

DIRECCIÓN DE NUEVAS CREACIONES

SOLICITUD FASE NACIONAL - PCT

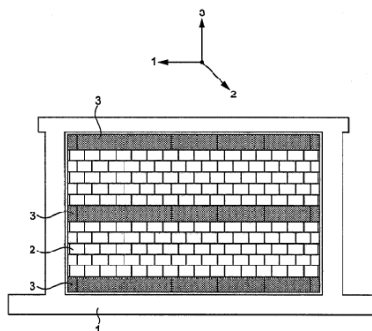


FIG. 1a

1	Título de la Invención (200 caracteres o espacios máximos)		
UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA			
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Identificación:			

☐ CEDULA DE CIUDADANIA
☒ EMPRESA EXTRANJERA
☐ PASAPORTE

☐ CEDULA DE EXTRANJERIA
☐ NIT

Número:

4097012-

3

Solicitantes

Apellidos - Nombres o Razón Social

Tipo

Identificación

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constitución:**

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BRETAÑA - INGLATERRA -
HERTFORDSHIRE

Identificación:

☐ CEDULA DE CIUDADANIA
☐ CEDULA DE EXTRANJERIA
☐ EMPRESA EXTRANJERA
☐ PASAPORTE
☐ NIT
☒ No Aplica

Número:

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5

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Identificación: ☒ CEDULA DE CIUDADANIA ☐ CEDULA DE EXTRANJERIA ☐ EMPRESA EXTRANJERA ☐ NIT ☐ PASAPORTE Número: 53215-				
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Número Solicitud:		PCT/GB2014/052702	Fecha Solicitud:	05/09/2014
Número Publicacion:		WO 2015/033161 A8	Fecha Publicacion:	12/03/2015
9	Declaraciones de prioridad		☒ SI ☐ NO	
(33) País de origen		Codigo del país	(31) No. Solicitud	(32) Fecha _

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10	Reivindicaciones			
Número reivindicaciones:		22	Pago Reivindicaciones:	
			No	
11	Reducción de tasas.			
<i>Declaro que carezco de medios económicos para presentar la solicitud de patente.</i> ☐ SI ☒ NO Nota: En caso de ser persona natural y carecer de medios económicos, y por lo tanto, aplique la reducción de tasas a que se refiere la resolución vigente en tarifas, debe firmar la presente solicitud bajo la gravedad de juramento.				
☐ Micro, pequeñas y medianas empresas ☐ Universidades públicas o privadas ☐ Entidades sin ánimo de lucro Debe aportar los documentos que se indican en el numeral 17 de anexos				
12	Documentos Anexos			
☒ Reivindicaciones ☒ Descripción ☒ Dibujos y/o Figuras ☒ Resumen ☐ Certificado Depósito Material Biológico ☐ Uso de Conocimiento tradicional ☐ Listado de secuencias ☒ Artes finales 12 x 12 cm ☐ Poderes, si fuere el caso ☐ Copia de la primera solicitud si se reivindica prioridad ☐ Traducción simple de la primera solicitud, si se reivindica prioridad ☒ Otros Anexos				

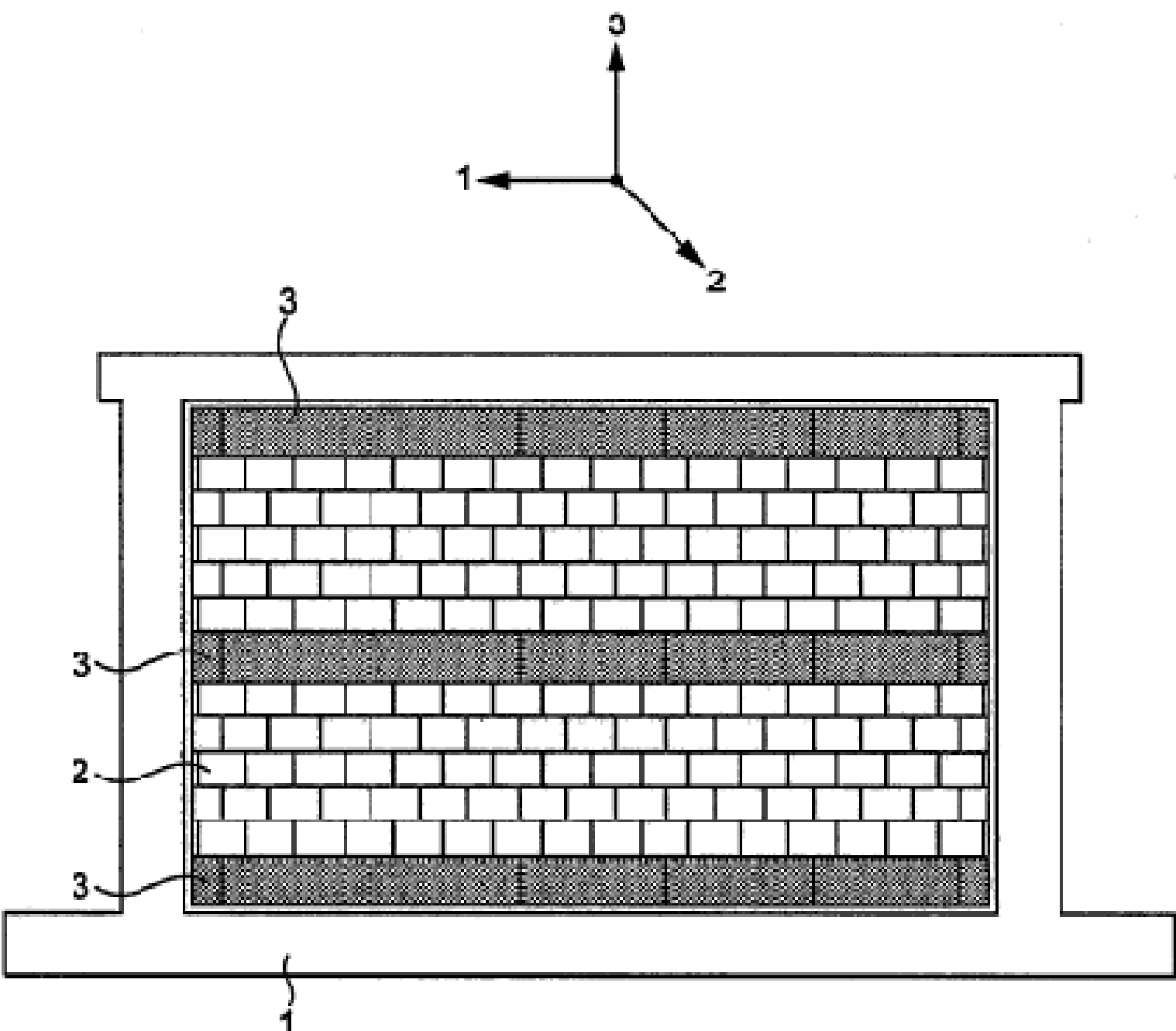


FIG. 1a

**MODIFICACIONES A LAS REIVINDICACIONES
PRESENTADAS EN FASE INTERNACIONAL
(INDICADAS EN EL REPORTE PRELIMINAR SOBRE
PATENTABILIDAD)**

Atentamente me permito informar a ese Despacho que el Capítulo Reivindicatorio tal como fue presentado originalmente en Fase Internacional fue modificado en dicha instancia bajo el Reporte Preliminar Internacional sobre Patentabilidad.

Las modificaciones realizadas se encuentran plenamente sustentadas en la descripción de la presente invención y en este sentido, no configuran una ampliación del invento o de la divulgación contenida en la solicitud presentada.

UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA

La presente invención se refiere a una parte de caucho para su uso como componente estructural para su incorporación en una pared de ladrillo o mampostería en un marco de hormigón armado (r. c. por sus siglas en ingles) para proteger la pared y la estructura contra el daño por la actividad sísmica.

Dos enfoques tradicionales populares para mejorar la respuesta sísmica de rellenos de mampostería en estructuras de marco r. c. son para evitar rellenos en el plano dañado de someterse al colapso fuera de plano durante un evento sísmico, o para evitar daños en el plano con el fin de evitar el colapso fuera del plano. Permitiendo que el daño tenga una desventaja de costo de reparación significativa reparación, ya que, después de un terremoto, los tabiques y rellenos dañados deben ser reemplazados. El último enfoque implica suspender paneles prefabricados a los marcos de una manera tal que las deformaciones en el plano no sean aplicadas a los paneles durante el evento sísmico. Esto requiere una tecnología sofisticada y costosa que no es ampliamente aplicable a los países de bajos ingresos. Además, puede resultar en una pobre durabilidad de las juntas entre los paneles prefabricados y, por lo tanto, puede resultar en un aumento en la demanda sísmica de la estructura de hormigón armado.

Daños en el plano de los rellenos y tabiques durante un terremoto es la principal causa del colapso fuera del plano. Hemos encontrado que el problema del colapso fuera del plano se puede resolver, de una manera diferente y mucho más eficiente en comparación con los enfoques tradicionales, mediante la prevención de daños en el plano utilizando un componente estructural de caucho. El componente también puede mejorar sustancialmente el desempeño sísmico de edificios (tanto nuevos como existentes) basados en estructuras resistentes a momento de hormigón armado.

