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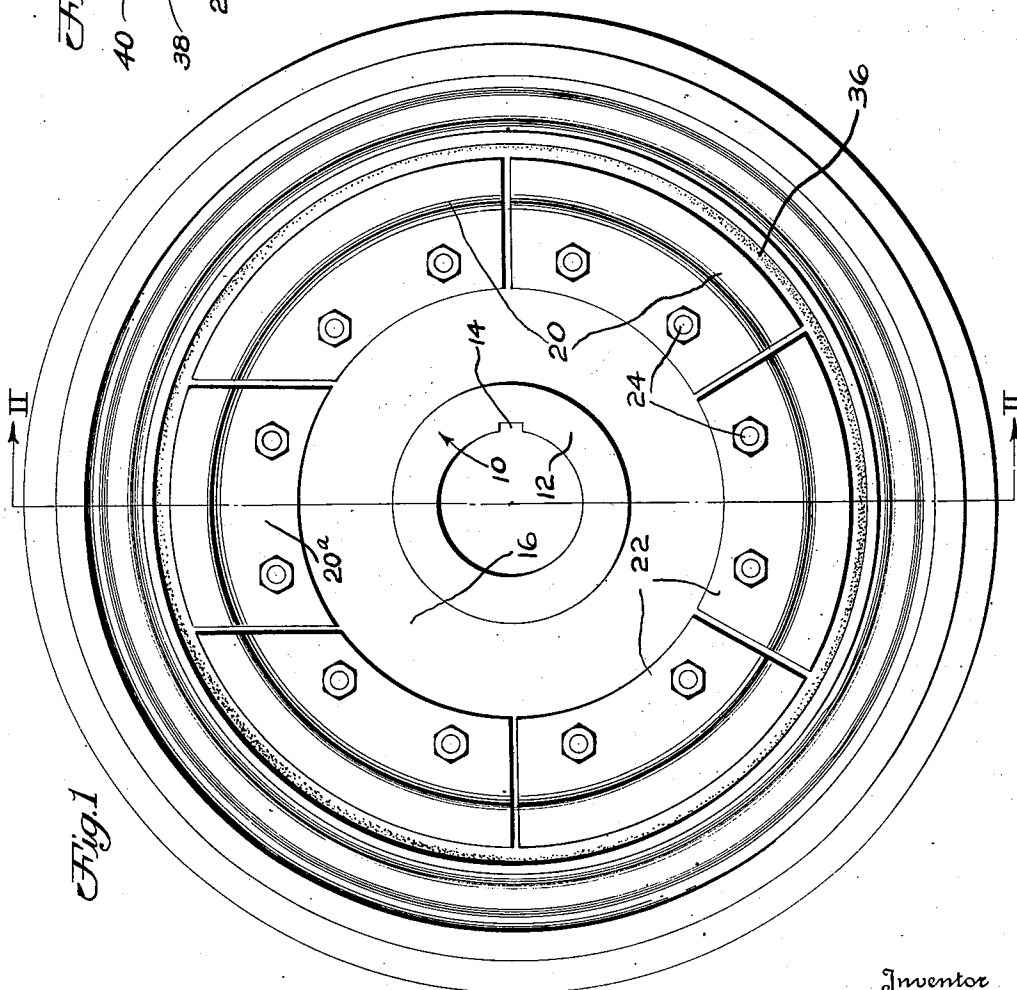
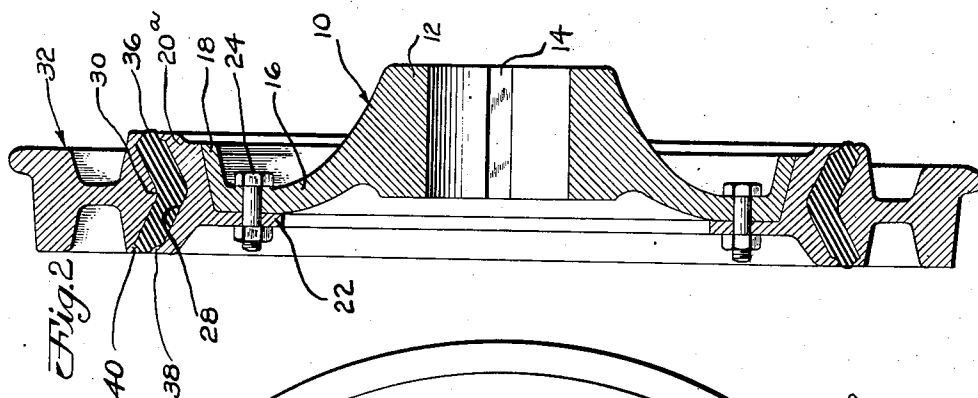
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2,113,379

