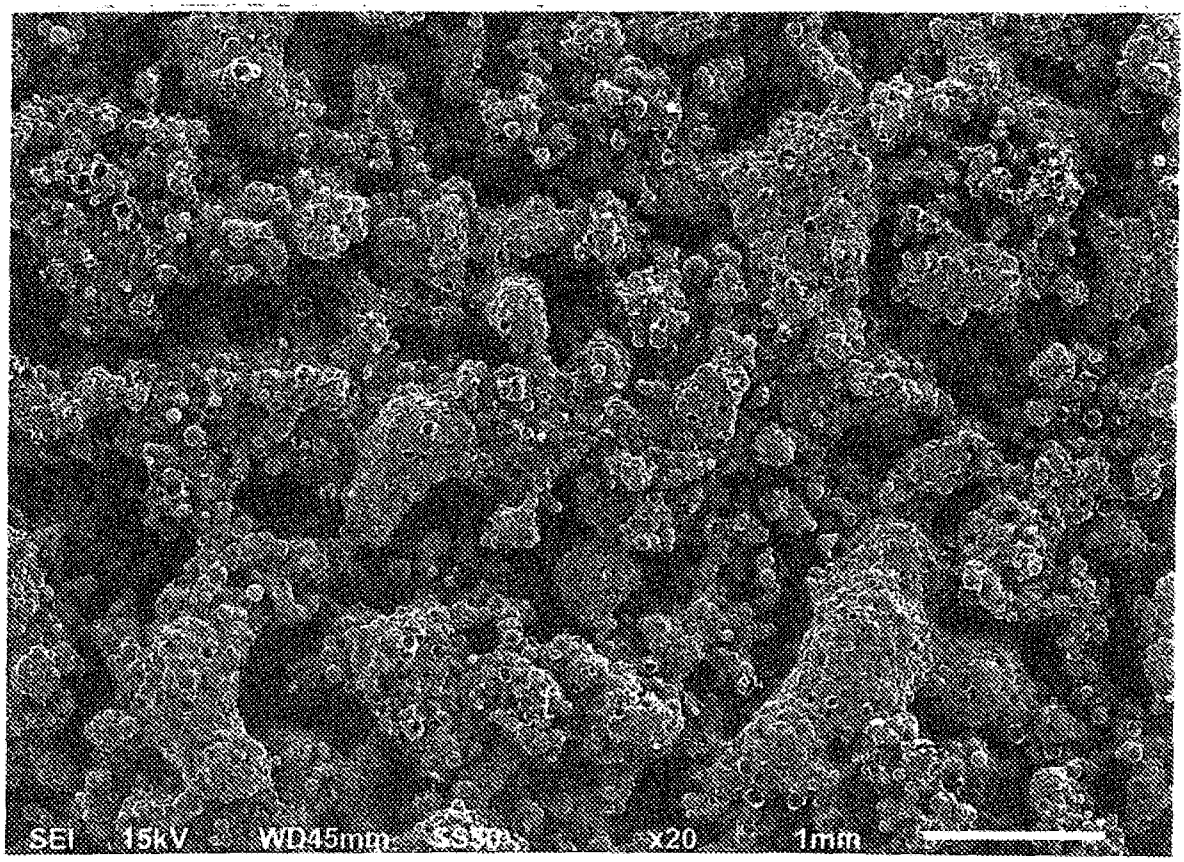

FIG. 3

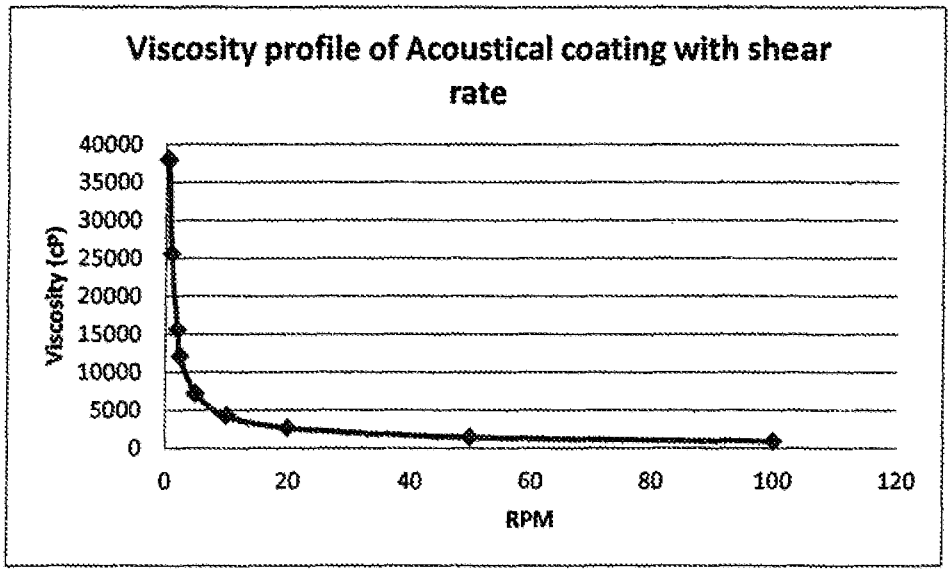
Viscosity profile of Acoustical coating with shear rate
Viscosity (cP)
40000
35000
30000
25000
20000
15000
10000
5000
0
0
20
40
60
80
100
