



(43) International Publication Date
9 October 2014 (09.10.2014)

(51) International Patent Classification:
B29B 17/02 (2006.01)

(21) International Application Number:
PCT/US2014/022422

(22) International Filing Date:
10 March 2014 (10.03.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/777,107 12 March 2013 (12.03.2013) US

(72) Inventors; and

(71) Applicants : LEE, Richard J. [US/US]; 3498 Meadowgate Drive, Murrysville, Pennsylvania 15668 (US). DOM, Alex J. [US/US]; 2064 John Wayne Drive, Kingman, Arizona 86401 (US). LEVINE, Alan M. [US/US]; 339 Coleman Drive, Monroeville, Pennsylvania 15146 (US).

(72) Inventor: SPANGLER, Charles E. (Deceased) (deceased).

(74) Agents: SILVERMAN, Arnold B. et al.; Eckert Seamans Cherin & Mellott, LLC, 600 Grant Street, 44th Floor, Pittsburgh, Pennsylvania 15219 (US).

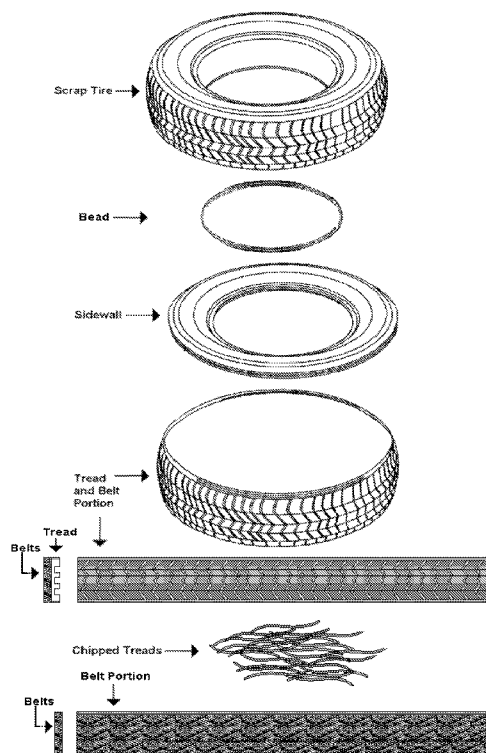
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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,

[Continued on next page]

(54) Title: METHOD FOR SELECTIVE BREAKDOWN OF VEHICLE TIRES

FIGURE 1



(57) Abstract: A method of processing vehicle tires includes separating the tires into a plurality of types of components having different properties from each other and further processing each type of component in a separate process from the other components to produce products with properties which differ from the properties of products produced from the other components. In one embodiment, the further processing includes separately processing at least two types of components by pyrolysis in order to produce carbon black having different properties.



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).

— *before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))*

Published:

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

METHOD FOR SELECTIVE BREAKDOWN OF VEHICLE TIRES

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority under 35 U.S.C. §119(e) to provisional application Serial No. 61/777,107, filed March 12, 2013.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of selectively breaking down vehicle tires in such a way as to permit subsequent processing of the individual portions to produce materials of different properties from different portions of the vehicle tire.

More specifically, it is contemplated that a scrap vehicle tire rather than being reduced to smaller shreds for further processing without consideration of different properties and different portions of the tire will be selectively severed for aggregating specific portions which have specific properties for further processing.

2. Description of the Prior Art

It has been known to sever tires into smaller pieces or shreds to facilitate subsequent processing of the tire components. U.S. Patent 8,263,038 discloses a method of controlling volatiles in recycled carbon black. It discloses introducing vehicle tire shreds into a pyrolysis reactor with subsequent processing of the recycled carbon black emerging from the pyrolysis reactor by subjecting it to devolatilization. See also U.S. Patents 6,835,861, 6,833,485 and 7,341,646 which disclose method and apparatus of pyrolysis of rubber and other hydrocarbon materials.