CUSHION WHEEL

Filed Aug. 9, 1934

2 Sheets-Sheet 1



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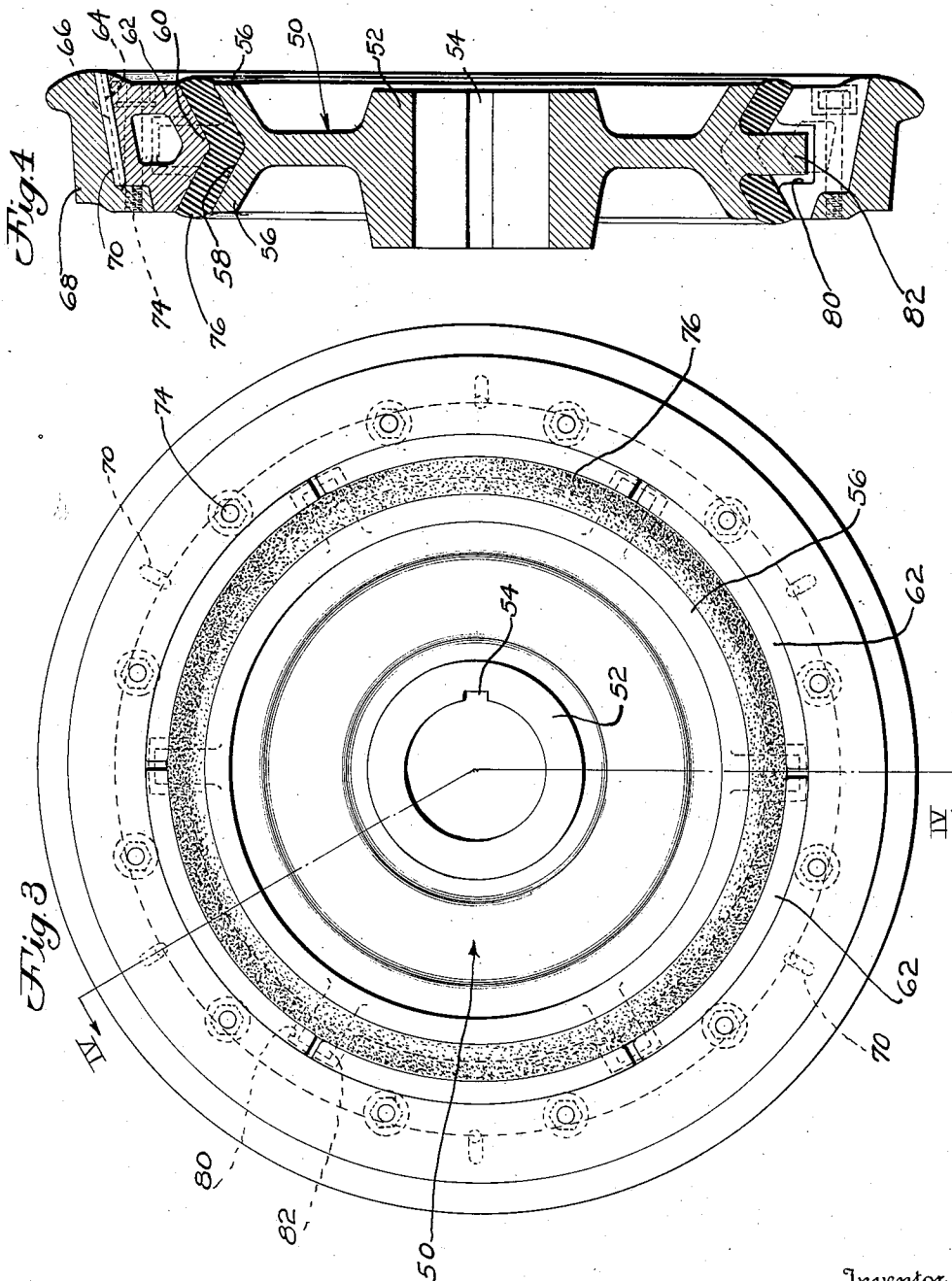
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UNITED STATES PATENT OFFICE