La presente invención provee una parte de caucho para el uso como un componente estructural para la incorporación en una estructura de pared de ladrillo o mampostería en un marco de hormigón armado, que se encuentra dentro del plano de la pared, cuya parte tiene una longitud X y una rigidez a lo largo de su longitud de S_x , una anchura y y una rigidez a través de su ancho de S_y , y un espesor z y una rigidez a través de su espesor de S_z , la rigidez de la parte siendo anisotrópica con $S_y > S_x$, dicha parte está adaptada de tal manera que, cuando está en uso, es capaz de controlar las vibraciones de la pared causadas por la actividad sísmica y también de tener un efecto de amortiguación de este modo se

aumenta la capacidad de disipación de energía de la estructura. Cuando la parte de caucho es para la ubicación horizontal dentro del plano de la pared y sobre o en una fila horizontal de ladrillos y en el que $S_z > S_y > S_x$. Alternativamente, cuando la parte es para ubicación verticalmente dentro del plano de la pared adyacente a una pila de ladrillos en la pared y al marco de r.c. se prefiere que $S_y > S_x$ y $S_y > S_z$. El enfoque innovador propuesto de acuerdo con la presente invención tiene las características de tecnología muy simple aplicables no sólo a las estructuras modernas, sino también a construcción tradicional de bajo costo prevalente en zonas sísmicas de bajos ingresos del mundo. Se basa en la obtención de una combinación de fuerza, deformabilidad y capacidad de disipación de energía en tres direcciones ortogonales desde el dispositivo de caucho. El uso de la parte de caucho de la invención, por lo tanto, reduciría al mínimo el daño sísmico a los tabiques y rellenaría a un nivel de rendimiento deseado, reduciría la demanda sísmica de estructuras de hormigón armado, proporcionando elementos disipadores de energía auxiliar y, por lo tanto, una reducción en la construcción del edificio y costes del ciclo de vida.

El componente estructural de la parte de caucho tiene preferiblemente una forma sustancialmente rectangular. Esta se puede fabricar por extrusión de una composición de caucho en la forma de una tira larga o por moldeo, por ejemplo compresión o moldeo por transferencia. El caucho puede ser un caucho sintético o un caucho natural o un caucho regenerado o reciclado.

De acuerdo con una realización preferida, la parte de caucho está en forma de una hoja. Preferiblemente, las dos superficies principales de la lámina son contorneadas. Por ejemplo, la sección transversal a través de la anchura de la parte tiene una pluralidad de porciones alternantes elevadas y partes rebajadas.

La parte de caucho, de acuerdo con una forma de realización preferida, es al menos parcialmente corrugada a través de su anchura, con las ondulaciones que se ejecutan a lo largo de la longitud de la pieza. Típicamente, las ondulaciones en sección transversal tiene la forma de una onda, tal como una onda curvada, una onda cuadrada o una onda triangular.

La parte de goma se puede laminar en una o en ambos lados principales, es decir, la superficie superior y la superficie inferior, con un material inextensible. Ejemplos de material inextensible incluyen una placa rígida y la tela no extensible. La laminación permite que la parte de caucho logre la rigidez requerida en las diversas direcciones.

Alternativamente, o adicionalmente, la parte de goma puede contener huecos y / o inclusiones para permitir que la parte logre la rigidez requerida en las diversas

direcciones. Las inclusiones pueden ser materiales compresibles o incompresibles.

Con el fin de que la invención puede ser totalmente entendida y fácilmente llevada a efecto, la misma se describirá ahora a modo de ejemplo solamente, con referencia a los dibujos adjuntos, de los cuales:

La Figura 1a es una vista esquemática de una estructura de hormigón armada con mampostería de relleno, donde una realización de un componente estructural de la parte de caucho de la presente invención se utiliza en cubiertas que reemplazan tres filas de ladrillos de mampostería en el relleno.

La Figura 1b es una vista esquemática de una estructura de hormigón armado con mampostería de relleno donde se muestra una parte de caucho de la invención que ha sustituido filas de mortero entre los ladrillos de mampostería en el relleno y la pared y el marco r.c.

Las figuras 2a a 2h muestran diferentes formas de realización de cubiertas que contiene parte de caucho tal como se aplica en la forma descrita en la figura 1a.

Las figuras 3a a 3e muestran diferentes formas de realización del componente estructural de la parte de caucho en sección transversal como se aplica en la forma descrita en la Figura 1b.

Como se muestra en la Figura 1a, un marco de hormigón armado 1 se rellena con ladrillos de mampostería 2. Tres filas de ladrillos de mampostería se sustituyen por componentes estructurales de material compuesto de caucho / mampostería 3 cada uno de los cuales comprende una parte de caucho de la invención tal como se muestra en la Figura 2a formando una cubierta sobre un ladrillo. Cubiertas alternativas, utilizando la parte de caucho se muestran esquemáticamente en las figuras 2b a 2h. El componente estructural ilustrado en la Figura 2b contiene inclusiones 4. El componente mostrado en la Figura 2c comprende una cubierta que tiene una sección transversal triangular y el componente mostrado en la Figura 2d comprende una cubierta que tiene una sección transversal arqueada. Las Figuras 2e a 2h muestran diseños alternativos para la cubierta de caucho que tiene huecos, inclusiones y / o laminados.

La figura 1b muestra una estructura de hormigón reforzado 1 que esta rellena con ladrillos de mampostería 2. En esta forma de realización las piezas de goma 5, en forma de tiras extruidas, sustituye mortero entre algunas de las capas sucesivas del ladrillo de mampostería. Las piezas de goma 5 pueden tener ondulaciones que corren a lo largo como se muestra en las figuras 3a a 3e. Las figuras 3a a 3c muestran diferentes formas de realización de ondulaciones que, en sección transversal, muestran formas de onda curvas. La figura 3d muestra una ondulación en forma de una onda cuadrada (en sección transversal) y la figura 3e

muestra una ondulación en forma de una onda triangular o en zigzag (en la sección transversal). La parte de caucho puede simplemente ser colocada entre dos capas sucesivas de ladrillos en el marco con mortero, u otra composición moldeable pero endurecible, llenando el espacio entre la parte de caucho y las superficies de los ladrillos. La figura 3a muestra una forma de realización en donde la parte de caucho 5 está incrustada en un mortero 6. El mortero, u otra composición moldeable pero endurecible, debe tener suficiente resistencia para soportar las tensiones requeridas para transmitir cualquier fuerza resultante de un evento sísmico entre los ladrillos y la parte de caucho. Alternativamente, la parte de goma se puede intercalar o unir entre placas rígidas o tela inextensible (por ejemplo, una tela tejida inextensible). El mortero, u otra composición moldeable pero endurecible, puede entonces ser utilizado para llenar los huecos entre la parte de caucho y las superficies de ladrillo, así como adherir la parte a las superficies de los ladrillos. Las superficies rugosas de placas rígidas o tela tejida proporcionarán un buen de entrada y, por lo tanto, un enlace más fuerte.

La capa de caucho puede ser homogénea, como se muestra en la figura 4a para la sección mostrada en la Figura 3b o laminada con materiales inextensibles 7 para lograr la rigidez requerida de los componentes en varias direcciones, como se muestra en las figuras 4b y 4e para la sección mostrada en la Figura 3b. Alternativamente, la capa de caucho puede tener huecos 8 como se muestra en la Figura 4c para la sección mostrada en la Figura 3b o con inclusiones compresibles o incompresibles 9 como se muestra en la Figura 4D por la sección mostrada en la Figura 3b. El caucho puede ser natural o sintético de material fresco o regenerado o reciclado teniendo niveles bajos o altos de amortiguación.

Preferiblemente con el fin de optimizar la amortiguación, el caucho será un caucho de alta amortiguación.

La parte de caucho se puede utilizar como un componente estructural en la construcción de una pared con el fin de prevenir el daño causado por un evento sísmico.

El concepto que subyace a la invención se basa en la obtención de una combinación de fuerza, deformabilidad y capacidad de disipación de energía en tres direcciones ortogonales de la parte de caucho. Por consiguiente, puede ser posible diseñar marcos de hormigón armado, tabiques y rellenos de tal manera que su comportamiento combinado está optimizado en términos de:

- Minimizar el daño sísmico para los tabiques y el relleno a un nivel de rendimiento deseado;

- Reducir la demanda sísmica del hormigón armado, proporcionando elementos auxiliares de disipación de energía;
- Mejorar el comportamiento sísmico de estructuras de hormigón armado existente, antes o después de un evento sísmico;
- Minimiza el coste de la construcción y su costo del ciclo de vida.

El material utilizado para la parte de caucho de la invención puede ser fresco o sintético reciclado o caucho natural y puede ser o bien de caucho de amortiguación baja o de caucho de amortiguación alta. Gomas de amortiguación alta serían adecuadas para las zonas de alta sismicidad, donde la demanda de ductilidad de las estructuras es alta. La mejora de amortiguación del edificio utilizando dispositivos de amortiguación auxiliares reduciría la demanda por parte de la estructura. Esto proporcionaría reducción en el costo de nuevas estructuras y ofrecería un enfoque de reequipamiento sencillo para actualizar edificios considerados vulnerables.