It has also been known to provide various forms of apparatus for cutting of vehicle tires. U.S. Patent 7,975,579 discloses apparatus for severing a tire along its tread in a plain generally parallel to the tire sidewalls.

U.S. Patent 5,235,888 discloses apparatus for severing the sidewalls from the tread. See also U.S. Patent 5,601,004.

U.S. Patent 5,555,782 discloses apparatus for cutting waste tires into pieces which can be stored in compact volumes for further use or disposal.

U.S. Patent 6,527,891 discloses a method of making steel belted planks by severing and assembling portions of tires. See also U.S. Patent 5,834,083 which discloses severing sidewalls from tires and slitting remaining portions to transversely orient them in a generally flat position and subsequently connecting the strips for use in various construction and landfill abutments.

Most prior art focused on equipment for mechanical, thermal, or chemical breaking down of tires. Current tire shredding equipment emphasizes reducing space taken up by waste tires and breaking tires down into smaller pieces that could be moved using mechanical conveying equipment and compacted or piled up more efficiently. Current shreds are mixtures of all the parts of a tire or, if the parts, are separated with an understanding to be able to dispose of them in a compact fashion. No emphasis or effort is made to separate the waste into constituent parts.

The present invention relates to a recognition that by separating the tires into component parts and groups of different classes of materials advantage could be taken of the composition of the various materials. A major advantage of this process is that the generated products are more valuable for recovering valuable resources for reuse than that generated by current processes and the material generated can be further broken down with less energy and less waste.

On an average, one discarded tire is generated per person every year in the United States. Discarded tires that are piled on a property pose significant hazards. These include highly polluting hard to extinguish fires and breeding grounds for snakes, vermin, and disease. Safe and economical disposal of waste tires has become a significant world-wide problem. Tires are viewed as one of the most problematic sources of waste. This is mainly due to the high quantities produced and their great durability, prohibiting the tire from breaking down.

There remains, therefore, a need for an improved method of recycling tires by severing the same into components such that the unique properties within the individual tire components may be employed separately in the manufacture of products of varying properties such as, for example, carbon black of different properties.

SUMMARY OF THE INVENTION

The method of the present invention contemplates severing a tire into at least three component parts, each of which has properties which differ from the properties of other component parts. In a preferred practice of the invention, the scrap tire has the bead separated as a first product, the sidewalls separated as a second product, the tread separated as a third product, the belt separated as a fourth product, and chipped treads provided as a fifth product. Some of these products may advantageously be separately processed in a pyrolysis reactor with the reprocessed pyrolyzed component having different properties from the other reprocessed components from the same tire.

It is an object of the present invention to provide a method which produces enhanced efficiency of use of recycled tires which are destined for further processing.

It is a further object of the present invention to provide such a method wherein the individual components of the segmented recycled tire are selected for specific properties present in a higher proportion in that component than in other tire components.

It is a further object of the present invention to provide a method for the segregated respective components providing unique properties in products made therefrom.

These and other objects of the present invention will be more fully understood from the following description of the invention on reference to the illustration appended hereto.

BRIEF DESCRIPTION OF THE DRAWING

The figure illustrates an exploded view of an scrap tire to be recycled overlying a plurality components which may be separated in accordance with the present invention. The upper portion shows the tire to be reclaimed underlying which is the tire bead, sidewall, tread, reinforcing belt separated from the tread, chipped treads which are the tread portions segmented into small pieces and a belt portion.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The majority of current shredding operations cut the tire into 1 inch to 6 inch shreds, which are a mix of the various components. These are often shredded or chipped to a finer size and are used for landfill cover, used in various recycle applications, or as tire derived fuel.