120
RPM

FIG. 4

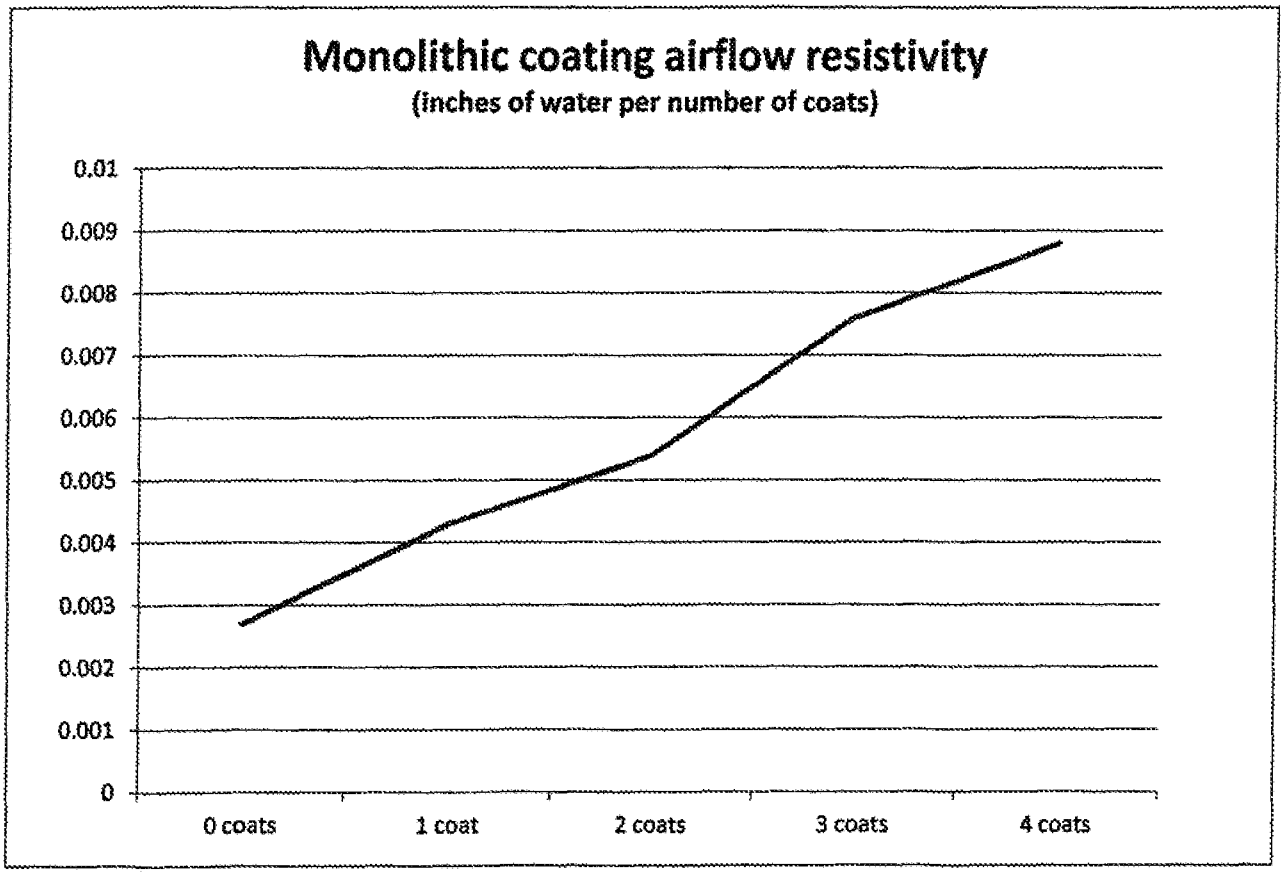
Monolithic coating airflow resistivity
(inches of water per number of coats)
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0 coats
1 coat
2 coats
3 coats
4 coats

