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(72) Inventor; and

(71) Applicant: **WILLIAMSON, Douglas** [NZ/NZ]; 217 Waltham Rd, Christchurch 8023 (NZ).

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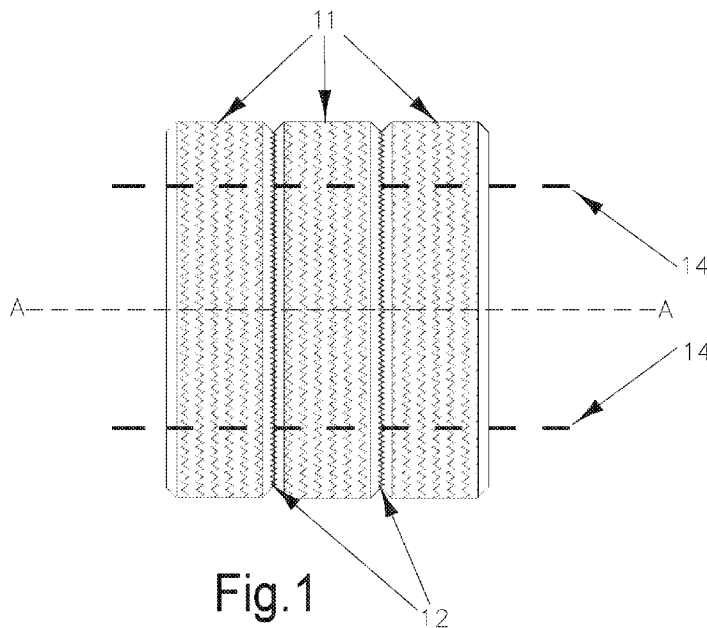
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(54) Title: MEANS OF UTILISING TYRES



(57) Abstract: This is a concept for making use of primarily waste tyres, but also other products, as well as using a method whereby the tyres can be securely joined together (either single tyres or bales) in a durable sustainable and environmentally friendly manner to create economically viable structures such as surfaces, walls, barriers and buildings.



WO 2021/161062 A1

Title

Means of utilising tyres.

Technical Field

[0001] The present invention relates to a method of utilising unwanted tyres to produce a range of useful products.

Background Art

[0002] Industrialised countries typically produce large volumes of discarded tyres. Storing the tyres indefinitely is not a desirable option – tyres stored in this way are a fire risk and also a source of vermin infestation, as well as being unsightly. Burying the tyres in landfill generally is unsatisfactory since the shape and material of the tyres means that they tend to “float” to the surface of landfill.

[0003] To date, the most satisfactory methods of utilising unwanted tyres are shredding the tyres and using the shredded material for uses such as roadbuilding, or burning or pyrolysing the tyres in high temperature furnaces. However, these options require a heavy investment in high cost and complex machinery and are viable only if a very large volume of discarded tyres is available. A further drawback to burning or pyrolyzing the tyres is the generation of toxic ash and toxic gases. Shredded material also was used as ground cover, but this gave problems of toxic leaching.

Summary of Invention

[0004] An object of the present invention is the provision of a method for using unwanted tyres to produce a range of useful products, without requiring an investment in high cost equipment such as tyre shredders or high temperature furnaces.

[0005] The present invention provides a method of producing a structure from single tyres, including the steps of:

- providing a plurality of single tyres;
- securing the tyres together in a row with the axes of rotation of the tyres aligned;
- wrapping the aligned tyres with a flexible wrapping material to form a structure of the desired length.