2,113,379

CUSHION WHEEL

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poration of Delaware

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15 Claims. (Cl. 295—11)

This invention relates to cushion wheels and more particularly to this general type of wheel which has a rubber body for cushioning purposes and a metal rim which adapts the assembly for railroad or other track uses.

Prior to the present invention various cushion wheels have been suggested and some manufactured, however certain difficulties have arisen in conjunction therewith which have rendered their use somewhat unsatisfactory. For example, in many former types of cushion or elastic wheels the rubber-cushioning body has not been held under compression forces with the result that the rubber is too limber or resilient for heavy loads. It has likewise been found that when the rubber is compounded to a greater stiffness and subjected to the same heavy loads that its life is materially reduced.

Reference should be had to my former Patents Nos. 1,648,413 granted November 8, 1927, and 1,948,304 granted February 20, 1934 which illustrate improved forms of cushion wheels, in which provision is made to hold the elastic body under compressive forces. Wheels of this type have been found quite satisfactory in use, however the present invention is believed to be an improvement thereof and concerns itself with a somewhat different construction to achieve an elastic wheel in which the cushioning body is very securely held in a tightly compressed condition.

It should be understood that the idea of holding the elastic body under compression is not basically new, however in the past wheel structures embodying this feature have proven difficult to manufacture, necessitating either very heavy presses or complicated apparatus for assembly purposes. Likewise trouble has been encountered in permanently holding the rubber or other elastic material in high compression over long periods of use. Moreover the commercial and patented art discloses structures which are not adapted for production and use due to complicated assemblage of numerous parts which are impractical to manufacture and maintain.

It is an object of the present invention to avoid and overcome the foregoing and other difficulties of prior-art structures by the provision of an improved cushion wheel structure in which the rubber-cushioning body is held under high compression forces in such a manner that it is capable of severe and extended use.

Another object of the invention is to provide an improved cushion wheel structure whereby in the assembly the elastic-cushioning body is put under compressive forces.

Another object of the invention is to provide a commercially practicable cushion wheel, particularly adapted for large-quantity production and satisfactory wearing life with little or no maintenance.

The foregoing and other objects of the invention are achieved in the cushion-wheel structures hereafter described and illustrated in the accompanying drawings, wherein

Fig. 1 is a side elevation of one form of the invention;

Fig. 2 is a diametric cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a side elevation of a second embodiment of the invention;

Fig. 4 is a diametric cross-sectional view taken on line 4—4 of Fig. 3.

While the invention and the principles thereof are capable of various embodiments, certain best-known forms thereof have been selected in accordance with the patent statutes for detailed illustration and description. Thus in the particular form of the invention seen in Figures 1 and 2 the wheel hub has been indicated generally by the numeral 10 and includes a hub portion 12 which may be formed with a keyway 14 if desired. The wheel hub 10 is also preferably formed with an integral radial flange 16 having a cone-shaped outer skirt portion 18. Mounted on the skirt portion 18 of the wheel hub 10 are a plurality of arcuate segments 20 which are provided with inwardly extending lugs or flanges 22 whereby the arcuate segments 20 may be secured to the flange 16 of the wheel hub 10 as by bolts 24. The segments 20 are formed on their radially outer surfaces with a channel or groove 28 which is substantially complementary to a rib 30 formed on the rim shown generally at 32.

