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PROCESS FOR THE PRODUCTION OF TIGHTENING PLATES

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This invention relates to a process for the manufacturing of tightening plates which are applied especially in tightening devices being submitted to relatively high temperatures.

Tightening plates manufactured according to this invention may for instance be used on a large scale in the tightening devices of cylinder heads, exhaust pipes of combustion engines such as of high efficiency used in aeroplones, and similar purposes. The new tightening plates are of a combination type, consisting of soft packing layers and supporting layers, for instance metal layers. The soft packing layers differ from already known tightening means in consisting of synthetic products showing a greater resistibility to heat than natural caoutchouc.

As such materials, polymerisates of organic compounds and mixtures with such polymerisates with resins, synthetic resins, softeners and vulcanizing materials; as well as with packing materials, come especially into question. Particularly good results can be obtained by the use of synthetic and caoutchouc-like polymerisates of unsaturated hydrocarbons, for instance: polymerisates of butadiene, dimethyl-butadiene, isoprene and the like. Into question, herewith, come highly-polymerised hydrocarbons of different grades of polymerisation, for example those, the molecular weight of which exceeds 100,000 or better 150,000. The increase of the molecular weight of such highly-polymerised hydrocarbons results in the increase of strength and elasticity with a simultaneous decrease of permanent elongation.

Further advantages of the above-mentioned synthetic products, as compared with natural caoutchouc, consist of a greater resistance to certain liquids and gases such as mineral oil, benzine, glycerine and the like. Furthermore, vinyl- or acryl-polymerisates and their mixtures with resins synthetic resins, softening and packing materials, can be advantageously made use of.

Other material such as resins, softeners, vulcanisation means, filling materials like soot, slag powder and the like may be added to the above mentioned soft base materials of the tightening plate, consisting of synthetic caoutchouc or highly polymerised hydrocarbons.

As an example for a composition of soft packing in accordance with the invention we name the following one:

	Parts
Perbunane (synthetic caoutchouc of the isoprene class)	100
Resin	10
Softener	5
Vulcanizing material	20
Inactive soot	50
Slag powder, slag wool, graphite, powder of chalk such as calcium silicate, and like filiers	230

The tightening plates may be manufactured in various manner, for instance by producing foils of soft packing material, consisting of synthetic caoutchouc or highly molecular hydrocarbons having a molecular weight of preferably not much less than 100,000, by means of mixing rolls, mashing or filtering devices.

For manufacturing these foils, the solid or pulpy form, the latex, a solution or an emulsion of artificial caoutchouc may be used.

These foils are now e. g. pressed on a layer of metallic packing of known composition, for instance a gauze of metal wire, upon a perforated flat piece of metal or the like and joined thereto by way of vulcanization.

When several metal layers are used, it is advantageous to place the filaments in the various gauzes so that they are not in parallel position but run in different directions so as to obtain the greatest possible tensile strength in all directions in the finished plate.

Two wire gauzes, for instance, the wires of each of which are arranged rectangularly in the base, are best placed one above the other in such a way that the wires run at an angle of 45 degrees to each other. The position of one wire in the lower gauze layer is at an angle of 45 degrees to the neighboring wire in the upper gauze.

Instead of wire gauze inlays also layers of long metal fibres may be used, the fibres of the different layers being so arranged that they do not run parallel to each other.

Stabilizing inlays consisting for instance of a perforated flat iron, a wire gauze or the like, are joined to the soft material part of the tightening device preferably by pressing or rolling the fluxible material, if necessary under application of heat, through or around the stabilizing inlays.

The tightening plate to be manufactured may for instance consist of a wire gauze as a stabilizing inlay, which is to be covered on top and below by layers of synthetic caoutchouc or similar artificial material. It has already been suggested to manufacture the plates desired by using two separate foils consisting of the same material which is to serve for covering the stabilizing inlay. One of these foils is then laid on top of the wire gauze, the other against the bottom of said gauze, the sides of the plates that face each other having been treated with sticking material before fastening them on to the gauze. Hereafter the whole of the tightening device is pressed together in a press or rolling device.