CAPÍTULO
REIVINDICATORIO
QUE CONTIENE LAS
MODIFICACIONES
HECHAS EN FASE
INTERNACIONAL
INDICADAS EN EL
REPORTE
PRELIMINAR
INTERNACIONAL
SOBRE
PATENTABILIDAD

REIVINDICACIONES

1. El uso de una parte de caucho en la construcción de pared de ladrillo o mampostería en un marco de hormigón armado para eliminar el daño en el plano a la pared mientras se controla su colapso fuera del plano durante un evento sísmico, dicha parte teniendo rigidez anisotrópica en las tres direcciones ortogonales de la pared, así como propiedades de amortiguación de este modo aumentando la capacidad de disipación de energía de la estructura, cuyo uso comprende localizar la parte de caucho en el plano de una pared y sobre o en una fila horizontal de ladrillos, en donde la parte de caucho tiene una longitud X y una rigidez a lo largo de su longitud de S_x , una anchura y y una rigidez a través de su ancho de S_y y un espesor z y una rigidez a través de su espesor de S_z , la rigidez de la parte siendo anisotrópica con $S_z > S_y > S_x$ y en donde la parte de caucho está en la forma de hoja.
2. El uso de acuerdo con la reivindicación 1, en donde la parte de caucho tiene una forma sustancialmente rectangular.
3. El uso de acuerdo con la reivindicación 1 o la reivindicación 2, en donde la parte de caucho tiene una sección transversal a través de la anchura de la parte que tiene una pluralidad de porciones alternantes elevadas y porciones rebajadas.
4. El uso de acuerdo con la reivindicación 3, en donde la parte tiene ondulaciones a lo largo de su longitud.
5. El uso de acuerdo con la reivindicación 4, en donde la sección transversal de las ondulaciones tiene la forma de una onda seleccionada a partir de una onda curvada, una onda cuadrada y una onda triangular.
6. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 5, en el que el caucho es un caucho sintético, un caucho natural, un caucho regenerado o un caucho reciclado.
7. El uso de acuerdo con cualquiera de las reivindicaciones precedentes, en donde la parte de caucho es una tira extruida.
8. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 6, en donde la parte de caucho es una parte moldeada.

9. El uso de acuerdo con cualquiera de las reivindicaciones precedentes, en donde la parte de caucho está laminada con un material inextensible.
10. El uso de acuerdo con la reivindicación 9, en donde la parte de caucho está laminada en ambos lados.
11. El uso de acuerdo con la reivindicación 9 o la reivindicación 10, donde el material inextensible es una placa rígida o una tela no extensible.
12. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 11, en donde el caucho de la parte de caucho contiene huecos o inclusiones.
13. El uso de acuerdo con la reivindicación 12, en donde las inclusiones son inclusiones compresibles o inclusiones incompresibles.
14. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 13, en donde la parte de caucho está formada en una cubierta para cubrir al menos parcialmente un ladrillo en la pared de ladrillo.
15. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 14, en donde el caucho de la parte de caucho es un caucho de alta amortiguación.
16. El uso de acuerdo con cualquiera de las reivindicaciones 1 a 15, en donde la parte de caucho se localiza entre dos filas horizontales sucesivas de ladrillos en la pared de ladrillo.
17. El uso de acuerdo de acuerdo con cualquiera de las reivindicaciones 1 a 16, en donde cualquier hueco entre la superficie externa de la tira de caucho y la superficie interna de los ladrillos esta rellena con composición endurecible.
18. El uso de una parte de caucho en la construcción de pared de ladrillo o mampostería en un marco de hormigón armado para eliminar el daño en el plano a la pared mientras se controla su colapso fuera del plano durante un evento sísmico, dicha parte teniendo rigidez anisotrópica y propiedades de amortiguación de este modo aumentando la capacidad de disipación de energía de la estructura, cuyo uso comprende localizar la parte de caucho verticalmente en el plano de una pared adyacente a una pila de ladrillos en la pared en el marco de hormigón armado, en donde la parte de caucho tiene una longitud X y una rigidez a lo largo

de su longitud de S_x , una anchura y y una rigidez a través de su ancho de S_y y un espesor z y una rigidez a través de su espesor de S_z , la rigidez de la parte siendo anisotrópica con $S_y > S_x$ y $S_y > S_z$ y en donde la parte de caucho está en la forma de hoja.

19. El uso de acuerdo con la reivindicación 18, en donde la parte de caucho tiene una forma sustancialmente rectangular.

20. El uso de acuerdo con la reivindicación 18 o la reivindicación 19, en donde la parte de caucho tiene una sección transversal a través de la anchura de la parte que tiene una pluralidad de porciones alternantes elevadas y porciones rebajadas.

21. El uso de acuerdo con la reivindicación 20, en donde la parte tiene ondulaciones a lo largo de su longitud.

22. El uso de acuerdo con la reivindicación 21, en donde la sección transversal de las ondulaciones tiene la forma de una onda seleccionada a partir de una onda curvada, una onda cuadrada y una onda triangular.

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(22) Fecha de solicitud: 05-04-16				(71) Solicitante(s): TUN ABDUL RAZAK RESEARCH CENTRE	
(30) Prioridad	(31) No. Prioridad	(32) Fecha	(33) País	(72) Inventor(es): AHMADI, Hamid Reza y DUSI, Alberto.	
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				(74) Apoderado: ALICIA LLORED A RICAURTE	
(85)	Fecha límite inicio fase nacional: 05-04-16			(87) Publicación internacional	
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“UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA”					

Resumen - Sector(es):

Resumen.-

Una parte de caucho para el uso como un componente estructural para la incorporación en una estructura de pared de ladrillo o mampostería en un marco de hormigón armado, que se encuentra dentro del plano de la pared, tiene una longitud X y una rigidez a lo largo de su longitud de S_x, una anchura y y una rigidez a través de su ancho de S_y, y un espesor z y una rigidez a través de su espesor de S_z, la rigidez de la parte siendo anisotrópica con S_y> S_x. La parte está adaptada de tal manera que, cuando está en uso, es capaz de controlar las vibraciones de la pared causadas por la actividad sísmica y también de tener un efecto de amortiguación de este modo se aumenta la capacidad de disipación de energía de la estructura. La parte de caucho esta preferiblemente en forma de una hoja y se puede laminar en una o en ambas superficies principales. Las dos superficies principales de la lámina pueden ser contorneados, por ejemplo ser onduladas través de su anchura.

Sector: Construcciones, paredes.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SJW/5191PCT0	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/GB2014/052702	International filing date (<i>day/month/year</i>) 05.09.2014	Priority date (<i>day/month/year</i>) 05.09.2013	
International Patent Classification (IPC) or national classification and IPC INV. E04B1/98			
Applicant TUN ABDUL RAZAK RESEARCH CENTRE			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (<i>sent to the applicant and to the International Bureau</i>) a total of <u>8</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. 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			
Date of submission of the demand 02.04.2015		Date of completion of this report 09.12.2015	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Righetti, Roberto Telephone No. +31 70 340-2405	



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/GB2014/052702

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-5 as originally filed

Claims, Numbers

7-16, 23-33 filed with the letter of

20-04-2015

1-6, 17-22 filed with telefax on 16-10-2015

Drawings, Sheets

1/6-6/6 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2014/052702

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 10.08.2015 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>3-33</u>
	No: Claims	<u>1, 2</u>
Inventive step (IS)	Yes: Claims	<u>18-33</u>
	No: Claims	<u>1-17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-33</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V.

1. Reference is made to the following documents:

- D1 DE 197 16 179 A1 (HÜLS AG) 22 October 1998 (1998-10-22)
- D2 WO 91/16195 A (SNYDER) 31 October 1991 (1991-10-31)
- D3 US 4 216 856 A (MORING ET AL.) 12 August 1980 (1980-08-12)
- D4 FR 2 912 163 A1 (L. VELARDO) 8 August 2008 (2008-08-08)
- D5 CN 102 268 900 A (UNIV. GUANGZHOU) 7 December 2011
(2011-12-07)
- D6 JP 2001 254534 A (SHIMIZU CORP.) 21 September 2001 (2001-09-21)
- D7 EP 0 599 145 A (CONTINENTAL AG) 1 June 1994 (1994-06-01)

2. The arguments submitted by the Applicant with his letter of 16-10-2015 have been duly and carefully evaluated. The Examining Division however cannot entirely follow the reasoning of the Applicant and maintains part of its objections of patentability as follows.

3. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1 and 2 is not new in the sense of Article 33(2) PCT.

4. The document D5 (cf. abstract; translation claim 4; figures 3-7) discloses the use of a rubber part (3) in the construction of a brick or masonry wall within a reinforced concrete frame structure (6',7,7') suitable for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event, the said part implicitly* having anisotropic stiffness in the three orthogonal directions of the wall as well as damping properties thereby increasing the energy dissipation capacity of the structure, which use comprises locating the rubber part (3) within the plane of the wall and on or in a horizontal row of bricks (2), wherein the rubber part (3) has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y

and a thickness z and a stiffness across its thickness of S_z , the stiffness of the part (3) being implicitly* anisotropic with $S_z > S_y > S_x$ and wherein the rubber part (3) is in the form of a sheet having a substantially rectangular shape (see figures 3-6).

