PUBLISHED

MAY 11, 1943.

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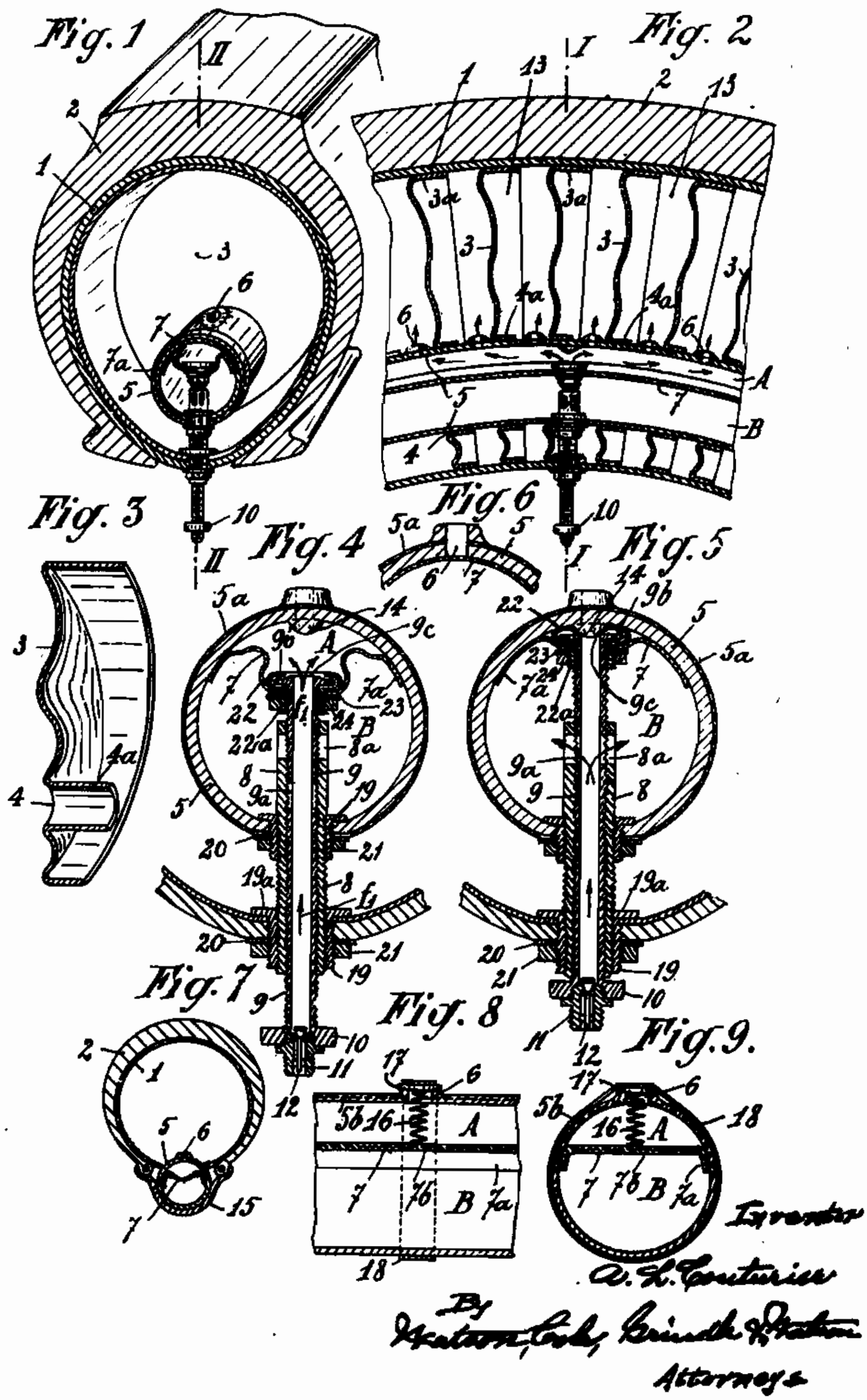
Filed May 5, 1942

Serial No.