The elastic cushioning body indicated at 36 is preferably made of high-grade rubber of medium resiliency such as, for example, tread-tire stock, compounded to take shock and compression rather than abrasion, and as seen in Fig. 2 of the drawings the elastic body 36 lies between the rim 32 and the arcuate segments 20, so that the body is confined in the channel 28 of the segments by the rib 30 of the rim 32. As described above the elastic body is held under heavy and permanent compression forces and these are achieved during the assembly of the wheel due to the wedging action between the conical skirt 18 of the wheel hub 10 and the associated tapered surface of the segments 20.

Briefly the assembling operation consists in placing the rim 32 of the wheel on a flat bed or

table, positioning the elastic body 36, in the form of a continuous ring or in the form of arcuate segments which are of approximately the same length as the metal segments 20, around and radially inside the rim. Next the metal segments 20 are positioned radially inwardly of the elastic body or bodies and finally the wheel hub 10 is placed into sliding and wedging contact with the arcuate segments, as will be evident. Relative axial movement of the wheel hub 10 and its integral conical skirt 18 and the arcuate segments 20 is now effected in any manner, as by a press or by tightening clamping bolts 24, and the parts are pressed to the position seen in Fig. 2. Of course relative axial movement of the conical skirt 18 and the arcuate segments 20 will effect a high compression of the elastic body 36 due to the radially outward movement of the segments 20 resulting.

In order to assist in maintaining the elastic body 36 in its proper cushioning position, it is advisable to form the sides of the channel 28 with radially outwardly directed flanges 38 and the rim may also be provided with similar flanges 40, which are directed radially inwardly.

The compressive forces on the elastic body are ordinarily such that no positive lock or drive is needed between the wheel hub and the rim, however means of this character may be provided as described in my former patents enumerated above if found necessary or desirable. Reference may also be had to the form of invention shown in Figs. 3 and 4 for positive locking and driving lugs.

The invention furthermore contemplates vulcanizing the elastic body 36 to the metal rim and segments prior to the final compressing and assembling action described just above. Or it may be advisable, in certain instances, to secure the rubber body by cement to smooth or roughened surfaces of the rim and arcuate segments.

By reason of the fact that the skirt portion 18 and inner surface of the rib 30 incline radially inwardly toward the outside of the wheel, difficulty would be encountered in inserting or removing the segments 20 in an axial direction. Obviously, due to the inclined shape of the skirt portion 18, wedge portion 30 of the rim 32, the cushion member 36 and the segments 20, the latter must be assembled and removed in a direction at an angle to the axis of the wheel. In order to permit this to be accomplished one of the segments, indicated in Figure 1 at 20^a, is formed with substantially parallel ends, that is to say it is separated from the adjacent segments 20 along lines extending tangentially instead of radially, as is the case of the other segments 20. This segment 20^a is, in effect, a key segment in that it is the last to be inserted when the wheel is assembled and is the first to be removed when the wheel is disassembled. By reason of its parallel ends the segment 20 may be inserted or withdrawn at an angle to the axis of the wheel, or radially inward, without wedging against the ends of the adjacent segments 20.

In the embodiment of the invention illustrated in Figs. 3 and 4 the numeral 50 indicates generally a wheel hub having a flanged hub portion 52 which may be formed with a locking keyway 54. The wheel hub 50 is provided at its outer periphery with oppositely inclined flanges 56 which provide a V-shaped groove or cavity 58 which is formed complementary to a V-shaped rib 60 formed on arcuate segments 62. The arcuate

ally outer surface 64 which has a sliding wedging action on a conical surface 66 formed on the rim 68. Locking keys 70 may be provided between the rim 68 and the segments 62 to prevent relative circumferential movement between the parts. Cap screws 74 are provided at spaced distances around the periphery of the wheel to secure the segment 62 to the rim 68.

