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(54) WASTE TIRES FOUNDATION BAGS

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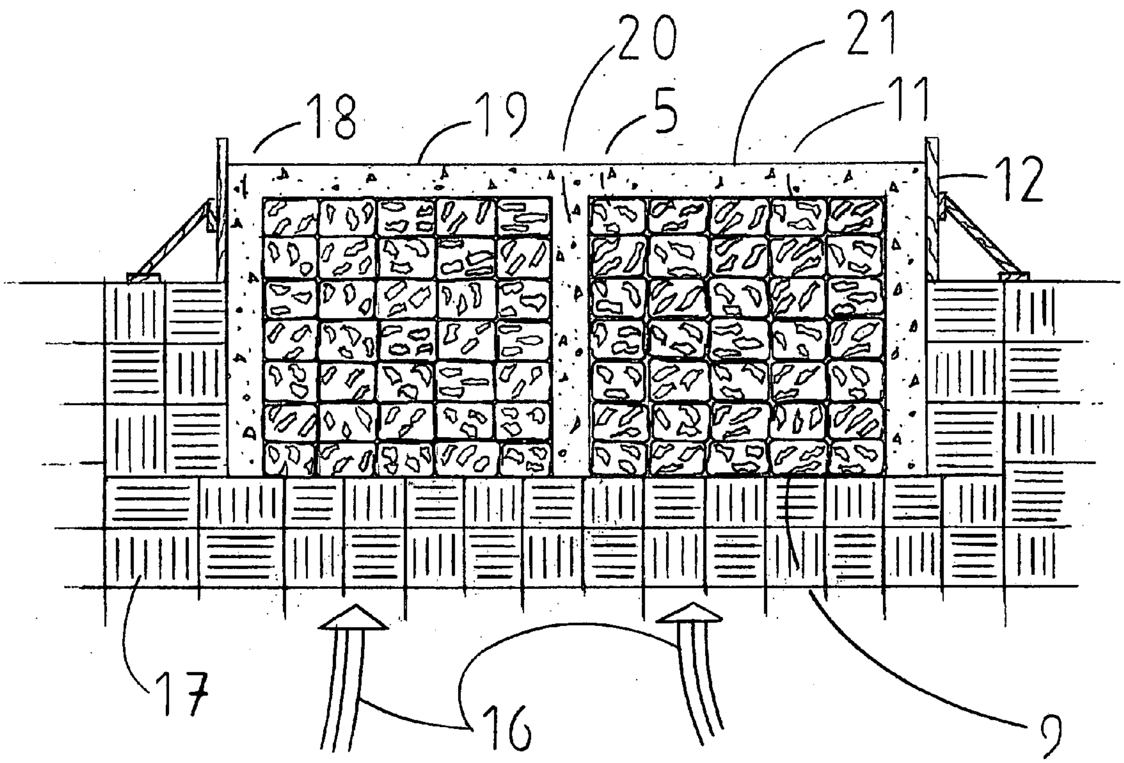
(57) ABSTRACT

The present invention is a waste-tire foundation bag. Stackable bags suitable for containing soil are filled with 50% waste tire portions and 50% soil. The bag openings are closed to prevent the contents from falling out. The bags are stacked in piles in a building-foundation excavation pit. Concrete is poured over and between the piles, whereby the solidified concrete foundation rests on the piles of waste-tire bags.



