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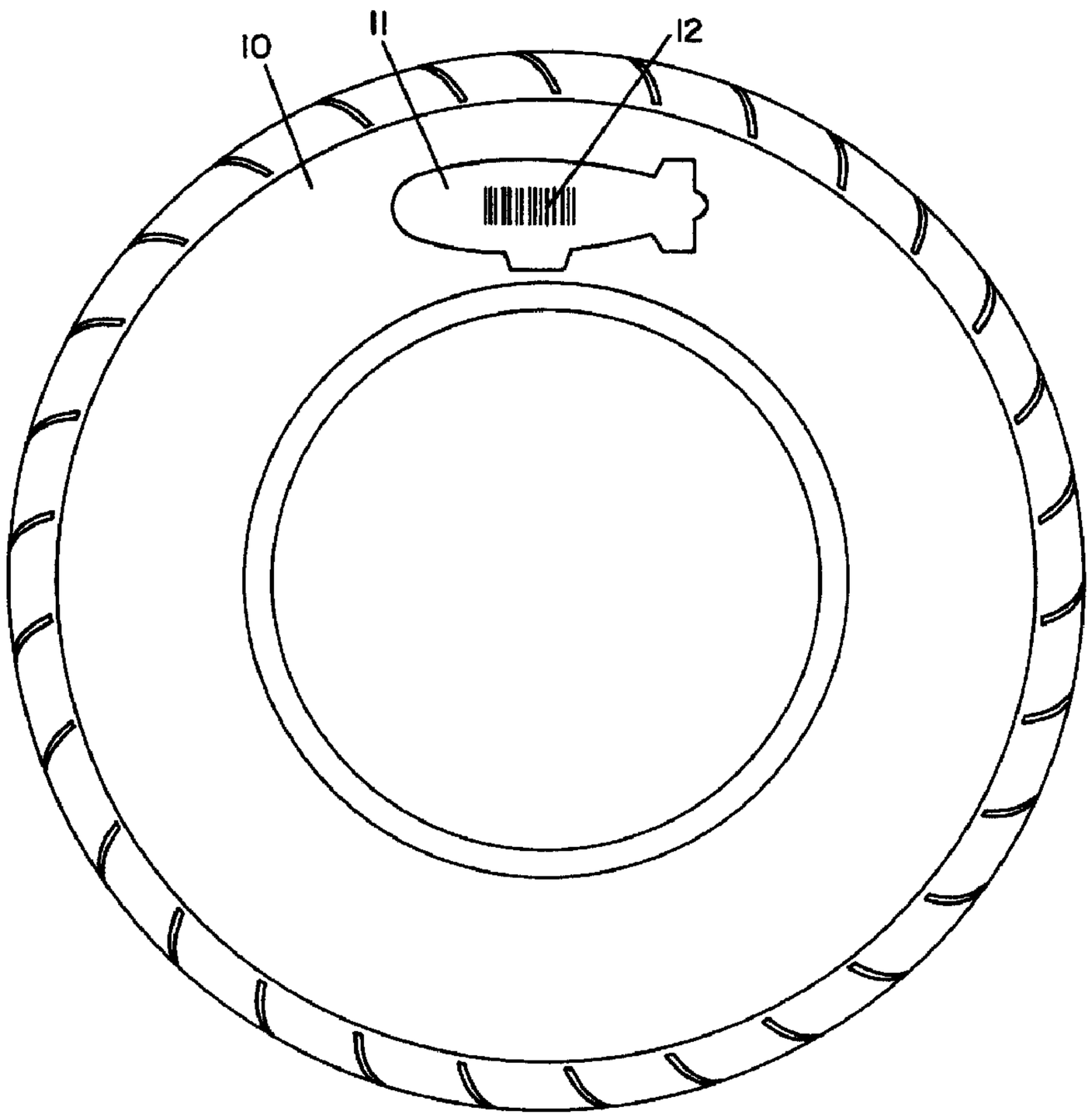
(54) Titre : ETIQUETTES PERMANENTES ET INVIOLABLES DE CODES A BARRES DE PNEUS
(54) Title: PERMANENT TAMPER RESISTANT BAR CODE LABELS FOR TIRES



(57) Abrégé/Abstract:
A process for labeling tires with a bar code is described which results in bar code labels that do not release from the tire during use and are consistently readable with bar code scanners. The labels use a rubber backing that bonds to the green tire during curing. A

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(57) Abrégé(suite)/Abstract(continued):
protective film on the labels protects the bar code during tire curing and can be removed thereafter or can become detached during use. An adhesive on the contact side of the label assures that the labels do not fall off or become misaligned prior to tire curing.