An elastic cushioning body 76 is positioned between the arcuate segments 62 and the V channel 58 formed on the wheel 50 with the parts taking the relation illustrated in Fig. 4. The elastic body 76 is preferably a high-grade rubber of medium resiliency such as, for example, the type of rubber generally employed for tire-tread use. This rubber is tough and long-wearing and is adapted to withstand shocks and compression forces without undue fatigue.

The invention contemplates locking the wheel hub 50 to the arcuate segments 62 so as to insure driving contact therebetween at all times. To this end the segments 62 are formed with recesses 80 which may be rectangular in shape and which are adapted to receive lugs 82 secured or formed integrally with the flanges 56 of the wheel hub 50. As seen in Figs. 3 and 4 the driving lugs 82 have considerable clearance in all directions with the recesses 80 formed in the arcuate segments 62, which clearance permits the elastic cushioning body 76 to normally absorb all driving and load forces.

As described, in conjunction with the form of the invention shown in Figs. 1 and 2, the elastic body 76 can be secured by vulcanization, cement or otherwise to the wheel parts, although this type of construction is not ordinarily necessary due to the high compressive forces on the said elastic body as described. However the surfaces of the arcuate segments 62 and the surfaces of the flanges 56 forming the channel 58 may be roughened, grooved or otherwise provided with gripping surfaces to assist in holding the elastic body 76 and the wheel parts in the proper related position.

If, however, these forces become greater than a certain safe limit which can be carried by the elastic body 76, the lugs 82 will come into contact with the recesses 80 and a positive drive will result while preventing failure of the wheel assembly.

The wheel parts in this form of the invention are assembled in much the same manner as that described in conjunction with Figs. 1 and 2. The wheel hub 50 is placed on a bed or press platen and the elastic body 76, either in the form of a continuous ring or in the form of arcuate segments, is laid in the channel 58 and the arcuate segments 62 are positioned radially of the elastic body 76 in spaced circumferential relation. The rim 68 is now placed around the arcuate segments with the keys 70 in proper position and the rim is forced over the segments 62 in any suitable manner as by a hydraulic press platen. In forcing the rim into position over the arcuate segments 62 the cooperating tapered surfaces 64 and 66 of these members result in radially inward movement of the segments 62, thereby effectively and highly compressing the elastic body 76 between the segments and the wheel hub 50. The cap screws 74 function to securely hold the rim 68 to the segment 62, thereby completing a rigid, simple and fool-proof elastic wheel in which the compression body of resilient material is firmly held under high compression forces during the life of the assembly. Positive driving

means have been provided between the wheel parts which only come into operation in case of failure of the resilient body or during periods of high overload thereon. The wheel parts are adapted to rapid and efficient commercial manufacture and are exceptionally few in number with the assembly relying on the simplicity and ruggedness of design to produce a long-lived fool-proof and commercially practicable elastic wheel for rail or track use, such as on railroad cars, street cars and the like.

While the wheel assemblies illustrated and described are particularly adapted for rail use, it should be appreciated that the assemblies are adapted to take any type of rim such as a plain, flat band, a pneumatic tire rim, etc., and accordingly the invention contemplates other embodiments for automotive, tractor or truck use.

Therefore the invention should not be limited to the several illustrative embodiments thereof particularly shown and described heretofore, but is properly defined by the appended claims.

