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TENNIS AND THE LIKE PLAYING BALLS

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This invention has reference to permanently sealed inflated objects particularly tennis and the like playing balls, which are dependent upon an inflation value.

5 On account of the permeability of the envelopes of these objects, particularly when composed of rubber, and the diffusion therethrough of the gas used for inflation, the internal pressure may gradually decrease and sooner or later, 10 the loss of pressure may become so great that the objects can be rendered useless for their intended purpose.

Hitherto efforts to prevent this loss of pressure have been directed mainly to treatment applied 15 from the exterior of the object, sometimes with damage to the envelope, but in any case only producing a temporary effect.

The aim of this invention is to provide for a constancy of internal pressure in objects of the 20 kind set forth, preferably without puncturing or in any other way damaging the envelope of the structure.

According to this invention, the inflation value in permanently sealed objects, particularly tennis 25 and the like playing balls, which is impaired by permeability of the envelope, is maintained or rehabilitated by providing for an indefinitely continuous generation of gas at an appropriate rate inside the object.

30 For this purpose we embody within the object, either forming a constituent of the envelope of the object itself, or placed within the envelope, known substance or substances capable of generating gas, preferably at a rate consistent with 35 the speed of escape of the gas by diffusion through the envelope, so as to make good the normal loss of inflation gas and prevent the loss of pressure which would otherwise occur.

Generally speaking, the invention comprises the 40 use of known substance or substances which naturally liberate gas either alone or in consequence of reaction with other agents.

The gas generating substance or substances may be embodied in the material with which the 45 envelope is constructed or may be independently applied, and if so, may be placed loosely within, or fixed to the inner surface of the envelope, at some suitable stage during the manufacture of the envelope. A combination of these methods 50 may alternately be adopted.

If the gas generating substance or substances should require the assistance of an agent, the agent also may constitute a normal constituent of 55 the envelope or it may be provided specially for the purpose, and may conveniently be water or

an aqueous solution for example of a suitable acidic or alkaline chemical compound.

Substances suitable for the purpose may comprise or be composed of metals such as aluminum, zinc, cadmium, magnesium and iron, or com- 60 pounds such as calcium hydride, aluminum carbide or the like, and are preferably employed in a powdered or disintegrated form. A mixture of barium peroxide and manganese dioxide may also be used or a mixture or compound of urea 65 with an acid such as oxalic acid.

As previously stated the metal or other substance or substances may be actually blended in the material of the envelope, or may be placed 70 inside the envelope before or after vulcanization.

We prefer, however, to distribute the substance or substances over the inner surface of the object and effect attachment thereto by any suitable 75 means, as for example by incorporation in a material of colloid character such as a gelatinous or rubber layer which is built into or upon the inner surface of the object during manufacture.

In the case of playing balls a method of uniform or regular distribution is preferred so as to avoid disturbance of the balance of the ball, as 80 would be the case were the substance or substances not embodied in or secured to the envelope itself but placed loosely in the ball.

However, we do not preclude ourselves from leaving the substance or substances loose or ap- 85 plying it or them locally at one or more positions.

In the case where the generation of gas is dependent on the chemical interaction of the substance or substances with an agent such as water 90 or an aqueous solution inside the ball, the rate of migration or penetration of the agent into the medium containing the gas-generating substance or substances will be an important factor in determining the rate of generation of the gas for 95 the maintenance of the inflation pressure.

The rate of generation of the gas can be adjusted by varying the proportion and amount of gas-generating substance or substances and/or of the additional agent if such be employed.

When gelatin, or say a gelatin-glycerin jelly is 100 used as a supporting medium, the rate of generation may further be adjusted by altering the hydrogen-ion concentration of the jelly or of the liquid in contact with it, and if the gas generating material be in a rubber medium the rate of evolu- 105 tion of gas may be preadjusted by suitable compounding of the medium, e. g. by adjusting the proportion of gas-generating substance or substances to rubber, or by the incorporation of suitable proportions of wax, carbon black, zinc oxide, 110

5 sulphur or any other compounding ingredient or by varying the degree of vulcanization of the rubber medium which may affect the reactivity of the substance or substances and also the rate of ingress of the chemical agent (e. g. water or aqueous solution from the inside of the structure).

10 In the case of aluminum carbide methane is generated, and in other instances for example aluminum or zinc, hydrogen is the gas evolved. In the case of a mixture of barium peroxide and manganese dioxide oxygen is generated. In the case of urea and oxalic acid, with an aqueous solution of sodium nitrite inside the ball, nitrogen is generated.

20 An example of a substance capable of naturally liberating gas alone is hydrogen peroxide which can be introduced into a tennis ball subsequent to its vulcanization by for example a hypodermic needle.

25 As rubber or the like is a substance commonly employed for the envelope, it will be appreciated that the incorporation of the substance or substances in the rubber will present no difficulties which cannot be easily overcome.

30 A suitable rubber medium containing gas-generating substance to be applied to the inner surface of the object and to generate gas by the action of a small quantity of water in the interior of the ball is as follows:

	Parts by weight
Rubber -----	100
Mercaptobenzthiazole -----	1.3
35 Sulphur -----	3
Zinc oxide -----	5
Stearic acid -----	1
Aluminum carbide -----	30

40 This rubber mixture can be vulcanized and in contact with water generates gas at a suitable rate.

What we claim is:—

45 1. A method for maintaining or rehabilitating the inflation value in permanently sealed objects, particularly tennis and the like playing balls, which is impaired by permeability of the envelope, which comprises continuously generating gas at a rate inside the object of substantially the same magnitude as the rate of gas loss therefrom by embodying within the object or substances capable of generating gas at a rate equal to the rate of gas loss therefrom.

2. A method of providing gaseous pressure in an enclosure having flexible walls that are not perfectly impermeable, which comprises embodying within the object a substance or substances capable of generating gas at a rate equal to the rate of gas loss therefrom. 80

3. A method as claimed in claim 2, wherein the substance or substances capable of generating gas are those which naturally liberate gas alone. 85

4. A method as claimed in claim 2, wherein the substance or substances capable of generating gas are those which generate gas in consequence of reaction with other agents.

5. A method as claimed in claim 2, wherein the gas generating substance or substances are embodied within the material with which the envelope is constructed. 90

6. A method as claimed in claim 2, wherein the gas generating substance or substances are independently applied. 95

7. A method as claimed in claim 2, wherein the gas generating substance is aided by an agent forming a normal constituent of the object.

8. A method as claimed in claim 2, wherein the gas generating substances comprise or are composed of reagents of the group consisting of aluminium, zinc, cadmium, magnesium, iron, calcium hydride, or aluminium carbide. 100

9. A method as claimed in claim 2, wherein the substances are employed in a powdered or disintegrated condition. 105

10. A method as claimed in claim 2, wherein the gas forming substance or substances are distributed over the inner surface of the object and attachment effected thereto by any suitable means. 110

11. A rubber walled enclosure having its interior filled with gas under pressure and a substance therein to evolve gases at a rate substantially the same as that of loss by leakage through the walls of said container. 115

12. A rubber walled enclosure having its interior filled with gas under pressure and a substance on the inner surface evolving gas at atmospheric temperatures at a rate substantially that at which gas passes through the walls of said enclosure. 120

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