Abstract Of The Disclosure

PERMANENT TAMPER RESISTANT BAR CODE LABELS FOR TIRES

A process for labeling tires with a bar code is described which results in bar code labels that do not release from the tire during use and are consistently readable with bar code scanners. The labels use a rubber backing that bonds to the green tire during curing. A protective film on the labels protects the bar code during tire curing and can be removed thereafter or can become detached during use. An adhesive on the contact side of the label assures that the labels do not fall off or become misaligned prior to tire curing.

PERMANENT TAMPER RESISTANT BAR CODE LABELS FOR TIRES

Field Of Invention

Bar code labels that can be electronically scanned and read with a bar code scanner are disclosed for pneumatic tires. The bar code is applied to a contrasting colored transferable rubber label which is then adhered to a green tire. The green tire is then cured in a tire press. During curing, the label is bonded to the tire. The bar codes do not peel from the cured tire since the rubber of the label is compatible with the rubber of the tire and is bonded thereto during curing of the tire.

Background Of The Invention

It would be desirable to have permanent bar codes affixed to pneumatic tires as a means of identifying the particular tire or provide certain manufacturing data about the tire. Traditional polyester-based bar code labels, which have a high modulus, cannot stretch as much as the tire sidewall during tire inflation and flexing of the tire sidewall. This creates interfacial tension between the polyester and the tire that generally results in a failure of the bond between the polyester label and the tire.

The use of white rubber compounds on tires (e.g. tire whitewall compounds) has generally been limited to technology where the white sidewall rubber compound is encased in a black rubber composition, which is then built into the tire. Subsequent to tire building and curing the black rubber composition encasing, the white

rubber compound is selectively ground away in areas where it is desired to have white rubber (e.g. the whitewall) thereby exposing the underlying white rubber.

Various patents and publications disclose alternative ways to affix light colored rubber articles to carbon black-filled pneumatic tires. Other patents and publications disclose various ways to affix identifying bar codes to tires. Problems with rubber bar codes include rubber flow distorting the bar code so it is no longer readable, problems with the label becoming detached and problems with the interface between the label and the tire being a failure site. The tire building industry has not identified a commercially viable way to apply a permanent tamper resistant two-dimensional bar code to identify tires both during manufacturing and during consumer use.

Summary Of The Invention

The invention relates to a process for attaching a label to a tire, the label having a machine readable bar code, comprising a) printing a mirror image of a high resolution bar code on a smooth film with an ink that is heat transferable from said film to an unsaturated hydrocarbon rubber, b) preparing a crosslinkable hydrocarbon rubber transfer label having a thickness of 0.005 to about 0.050 inches (0.013 to about 0.13 cm), c) after steps a and b affixing said mirror image bar code and said smooth film to one face surface of said rubber transfer label,
d) crosslinking the hydrocarbon rubber of said rubber transfer label so that its Mooney torque is at least 70% of the maximum torque of the compound in the Mooney curemeter plot, e) transferring with heat and transposing said mirror image bar code onto said rubber transfer label forming a

crosslinked rubber transfer having a machine readable bar code thereon and said film on top of said bar code, either 1) after affixing said rubber transfer label to said mirror image bar code and in the same step as crosslinking the hydrocarbon rubber of said transfer label or 2) after affixing said hydrocarbon rubber transfer to said mirror image bar code in a separate step subsequent to crosslinking said hydrocarbon rubber, f) after the crosslinking step and the transferring step of the bar code, affixing one or more discontinuous heat curable hydrocarbon rubber-based adhesive portions, having a thickness from 0.001 to about 0.050 inches (0.0025 to about 0.13 cm) to a face surface of said rubber transfer label; wherein the face to which said adhesive is affixed is opposite the face where the bar code is transferred, g) after affixing said adhesive, affixing, via said adhesive, said hydrocarbon rubber transfer label with bar code and said film thereon to a surface of a green tire and h) curing said green tire in a tire curing press, and i) removing said film from said crosslinked rubber transfer.

A process has been created to put a commercially viable bar code identifier on pneumatic tires. While somewhat lengthy, the process is very easy to implement and avoids many of the defects of prior art processes.

A light colored rubber transfer label is prepared from a crosslinkable (e.g. unsaturated) hydrocarbon rubber, light colored pigment, and other rubber compounding ingredients. A mirror image bar code (printed right to left) is applied to a smooth film e.g. polyester. The bar code is characterized as heat transferable to a hydrocarbon rubber. The bar code on

the film is affixed to the rubber transfer label. At this point the rubber transfer label can be cured or uncured. If the label is uncured, it is cured as part of the thermal transfer of the bar code from the film. If the label has already been cured in a separate step, then it may be further cured during the thermal transfer of the bar code.