Typical passenger tires are generally composed of styrene-butadiene rubber cross-linked with sulfur through the vulcanization process and contains carbon black, and sometimes silica, as reinforcing agents. It also contains a percentage of natural rubber and sometimes other elastomers to adjust traction and abrasion resistance. In addition, it contains residual accelerators from the cure process, antioxidants, and antiozonants. The tire is strengthened with steel or polymer cords to withstand mechanical stresses. These various components are engineered such that different parts of the tires contain components of different compositions. For example, the bead where the tire contacts the rim contains a rubber that is designed to seal and has steel wires within it. The tread region is reinforced with a high reinforcing carbon black which is under-laid with a polymer (nylon or polyester) cord and/or a steel mesh.

The various parts of tires are designed, through the use of different polymer mixtures and reinforcing aides to have different properties. By removing the bead,

separating the sidewalls, separating the tread, and the cord portion into separate streams, the components could be distributed into specific application as value-added ingredients.

Component streams would include at least bead, sidewalls, treads, and belt portion.

An example of such an enhanced application is to use shreds from the tread region as a feedstock in a pyrolysis, such as the one disclosed by Delta-Energy in U.S. Patent 6,833,485, 6,835,861 and 7,341,646), where the recovered recycled carbon black would contain higher reinforcing carbon black. For example, the tread would tend to have smaller carbon particles while the sidewalls would have larger particles. The tread particles would, therefore, provide more reinforcement than the sidewall particles. The separated processed tread and sidewall component portions would have their respective carbon particles sized and used as separate feedstocks for a pyrolysis reactor to thereby produce two separate carbon blacks of different reinforcing properties.

The bead would typically be recycled steel which would be removed so as to be a separately marketable metal product while minimizing the wear and tear on the preprocessing equipment as the bead would not have to be processed by such equipment.

It will be appreciated from the foregoing that the present invention rather than merely severing vehicle tires into small portions without regard to the different characteristics of certain portions of the tire with respect to other portions, seeks to maximize the yield on reclaimed tires by segregating components of different properties into individual groups in order to maximize the benefits from reclamation.

Another example would be using the belt portions from tires to be incorporated into conveyer belts, for example.

Whereas, particular embodiments of the invention have been described herein for purposes of illustration, it will be appreciated by those skilled in the art that numerous variations of the details may be made without departing from the invention as described in the appended claims.

Claims:

1. A method of processing vehicle tires comprising

separating said tires into a plurality of types of components having different properties from each other, and

further processing each said type of component in a separate process from the other said components to thereby produce products with properties which differ from the properties of the other said components were they subjected to the identical process.
2. The method of Claim 1 including