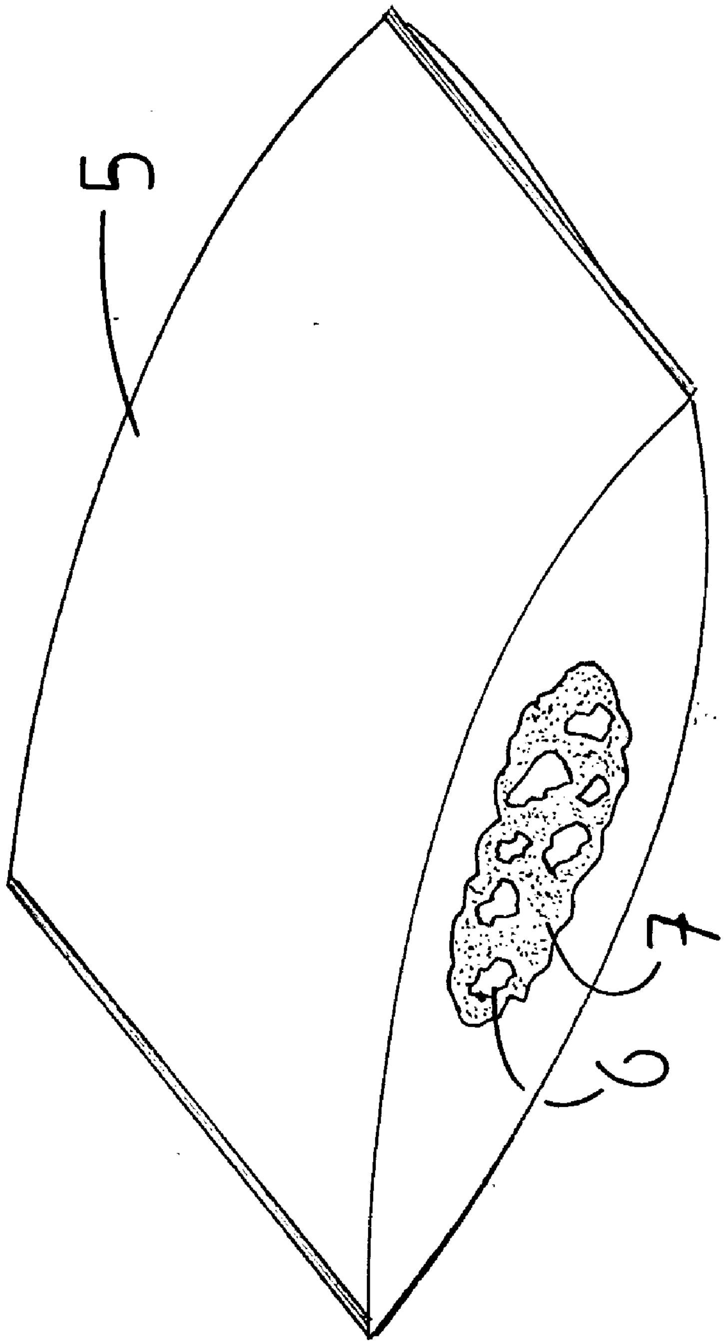


Fig 1

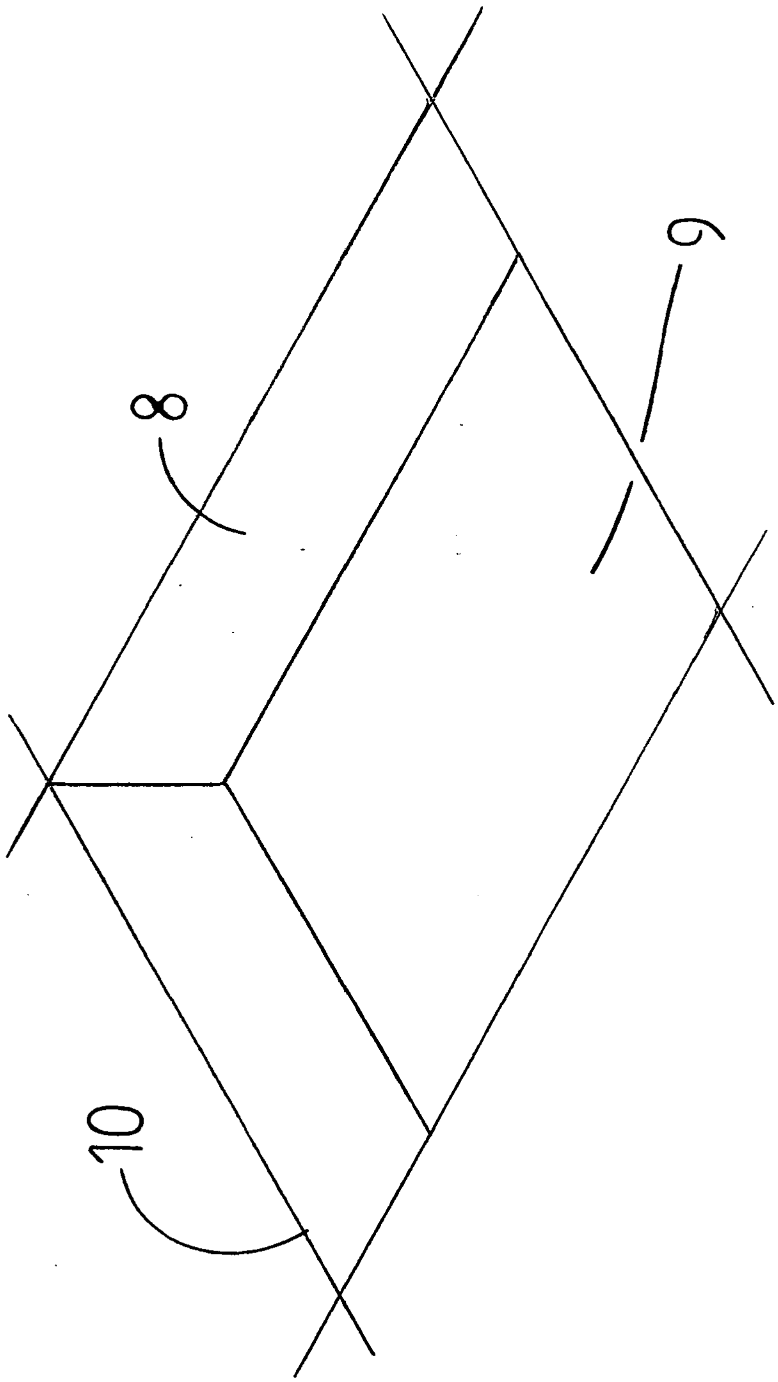


Fig 2

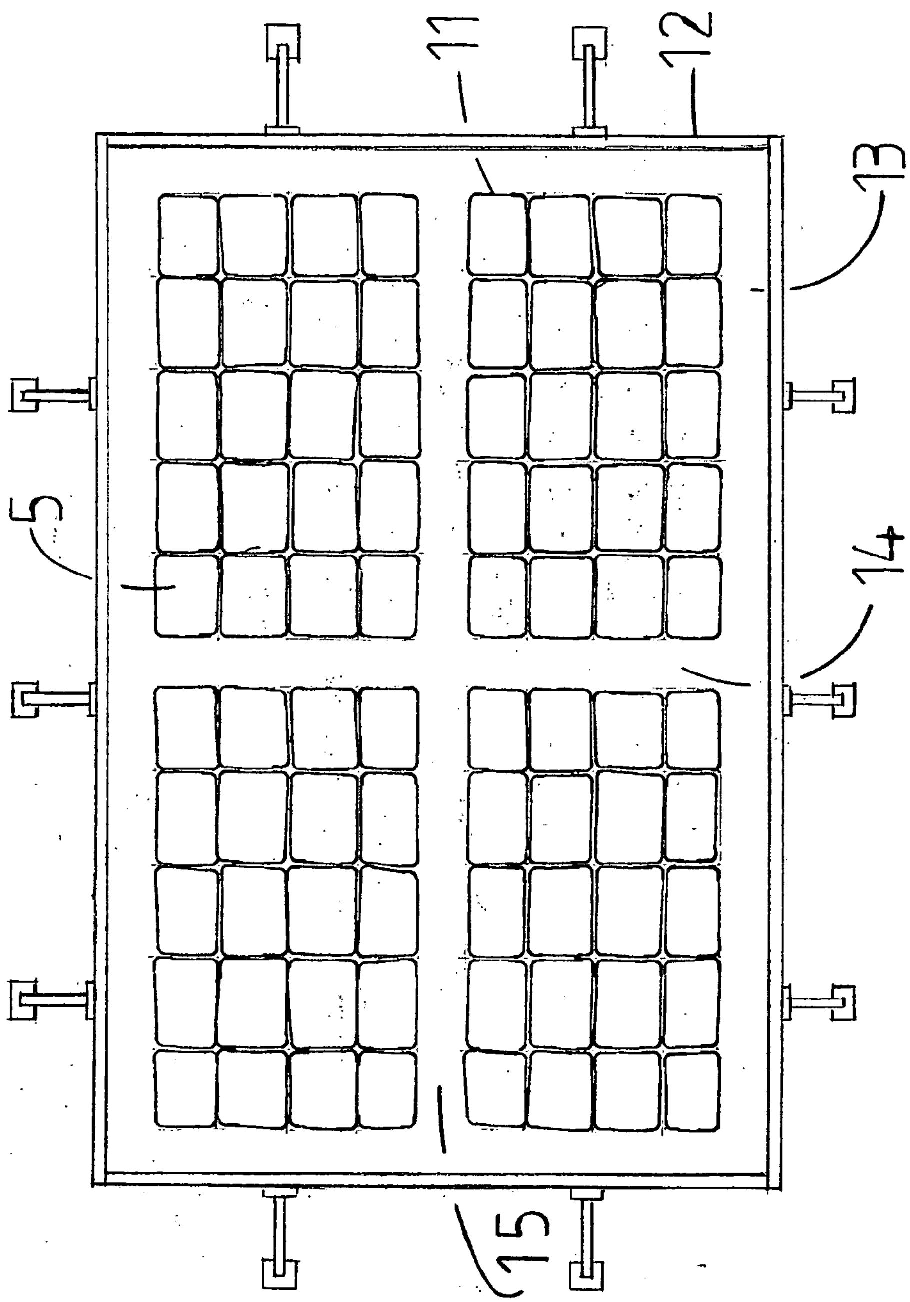


Fig 3

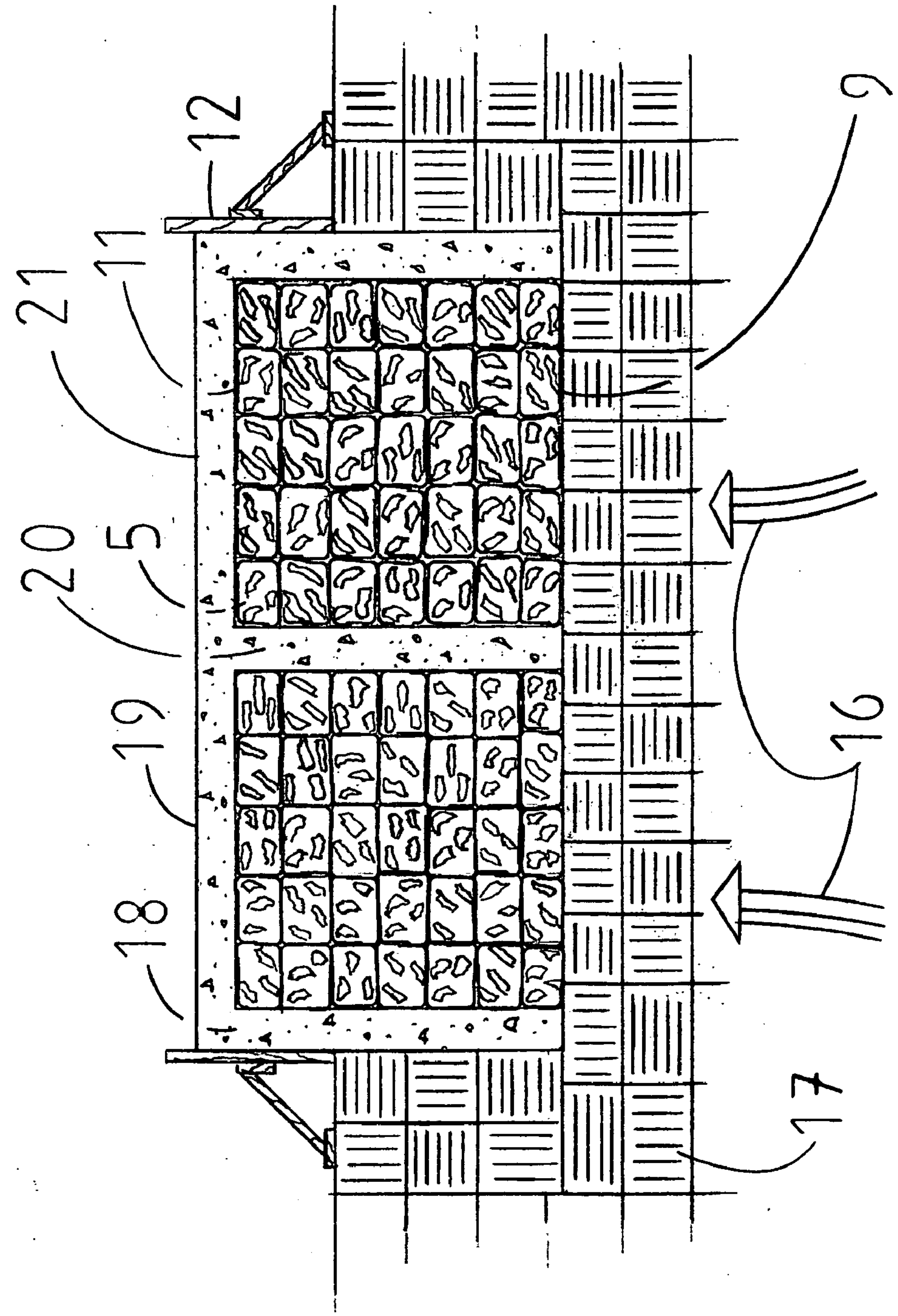


Fig 4

WASTE TIRES FOUNDATION BAGS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] See Application Data Sheet.

[0002] Not Applicable

[0003] Not Applicable

BACKGROUND OF THE INVENTION

[0004] 1. Field of the Invention

[0005] The present invention relates generally to waste tire recycling products and methods. However, the invention more particularly relates to waste tire products used to protect concrete building foundations from the effects of expansive soils The invention will be best understood by reference to the following discussion and the associated figures.

[0006] 2. Description of Related Art