- [0006] It is envisaged that the tyres may be secured together by sewing or stapling the tyre sidewalls together or securing one or more connecting wires to the surfaces of the aligned tyres.
- [0007] Preferably, the flexible wrapping material is UV resistant (for example UV resistant plastic wrap) and impermeable, to reduce the risk of additives leaching from the tyres when the structure is in use. However, for some applications it is envisaged that a flexible fabric wrap or a flexible wire mesh wrap could be used instead.
- [0008] The present invention also provides a method of producing a structure from tyre bales, including the steps of:
- arranging two or more bales of tyres to form a predetermined configuration;
 - wrapping the arranged bales with a flexible wrapping material to form a structure.
- [0009] Preferably, before wrapping, the bales are secured together e.g. by connecting wires.
- [0010] As used herein, the reference to “tyre bales” refers to tyres formed into a compressed bale using any of a range of known tyre bailing equipment. Typically, about 100 average-size, tyres are compressed into a bale of approximately 1.6 by 1.4 by 1.0 metres, weighing about 800 KG. A typical tyre bale is tied with a plurality of spaced wires around the bale.

Brief Description of Drawings

- [0011] By way of example only, a preferred embodiment of the present invention is described in detail with reference to the accompanying drawings, in which:

Figure 1 is a diagram showing the first stage of producing a structure from single tyres;

Figure 2 is a diagrammatic representation of a structure produced from single tyres;

Figure 3 is a diagrammatic representation of a tyre bale; and

Figure 4 is a diagrammatic representation of a structure produced from a plurality of tyre bales.

Best Mode for Carrying Out the Invention

[0012] Referring to Figures 1 and 2, a structure 10 may be made from single unwanted tyres 11 by following the steps given below:

- Three tyres 11 are secured together with their axes of rotation A – A aligned as shown in Figure 1. The tyre sidewalls may be secured together as indicated by zigzag lines 12, securing the adjacent side walls of the tyres together. The tyres may be secured together e.g. by stitching or stapling or any other suitable method.
- The secured tyres 11 are then wrapped with a flexible wrapping material 13 which is wound around the three tyre unit in a series of overlapping layers, to completely encase the unit. The wrapped unit provides a stable, ready to use structure, suitable for use in a number of different applications as discussed below.

[0013] It will be appreciated that any number of tyres may be secured together and wrapped in this way, depending upon the size of the structure required. It is envisaged that tyres would be secured to the structure one by one and the resulting line of tyres progressively wrapped.

[0014] As an alternative, or in addition, to securing the tyre sidewalls together, the tyres can be secured together by stapling lengths of metal bar 14 at spaced intervals along the outer surfaces of the tyres, before wrapping.

[0015] Referring to Figure 3, a tyre bale 20 is shown, consisting of a large number (typically about 100) of baled unwanted tyres which are packed and compressed into a bale and secured in the compressed position by a series of spaced wires 21, 22. Bales of this type are well-known and commonly used to compact unwanted tyres into a manageable state for large-scale transport.

[0016] The bale 20 is shown as secured by plain wires 21, 22, but it also is possible to include wire strainers (of known type) on each of the wires so that the wires can be tightened further if necessary.

- [0017] Depending upon the length of structure required, two or more bales 20 are secured together in a stack of the required shape, by securing the wires 21, 22 together and/or by wrapping additional wires around the stack of bales. The stack of bales is then wrapped with overlapping layers of a flexible wrapping material 23, as shown in Figure 4, to provide a single structure of the desired size and shape.
- [0018] As with the units made from single tyres, the structures made from bales can be further strengthened by securing spaced steel bars along the length of the structure before wrapping.
- [0019] The wrapping material used to wrap the tyre units or the tyre bales is selected depending upon the intended end use of the structure:— for example, if the structures are to be buried or encased in some way, then it is not necessary to use a UV resistant wrapping material. However, if the structures are to be stored in daylight for some time before using, or are to be used exposed to the light, a UV resistant wrapping material is preferable.
- [0020] It is envisaged that the wrapping material will be applied using a wrapping machine constructed in accordance with the principles used by any of the variety of known machines currently used for wrapping hay and silage bales, suitably scaled up to allow for the heavier weights of the tyres/bales.
- [0021] Depending upon the end use of the wrapped structure, the wrapping material could be selected from a wide range of materials, for example:
- waterproof plastic material;
 - ripstop nylon;
 - wire mesh;
 - high tensile wire.
- [0022] The bales could be arranged end to end as shown in Figure 4, but preferably the bales would be not only arranged end to end but also stacked two or more deep and simultaneously compressed and wrapped.
- [0023] Structures made either from single tyres secured together or from tyre bales secured together may be used for a wide variety of applications, some of which are listed below:

- Forming fences and traffic barriers. For these applications, the structures could be covered with an outer layer of birth or other surfacing materials such as concrete.
- Forming building walls, with the addition of a suitable surfacing material such as concrete.
- Forming impact resistant track surface areas such as running tracks and recreation areas, by sinking the structures into the ground and adding a suitable surfacing layer. The surfacing layer could be a replaceable wear cover or could be a permanent top surface.
- Forming seaside or underwater structures such as artificial reefs or shore protection structures.
- Forming complete buildings by combining the structures with conventional building materials.

[0024] If the structures require a concrete surface, this can be achieved either by spraying the structure with concrete or moulding concrete over the structure.

[0025] The Figures show only structures made of small number of tyres or bales, as the case may be. However, it will be appreciated that extremely long structures may be constructed and covered by continuous wrapping.

What I claim is

[0026] The embodiments of the invention in which an exclusive property or privilege is claimed are defined as followed:

1. A concept for making use of waste tyres by using a method whereby the tyres can be securely joined together by either a single tyre or multiple bales.
2. A wrapping machine to complete the task in claim 1 which is an adaption of a foliage bailing machine but modified to accept the greater weight of bales as well as having the ability to compress the bales and single tyres together.
3. The machine which is subject to claim 2 can be adapted to use different wrapping materials including but not limited to:
 - plastic;
 - UV resistant plastic;
 - ripstop nylon;
 - Geotech material.
 - ripstop nylon;
 - polyester;
 - wire mesh;
 - wire.
4. The end product subject to claims 1-3 can be adapted and reinforced with:
 - rebar;
 - reinforcing mesh;
 - Geotech material;
 - Kevlar;

subject to requirements and physical location.

5. The end product subject to claims 1-4 in the case of single tyres has beads that can be stapled or sewn together to enhance strength.

AMENDED CLAIMS

received by the International Bureau on 10 January 2021 (10.06.2021)

What I claim is

[0036] The embodiments of the invention in which an exclusive property or privilege is claimed are defined as followed:

1. A method for making use of waste tyres whereby an end product is capable of being formed by mechanically securely joining single tyres together or by mechanically forming the tyres into multiple bales.
2. A wrapping machine to complete the method in claim 1 which is an adaption of a foliage wrapping machine but modified to accept the greater weight of bales as well as having the ability to compress the bales or single tyres together to create an autonomous continuous structure.
3. The machine which is subject to claim 2 is capable of being adapted to use different wrapping materials including but not limited to: plastic; fireproof plastic; UV resistant plastic; ripstop nylon; erosion control material; polyester; wire mesh; or wire.
4. The method in claim 1 or the wrapping machine in claims 2 or 3, wherein the end product is capable of being adapted and reinforced subject to requirements and physical location with: rebar; reinforcing mesh; erosion control material; or aramid; wherein the use of this method and wrapping process can be used to seal the end product to prevent leachate and mitigate the fire risk to the end product.

STATEMENT UNDER ARTICLE 19 (1)

The most important feature of this invention (as compared to those presented by the search) is that it discloses a method whereby single tyres or bales can be continuously mechanically wrapped. This is impossible in the examples cited by the search. Furthermore, the baling machine and baling process is completely different from the wrapping machine and wrapping process. Where baling compresses multiple tyres (which are then manually bound and ejected as a single bale), the wrapping process disclosed in this patent joins multiple bales by mechanical wrapping and ejects a single continuous structure, be it vertical or horizontal. It can also join multiple single tyres and eject a continuous structure by being wrapped around the circumference of the tyres. The wrapping of the single tyres disclosed in the patents compared in the search are wrapped through their central axis, making it impossible to do it continuously or mechanically.