Curing of the rubber transfer label can be brought about by various procedures wherein the rubber is put in an appropriate shape and heated for 1 to 120 minutes to a temperature from about 80°C to about 160°C. It is desirable that the rubber of the label be cured to at least 50, 60, or 70 percent of its maximum cure (modulus) as determined by a Mooney cure meter.

For the thermal transfer to be effective, the surface of the film with the bar code thereon has to be in physical contact with the rubber label. The film is not generally removed immediately after the thermal transfer, but is rather left on the label to protect the surface from contamination and possibly minimize any further flow of the rubber of the label during processing at elevated temperatures. If the film is transparent, a bar code reader can read the label at this stage, facilitating in process monitoring of the labels and any tires to which the labels are subsequently attached.

After the transfer of the bar code to the rubber label and the curing of the rubber label, a pressure sensitive adhesive desirably on a release liner is applied to the label on the surface opposite the bar

code. Desirably the adhesive is a rubber-based adhesive as described for tread splicing and retreading of tires. Desirably the adhesive is applied in small discrete portions to the label so that the adhesive only covers less than 30 percent, less than 20 percent or less than 10 percent of the bottom surface of the label. Desirably the adhesive is in one or more discrete portions and is applied as a solventless adhesive. Desirably the adhesive thickness is from about 0.001 to about 0.050 inches (0.0025 to about 0.13 cm). A simple way to apply the adhesive is to adhere the adhesive to a release backing and then apply the label or groups of labels over the adhesive on the release backing. The labels can be trimmed or die cut after affixing to the release backing to form more uniform or decorative shapes in the final label. It is anticipated that these labels will adhere to the tire for the life of the tire and the bar codes will remain readable.

The label can then be applied to pneumatic tires. While the labels can be applied anywhere on the tires, it is desirable to apply them on the interior or exterior of the sidewalls where there is minimum abrasion. The labels can be in the form of shaped appliques that have a pleasing appearance while carrying the identifying bar code information. The appliques can have various shapes (outlines) other than circles, ellipse, rectangle or other shapes, e.g. parallelogram. Such shapes include images of plants, animals, people, and articles such as cars, chairs, logos, etc. The adhesive is necessary to secure the

labels on the tire if sufficient tackiness is not present on the green tire to hold the label securely to the tire.

After affixing the label to the green tire, the tire is cured (crosslinked) in a tire curing press or the equivalent. The film on the label can remain on the label during this step and may help to avoid contamination of the label surface. After curing, the film can be removed from the bar code label or left in place. If the film is transparent, the bar code can be read without removing the film. If the tire needs painting after cure, the transparent film should be removed after paint application.

It has been observed that the bar codes applied with this process have been easily readable by a scanner after inflating the tire multiple times and using the tire. This was unexpected as the low modulus of the labels opened the possibility of the labels stretching which might have changed the spacing between the bars of the bar code. The interface between the tire and the label has not been a site for failure or cracking of the tire. The labels have been tamper resistant in that they can be cut off of the tire but this leaves knife marks on both the tire and the label, thereby, hampering reuse of the label or the application of an alternate label to the tire.

Detailed Description Of The Invention

A process has been created to put a commercially viable bar code identifier on pneumatic tires. While somewhat lengthy, the process is very easy to

implement and avoids many of the defects of prior art processes. Those defects include labels that fall off, labels that are unsightly due to contamination with black rubber compounds or misalignment during manufacturing, labels that are no longer readable, labels that are easily removed and reapplied to other tires, and labels that nucleate failure or cracks in a tire.

Generally a light colored rubber transfer label is prepared from a crosslinkable (e.g. unsaturated) hydrocarbon rubber, light colored pigment, crosslinking agent and other rubber compounding ingredients. Titanium dioxide pigments are preferred pigments and are desirably present in an amount of at least 10 phr (parts by weight per 100 parts by weight of rubber) in the label composition. One potential material for the label is a tire whitewall compound. These usually include an isobutylene polymer, natural rubber and optionally EPDM rubber along with curatives, pigments, etc. Alternatively, a white rubber composition can be made based primarily on natural rubber as the rubber component. The label will be defined as a non-black rubber meaning that it does not have a significant amount of carbon black e.g. less than 10 phr and does not appear to be dark gray or black. Alternatively, if a light colored thermally transferable ink is available, a dark colored or even black rubber transfer label can be used. A crosslinkable rubber will be defined as a rubber along with its crosslinking agent that can be

cured under conditions found in a conventional tire cure press.