[0007] Every year, millions to billions of waste tires need to be disposed. Waste tires are a greater disposal problem than most wastes, because they will not stay buried in landfills. Instead, due to their unique shape, tires tend to trap gases and float to the top of a landfill. Consequently, waste tires are stored in tire piles or dumped illegally. In addition to being unsightly, these tires are a breeding ground for pests, such as mosquitoes or rats. Tire piles are inherently a fire hazard due to a combination of a flammable substance of rubber and excess air being trapped in the tires. Also, oil released from melting rubber can pollute ground or surface waters. These hazards become increasingly significant due to the sheer number of tires to be disposed. One solution to the growing tire problem is to reduce the production of waste tires by purchasing higher mileage tires, purchasing retreaded or re-manufactured tires, or performing regular tire maintenance. A second solution is to reuse or recycle waste tires. Tire-shreds and crumb-rubber tire portions, a tire-derived material, are currently being used in a number of applications: in highway pavement, athletic track surfaces, playgrounds, as illustrated in U.S. Pat. No. 6,960,046, landfill liners, compost bulking agents, various manufactured products, energy recovery and artificial reefs for aquatic life. The tire portions are produced by chopping up waste tires, cleaning the chopped up rubber and removing any metal particles.

[0008] Preventing cracking in concrete building foundations is another problem completely unrelated to the problem of waste tire disposal. Commercial and residential buildings are often built on foundations comprising vertical perimeter walls of poured concrete. Since the vertical foundation walls are structural members that support the building, they are usually several feet in depth and function as beams bridging between footers or piers resting on bedrock or stable soil. It is common practice in such buildings to provide a ground floor, wherein at least a portion of the ground floor walls include the vertical foundation walls and wherein the ground floor is a poured concrete slab resting on the soil enclosed by the foundation walls. Typically, the foundation is constructed by first excavating a pit for the ground floor and the foundation footers. Then, forms are erected around the periphery of the pit and concrete for the foundation walls is poured into the forms. The ground floor is next formed by pouring concrete onto a form supported by the soil and/or by the side walls.

