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## FIBROUS MOULDED BODIES

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Moulded bodies and process for their production from fibrous initial substances are extensively known. In one of the processes, the initial material, e. g., wood, is converted by purely mechanical means, while retaining therein the substances such for example as lignine, etc. contained in it in addition to the fibres, into separate very short fibres, whereupon these fibres are pressed with the addition of water or the like if necessary into comparatively hard moulded bodies such for example as sheets.

Such moulded bodies do not, however,—in particular in respect of resistance to breakage—satisfy the requirements placed thereon. Furthermore, the process of production has in particular the drawback that for the production of particularly hard moulded bodies the fibrous substances must be converted for example by grinding the wood in ordinary wood grinding processes into specially short fibres, and the fibrous pulp in this case assumes a glutinous character. With short fibres having a glutinous effect, however, it is known that the indipensable de-watering necessary for further working is accompanied by great difficulties. At least special measures for the de-watering are necessary which however again retard the process of production and by the glutinous constitution of the fibrous pulp the condensing and compression of the fibrous material into a perfect and in particular a hard moulded body is made much more difficult or frequently even made impossible.

To obtain a utilisable fibrous mass for the moulded bodies desired, it has furthermore been proposed to mix very short fibres obtained according to the above-described and purely mechanical process, with longer fibres.

But there are considerable drawbacks also in the production and working of such mixtures consisting essentially of comparatively fine and comparatively coarse fibrous material. In particular in the production, e. g., grinding of the initial substance from comparatively short fibres, substances of mealy constitution are also produced, which make the desired felting of the fibres difficult, since they rest between the separate fibres adapted for felting and at these places greatly obstruct the close connection together and felting.

The moulded bodies according to the invention are without these drawbacks. The fibrous mass used for the moulded bodies according to the invention is essentially characterised by consisting almost exclusively of bundles of fibres and/or chains of fibrous bundles, which are felted together.

The moulded bodies are made in a simple manner and avoiding the drawbacks of the known processes by the initial material being converted by suitable removal of so-called semi-cellulose consittuents and by mechanical treatment into pliable fibrous bundles and chains of fibrous bundles highly adapted for felting, and these are then pressed in manner known per se.

Among the so-called semi-cellulose constituents which are contained in the initial material in addition to the cellulose, are to be preferably understood resins, pentosanes, pectines and possibly also silicic acid, lignine, and the like. Such substances impart, as is known, for example to the wood its peculiar character according to which it is to be regarded for example as a comparatively hard and rigid fibre carrier.

According to the process of the invention, there can be produced comparatively very hard, dense, strong and if necessary grained moulded bodies such as plates or the like if desired with practically entirely felted fibre bundles and chains of fibre bundles and with specific gravities of about 0.8–1.2. The procedure can be adapted without difficulty in the production process such that moulded bodies are obtained with specially pronounced and suitable grainings and designs.

According to the invention, vegetable materials of all kinds and in particular for example wood, fibre carriers similar to wood, straw and the like, are suitable as initial material for the process.

To produce the moulded bodies, the procedure is for example in particular adopted that solid wood, e. g. waste pieces from saw mills, is first reduced mechanically into for example coarse chips; with straw as the initial material coarse straw chaff is correspondingly produced. The reduced material is then in kown manner passed through a sieve to remove dust and mealy substances, whereupon it is chemically decomposed for example by digesting in a boiler and preferably by the removal of certain quantities of the semi-cellulose constituents, treated to produce good feltability of the fibre bundles and chains of fibre bundles. In this stage of the process, care must be taken that the material is as far as possible not altered externally in form. It is then subjected to mechanical effects, preferably squeezing or beating until the natural structure of the fibre bundles is loosened and afterwards further treated in known manner, e. g., in a refiner and ground while maintaining as far as pos-

sible the fibre chains and fibre bundles, whereupon the fibre bundles and fibre bundle chains coming from the refiner can, if necessary after impregnation with or without the addition of binding or hardening agents and with heating, be pressed to form any desired moulded bodies. With respect to the treatment in the refiner, care must be taken that the defibering of the material in the sense of the invention takes place so that the fibre chains and fibre bundles are in the main retained. If in this stage of the process portions of the fibre bundles are further decomposed so that separate fibres and possibly also fibrous pulp are produced, these decompositions produced beyond the desired fibre bundles can, as has been found, facilitate the further treatment of the fibre bundles or chains of fibre bundles into moulded bodies by forming to a certain extent a cementing substance for the fibre bundles and chains.