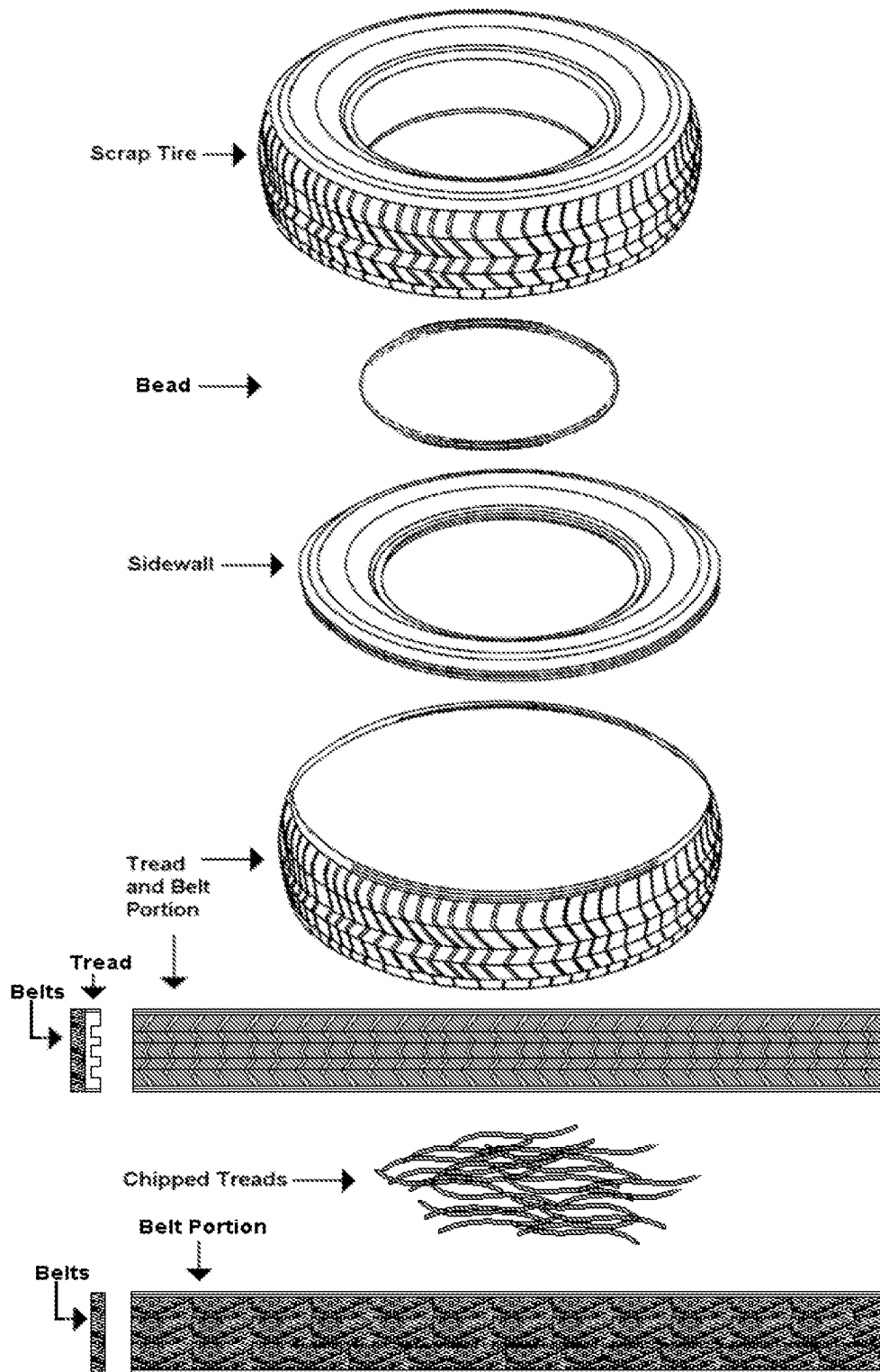
selecting said plurality of components consisting of at least two components selected from the group consisting of tire beads, tire sidewalls, tire treads, tire belts and chipped treads.
3. A method of claim 1 including

subjecting some of said components prior to said further processing reducing the size of said components.
4. A method of claim 3 including

said further processing of at least two said types of components by pyrolysis, whereby the pyrolysis will produce carbon black having different properties.

FIGURE 1

1/1



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/22422

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B29B 17/02 (2014.01)

USPC - 106/472; 423/449.7

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)

USPC - 106/472; 423/449.7

IPC(8) - B29B 17/02 (2014.01)

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

USPC - 106/472; 423/449.7; 423/461; 241/101.2; 241/69; 241/301; 241/DIG.31

IPC(8) - B29B 17/02 (2014.01) (keyword delimited)

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

Patbase; Google, Google Patent

Search terms used: tires tyres beads sidewalls treads belts cords recycle recover pyrolysis used waste scrap

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,966,487 A (Crane et al.) 29 June 1976 (29.06.1976), col 1, ln 1-43; col 2, ln 1-9	1-4
A	US 4,863,106 A (Perkel) 05 September 1989 (05.09.1989), entire document	1-4
A	US 4,240,587 A (Letsch) 23 December 1980 (23.12.1980), entire document	1-4



Further documents are listed in the continuation of Box C.



* 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

04 June 2014 (04.06.2014)

Date of mailing of the international search report

15 AUG 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774