[0009] A major problem with conventional construction in certain soil and climate conditions is that the slab floor is unstable due to movement of the underlying soil. Expansive soils are prevalent in many areas of the United States and other countries. These expansive soils can expand and contract considerably as a result of cyclical changes in moisture content or as a result of freezing and thawing cycles. The soil expansion and contraction problem can be especially severe when the floor is simply a slab of concrete poured onto the surface of the soil that forms the floor of the excavation pit. For example, certain dense clay soils tend to dry out after excavation and then later absorb water and swell. This swelling or expansion causes the slab to move relative to the foundation walls which can generate large forces that are sufficient to crack or break the slab. In general, because the foundation walls must support the building, they are supported by piers or pads on solid ground or bedrock or piers or pads on footings and therefore are very stable. However, the movement of the slab mechanically attached to the side of the foundation wall can readily damage the relatively rigid walls.

[0010] A variety of techniques have been implemented to control the effects of expansive soils on concrete foundations and structural slabs or floors. U.S. Pat. No. 5,172,528 uses tire bales as a fill material for foundation components. U.S. Pat. No. 7,003,918 reveals a building foundation with a unique slab and wall assembly. And U.S. Pat. No. 5,924,251 discloses a novel trench footing system. Generally, each of these techniques attempts to separate the foundation walls and structural slabs or flooring from the heaving soils or to at least absorb some of the expansive forces created by the moving soil. To address the problematic soils, such as Bentonite clay, builders have employed techniques such as raised, suspended, or free-spanning floors. Unfortunately, these techniques have proven to be costly, to increase the complexity of fabricating concrete foundations and flooring, to cause long-term structural or safety problems, and to reduce spacing between the floor and ceiling. Additionally, to obtain a particular wall height, a taller or bigger side wall is required to accommodate for the thickness of the floor slab and/or for void space provided under the floor slab. This requires additional material costs for concrete and labor costs for excavating and fabricating the foundation walls.

[0011] A common technique of protecting the foundation and slab from the expanding soil is to create a void space under the concrete slab or floor. To create the void, cardboard forms or other degradable material forms and/or removable forms are positioned under the form or pan used during pouring of the foundation walls and floor. With time, the material of the void form begins to deteriorate creating a void in which the soil can expand without moving the wall or floor. However, the degradation of the forms typically is accompanied by mold growth and the release of associated toxins, which can result in safety issues within the structure above the concrete foundation. Additionally, jobsite delays and inclement weather during initial construction can result in premature degradation of the cardboard void form and loss of the strength needed to support the curing concrete wall and floor.

[0012] Other difficulties that face the designer of a foundation are how to maintain the integrity of the void space underneath the walls and floor slab and how to maintain the strength of the foundation. When a void space is provided under a foundation wall and/or under a concrete slab attached to the side of the wall, excavated soil has a tendency to fall or migrate horizontally from excavated earthen walls and backfill into the void. This can lead to expansive soils being in contact, at least locally, with the foundation wall and/or floor, which can result in heaving or at least additional stresses in the foundation. The strength of the floor is often deteriorated by providing openings for utilities, such as plumbing and a sump pit used for draining collected groundwater from the area around the foundation. For example, sump pits are often placed as part of forming the slab for the floor or foundation slab, which causes a reduction in the slab strength in the vicinity of the sump pit that can result in cracking or failure of the slab. Additionally, the sump pit may itself be in contact with expansive soil that applies force against the pit and the pit walls in turn apply a force against the adjoining portion of the foundation slab. If provided simply as an opening in the slab, the sump pit may provide a path for molds and the like to enter the space above the slab, i.e., the commercial or residential building.