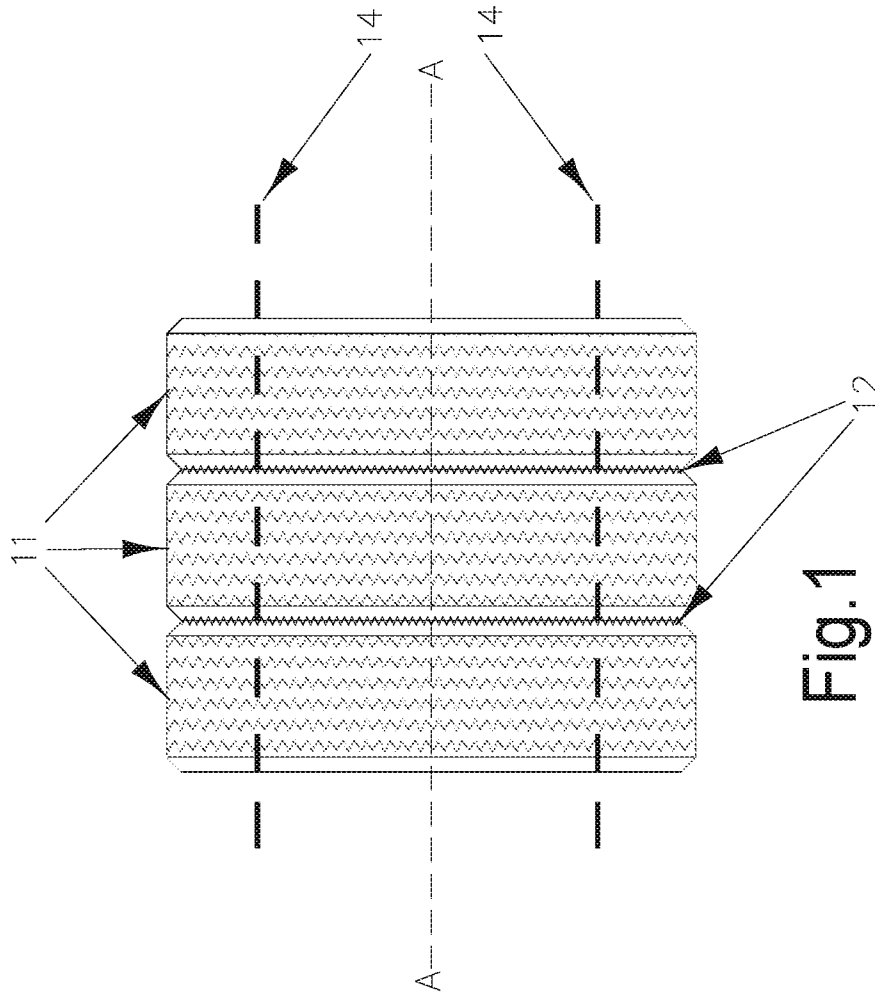


Fig.1

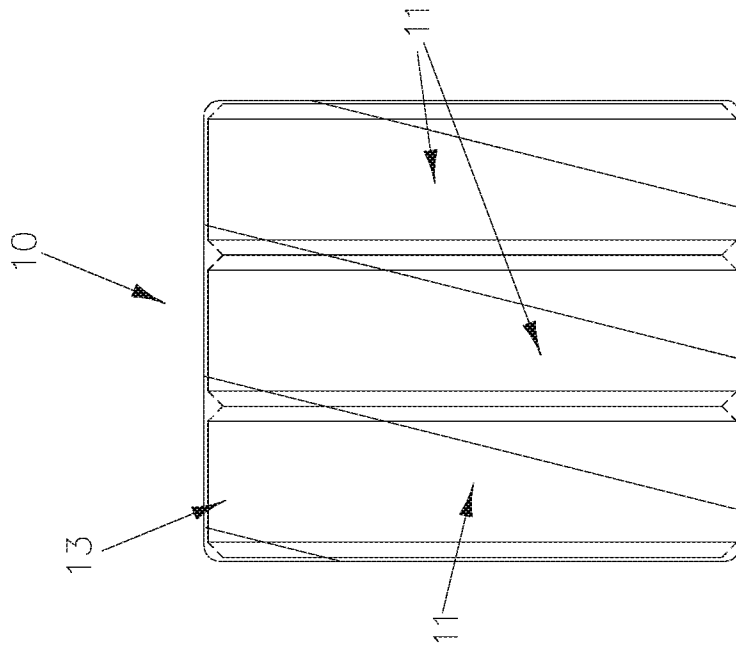


Fig.2

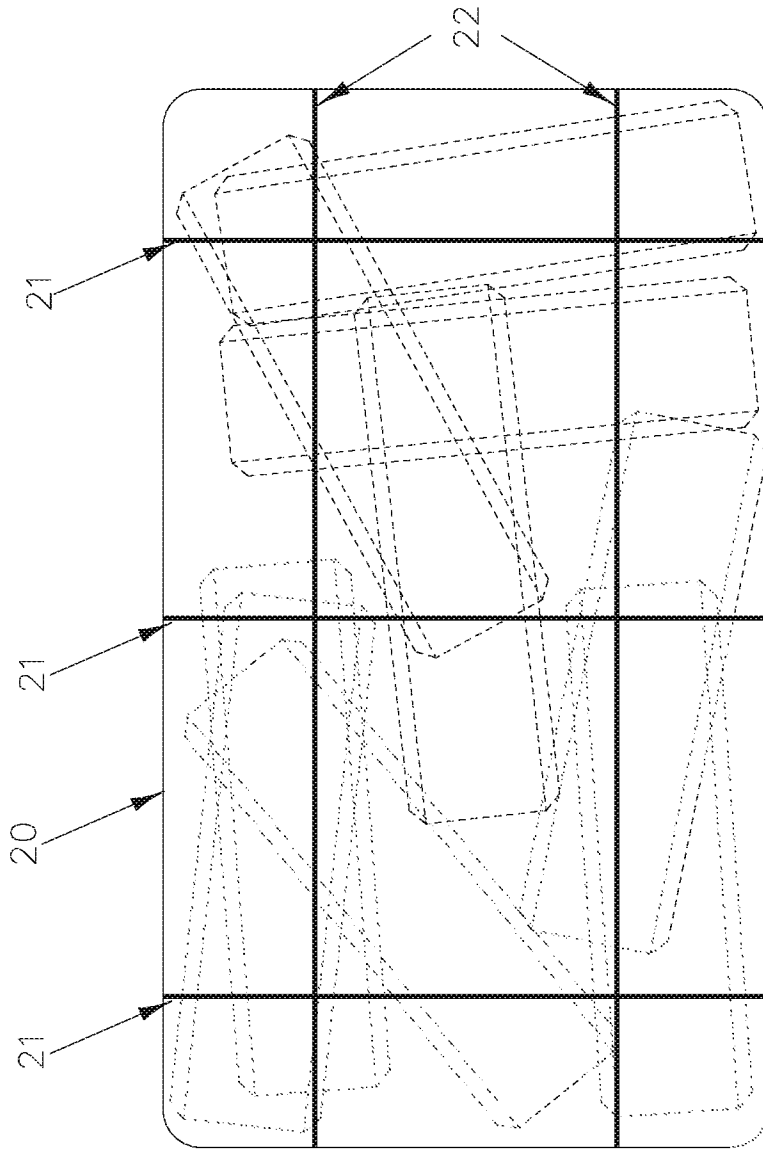


Fig.3

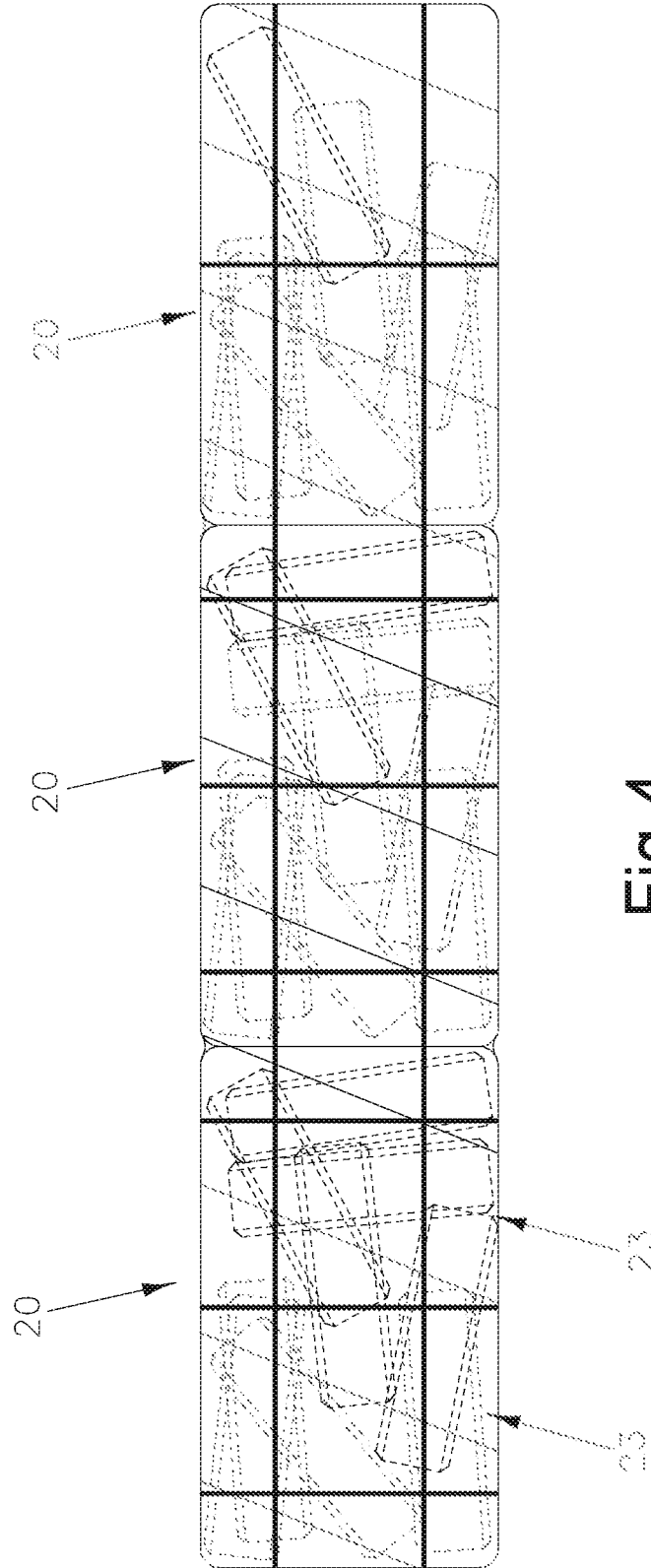


Fig.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB20/51003

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B09B 1/00; B65D 71/02, 85/62, 85/06; E02D 29/02 (2020.01)

CPC - B09B 1/00; B30B 9/3028; B65D 71/02, 85/62, 85/06; E02D 29/02

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)

See Search History document

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

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,795,106 A (HERD, I) 18 August 1998; Figure 4; Column 2, Lines 46-51	1-4
X	US 5,172,528 A (CLARKE, P) 22 December 1992; Figure 1; Column 3, Lines 50-54 and Column 4, Lines 40-44	1-4
A	US 5,590,594 A (PEDERSON, L) 07 January 1997; Figure 7; entire document	1-4
A	US 6,098,531 A (REINERT, G) 08 August 2000; Figures 3-4; entire document	1-4
A	US 4,057,141 A (LAURIE, A et al.) 08 November 1977; Figure 1; entire document	1-4

 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

"D" document cited by the applicant in the international application

"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

27 April 2020 (27.04.2020)

Date of mailing of the international search report

12 MAY 2020

Name and mailing address of the ISA/US

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P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Shane Thomas

Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB20/51003

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: 5
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.