A mirror image bar code (printed right to left) is applied to a smooth film e.g. polyester. The smooth film only acts as a carrier or support for the initial bar code image. Later in the process it acts as a protective layer for the newly-formed bar code label until after the tire is cured. The material of the smooth film can be a thermoplastic, e.g. polyester, thermoset or other material. Desirably the film has a high modulus at 5% elongation such as of at least 2 or 5 MPa. The ink used to form the bar code image is desirably transferable from the film to the crosslinkable rubber of the label. Thus, it is desirably that the film not absorb or imbibe the ink preventing a subsequent transfer. The bar code is characterized as heat transferable to the hydrocarbon rubber of the label. The ink is desirably thermally stable such that it does not degrade at the cure temperature for a tire. Desirably the ink is thermally transferred at a temperature above 50°C, more desirably above 80°C, and preferably above 100°C. Thus, the binder for the ink desirably converts from a high viscosity liquid below these transfer temperatures to a low viscosity liquid (readily transferable and capable of migrating into the rubber) above these temperatures. The ink may include dyes and/or pigments. The important criteria for the ink are that it transfers as a sharp clear image to the rubber and that it is stable to thermal changes on tire curing and aging. Desirably it is a rubber-based

ink and partially penetrates the label so that surface scratches do not affect its readability.

After the bar code on the film is prepared and the label is initially shaped from the light colored rubber composition, the bar code on the film is affixed to the rubber (transfer) label. At this point the rubber transfer label can be cured or uncured and may have dimensions different from its final dimensions (e.g. thicker and/or having greater width or length). If the label is uncured when the bar code and film are attached, it is at least partially cured as part of the thermal transfer of the bar code from the film. If the label has already been cured in a separate step, then it may be further cured during the thermal transfer of the bar code.

Curing of the rubber transfer label can be brought about by various procedures wherein the rubber is put in an appropriate shape and heated for 1 to 120 minutes to a temperature from about 80°C to about 160°C. It is desirable that the rubber of the label be cured prior to or concurrently with the thermal transfer of the bar code to at least 50, 60, or 70 percent of its maximum cure as determined by a Mooney cure meter for the rubber composition of the transfer label.

For the thermal transfer to be effective, the surface of the film with the bar code thereon has to be in physical contact with the rubber label. The bar code which was initially read from right to left on the film is inverted on the rubber label so that it reads from left to right on the rubber label. The

film is not generally removed immediately after the thermal transfer, but is rather left on the label to protect the surface from contamination and possibly minimize any further flow of the rubber of the label during processing at elevated temperatures. Since rubbers are high viscosity liquids their flow is minimized when in direct contact with a solid surface like a film. If the film is transparent, a bar code reader can read the label at this stage, facilitating in process monitoring of the labels and any tires to which the labels are subsequently attached.

Either in a separate step from transferring the bar code from the film or simultaneous thereto, the rubber of the rubber transfer label is cured (crosslinked). Desirably this curing at this stage occurs to the extent of at least 50, 60 or 70 % of the maximum Mooney modulus on Mooney cure meter (or its equivalent) for the rubber compound. Thus, the resistance to flow of the rubber is significantly increased so that in subsequent steps in the tire cure press the rubber of the label and the image of the bar code thereon do not flow to the extent that the bar code becomes unreadable. Even though the label is partially or fully cured, some crosslink sites remain in the rubber and will chemically bond to the tire during the cure of the green tire in the tire cure press. Chemical bonds will extend from the tire to the label and from the label to the tire. The amount and type of curative in the label can be optimized to control the final crosslink density and modulus of the rubber of the label. Desirably the rubber of the

label ends up with a modulus of from about 0.02 to about 1 MPa at 5 percent elongation. Desirably the thickness of the rubber portion of the final label (less adhesive) is from about 0.005 to about 0.050 inches (0.013 to about 0.13 cm) and more desirably from about 0.005 to about 0.020 or 0.030 inches (0.013 to about 0.05 or 0.076 cm). These fairly thin labels have good integrity due to their tendency to chemically bond to the tire. As they are very thin, they do not displace a significant amount of the rubber of the tire nor do they significantly weaken the tire at their point of attachment.

After the transfer of the bar code to the rubber label and the curing of the rubber label, a pressure sensitive adhesive optionally on a release liner is applied to the label on the surface opposite the bar code. Desirably the adhesive is a rubber-based adhesive as described for tread splicing and retreading of tires although other adhesives are functional in this application. Desirably the adhesive is applied in small, discrete portions to the label so that the adhesive only covers less than 30 percent, less than 20 percent or less than 10 percent of the bottom surface of the label (opposite the side where the bar code was applied). Desirably the adhesive is in one or more discrete portions and preferably in two or more discrete portions per label. Desirably it is applied as a solventless adhesive. Desirably the adhesive thickness is from about 0.001 to about 0.050 inches (0.0025 to about 0.13 cm). A simple way to apply the adhesive is to adhere the