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/050225

A. CLASSIFICATION OF SUBJECT MATTER
INV. C09D5/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C09D C08K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7 879 433 B1 (FELEGI JR JOHN [US] ET AL) 1 February 2011 (2011-02-01) column 5 - column 6; claims 1-9	1-10
X	US 8 536 259 B2 (USG INTERIORS LLC) 17 September 2013 (2013-09-17) column 16; claim 1	1-10
X	EP 1 589 066 A1 (ARIEL ZEEV [IL]) 26 October 2005 (2005-10-26) page 5 - page 6; claims 1-19	1-10
X	EP 0 761 776 A2 (ARMSTRONG WORLD IND INC [US]) 12 March 1997 (1997-03-12) page 4 - page 5; claims 1-12	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 November 2017	27/11/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Jung, Andreas

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/050225

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7879433 B1	01-02-2011	NONE	
US 8536259 B2	17-09-2013	AR 081926 A1	31-10-2012
		AU 2011271204 A1	07-02-2013
		CA 2802353 A1	29-12-2011
		CN 102947397 A	27-02-2013
		EP 2585544 A1	01-05-2013
		HK 1182412 A1	06-03-2015
		JP 5785257 B2	24-09-2015
		JP 2013534553 A	05-09-2013
		MX 341142 B	09-08-2016
		MY 161788 A	15-05-2017
		RU 2013102368 A	27-07-2014
		TW 201202360 A	16-01-2012
		UA 111721 C2	10-06-2016
		US 2011319543 A1	29-12-2011
		WO 2011163102 A1	29-12-2011
EP 1589066 A1	26-10-2005	EP 1589066 A1	26-10-2005
		US 2005256228 A1	17-11-2005
EP 0761776 A2	12-03-1997	CA 2184557 A1	02-03-1997
		DE 69613290 D1	19-07-2001
		DE 69613290 T2	06-12-2001
		EP 0761776 A2	12-03-1997
		GB 2304725 A	26-03-1997
		US 5888626 A	30-03-1999
		US 6284351 B1	04-09-2001

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 4800WOINT	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2017/050225	International filing date *(day/month/year)* 06 September 2017 (06.09.2017)	Priority date *(day/month/year)* 07 September 2016 (07.09.2016)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant USG INTERIORS, LLC		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 12 March 2019 (12.03.2019)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Agnès Wittmann-Regis e-mail: pct.team6@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2017/050225	06.09.2017	07.09.2016

International Patent Classification (IPC) or both national classification and IPC
INV. C09D5/02

Applicant
USG INTERIORS, LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Jung, Andreas Telephone No. +49 89 2399-0

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-10
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-10
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1. Prior art

D1 US 7 879 433 B1 (FELEGI JR JOHN [US] ET AL) 1 February 2011 (2011-02-01)

D2 US 8 536 259 B2 17 September 2013 (2013-09-17)

D3 EP 1 589 066 A1 (ARIEL ZEEV [IL]) 26 October 2005 (2005-10-26)

D4 EP 0 761 776 A2 (ARMSTRONG WORLD IND INC [US]) 12 March 1997 (1997-03-12)

2. Claims

Independent claims are claim 1 (product, formulation), claim 6 (method) and claim 8 (product, coating).

re item V

3. Novelty

Document D1 discloses (column 5 - column 6; claims 1-9) a coated panel including a coating layer that is applied on top of the coating layer. A coarse particle layer applied on top of the coating layer has an average particle size that range from about 250 to 750 microns.