[0013] Hence, there remains a need for a foundation design that accounts for expansive soil but that also provides a relatively inexpensive method for protecting the foundation walls and flooring slab from the effects of expansive soils. As stated, recycling scrap tires into other commercially useful products offers another disposal alternative of waste tires. However, because of the problems attributed to recycling, such as cost and lack of potential use, less than 7% of scrap tires are recycled in this manner. Accordingly, tire recycling has not proven to be a viable tire disposal alternative. Therefore, it would be desirable to incorporate the use of waste tires as a means for protecting concrete foundations from the effects of expansive soil.

BRIEF SUMMARY OF THE INVENTION

[0014] The present invention is directed to a waste-tire recycling product that overcomes the disadvantages as mentioned. A waste-tire recycling product having features of the present invention comprises an ordinary stackable bag, suitable for filling with soil and placing underneath concrete foundation structures, for the purpose of supporting the foundation structures; deformable substances, preferably non-biodegradable substances; and geological substances. The bag is filled with the deformable and geological substances and closed to prevent the contents from falling out. The bags are stacked in piles in a building-foundation excavation pit. Concrete is poured over and between the piles, forming the building foundation structures or other concrete structures, whereby the foundation structure rests on top of the piles of stacked bags.

[0015] If the deformable substance is waste tire portions, partially filling the bags with such portions is an environmentally safe means for disposing of waste tires. The United States Environmental Protection Agency has stated that the burying of waste tire portions mixed with soil poses no environmental risk, because of inherent properties of waste tires. The surface of used tires has been subjected to years of exposure to oxygen by high speed rotation in the atmosphere, causing oxidation. Oxidation interlocks the surface molecules with oxygen and out-gassing, or fly-away molecules of synthetic rubber is considerably limited if not stopped completely.

[0016] An excavation pit exposed to expansive soil imposes heaving forces which can crack concrete structures. The deformable materials within the stacked bags will absorb much of the pressure posed by the expansive soil, relieving excess pressure from the concrete structures above. Another advantage of using waste tire portions is that they are not biodegradable, so they will remain underneath concrete structures as long as the structures themselves. These advantages will encourage builders to use waste tire bags to protect concrete foundation structures from the effects of expansive soil. The rampant use of waste tires in this fashion will aid in the ongoing struggle to develop new, useful, and environmentally safe ways to dispose of waste tires.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0017] The above mentioned and other objects and features of this invention and the manner of attaining them will become apparent, and the invention itself will be best understood by reference to the following description of the embodiment of the invention in conjunction with the accompanying drawings, wherein:

[0018] FIG. **1** An Isometric View of a Waste-Tire Foundation Bag;

[0019] FIG. **2** An Isometric View of a Foundation Excavation Pit;

[0020] FIG. **3** A Plan View of Piles of Waste Tire Foundation Bags inside an Excavation Pit

[0021] FIG. **4** A Section Elevation of a Concrete Slab Set on Piles of Waste Tire Foundation Bags

DETAILED DESCRIPTION OF THE INVENTION

[0022] The present invention is presented in FIG. **1**. The bag **5** is typical of the bags used to contain soil for being placed underneath a concrete building foundation, as usually done in the building construction industry. The difference is that bag **5** is filled 50% with waste tire portions **6** and 50% soil **7**, preferably sand or back-fill soil, i.e., soil absent nutrients prevalent in topsoil. The filled bags **5** are neatly stacked into piles **11** of even rows and columns forming level square or rectangular rows and vertical columns, around several rows high and columns wide, as depicted in FIGS. **3** and **4**. The piles **11** are placed in a normal building-foundation excavation pit **8**, as depicted in FIG **2**. A normal temporary form wall **12** is installed around the pit perimeter **10**, as depicted in FIGS. **3** and **4**. The piles **11** are placed apart forming longitudinal spaces **15** and transverse spaces **14**, as depicted in FIG. **3**. Groundwork plumbing and electrical (not shown) may be installed between the spaces **14** and **15**. Concrete **21** is poured between the spaces **14** and **15** and over the piles **11**, forming interior concrete beams **20**, exterior concrete foundation walls **18**, and a level concrete foundation slab **19**, as depicted in FIG. **4**.