What I claim is:

1. A cushion wheel including a wheel hub, a radially extending flange integral with the wheel hub, an axially inclined seat on the flange circumference, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments and the wheel hub will move the segments radially outwardly, means for positioning the segments axially of the wheel hub, a rim surrounding the segments, an elastic body positioned between the rim and segments and held in highly compressed condition thereby, said rim and segments having a complementary V-rib and V-groove which receive and engage the elastic body to hold it in substantial V-shape.
2. A cushion wheel including a wheel hub, a radially extending flange integral with the wheel hub, an axially inclined seat on the flange circumference, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments and the wheel hub will move the segments radially outwardly, means for positioning the segments axially of the wheel hub, a rim surrounding the segments, an elastic body positioned between the rim and segments and held in highly compressed condition thereby, the tapered portions being so shaped as to create at least as great a compression of the rubber when the segments, hub and rim are in their final operative relation to each other, as is created when the parts are arranged in any of their other relative positions during assembly thereof.
3. A cushion wheel including a wheel hub, axially inclined seat means integral with the wheel hub, a plurality of arcuate segments positioned on the seat means and having complemental tapered portions resting on the seat means whereby relative axial movement of the segments and the wheel hub will move the segments radially outwardly, means for positioning the segments axially of the wheel hub, a rim surrounding the segments, an elastic body positioned between the rim and segments and held in highly compressed condition thereby, said rim and segments having a complementary means which receive and engage the elastic body to hold it in axial and circumferential radial cushioning positions, the tapered portions being so shaped as to create at least as great a compression of the rubber

when the segments, hub and rim are in their final operative relation to each other, as is created when the parts are arranged in any of their other relative positions during assembly thereof.

4. A cushion wheel including a wheel hub, means integral with the wheel hub providing an axially inclined seat, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments and the wheel hub will move the segments radially outwardly, means for positioning the segments axially of the wheel hub, a rim surrounding the segments, an elastic body positioned between the rim and segments and held in highly compressed condition thereby, the tapered portions being so shaped as to create at least as great a compression of the rubber when the segments, hub and rim are in their final operative relation to each other, as is created when the parts are arranged in any of their other relative positions during assembly thereof.

5. In combination in an elastic wheel, a rotatable center, a rim, a rubber body cushioning the rim on the center and radially movable means actuated by relative axial movement of the rim and center for clamping the rubber body under compression and adjustable mechanism controlling the action of the compression means, said radially movable means having tapered portions cooperating with tapered portions on the rim, the tapered portions being so shaped as to create at least as great a compression of the rubber when the segments, hub and rim are in their final operative relation to each other, as is created when the parts are arranged in any of their other relative positions during assembly thereof.

6. In combination, a rotatable wheel center having a grooved circumference, a rim surrounding the center, an elastic body positioned in the grooved circumference of the center, a plurality of arcuate segments between the rim and the elastic body, a radially inwardly raised area on the segments complemental to the groove on the center, cooperating inclined portions on the rim and segments so inclined that relative axial movement between said rim and segments causes the segments radially inwardly to effect a high compression on the rubber body and to secure the rim and segments to the center, means for moving and holding the segments axially of the rim, means for holding the segments and rim against relative circumferential movement and positive stop means limiting the radial and circumferential movements of the center and the rim.

7. In combination, a rotatable wheel center, a rim surrounding the center, an elastic body positioned in the center, a plurality of arcuate segments between the rim and the elastic body, cooperating portions on the rim and segments whereby relative axial movement therebetween will move the segments radially inwardly to effect a high compression on the rubber body and to secure the rim and segments to the center, and means for moving and holding the segments axially of the rim, the cooperating portions on the rim and segments for forcing the segments radially to effect a high compression being so shaped as to create at least as great a compression of the rubber when the segments, hub and rim are in their final operative relation to each other, as is created when the parts are arranged in any of their other relative positions during assembly thereof.

8. A cushion wheel including a hub portion, a rim portion, and a cushioning member of substantially V-shape in cross-section interposed therebetween with the edges thereof exposed to permit it to flow under the forces of compression, one of said portions being shaped to conform to the configuration of the adjacent side of said cushioning member, and a plurality of segments interposed between the other of said portions and the other side of said cushioning member and each being shaped to conform to the configuration of the adjacent portion of the latter, the configurations of said hub and wheel portions and said cushioning member tending to maintain the parts against axial displacement when under load, and said segments being unitary and individually mounted to require bodily assembly as a unit from one side of the wheel only and together maintaining said cushioning member under compression.