D2 discloses (column 16; claim 1) a curable, formaldehyde free coating composition comprising an calcium aluminosilicate powder of a median particle size of about 250 microns or less.

D3 discloses (page 5 - page 6; claims 1-19) an acoustically transparent paint that includes hollow microspheres of blown glass and comprises solid particles of no more than 200micrometers in diameter, wherein the solid content is between 40% and 65% (w/w).

D4 discloses (page 4 - page 5; claims 1-12) an optically opaque sound transparent paint coating comprising large size inert particles ranging from about 40 mesh to 150 mesh (420-100microns).

Thus, the independent claims are regarded as not novel.

4. Inventive step

Closest prior art is considered to be D1.

Provided the applicant files amended claims which meet the requirements of Art. 33(2) PCT, the applicant should indicate the distinguishing features and render credible why the distinguishing features are not obvious from the prior art or connected with an unexpected technical effect.

5. Industrial applicability

The subject-matter of claims 1 - 10 is industrially applicable.

re item VIII

6. Clarity

6.1 The present set of claims discloses multiple features which attempt to define the subject-matter in terms of the result to be achieved which merely amounts to a statement of the underlying problem (desiderata).

This applies to the following claims and features:

Claim 1:

"...to enable the formulation to be sprayed in droplets that retain their identity when in mutual contact."

Claim 5:

"...is dry to the touch in 30 minutes."

Claim 6:

"...at a rate that permits the droplets to dry by evaporation of water before the droplets merge substantially fully together whereby voids remain between the dried droplets."

6.2 Furthermore, the following terms are vague und unclear und thus not suitable to define the scope of protection with regard to prior art:

Claim 1:

"relatively large filler particles"
"high pigment to volume concentration"
"high viscosity"
"high shear thinning"
"fast drying"

Claim 8:

"sufficient portions"

6.3 The following properties as disclosed in the claims are unclear, since no method is provided for their determination

Claim 2:

Viscosity in BBU-units.

Claim 3:

Particles have a size of between 20 and 900 microns (determination of particle size).

Claim 5:

"...dry to touch"

Thus, the requirements of Article 6 PCT are not fulfilled.

7. Disclosure

With regard to the objections concerning the "result to be achieved" it is pointed out, that a functional formulation of a claim constitutes a reach-through claim which is also directed to future inventions based on the one now being disclosed. As the applicant is entitled to claim patent protection only for his actual contribution to the art, it is therefore both reasonable and imperative to limit the claim's subject-matter accordingly. Patent protection is not designed for the purpose of reserving an unexplored field of research for a particular applicant, as reach-through claims do, but to protect factual results of successful research as a reward for making concrete technical results available to the public.

A functional definition of a chemical composition (in this case in a reach-through claim) covers all compositions possessing the capability according to the claim. In the absence of any selection rule in the application in suit, the skilled person, without the possibility of having recourse to his common general knowledge, must resort to trial-and-error experimentation on arbitrarily selected chemical compositions to establish whether they possess the capability according to the claim; this represents for the skilled person an invitation to perform a research programme and thus an undue burden.

Thus, the requirements of Article 5 PCT are not fulfilled.

8. Final remarks

With regard to a potential entry of the application into the European Phase, the examiner whishes to point out, that at present it cannot be seen how to amend the present set of claims in a way as to be patentable under the EPC.