One of the most important aims of the process according to the invention is the production of a fibrous material which, on the one hand for example has not the hard natural character of the wood, but has a greater flexibility and feltability and which on the other hand is not decomposed into the smallest individual fibres as is otherwise striven for, for example, for making paper and pulp.

Specially useful and durable moulded bodies have been obtained when care has been taken to obtain completely irregular positioning and felting of the fibre bundles and fibre bundle chains, at least in one direction. In using the moulded body, care is then preferably taken that the said direction of the irregularly located fibre bundles and fibre bundle chains practically coincides with the longitudinal or if necessary the horizontal direction of the moulded body, e. g., the main plane direction of a plate.

In carrying out the production process and in particular in the mechanical subdivision of the initial material into coarse pieces, it is preferably arranged that mealy substances or constituents are not produced.

To attain good feltability or a certain flexibility and softness, first the coarse pieces are treated chemically in such manner that preferably 20–40% of the semi-cellulose constituents referred to above are removed. To this end, the pieces are preferably subjected in known manner and if necessary under pressure to a boiling process in a lye, preferably in a 4–10% soda lye.

With the hitherto known processes, the material boiled in this manner has been subjected directly afterwards to complete disintegration into a fibrous mass, to which end refiners have been used into which the chips have been placed.

Contrary thereto, according to the process the procedure is adopted that the chips after the chemical treatment described are first subjected to a further mechanical treatment until the fibre bundle structure is loosened, pressing, squeezing, beating or the like, being used for the mechanical treatment. The pressing or the like is preferably carried out by means of pairs of rolls. For example, the chips previously treated chemically are carried between rolls under pressures exerted by these of 4–500 kgs. per cm.$^2$, special care being paid to the pieces being subjected practically entirely in the longitudinal direction of the fibre to a beating or partial bursting. In this way a loosening of the fibre chains in the direction of their natural growth is effected. To attain such disintegration of the chips and the like, such devices must be used which, like pairs of rolls, at least do not facilitate the formation of undesired mealy substance.

After the mechanical intermediate treatment outlined, consisting of pressing and the like, a further defibering or disintegration of the chips and the like is carried out in known manner by grinding in refiners, but this only to such an extent that the prior loosening of the wood structure is now followed by a distintegration in the main of fibre bundles and chains. In this there is the important advantage that in particular on account of the treatments which have already taken place of the fibrous material, on the one hand mealy substances are practically not produced and, on the other hand, the refiner after a comparatively short period of working and with comparatively little expenditure of energy gives a fibrous material which according to the aim of the invention consists in the main of fibre bundles and fibre bundle chains.

This fibrous material is then further worked into moulded bodies of the most varied kind and design, and can for example be first placed in a mixing hollander or in a mixing trough in which it is preferably impregnated with substances making it waterproof. When using a hollander, particular care has to be taken that the so-called shearing effect does not occur in the hollander.

After the removal of the fibrous material from the hollander, or the mixing trough, it can if necessary be pressed, after a suitable shaping and under particularly favourable temperatures, with or without binding agents into hard dense and strong moulded bodies. Artificial and natural resins, casein and substances similar to casein, as also drying oils, can be used as binders. In the absence of binders, temperatures of preferably 50–200° C. with corresponding pressures of 3–120 kg. per cm.$^2$ are used; in the presence of binders, the temperatures to be used are suitably adapted to the binders.

It is to be particularly noted that the moulded bodies such for example as plates, according to the invention, show an artificial graining specially characteristic on the surface, if necessary particularly influenced by the individual steps of the process and comparable in its irregularity, structure and appearance somewhat to a metal cut, whilst the hitherto known moulded bodies have a uniform structure and surface free from grain comparable to a smooth paper.

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