9. A cushion wheel including a hub portion, a rim portion, and a cushioning member interposed therebetween, and a plurality of segmental members interposed between one of said portions and said cushioning member for maintaining the latter under compression, one of said segmental members having its ends so formed as to be removable in a radial direction inwardly toward the axis of the hub when the segments are clear of the hub.

10. A cushion wheel including a hub portion, a rim portion, and a cushioning member interposed therebetween, a plurality of segmental members interposed between one of said portions and said cushioning member for maintaining the latter under compression, one of said segmental members having parallel ends so as to be removable in a radial direction inwardly toward the axis of the hub when the segments are clear of the hub.

11. A cushion wheel including a hub portion, a rim portion, and a cushioning member interposed therebetween, and a plurality of segmental members interposed between one of said portions and said cushioning member for maintaining the latter under compression, some of said segmental members being separated from one another along lines extending radially and at least one of said segmental members being separated from adjacent segments along lines other than radial lines extending in such a direction that they are spaced apart at the inner edge of the segment at least as much as at the outer edge thereof, whereby said last-mentioned segmental member may be moved inwardly toward the axis of the hub when the segments are clear of the hub.

12. A cushion wheel including a wheel hub, a radially extending flange member integral with the wheel hub, a rim member surrounding and spaced from said flange, an axially inclined seat on one of said members facing the other of said members, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments will move the segments toward and away from the member other than that first specified as having the tapered seat thereon, depending upon the direction of axial movement of said segments, an elastic body positioned between the segments and said member other than that specified as having the tapered seat and held in highly compressed

condition therebetween, said segments and said member other than the first one specified as having the tapered seat, having a complementary V-rib and V-groove which receive and engage the elastic body to hold the same in substantial V-shape.

13. A cushion wheel including a wheel hub, a radially extending flange member integral with the wheel hub, a rim member surrounding and spaced from said flange, an axially inclined seat on one of said members facing the other of said members, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments will move the segments toward and away from the member other than that specified as having the tapered seat thereon depending upon the direction of axial movement of said segments, an elastic body positioned between the segments and said member other than that specified as having the tapered seat and held in highly compressed condition therebetween, said elastic body being under its greatest compression for any relative position of the parts, when said members, segments and elastic body are in their final operative relation with respect to each other, and means for holding said members, segments and elastic body in operative relation.

14. A cushion wheel comprising a wheel hub having but a single peripheral frusto-conical seat, a plurality of arcuate segments having complementary conical seats abutting said frusto-conical seat on said hub, a rim, an elastic body under high compression arranged between said rim and segments and held against lateral displacement relative thereto, said complementary conical seats being such that upon axial forcing of said hub relatively toward said assembled arcuate segments, rim and elastic body, the said seats will cause constantly increasing compression of said elastic body up to and including the final assembled positions of these parts, and means for holding said segments, hub, rim and elastic body in assembled relation, the said segments and rim having opposed seats for the elastic body shaped to prevent lateral shifting of the elastic body from between said rim and segments when the latter are in assembled position.

15. A cushion wheel including a wheel hub, a radially extending flange member integral with the wheel hub, a rim member surrounding and spaced from said flange, an axially inclined seat on one of said members facing the other of said members, a plurality of arcuate segments positioned on the seat and having complemental tapered portions resting on the seat whereby relative axial movement of the segments will move the segments toward and away from the member other than that first specified as having the tapered seat thereon, depending upon the direction of axial movement of said segments, an elastic body positioned between the segments and said member other than that specified as having the tapered seat and held in highly compressed condition therebetween, the opposed surfaces of said segments and said member, other than the first one specified as having the tapered seat, having complemental surfaces other than flat surfaces engaging the elastic body to hold the same.

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