The subject-matter of use claims 1 and 2 is therefore deprived of novelty, Article 33(2) PCT.

**it is implicit from the figures that the rubber sheet has a lower stiffness along its length (that has been defined as "x" direction), than across its width (defined as "y" direction), and that its stiffness across its width is lower than its stiffness across its thickness (defined as "z" direction), because the magnitude of the length is greater than the magnitude of the width, which in turn is greater than the magnitude of the thickness, and because the stiffness of an homogeneous body (in this case a sheet made of rubber) in a given direction is inversally proportional to the linear extension of that body in that direction according to the equation $K_i = A_i E / L_i$, where K_i is the stiffness of the body in the "i" direction, L_i is the linear extension of the body in the "i" direction, A_i is the cross section of the body in a plane perpendicular to the "i" direction, and E is the Young modulus of the material. Even without considering the magnifying effect of A_i , one can deduce from this formula that $S_z > S_y > S_x$, since $L_z < L_y < L_x$ (even more if we also consider A_i since $A_z > A_y > A_x$).*

5. Dependent claims 3 to 17 do not appear to introduce features that would support an inventive step in the sense of Article 33(3) PCT, because these features are either constructive details linked to their inherent benefits, or mere choices linked to the circumstances among known and obvious features.

6. The document D5 as already said in paragraph 4 discloses the use of a rubber sheet (3) in the construction of a brick or masonry wall within a reinforced concrete frame structure (6', 7, 7') suitable for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event, the said sheet implicitly** having anisotropic stiffness in the three orthogonal directions of the wall as well as damping properties thereby increasing the energy dissipation capacity of the structure.

The subject-matter of use claim 18 differs from what is known from D5 in that the use of said rubber sheet comprises:

- (a) locating the rubber sheet vertically within the plane of the wall adjacent a vertical stack of bricks in the wall and in the reinforced concrete frame, wherein

- (b) the rubber sheet has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness across its thickness of S_z , the stiffness of the sheet being such that $S_y > S_x$ and $S_y > S_z$.

The subject-matter of use claim 18 is therefore new, Article 33(2) PCT.

*** see note under paragraph 4*

7. The problem to be solved by the present invention may be regarded as to find an alternative way to the one of D5, for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event. The solution to this problem proposed in use claim 18 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The features (a) and (b) are not known, either alone or in combination, from the cited prior art, see documents D1 - D7. These two features are also not fairly derivable from these documents.

Concerning feature (a), this feature seems to be suggested from D5, figure 1, although the insertion of a vertically extending rubber sheet between the bricks and the frame would not have much appeal for a skilled person -in this case a civil engineer- since it would appear *prima facie* to reduce the resistance of the wall; concerning feature (b), even inserting vertically in D5 the rubber sheet between the stack of bricks and the frame, there is no way^{***} to arrive at $S_y > S_z$ on the basis of what has been said in the note under paragraph 4 with an homogeneous rubber sheet.

**** in order to fulfil this inequality the only option for an homogeneous rubber sheet would be to have a thickness far greater than its width, which option is not realistic, especially starting from what is known from D5*

8. Claims 19-33 are dependent on claim 18 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

R. Righetti

CONFIRMATION

By facsimile

Your Ref

Our Ref **SJW/5191PCT00**

European Patent Office
80298 Munich
Germany

EPO - Munich
75

22. Okt. 2015

16th October 2015

Dear Sirs

**Re: International Application No. PCT/GB2014/052702
Tun Abdul Razak Research Centre**

I am writing in reply to the Written Opinion of the International Preliminary Examining Authority (Form PCT/IPEA/408) dated 17th August 2015.

Enclosed herewith are fresh pages 6 and 8. These are intended to replace pages 6 and 8, respectively, which were enclosed with my letter of 20th April 2015.

The fresh page 6 contains an amended claim 1. The fresh page 8 contains an amended claim 18. No other claims are amended. Both claim 1 and claim 18 are amended to recite “, and wherein the rubber part is in the form of a sheet”. These words are inserted at the end of these claims.

Support for the amendment made to claim 1 and to claim 18 is present in the application as filed at page 2, lines 8-7 from the bottom of the page. Accordingly, it is submitted that the amendment made to claims 1 and 18 herein does not introduce new subject matter and, thus, the amended claims 1 and 18 do not go beyond the disclosure in the application as filed. The amendments, thus, meet the requirements of Article 19(2) PCT and Rule 46.5 PCT.

In the Written Opinion, Sheets 1/2, the Examiner alleges that the subject matter claimed in claim 1 as filed with my letter of 20th April 2015 lacks novelty over the disclosure in FR 2912163A (D4).

D4 relates to a block for use in the construction or erection of a wall or partition, floor or ceiling, door lintel or window lintel, or roof (D4, page 1, lines 1-4). The construction according to D4 will be built up by assembling blocks, honeycomb at their centres, which for example may be formed of rubber (D4, page 2, lines 9-10).

cont.../2

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European Patent Office

16th October 2015

The invention consists of a parallepiped block (D4, page 2, lines 14-15). The Figures in D4 illustrate blocks which have dimensions comparable to those of standard bricks or building blocks. D4 neither discloses nor suggests rubber sheets.

Claim 1, as amended herein, requires the rubber part to be in the form of a sheet. As such, claim 1 relates to subject matter that is not disclosed in D4 and which is, thus, novel over D4. It is submitted, therefore, that the subject matter of claim 1 meets the requirements of Article 33(2) PCT. The subject matter of every other claim which depends directly or indirectly from claim 1 must also be novel over the contents of D4.

For similar reasons as given above in respect of claim 1, the subject matter claimed in claim 18 is also novel over the contents of D4. The subject matter of each of the claims that is dependent directly or indirectly on claim 18 is also novel over the contents of D4.

The subject matter claimed in the present application as amended herein also involves an inventive step.

Claim 1 is directed to the use of a rubber part in the construction of a brick or masonry wall within a reinforced concrete frame structure for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event. The rubber part, which is in the form of a sheet, has anisotropic stiffness in the three orthogonal directions of the wall, as well as damping properties, thereby increasing the energy dissipation capacity of the structure. The use comprises locating the rubber part within the plane of the wall and on or in a horizontal row of bricks. The rubber part, which is stated above, is in the form of a sheet, has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness z and a stiffness across its thickness of S_z , the stiffness being anisotropic with $S_z > S_y > S_x$.

Seismic protection of the masonry wall can be achieved by utilising, simultaneously, the following three mechanisms I, II and III.

I. Out-of-plane containment by invoking arch mechanism

Arching profile is generated due to the rotation of masonry bricks within a wall. As

cont.../3

the masonry wall is constrained within the reinforced concrete frame the rotation of the brick leads to the generation of a clamping force which will tend to hold the bricks in position and resist their rotation. The generation of a sufficiently high clamping force is crucial in this approach. However, a very high clamping force will result in crushing of the masonry bricks due to high localised contact stresses between the adjacent bricks. This leads to a significant reduction in the clamping force and, therefore, the bricks can pop out of the wall.

The use of the rubber part, according to the present invention, controls out-of-plane collapse. The rubber part, which is in the form of a sheet enables the generation of sufficiently high clamping force. However, since this force is spread over a wider area due to the presence of the rubber sheet, the contact stresses do not reach the crushing threshold for the bricks. This is especially so when the rubber part in the form of a sheet is located horizontally between rows of bricks.

The requirement that the sheet has higher stiffness in shear along the out-of-plane direction of the wall prevents the bricks from sliding out of the wall.

II. In-plane damage control

As the reinforced concrete framed structure deflects sideways in plane of the wall during a seismic event, it exerts a diagonal resultant force on the rows of bricks of the masonry infill. These forces can be very high and crush the bricks due to the in-plane motion of the frame. A sheet of rubber placed vertically in between the frame and the rows of bricks of the masonry infill also controls the force exerted on the bricks.

The sheet of rubber placed horizontally between rows of bricks will undergo shear deformation as the rows of bricks move in-plane of the wall under the action of the force transmitted by the columns of the r.c. frame onto the bricks.

The presence of the rubber sheet, especially when a vertical and a horizontal sheet are used, reduces the magnitude and direction of the forces acting on the bricks and therefore eliminates the in-plane damage to the wall.

The compressive stiffness of a vertical sheet of rubber further controls the amount of the force transmitted onto the bricks. If the compressive stiffness is low enough then a limited force is transmitted to the rows of the bricks and hence no damage is experienced by the bricks.

III. Energy dissipation to control the response of the structure and the wall

The compressive stiffness of a vertical sheet of rubber can be adjusted so that sufficient force is transmitted to the rows of bricks to move them over the horizontal sheet of rubber placed in between the rows of the bricks. The horizontal cyclic translation of the bricks during an earthquake results in the shear deformation of this horizontal sheet. This can be used not only to eliminate damage in the bricks but also to dissipate energy through the shear deformation of the horizontal sheet of rubber. The approach described above increases the damping property of the structure frame and therefore reduces the global response of the structure. This, in turn, reduces the demand on the structure as well as the wall.