adhesive to a release backing and then apply the label or groups of labels over the adhesive on the release backing. The labels can be trimmed or die cut after affixing to the release backing to form more uniform or decorative shapes in the final label. The labels with the release backing can be rolled up and stored for later use. If the labels are die cut after being affixed to the release backing, the scrap rubber cut from the label can be left on the release backing. This can facilitate the isolation of the usable and non-usable part of the product. The adhesive is specified for the labels because some of the tires will not have sufficient green tack to hold the labels securely in the selected location until the tire is put in the mold and fully cured. Rather than have some labels with adhesive and others without, adhesive is advantageously applied to all the labels. It is anticipated that these labels will adhere to the tire for the life of the tire and the bar codes will remain readable.

The label can then be applied to pneumatic tires. While the bar code label can be applied anywhere on the tires, it is desirable to apply them on the interior or exterior of the sidewalls (rather than the tread region) where there is minimum abrasion. The labels can be in the form of appliques that have a pleasing appearance while carrying the identifying bar code information. It is anticipated that the labels will be better adhered due to the fact that many cured rubber compositions adhere to uncured rubber compositions better if there is no intervening

adhesive. The adhesive is necessary to secure the labels on the tire if sufficient tackiness is not present on the green tire to hold the label securely to the tire.

After affixing the label to the green tire, the tire is cured (crosslinked) in a tire curing press or the equivalent. Curing of green tire can be brought about by various procedures in a tire press; wherein the rubber is put in an appropriate shape and heated for 1 to 120 minutes to a temperature from about 80°C to about 160°C. It is desirable that the rubber of the label be cured to at least 70, 80, or 90 percent of its maximum torque as determined by a Mooney cure meter for the rubber compositions of the tire.

The film on the label can remain on the label during this step and may help minimize rubber flow on the surface of the label and avoid contamination of the label surface. After curing, the film can be removed from the bar code label or left in place. If the film is transparent, the bar code can be read without removing the film. At some stage after tire curing it is probably desirable to remove the protective film from the bar code.

It has been observed that the bar codes applied with this process have been easily readable by a scanner after inflating the tire multiple times and using the tire. This was unexpected as the low modulus of the labels opened the possibility of the labels stretching which might have changed the spacing between the bars of the bar code. The interface between the tire and the label has not been a site for

failure or cracking of the tire. The labels have been tamper resistant in that they can be cut off the tire but this leaves knife marks on both the tire and the label, thereby, hampering reuse of the label or the application of an alternate label to the tire. Label removal also weakens a tire surface and premature failure there may occur.

The bar codes of this process are useful to identify rubber goods such as tires where the rubber goods are anticipated to stretch during use or installation, and this stretching causes failure of conventional bar codes. Specific applications include in-process identification during tire manufacturing processes, identifying specific tires that are approved for use in car races, and identifying tires by reading their bar codes so that their retreading history or ownership history can be known or confirmed.

Experimental

An initial screening test was run to determine the deficiencies of the available bar code labels. One problem was that the labels were not thought to be tamper resistant. An adhesion test was developed. It comprised a) attaching a label to a tire sidewall substrate and curing the sidewall substrate in a mold with the label attached, b) using a knife to cut underneath a corner of a bar code label, and c) attempting to lift the bar code off the sidewall by that corner. The results were either 1) Unacceptable - the label can be removed without disintegrating, 2)

Acceptable - the label cannot be removed without disintegrating, and 3) Tamperproof - the label cannot be lifted without damaging the test piece.

A loss of the labels from the tire was a frequent problem. A test was devised in which the sidewall was stretched a number of cycles and the readability of the label was thereafter evaluated. A tire sidewall compound 100 mil thick (.25 cm) and 3 x 7.9 inches square (7.6 x 20 cm) was used as the substrate. Three adjacent bar code labels were placed on each substrate. The laminate was cured in a mold for 24 minutes at 320°F (160°C) under 20 tons (about 89 kn) platen pressure. The substrate was cut to yield three samples, each 1 inch (2.54 cm) wide with a bar code centered in the 1 inch (2.54 cm) strip. These 1 inch (2.54 cm) strips were stretched from zero to 20% to zero on a cyclic basis at a rate of 200 cycles per minute for 3 hours. To pass the test, the bar code must be readable in a bar code scanner after the test and even a fraction of the bar code label should not separate from rubber where it is attached.

The results are shown in the following Table 1.