441,860



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ALIEN PROPERTY CUSTODIAN

AIR TUBES FOR PNEUMATIC TYRES

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Application filed May 5, 1942

My invention relates to air tubes for pneumatic tyres applicable to vehicles of any kind.

A primary object is to provide an air tube constructed to minimize deflation in case of puncture. According to my invention, the air tube is divided in a number of cells by air-tight flexible inner partitions; through the latter passes an air supply tube having an inflating valve, said tube being adapted to deliver air to the cells through apertures in its periphery. The air supply tube may be provided with a membran arranged to be applied against its inner wall after inflation of the cells, and to close the apertures, so as to prevent any back flow of air through the inflating valve.

The following description with reference to the appended drawings given by way of non-limitative examples will show the manner in which my invention may be carried out into practice.

Fig. 1 is a transverse section through a pneumatic tyre having an air tube in accordance with this invention, the section being taken along line I—I of Fig. 2.

Fig. 2 is a corresponding longitudinal section of a portion of the tyre, the section being taken along line II—II of Fig. 1.

Fig. 3 is a perspective view, partly broken away, showing a partition.

Figs. 4 and 5 are transverse sections of the air supply tube through the inflating valve, during inflation and at the end of inflation respectively.

Fig. 6 is a partial cross-section analogous to Figs. 4 and 5, showing the parts adjacent to an air supply aperture.

Fig. 7 shows a modified form of the embodiment illustrated by Fig. 1.

Figs. 8 and 9 are respectively a longitudinal section and a cross section of a modified air tube.

Referring to Figs. 1 to 6, the air tube **1** positioned in cover **2** is divided into compartments or cells **13** by transverse partitions **3** made of rubber or like flexible material; any suitable number of cells may be provided, for instance 80 in a conventional automobile air tube. Each partition **3** (Figs. 2 and 3) has a larger diameter than air tube **1** in order to have a substantial amount of play. The marginal portion of each partition is bent at **3a** and is cemented and vulcanised to the inner surface of the air tube. As better shown on Fig. 2 and 3 the bent portion or flange **3a** has a gradually increasing width from the bead side to the crown side of the tube, its outer end lying substantially in a radial plane with respect to the wheel.

In the vicinity of the bead contacting or lower portion of the air tube, each partition **3** has an aperture **4** with a wide collar **4a** to accommodate an endless tube **5** on which the collars **4a** are cemented and vulcanised to ensure air-tightness.

The tube **5** is made of rubber with a strong canvas layer positioned around it, as shown at **5a**, or alternatively embedded therein, so as to remain sufficiently rigid and avoid any distorsion; the tube **5** has apertures **5** with reinforced edges each of which opens in a cell **13** for air supply thereto. The tube **5** is divided into two annular chambers A, B by an endless band or membran which is cemented along its edges at **7a** (Figs. 1 and 4) and is wide enough to move in the tube and close the apertures therein as will be hereinafter explained.

The inflating valve for supplying air to the cells extends as far as and opens through said band or membran **7**; the valve comprises two concentrical cylindrical parts **8**, **9**; part **9** is screwed into part **8** so that they may be moved lengthwise with respect to one another. The outer part **8** is secured to air tube **1** (Figs. 4 and 5) by means of a sleeve **19** provided with inner and outer screw-threads, which is screwed over part **8**, the upper end of sleeve **19** has a flange **19a** and the air tube **1** is nipped in known manner between flange **19a** and a washer **20** by a tightening nut **21** screwed on the body portion of sleeve **19**. The outer part **8** of the valve extends into tube **5** to which it is secured in the same way as described with reference to air tube **1**; as to inner part **9**, it is secured through its upper end to the band or membran **7** in the following manner:

The upper end of part **9** has a flange **9b** which may freely turn in a groove in a big washer **22**; the latter merges downwardly into a sleeve **22a** having an outer screw-thread to receive a splined washer **23** and a nut **24**. The band or membran **7** is nipped by nut **24** between washers **22** and **23**. Hence the inner part **9** of the valve may rotate to be screwed into outer part **8** or unscrewed for relative lengthwise movement. Said inner part at its base is rigid with a nut or knurled thumb-piece **10** which enables of rotating it. Parts **8** and **9** have ports **8a**, **9a** which are offset or staggered in vertical direction so that they may be brought to register by suitably moving part **9** in part **8**. The outer end **11** of part **9** is arranged to accommodate the inflating pump connector and the air check valve **12** is housed therein. A resilient pad **14** is positioned on the inner surface of tube **8** opposite the end **9c** of part **9**.