According to the above-mentioned variation one foil only of the covering material is rolled out which has about double the thickness of the two aforesaid foils. This foil of double thickness is laid above or below the wire gauze, whereupon both parts are united for instance by pressing.

The shapeable and fluxible material is thereby pressed through the meshes and around the single filaments of the gauze.

Thereby a completely uniform plate is obtained which has the advantage that it cannot be split into separate sheets again. The manufacturing process as described above is cheaper than the manufacturing of the tightening plate by joining several plates together. Furthermore it has the great advantage that a uniform plate manufactured in the way described is completely tight and may be used with far higher pressures than a tightening plate composed of several foils.

For the process of manufacturing a tightening plate which is to contain two stabilizing inlays one above the other, an especially thick foil shall be rolled out in a similar way, which is to have three times the strength of the layers situated above, below or between the inlays. This thick layer of fluxible material is then preferably sandwiched in between the two stabilizing layers. When pressing, the fluxible material of the foil flows through the perforations of the stabilizing inlay and around the solid parts of said inlays. As much as the manufacturing of two foils is thereby saved. It is also easier to manufacture a thick layer of a given size than a thin one. When manufacturing plates with two hard material inlays, for instance wire gauzes, one may proceed by putting the two gauzes one upon the other and to apply to the top and the bottom side of these two layers a soft material foil for instance of artificial caoutchouc, thus having the two wire gauzes sandwiched in together between two soft material foils. The whole packing is then pressed. The soft material flows through the openings of the inlays and around the filaments into the space between the two gauzes. Consequently a tightening plate is obtained which is completely homogenous as all enclosed air is removed by strong pressing.

For manufacturing tightening plates in the above-mentioned way such inlays, for instance flat irons, may preferably be used which have a rough or reamer-like surface or one which is provided with a number of projecting parts or points which stand out in relief from the surface. It is especially easy to press a fluxible material through the openings or interruptions and around the outstanding parts of such inlays.

Furthermore, when using vulcanizable or fluxible material the velocity of vulcanization is increased, for the projecting parts coming into contact with the pressing device cause a quicker distribution of heat through the whole mass of the material to be vulcanized. These tightening-devices show the advantage of greater heat conductivity also after finishing.

Experience has proved that conductivity of temperature of the new tightening means is very good, also when several layers of synthetic caoutchouc together with layers of gauze of metallic wire are used.

In consequence of the high elastic qualities of synthetic caoutchouc or highly polymerised hydrocarbons it is also possible to keep the tightening layers made of these materials, and covering the layers of metal gauze, relatively thin so as to improve the heat conductivity of the whole tightening plates considerably.

This is a remarkable advantage e. g. against already known tightening materials made of metal gauze and asbestos layers. It is not possible to keep the latter equally thin, partly because asbestos as a working material does not allow for the making of plates of the required thinness, partly because the asbestos layer must have a certain thickness to make up for the unevenness of the metal gauze, if a decrease of tightening is to be avoided.

No lessening of tightening pressure was found even after use for a longer period.

When one fastened at room temperature no re-adjustment of the fastening means is necessary even after the use at high temperature, less supervision is therefore required with the new tightening means as compared with types which are now in use.

While the contrary was to be expected, no hardening or destruction takes place when the tightening plates according to the invention are applied e.g. in cylinder heads and are thereby subjected to the extreme conditions of a combustion room, such as abnormally high temperature. Even when subjected for a longer period to such strain it never occurred that a plate was burnt or stuck to the cylinder walls.

It is therefore possible to remove the tightening plates without destroying them or injuring the surfaces, whereafter the plates may be used again.

No special treatment of the tightening plates such as applying graphite to their surfaces is necessary before mounting them in the motor.

Not only will the tightening plate or the like be much cleaner to handle but also the tightening effect will be increased, when the application of a graphite coating is omitted, because the soft and highly elastic surfaces of the packing will be more capable of filling and thereby closing the irregularities of the tightening surfaces, when free from such graphite coating.

This measure also decreases the possibility of the tightening material being squashed away along the tightening planes under the effect of high pressure.

These improved qualities of tightening plates manufactured according to my invention are even effective when the tightening surfaces were not prepared very properly.

This application is a division of application Serial No. 312,785.

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