[0023] The piles **11** of stacked bags **5** form the undergirding support of the concrete foundation **21**, as depicted in FIG. **4**. The waste tire portions **6** are distributed throughout all the bags **5**, comprising 50% of the contents inside the bags **5**. The piles **11** are compact abutting the concrete foundation structure **21** and the excavation pit bottom **9** below, forming a wedge there between, as depicted in FIG. **4**. In the event, the excavation pit **8** is exposed to expansive soil **17**, capable of transmitting heaving forces **16** to the surface, the waste tire portions **6** will absorb much of the pressure by deforming in response to pressure. As the excavation pit bottom **9** heaves up against the compacted piles **11**, this condition causes stresses on all the bags **5** and pressure inside all the bags **5**. As a result, the elastic properties of the waste tire portions **6** will cause the portions to contract absorbing pressure. Because this, phenomenon occurs throughout the piles **11**, the overall pressure transmitted from the piles **11** to the concrete structure **21** will be significantly less than the heaving forces **16**.

[0024] The larger and wider the piles **11** the more pressure from the heaving forces **16** can be absorbed by the waste tire portions **6**. Filling the bags **5** with tire portions **6** and soil **7** or other substances, in lieu of soil **7**, in closed bags **5** facilitates the intensification of the pressure inside the bag **5** against the tire portions **6**. Merely filing the excavation pit **8** with soil and tire portions will not uniformly transmit pressure to the tire portions **6**. Under such arrangement pockets of large pressure may still be imparted from the heaving forces **16** to the concrete structure **21** causing cracking of the concrete structure **21**. For best results the bags **5** should be made of material that can withstand the stresses imposed by heaving forces **16**. Calculating such stresses and designing a bag to withstand such stresses are well known in the art.

What is claimed is:

1. A container for placing underneath construction foundation structures, construction foundation structure comprising: a plurality of bags; deformable substances; and geological substances; the bags being filled with the deformable and geological substances; a concrete slab on grade; and concrete footers; the concrete footers tied to the concrete slab; the filled bags being placed underneath the the concrete slab, and between the concrete footers; the bottom of concrete footers and the bags rest on supporting bedrock, ground or subsurface in which the construction foundation structures is lodged.

2. The construction foundation structure of claim 1, wherein the deformable substances are waste tire portions.

3. The construction foundation structure of claim 1, wherein the geological substances are selected from the group (bottom soil, rocks, pebbles, and gravel); wherein the deformable substances are waste tire portions.

4. The construction foundation structure of claim 1, wherein the bags are stacked in rows and columns.

5. A waste tire bag, the waste tire bag comprising: a sealable and stackable bag; waste tire portions; and geological substances from the group (sand, rocks, pebbles, and gravel); the bag being filled with the tire portions and the geological substances.

6. The waste tire bag of claim 5, wherein the geological substance is soil; wherein the bag is filled with 50% waste tire portions and 50% bottom soil, where the soil and waste tire portions are evenly distributed throughout the bag, as such distribution can be practically achieved by mixing the soil and waste tire portions together.

7. The waste tire bag of claim 5, wherein the volume of the bag is filled with 50% tire portions and 50% geological substances from the group (sand, rocks, pebbles, and gravel) where the geological substances and waste tire portions are evenly distributed throughout the bag, as such distribution can be practically achieved by mixing the geological substances and waste tire portions together.

8. The waste tire bag of claim 6, wherein the bag is made of non-biodegradable material.

9. The waste tire bag of claim 7, wherein bag is made of non-biodegradable material.

10. A method of using the waste tire bag of claim 9, comprising: the step of stacking the bags in piles, the piles comprising level rows and vertical columns, several rows wide and several columns high; the step of placing the piles inside a building-foundation excavation pit; the step of constructing a temporary form-wall fence around and flush with the pit perimeter; the step of arranging the piles evenly and spaced apart within the pit, the pile arrangement forming longitudinal and transverse spaces between the piles and between the piles and the pit perimeter and form-wall fence perimeter; the step of installing groundwork plumbing and electrical in between said spaces; the step of pouring concrete into the spaces and over the piles.

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