Should the applicant nevertheless decide to enter the European Phase he is requested to indicate the basis for every amendment made and to convert all units into S.I. units.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2017/050225	06.09.2017	07.09.2016

International Patent Classification (IPC) or both national classification and IPC
INV. C09D5/02

Applicant
USG INTERIORS, LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Jung, Andreas Telephone No. +49 89 2399-0

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-10
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-10
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1. Prior art

D1 US 7 879 433 B1 (FELEGI JR JOHN [US] ET AL) 1 February 2011 (2011-02-01)

D2 US 8 536 259 B2 17 September 2013 (2013-09-17)

D3 EP 1 589 066 A1 (ARIEL ZEEV [IL]) 26 October 2005 (2005-10-26)

D4 EP 0 761 776 A2 (ARMSTRONG WORLD IND INC [US]) 12 March 1997 (1997-03-12)

2. Claims

Independent claims are claim 1 (product, formulation), claim 6 (method) and claim 8 (product, coating).

re item V

3. Novelty

Document D1 discloses (column 5 - column 6; claims 1-9) a coated panel including a coating layer that is applied on top of the coating layer. A coarse particle layer applied on top of the coating layer has an average particle size that range from about 250 to 750 microns.

D2 discloses (column 16; claim 1) a curable, formaldehyde free coating composition comprising an calcium aluminosilicate powder of a median particle size of about 250 microns or less.

D3 discloses (page 5 - page 6; claims 1-19) an acoustically transparent paint that includes hollow microspheres of blown glass and comprises solid particles of no more than 200micrometers in diameter, wherein the solid content is between 40% and 65% (w/w).

D4 discloses (page 4 - page 5; claims 1-12) an optically opaque sound transparent paint coating comprising large size inert particles ranging from about 40 mesh to 150 mesh (420-100microns).

Thus, the independent claims are regarded as not novel.

4. Inventive step

Closest prior art is considered to be D1.

Provided the applicant files amended claims which meet the requirements of Art. 33(2) PCT, the applicant should indicate the distinguishing features and render credible why the distinguishing features are not obvious from the prior art or connected with an unexpected technical effect.

5. Industrial applicability

The subject-matter of claims 1 - 10 is industrially applicable.

re item VIII

6. Clarity

6.1 The present set of claims discloses multiple features which attempt to define the subject-matter in terms of the result to be achieved which merely amounts to a statement of the underlying problem (desiderata).

This applies to the following claims and features:

Claim 1:

"...to enable the formulation to be sprayed in droplets that retain their identity when in mutual contact."

Claim 5:

"...is dry to the touch in 30 minutes."

Claim 6:

"...at a rate that permits the droplets to dry by evaporation of water before the droplets merge substantially fully together whereby voids remain between the dried droplets."

6.2 Furthermore, the following terms are vague und unclear und thus not suitable to define the scope of protection with regard to prior art:

Claim 1:

"relatively large filler particles"
"high pigment to volume concentration"
"high viscosity"
"high shear thinning"
"fast drying"

Claim 8:

"sufficient portions"

6.3 The following properties as disclosed in the claims are unclear, since no method is provided for their determination

Claim 2:

Viscosity in BBU-units.

Claim 3:

Particles have a size of between 20 and 900 microns (determination of particle size).

Claim 5:

"...dry to touch"

Thus, the requirements of Article 6 PCT are not fulfilled.

7. Disclosure

With regard to the objections concerning the "result to be achieved" it is pointed out, that a functional formulation of a claim constitutes a reach-through claim which is also directed to future inventions based on the one now being disclosed. As the applicant is entitled to claim patent protection only for his actual contribution to the art, it is therefore both reasonable and imperative to limit the claim's subject-matter accordingly. Patent protection is not designed for the purpose of reserving an unexplored field of research for a particular applicant, as reach-through claims do, but to protect factual results of successful research as a reward for making concrete technical results available to the public.

A functional definition of a chemical composition (in this case in a reach-through claim) covers all compositions possessing the capability according to the claim. In the absence of any selection rule in the application in suit, the skilled person, without the possibility of having recourse to his common general knowledge, must resort to trial-and-error experimentation on arbitrarily selected chemical compositions to establish whether they possess the capability according to the claim; this represents for the skilled person an invitation to perform a research programme and thus an undue burden.

Thus, the requirements of Article 5 PCT are not fulfilled.

8. Final remarks

With regard to a potential entry of the application into the European Phase, the examiner whishes to point out, that at present it cannot be seen how to amend the present set of claims in a way as to be patentable under the EPC.

Should the applicant nevertheless decide to enter the European Phase he is requested to indicate the basis for every amendment made and to convert all units into S.I. units.