Table 1				
Label	Label Material	Supplier	Adhesion	Read-ability
First Rubber Sidewall Composition				
	Polyester	Computype	acceptable	passed
F103	Polyester	Filmquest, Inc.	unacceptable	failed
F103	Polyester	Filmquest	unacceptable	failed
F103A	Polyester	American Coated Products	acceptable	passed
F103B	Polyester	same	acceptable	passed
F103C	Polyester	same	acceptable	passed
Exp'l	Rubber	present invention	tamper resistant	not tested
Second Rubber Sidewall Composition				
	Polyester	Computype	acceptable	failed
	Polyester	Brady	unacceptable	not tested
F103C	Polyester	American Coated Products	acceptable	failed
Exp'l	Rubber	present invention	tamper proof	passed

Computype is located in St. Peters, Missouri, USA and its polyester film is identified as "Data2"*.

Filmquest, Inc. is located in St. Charles, Illinois, USA. American Coated Products is located in Indianapolis , Indiana, USA. Brady is located at Menomonee Falls, Wisconsin, USA.

Several of the polyester based-labels (supplied by Computype and American Coated Products) had acceptable performance in the adhesion test and passed the Readability test with the first rubber sidewall composition. Several of these labels were retested with a second rubber sidewall composition. While

*Trade-mark

these polyester-based labels applied to the second rubber sidewall composition were acceptable in the Adhesion test, they failed to remain attached to the tire in the Readability test and, therefore, failed the Readability test. Fourier transformed infrared analysis (FTIR) of the surfaces of the sidewalls and the label indicated that the mode of failure of the bond between the sidewall and the label with the first rubber sidewall composition was fracture within the adhesive layer. FTIR analysis of the surfaces from the second sidewall rubber composition indicated that failure occurred between the adhesive and the polyester leaving an adhesive residue only on the rubber sidewall composition. Thus, something in the second rubber sidewall composition may have caused failure of the adhesive between the polyester layer and the adhesive. Based on this analysis, it is anticipated that none of the polyester-based bar code label would pass the adhesion test with the second rubber sidewall composition.

The rubber bar code label of the present invention was the only bar code to pass the Readability test with both sidewall rubber compounds and also be tamper proof in the Adhesion test with both of the sidewall rubber compounds.

As white rubber compositions are sometimes stained by antioxidants or oils in tire sidewalls, the rubber labels of the present invention were tested in an accelerated contact staining of white rubber goods. The test involved placing black sidewall rubber composition on the top of the bar code (after

transparent film removal) followed by a 1 lb. (454 gm) weight. It was heated in an oven for 3 days at 160°F (71°C). Then the top black sidewall rubber composition and weight were removed and the bar code was exposed for 2 hours under UV light. Even though the white rubber labels were only 12.5 mils thick, the staining was only trace and did not affect readability of the bar codes.

The modulus of the control polyester and experimental rubber labels was also measured. The polyester had 5% modulus of 12 MPa and an elongation at break of about 80-90%. The rubber had a 5% modulus of about 0.2 or 0.3 MPa and an elongation at break of about 600%.

While in accordance with the patent statutes the best mode and preferred embodiment has been set forth, the scope of the invention is not limited thereto, but rather by the scope of the attached claims.

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CLAIMS:

1. A process for attaching a label to a tire, the label having a machine readable bar code, comprising

a) printing a mirror image of a high resolution bar code on a smooth film with an ink that is heat transferable from said film to an unsaturated hydrocarbon rubber,

b) preparing a crosslinkable hydrocarbon rubber transfer label having a thickness of 0.005 to about 0.050 inches (0.013 to about 0.13 cm),

c) after steps a and b affixing said mirror image bar code and said smooth film to one face surface of said rubber transfer label,

d) crosslinking the hydrocarbon rubber of said rubber transfer label so that its Mooney torque is at least 70% of the maximum torque of the compound in the Mooney curemeter plot,

e) transferring with heat and transposing said mirror image bar code onto said rubber transfer label forming a crosslinked rubber transfer having a machine readable bar code thereon and said film on top of said bar code, either

1) after affixing said rubber transfer label to said mirror image bar code and in the same step as crosslinking the hydrocarbon rubber of said transfer label or

2) after affixing said hydrocarbon rubber transfer to said mirror image bar code in a

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separate step subsequent to crosslinking said hydrocarbon rubber,

f) after the crosslinking step and the transferring step of the bar code, affixing one or more discontinuous heat curable hydrocarbon rubber-based adhesive portions, having a thickness from 0.001 to about 0.050 inches (0.0025 to about 0.13 cm) to a face surface of said rubber transfer label; wherein the face to which said adhesive is affixed is opposite the face where the bar code is transferred,

g) after affixing said adhesive, affixing, via said adhesive, said hydrocarbon rubber transfer label with bar code and said film thereon to a surface of a green tire and

h) curing said green tire in a tire curing press, and

i) removing said film from said crosslinked rubber transfer.