Control of the in-plane and out-of-plane deformation of a masonry wall can only be achieved via the insertion of sheets of rubber with anisotropic stiffness in three orthogonal directions in order to a) invoke arching mechanism under large out-of-plane accelerations and b) to deform in shear along the direction of the rows of the masonry bricks in order to control in-plane stresses imposed on the masonry bricks during the swaying of the reinforced concrete frame structure. This can only be achieved if the rubber part is a sheet so that 1) for the arching mechanism to be effective, the vertical, tilting and out-of-plane shear stiffness of the rubber joint has to be very high and 2) the amount of the energy stored and subsequently dissipated through the joint depends on the shear strain imposed on the rubber. For a given displacement, the thinner the rubber part, the higher the strain and, therefore, the larger the dissipation of energy by the rubber.

These requirements are neither taught nor suggested in D4. D4 is concerned with blocks of rubber, rather than sheets of rubber. The former would exhibit much lower vertical tilting and shear stiffness compared to a sheet of rubber and thus not be effective in protecting the masonry wall.

D4 does not refer anywhere to the arching mechanism and shear deformation of the rubber block as a fundamental concept used in the design disclosed in D4. D4 refers to absorption of seismic vibrations only once. How this effect is achieved is not described in D4.

D4, further, specifies the use of tendons and other means of interlocking the blocks. The present invention does not rely on additional insertion to achieve the desired function.

The technical problem to be solved by the person skilled in the art, starting from D4 as representing the closest prior art, is to eliminate in-plane damage to a brick or masonry wall within a reinforced concrete frame during a seismic event, while controlling out-of-plane collapse of the wall. The problem is solved, according to claim 1, by locating a rubber part in the form of a sheet within the plane of the wall and on or in a horizontal row of bricks, wherein the rubber part has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness z and a stiffness across its thickness of S_z , the stiffness of the rubber part being anisotropic with $S_z > S_y > S_x$.

This solution is not suggested in D4. Furthermore, none of D1, D2, D3, D5, D6 or D7 have disclosures which make up this deficiency in the teaching in D4. For this reason, the subject matter claimed in claim 1 was not obvious to the person skilled in the art from D4 combined with one or more of the other cited prior art documents.

The invention claimed in claim 18 as amended herein is comparable to that claimed in claim 1 except that claim 18 is concerned with the use of the rubber part, in the form of a sheet, when located vertically within the plane of the wall adjacent to a stack of bricks in the wall and in the reinforced concrete frame. It is discussed above how the location vertically in the wall, of a rubber part in the form of a sheet, provides protection for a wall during a seismic event.

The technical problem to be solved by the person skilled in the art, starting from D4 as representing the closest prior art, is to eliminate in-plane damage to a brick or masonry wall within a reinforced concrete frame during a seismic event, while controlling out-of-plane collapse of the wall. The problem is solved, according to claim 18, by locating a rubber part, in the form of a sheet, vertically within the plane of the wall adjacent a vertical stack of bricks in the wall and in the reinforced concrete frame, wherein the rubber part has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness z and a stiffness across its thickness of S_z , the stiffness of the rubber part being anisotropic such that $S_y > S_x$ and $S_y > S_z$.

This solution is not suggested in D4. Furthermore, none of D1, D2, D3, D5, D6 or D7 have disclosures which make up this deficiency in the teaching in D4. For this reason, the subject matter claimed in claim 18 was not obvious to the person skilled in the art from D4 combined with one or more of the other cited prior art documents.

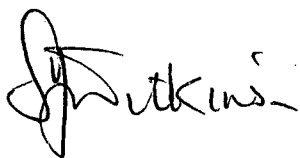
Page 6

European Patent Office

16th October 2015

Having regard to the above, it is submitted that the invention claimed in claim 1 and the invention claimed in claim 18 involve an inventive step over the cited prior art and, thus, meet the requirements of Article 33(3) PCT. The subject matters of claims dependent directly or indirectly on either claim 1 or claim 18 must also involve an inventive step.

Yours faithfully

A handwritten signature in black ink, appearing to read 'J. Wilkinson', with a stylized, cursive script.

WILKINSON, Stephen John

Encs.

CLAIMS

1. The use of a rubber part in the construction of a brick or masonry wall within a reinforced concrete frame structure for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event, the said part having anisotropic stiffness in the three orthogonal directions of the wall as well as damping properties thereby increasing the energy dissipation capacity of the structure, which use comprises locating the rubber part within the plane of the wall and on or in a horizontal row of bricks, wherein the rubber part has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness z and a stiffness across its thickness of S_z , the stiffness of the part being anisotropic with $S_z > S_y > S_x$ and wherein the rubber part is in the form of a sheet.
2. The use according to claim 1, wherein the rubber part has a substantially rectangular shape.
3. The use according to either claim 1 or claim 2, wherein the rubber part has a transverse cross-section across the width of the part which has a plurality of alternating elevated portions and lowered portions.
4. The use according to claim 3, wherein the part has corrugations running along its length.
5. The use according to claim 4, wherein the cross-section of the corrugations has the form of a wave selected from a curved wave, a square wave and a triangular wave.
6. The use according to any one of claims 1 to 5, wherein the rubber of the rubber part is a synthetic rubber, a natural rubber, a reclaimed rubber or a recycled rubber.

17. The use according to any one of claims 1 to 16, wherein any gaps between the external surface of the rubber strip and the internal surfaces of the bricks are filled with a hardenable composition.
18. The use of a rubber part in the construction of a brick or masonry wall within a reinforced concrete frame structure for eliminating the in-plane damage to the wall while controlling its out-of-plane collapse during a seismic event, the said part having anisotropic stiffness and damping properties thereby increasing the energy dissipation capacity of the structure, which use comprises locating the rubber part vertically within the plane of the wall adjacent a vertical stack of bricks in the wall and in the reinforced concrete frame, wherein the rubber part has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y and a thickness z and a stiffness across its thickness of S_z , the stiffness of the part being anisotropic such that $S_y > S_x$ and $S_y > S_z$, and wherein the rubber part is in the form of a sheet.
19. The use according to claim 18, wherein the rubber part has a substantially rectangular shape.
20. The use according to either claim 18 or claim 19, wherein the rubber part has a transverse cross-section across the width of the part which has a plurality of alternating elevated portions and lowered portions.
21. The use according to claim 20, wherein the part has corrugations running along its length.
22. The use according to claim 21, wherein the cross-section of the corrugations has the form of a wave selected from a curved wave, a square wave and a triangular wave.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.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. PCT/GB2014/052702	International filing date (day/month/year) 05.09.2014	Priority date (day/month/year) 05.09.2013
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International Patent Classification (IPC) or both national classification and IPC
INV. E04B1/98 E04B2/02

Applicant
TUN ABDUL RAZAK RESEARCH CENTRE

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 43bis.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 notified the International Bureau under Rule 66.1bis(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:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	Date of completion of this opinion see form PCT/ISA/210	Authorized Officer Telephone No. +31 70 340-0 
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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 43bis.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 filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
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 in 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 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>5-7, 9, 10, 13, 16, 20, 21</u>
	No: Claims	<u>1-4, 8, 11, 12, 14, 15, 17-19</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-21</u>
Industrial applicability (IA)	Yes: Claims	<u>1-21</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

1. Reference is made to the following documents:

- D1 DE 197 16 179 A1 (HÜLS AG) 22 October 1998 (1998-10-22)
- D2 WO 91/16195 A (SNYDER) 31 October 1991 (1991-10-31)
- D3 US 4 216 856 A (MORING ET AL.) 12 August 1980 (1980-08-12)
- D4 FR 2 912 163 A1 (L. VELARDO) 8 August 2008 (2008-08-08)
- D5 CN 102 268 900 A (UNIV. GUANGZHOU) 7 December 2011 (2011-12-07)
- D6 JP 2001 254534 A (SHIMIZU CORP.) 21 September 2001 (2001-09-21)
- D7 EP 0 599 145 A (CONTINENTAL AG) 1 June 1994 (1994-06-01)

1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1 - 4, 8, 11, 12, 14, 15, 17 - 19 is not new in the sense of Article 33(2) PCT.

1.1 The document D1 (cf. page 2, line 11 - line 68; page 4, line 5 - line 20; figures 1-7) discloses a rubber part (1-3) suitable for use as a structural component for incorporation into a brick or masonry wall structure in a reinforced concrete frame, and suitable to be located within the plane of the wall, which part has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y , and a thickness z and a stiffness across its thickness of S_z , the stiffness of the part being anisotropic with implicitly* $S_y > S_x$.

**it is implicit from figure 7 that the stiffness of the rubber part is bigger in the transversal direction because of the presence of the transversal reinforcements 1*

1.2 Since the additional functional feature of claim 1 "the said part being adapted such that, when in use, it is capable of controlling vibrations of the wall caused by seismic activity and also of having a damping effect thereby increasing the energy

dissipation capacity of the structure" does not clearly differentiate the subject-matter of claim 1 from the rubber part known from D1 -which is also capable of controlling vibrations and having a damping effect when used in a wall- the subject-matter of claim 1 is deprived of novelty, Article 33(2) PCT.