The operation is as follows (Figs. 1, 2 and 4): when air supplied to the valve from an inflating pump, it travels along a path indicated by arrow f_1, enters the upper annular chamber A in tube 5 and is distributed past apertures 6 into the various cells 13 in the air tube. As soon as the air pressure within the air tube is deemed suitable, the knurled thumb-piece or nut 10 is operated to move up part 9 in part 8. At the end of its stroke, part 9 has its end 9c in abutting contact with pad 14, thereby preventing any back flow of air towards check valve 12; ports 8a and 9a are in registering relationship as shown on Fig. 5. As inflating is resumed, air from the pump is forwarded through ports 8a, 9a into lower annular chamber B in tube 5; inflation is continued until the pressure prevailing in chamber B is substantially higher than within the cells, in order that membran 7 is securely applied against the inner wall of tube 5 and thus closes apertures 6 (Fig. 6). From now on, the inflating connector may be removed and the valve nose may be fitted with its cap, any back flow of air from the cells being prevented.

Assuming that any one of the cells happens to be punctured, the pressure in the other cells will elastically deform the partitions of the emptied cells, the average inner pressure of the air tube will be lowered by a negligible amount and the tyre will generally behave as though no deflation took place.

The operation for deflating the air tube is as follows: chamber B is set in communication with atmosphere, ports 8a and 9a being in registering relationship, then nut 10 is operated to move down valve part 9, when chamber A and thus all cells are in communication with atmosphere through the valve inner hole.

Instead of being housed within the air tube, the feed tube 5 may be partly located without air tube 1, as shown on Fig. 7; in such instance, the supply tube is partly encased in a well base rim 15. The latter arrangement which results in a lighter weight is particularly valuable for bicycles and motocycles.

According to a further modification, each aperture 6 corresponding to a cell is provided with a check valve adapted to close it for preventing agress of air from the cell when inflation is being performed. The check valve arrangement plays the part previously attributed to membran 7. A check valve of this character may be constructed as shown on Figs. 8 and 9, i. e. comprises a flat disk 17 biassed by a spring 16 away from its seat. A resilient ring or belt 18 secured to supply tube 5 limits the movement of check valve 17 away from its seat. The partition 7 which divides tube 5 into chambers A and B and that portion of tube 5 which lies above partition 7 are suitably provided with canvas as diagrammatically indicated at 7b, 5b on Figs. 8 and 9, so as to be substantially rigid and, as already explained, the valve is attached to said partition for supplying air either to chamber A or to chamber B.

Air forwarded to chamber A enters the cells through apertures 8; as the pressure in the cells is the same as in said chamber, check valves 17 are held away from their seats by springs 18. When the pressure is deemed suitable, the valve is operated as hereinbefore set forth to supply inflating air to chamber B and a pressure slightly above the pressure prevailing in chamber A is built up in said chamber B. As chamber B becomes expanded, belts 18 are caused to press check valves 17 onto their seats against action of springs 16; apertures 6 are thus closed thereby providing for maintenance of pressure in the air tube.

For deflating the latter, it is only necessary to unscrew the valve, assuming said valve in communication with chamber B, to cause escape of air from said chamber; as the belts 18 are no longer stressed, they release check valves 17 which are then biassed by springs 16 away from their seats, thereby placing the cells in communication with chamber A. By properly operating the valve, chamber A is in turn placed in communication with atmosphere and becomes deflated.

It will be apparent that the foregoing embodiments of my invention may be altered without departing from the spirit of said invention as comprehended with the appended claims; for instance, I may divide the cells into two or three compartments which would amount to supplementary cells.

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