2. A process according to claim 1 wherein affixing said adhesive is accomplished by applying the adhesive on a release backing to the face of said hydrocarbon rubber transfer opposite said bar code; and wherein said release backing is separated from said crosslinked rubber transfer prior to applying said transfer to the green tire.

3. A process according to claim 2, wherein after applying said adhesive on a release backing, said crosslinked rubber transfer is cut or trimmed to an appropriate size and shape for said label.

4. A process according to claim 2 wherein said one or more discontinuous heat curable hydrocarbon rubber-based adhesive portions is two or more portions per label.

5. A process according to claim 1 wherein said label is a non-black rubber.

6. A process according to claim 1 wherein said bar code is printed with a rubber-based ink.

7. A process according to claim 1 wherein said unsaturated rubber specimen carrying said bar code is molded or shaped into a decorative image before being affixed to said tire.

8. A process according to claim 1 wherein said hydrocarbon transfer label after crosslinking has a modulus at 5% elongation of from about 0.2 to about 1 MPa.

9. A process according to claim 1 wherein said label has a decorative shape other than a circle, ellipse, rectangle or other parallelogram.

10. A process according to claim 1 wherein said bar code is a unique bar code serving to identify one individual tire from all other tires.

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11. A process according to claim 1 wherein said bar code serves to identify the tire manufacturer, type, or the particular tire.

12. A process according to claim 1 wherein said smooth film is a polyester film.

SMART & BIGGAR

OTTAWA, CANADA

PATENT AGENTS

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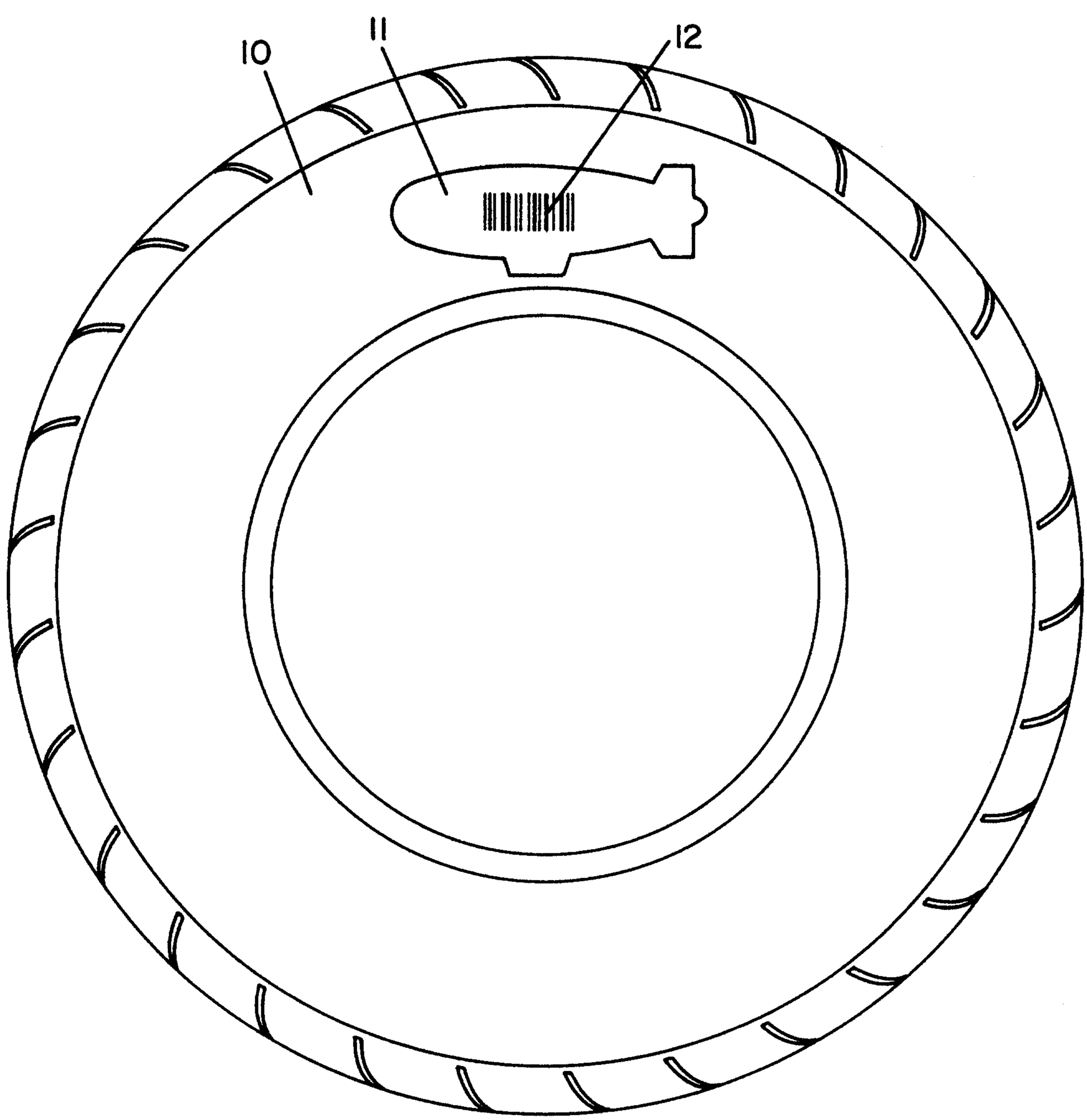