1.3 Documents D2, D3 and D4 also anticipate the subject-matter of claim 1:

- D2 (cf. page 10, line 4 - line 24; page 15, line 3 - page 16, line 12; figures): laminated rubber strip (10-16, 20-16,...) having anisotropic properties, being essentially rigid in a direction at right angles to its longitudinal axis (cf. abstract), and being suitable for use as a structural component for incorporation into a brick or masonry wall structure in a reinforced concrete frame;
- D3 (cf. column 4, line 60 - line 65; figure 4): laminated rubber strip having anisotropic properties, having implicitly a bigger stiffness in a direction transversal to its longitudinal axis (see figure 4: among the three reinforcing layers, two have fibers aligned in the transversal direction and only one in the longitudinal one), and being suitable for use as a structural component for incorporation into a brick or masonry wall structure in a reinforced concrete frame;
- D4 (cf. claims 1-7; figures): rubber part (rubber brick) having a bigger stiffness** in a transversal (vertical) direction than in the longitudinal direction because of its geometry (lower void/material ratio in the vertical direction than in the longitudinal one) and being evidently suitable for use as a structural component for incorporation into a brick wall structure in a reinforced concrete frame.

*** obviously in this case the stiffness refers to the stiffness of the part and not of the material*

1.4 The features introduced by dependent claims 2 - 4, 8, 11, 12, 14, 15, 17 - 19 are also known from documents D1-D4 in combination with the features of claim 1:

- claim 2: known from D1-D4 (see figures);
- claims 3, 4: the way in which these claims are formulated (the term stiffness is not clearly defined here nor in claim 1) does not allow to clearly differentiate their subject-matter from at least the rubber brick of D4 (see figures);
- claim 8: explicitly known from D1, D2 and D4;
- claims 11, 12: known from D2 and D3 (the term "inextensible" is furthermore quite vague);

- claims 14, 15: known from D1 and D4 (see figures);
- claim 17: the way this claim is formulated does not clearly differentiate its subject-matter from the rubber parts of D1-D4 ("high damping rubber" is not a clearly specified material);
- claims 18, 19: known from D4 (see figures).

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of at least dependent claims 5 - 7, 9, 10, 13, 16, 20 and 21 does not appear to involve an inventive step in the sense of Article 33(3) PCT, for the following reasons:

- claims 5-7: constructive details linked to their inherent benefits and already known per se in the prior art (see e.g. D7, figures);
- claim 9: well known manufacturing method furthermore suggested by D1-D3;
- claim 10: well known manufacturing method furthermore suggested by D4;
- claim 13: mere constructive detail linked to its inherent benefit;
- claim 16: constructive detail suggested by D5 and D6 (see figures);
- claims 20, 21: use of the rubber part or strip according to the circumstances or to the code of proper building.

R. Righetti

CORRECTED VERSION

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
12 March 2015 (12.03.2015)



(10) International Publication Number
WO 2015/033161 A8

- (51) International Patent Classification:
E04B 1/98 (2006.01) *E04B 2/02* (2006.01)
- (21) International Application Number:
PCT/GB2014/052702
- (22) International Filing Date:
5 September 2014 (05.09.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
1315849.8 5 September 2013 (05.09.2013) GB
1409155.7 22 May 2014 (22.05.2014) GB
- (71) Applicant: TUN ABDUL RAZAK RESEARCH CENTRE [GB/GB]; Brickendonbury, Hertfordshire SG13 8NL (GB).
- (72) Inventors; and
(71) Applicants (for US only): AHMADI, Hamid Reza [GB/GB]; 53 Warwick Road, New Barnet, Hertfordshire EN5 5EQ (GB). DUSI, Alberto [IT/IT]; Via G. Garibaldi, 40, 26010 Azzanello CR (IT).
- (74) Agents: STEVENS HEWLETT & PERKINS et al.; 1 St. Augustine's Place, Bristol, BS1 4UD (GB).

(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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).

Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: A RUBBER PART FOR INCORPORATION INTO A BRICK OR MASONRY WALL IN A REINFORCED CONCRETE FRAME TO PROTECT AGAINST DAMAGE CAUSED BY SEISMIC ACTIVITY

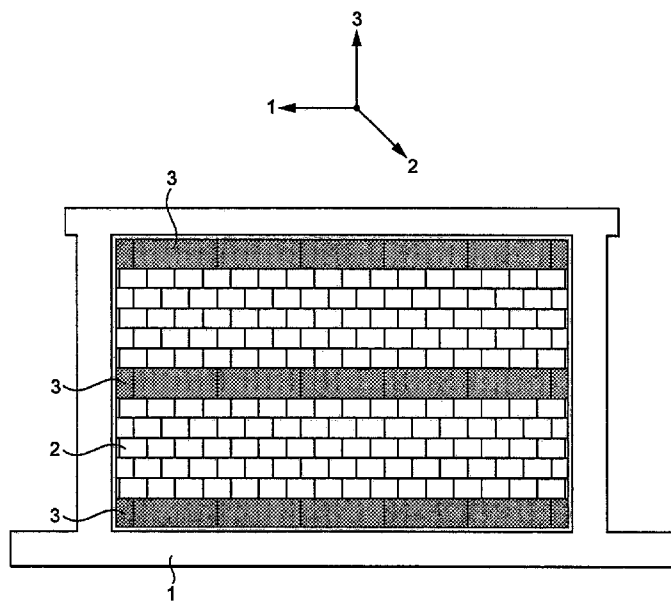


FIG. 1a

(57) Abstract: A rubber part for use as a structural component for incorporation into a brick or masonry wall structure in a reinforced concrete frame, to be located within the plane of the wall, has a length x and a stiffness along its length of S_x , a width y and a stiffness across its width of S_y , and a thickness z and a stiffness across its thickness of S_z , the stiffness of the part being anisotropic with $S_y > S_x$. The part is adapted such that, when in use, it is capable of controlling vibrations of the wall caused by seismic activity and also of having a damping effect thereby increasing the energy dissipation capacity of the structure. The rubber part is preferably in the form of a sheet and can be laminated on one or both major surfaces. The two major surfaces of the sheet may be contoured, for instance being corrugated across its width.



Published:

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

(15) Information about Correction:

see Notice of 22 October 2015

(48) Date of publication of this corrected version:

22 October 2015

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SJW/5191PCT0	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/GB2014/052702	International filing date (<i>day/month/year</i>) 5 September 2014 (05-09-2014)	(Earliest) Priority Date (<i>day/month/year</i>) 5 September 2013 (05-09-2013)
Applicant TUN ABDUL RAZAK RESEARCH CENTRE		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out 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))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6**bis**(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1a
☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention
b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2014/052702

A. CLASSIFICATION OF SUBJECT MATTER
 INV. E04B1/98 E04B2/02
 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)

E04B E04H B32B B29K

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	DE 197 16 179 A1 (HÜLS AG) 22 October 1998 (1998-10-22)	1-8, 11-15, 17,18
A	page 2, line 11 - line 68 page 4, line 5 - line 20; figures 1-7 -----	9,10,16
X	WO 91/16195 A (SNYDER) 31 October 1991 (1991-10-31)	1-4,8,9, 11-15, 17,18
A	page 10, line 4 - line 24 page 15, line 3 - page 16, line 12; figures -----	5-7,10, 16
X	US 4 216 856 A (MORING ET AL.) 12 August 1980 (1980-08-12)	1-4,8, 11-15,17
A	column 4, line 60 - line 65; figure 4 ----- -/-	5-7,9, 10,16,18



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

11 December 2014

Date of mailing of the international search report

17/12/2014

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Righetti, Roberto

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2014/052702

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	FR 2 912 163 A1 (L. VELARDO) 8 August 2008 (2008-08-08) claims 1-7; figures -----	1-8, 10-21 9
X	CN 102 268 900 A (UNIV. GUANGZHOU) 7 December 2011 (2011-12-07) abstract; figures -----	1-3,8,9, 16-21
X	JP 2001 254534 A (SHIMIZU CORP.) 21 September 2001 (2001-09-21) abstract; figures -----	1-3,8,9, 16-19,21
X	EP 0 599 145 A (CONTINENTAL AG) 1 June 1994 (1994-06-01) column 1, line 1 - line 21; figures -----	1,5-9,14

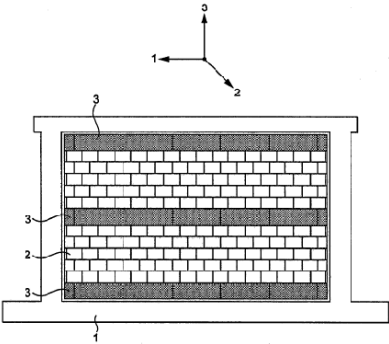
INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2014/052702

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19716179	A1	22-10-1998	NONE
WO 9116195	A	31-10-1991	CA 2068529 A1 21-10-1991 US 5096772 A 17-03-1992 WO 9116195 A1 31-10-1991
US 4216856	A	12-08-1980	NONE
FR 2912163	A1	08-08-2008	NONE
CN 102268900	A	07-12-2011	NONE
JP 2001254534	A	21-09-2001	NONE
EP 599145	A	01-06-1994	CZ 9302388 A3 15-06-1994 EP 0599145 A1 01-06-1994 ES 2099349 T3 16-05-1997

 SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO DIVISION DE NUEVAS CREACIONES TARJETA ARCHIVO TEMÁTICO PATENTE DE INVENCION PCT <u> X </u> MODELO DE UTILIDAD DISEÑO INDUSTRIAL														
(21) No. de solicitud: (22) Fecha de solicitud: 05-04-16														
(51) Clasificación Internacional: E04B 1/98														
(71) Solicitante(s): TUN ABDUL RAZAK RESEARCH CENTRE														
(72) Inventor(es): AHMADI, Hamid Reza y DUSI, Alberto.														
(74) Apoderado: ALICIA LLOREDA RICAURTE														
<table><tr><td>(30) Prioridad</td><td>(31) No. Prioridad</td><td>(32) Fecha</td><td>(33) País</td></tr><tr><td></td><td>1315849.8</td><td>05-09-13</td><td>GB</td></tr><tr><td></td><td>1409155.7</td><td>22-05-14</td><td>GB</td></tr></table>		(30) Prioridad	(31) No. Prioridad	(32) Fecha	(33) País		1315849.8	05-09-13	GB		1409155.7	22-05-14	GB	
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	1409155.7	22-05-14	GB											
(85) Fecha límite inicio fase nacional: 05-04-16		(87) Publicación internacional												
(86) Datos relativos a la presentación de la solíc. PCT														
Fecha de presentación de la solicitud: 05-09-14														
No. de solicitud: PCT/GB2014/052702		Fecha: 12-03-15												
		No. Publicación: WO 2015/033161 A8												
(54) Título: UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA														
(57) Resumen:														
Resumen.- Una parte de caucho para el uso como un componente estructural para la incorporación en una estructura de pared de ladrillo o mampostería en un marco de hormigón armado, que se encuentra dentro del plano de la pared, tiene una longitud X y una rigidez a lo largo de su longitud de S_x, una anchura y y una rigidez a través de su ancho de S_y, y un espesor z y una rigidez a través de su espesor de S_z, la rigidez de la parte siendo anisotrópica con S_y> S_x. La parte está adaptada de tal manera que, cuando está en uso, es capaz de controlar las vibraciones de la pared causadas por la actividad sísmica y también de tener un efecto de amortiguación de este modo se aumenta la capacidad de disipación de energía de la estructura. La parte de caucho esta preferiblemente en forma de una hoja y se puede laminar en una o en ambas superficies principales. Las dos superficies principales de la lámina pueden ser contorneados, por ejemplo ser onduladas través de su anchura.														
Sector: Construcciones, paredes.														

 SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO DIVISION DE NUEVAS CREACIONES TARJETA ARCHIVO PROPIETARIOS PATENTE DE INVENCION PCT <u> X </u> MODELO DE UTILIDAD DISEÑO INDUSTRIAL														
(21) No. de solicitud: (22) Fecha de solicitud: 05-04-16														
(51) Clasificación Internacional: E04B 1/98														
(71) Solicitante(s): TUN ABDUL RAZAK RESEARCH CENTRE														
(72) Inventor(es): AHMADI, Hamid Reza y DUSI, Alberto.														
(74) Apoderado: ALICIA LLOREDA RICAURTE														
<table><tr><td>(30) Prioridad</td><td>(31) No. Prioridad</td><td>(32) Fecha</td><td>(33) País</td></tr><tr><td></td><td>1315849.8</td><td>05-09-13</td><td>GB</td></tr><tr><td></td><td>1409155.7</td><td>22-05-14</td><td>GB</td></tr></table>		(30) Prioridad	(31) No. Prioridad	(32) Fecha	(33) País		1315849.8	05-09-13	GB		1409155.7	22-05-14	GB	
(30) Prioridad	(31) No. Prioridad	(32) Fecha	(33) País											
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	1409155.7	22-05-14	GB											
(85) Fecha límite inicio fase nacional: 05-04-16		(87) Publicación internacional												
(86) Datos relativos a la presentación de la solicitud PCT														
Fecha de presentación de la solicitud: 05-09-14														
No. de solicitud: PCT/GB2014/052702		Fecha: 12-03-15												
		No. publicación: WO 2015/033161 A8												
(54) Título: UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA														

UNA PARTE DE GOMA PARA INTRODUCIRLA EN UNA PARED DE LADRILLO O MAMPOSTERÍA EN MARCO DE HORMIGÓN ARMADO PARA PROTEGER CONTRA EL DAÑO CAUSADO POR LA ACTIVIDAD SÍSMICA

RESUMEN – OBJETO Y FINALIDAD DE LA INVENCION

Una parte de caucho para el uso como un componente estructural para la incorporación en una estructura de pared de ladrillo o mampostería en un marco de hormigón armado, que se encuentra dentro del plano de la pared, tiene una longitud X y una rigidez a lo largo de su longitud de S_x , una anchura y y una rigidez a través de su ancho de S_y , y un espesor z y una rigidez a través de su espesor de S_z , la rigidez de la parte siendo anisotrópica con $S_y > S_x$. La parte está adaptada de tal manera que, cuando está en uso, es capaz de controlar las vibraciones de la pared causadas por la actividad sísmica y también de tener un efecto de amortiguación de este modo se aumenta la capacidad de disipación de energía de la estructura. La parte de caucho esta preferiblemente en forma de una hoja y se puede laminar en una o en ambas superficies principales. Las dos superficies principales de la lámina pueden ser contorneados, por ejemplo ser onduladas a través de su anchura.

SECTOR: Construcciones, paredes.