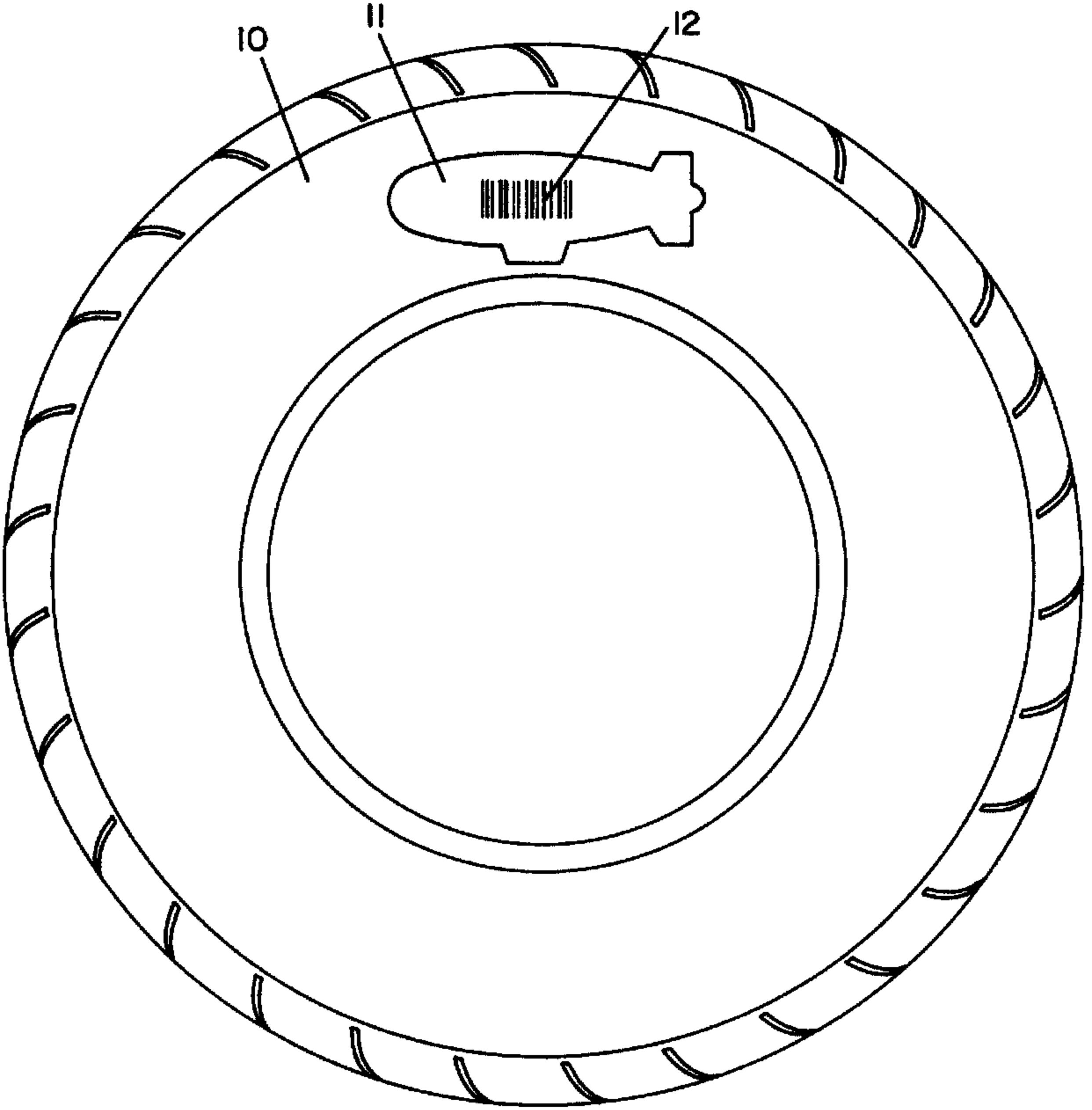
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