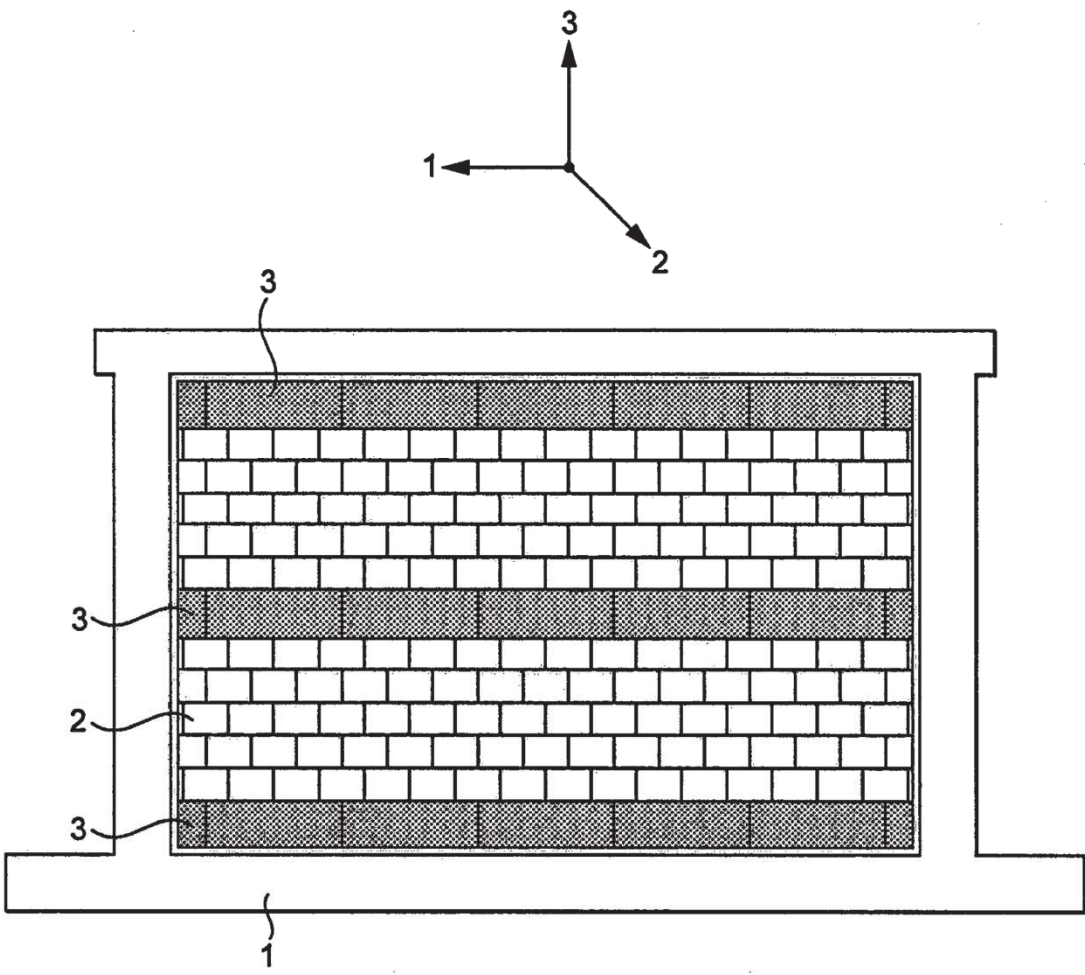


FIG. 1a

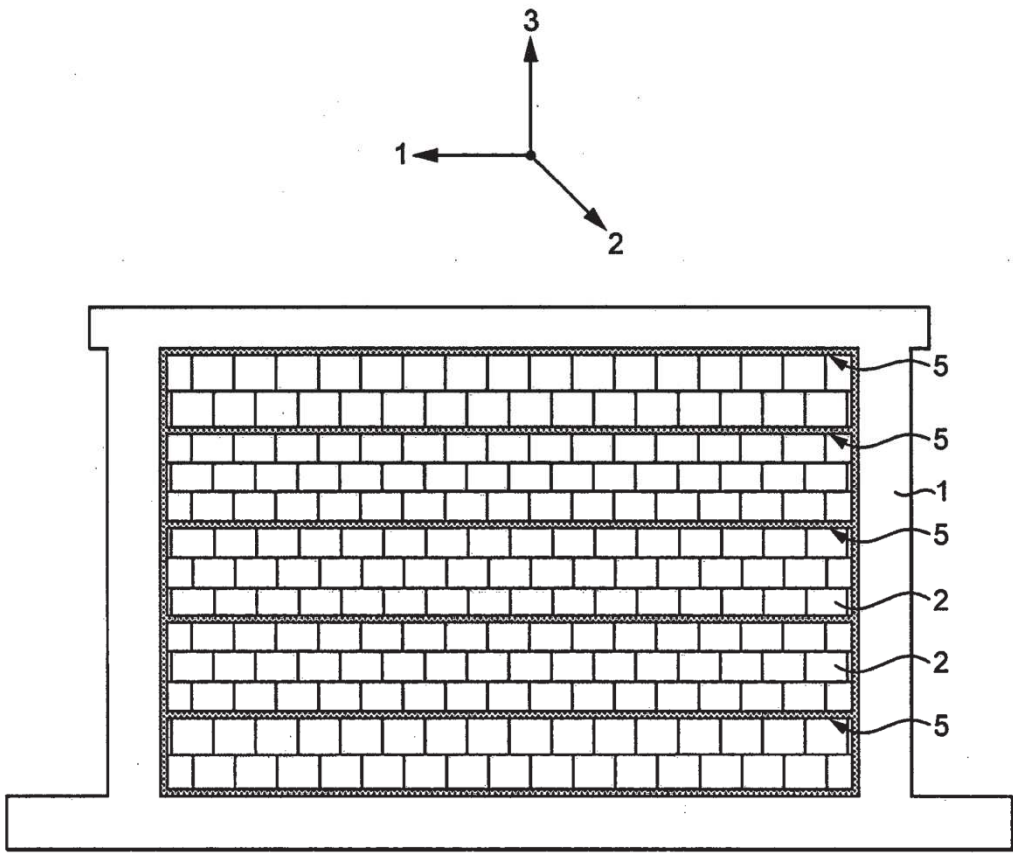


FIG. 1b

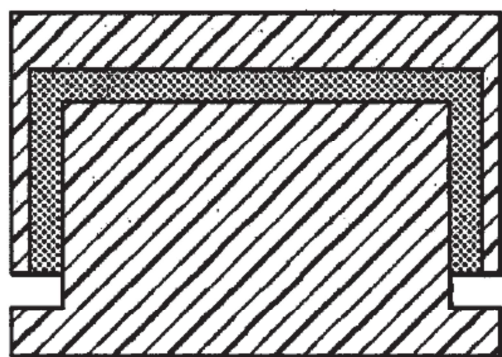


FIG. 2a

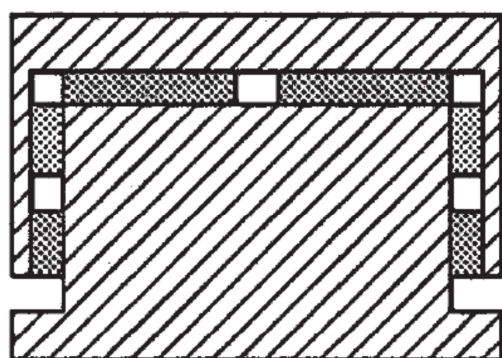


FIG. 2b

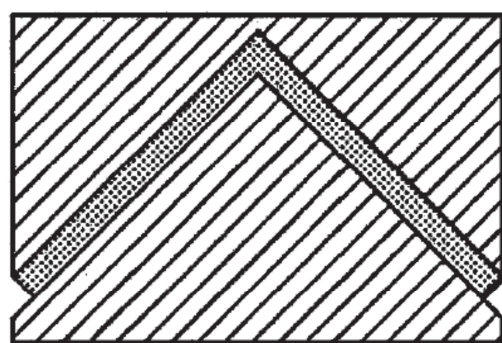


FIG. 2c

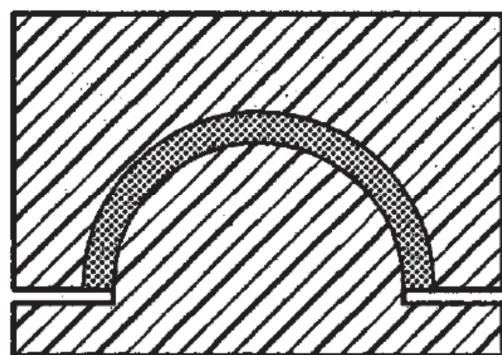


FIG. 2d

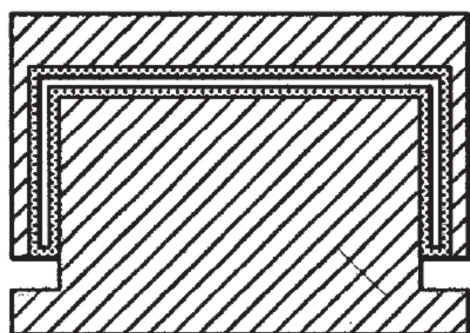


FIG. 2e

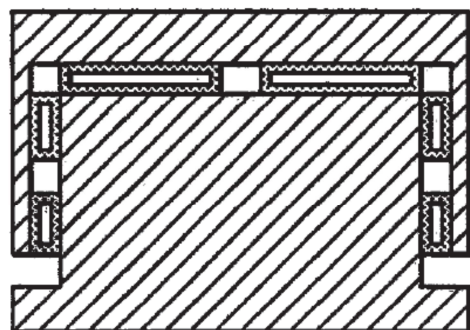


FIG. 2f

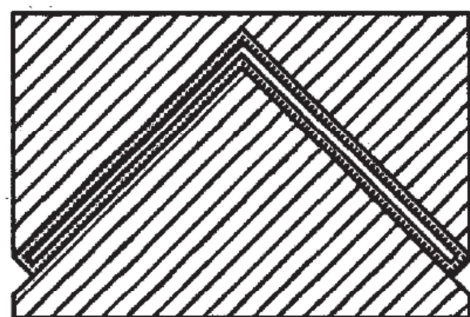


FIG. 2g

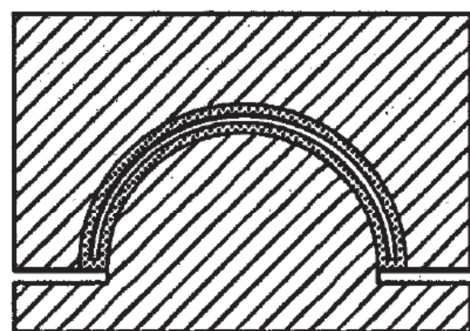


FIG. 2h

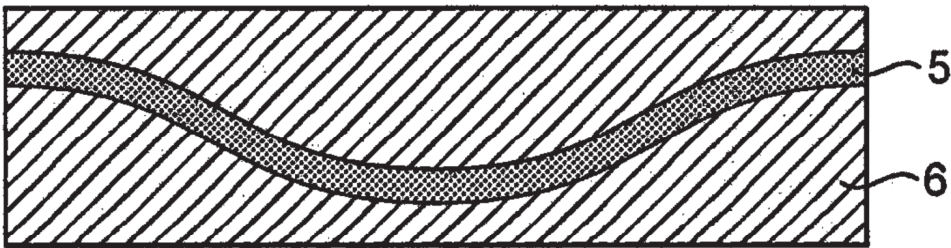


FIG. 3a



FIG. 3b



FIG. 3c



FIG. 3d

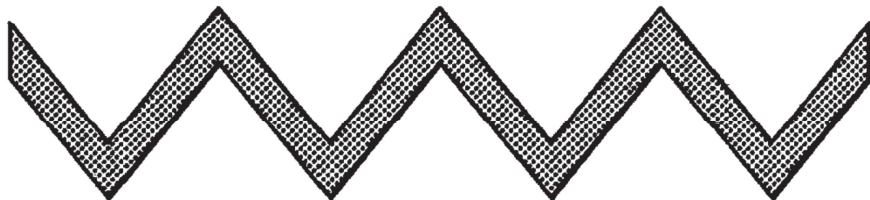


FIG. 3e



FIG. 4a



FIG. 4b



FIG. 4c

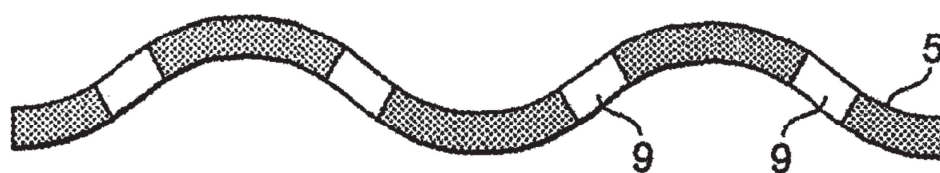


FIG. 4d



FIG. 4e