PUBLISHED

JUNE 1, 1943.

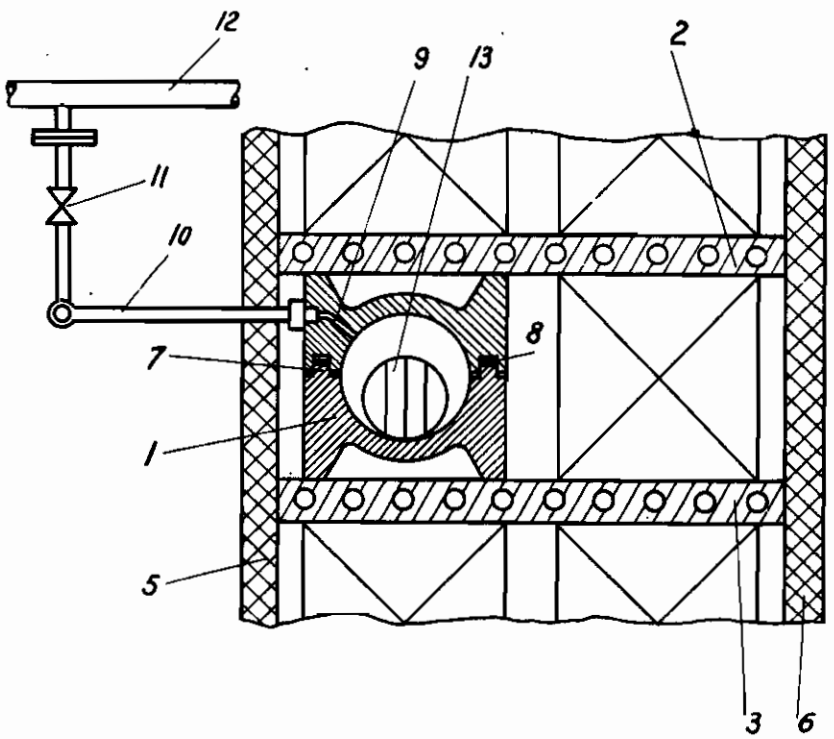
BY A. P. C

M. C. L. RICARD

PROCESS AND DEVICE FOR THE MANUFACTURE OF MOULDED OBJECTS OF A CELLULAR, RUBBER-LIKE SUBSTANCE HAVING CLOSED, GAS-TIGHT CELLS FILLED WITH GAS, PARTICULARLY OF CELLULAR EBONITE

Filed Jan. 17, 1940

Serial No. 314,347



Inventor:
M. C. L. Ricard,
By E. F. Kenderott
Atty

Published June 1, 1943 Serial No. 314,347

ALIEN PROPERTY CUSTODIAN

PROCESS AND DEVICE FOR THE MANUFACTURE OF MOULDED OBJECTS OF A CELLULAR, RUBBER-LIKE SUBSTANCE HAVING CLOSED, GAS-TIGHT CELLS FILLED WITH GAS, PARTICULARLY OF CELLULAR EBONITE

Marie Charles Léon Ricard, Paris, France; vested in the Alien Property Custodian

Application filed January 17, 1940

The present invention relates to a process and to a device for the manufacture of moulded objects of a cellular, rubber-like substance with closed, gas-tight cells filled with gas, particularly of cellulose ebonite. It is known that the cellular substances with gas-tight cells, particularly multicellular rubber and ebonite, are manufactured from a mass of crude rubber subjected first to a prevulcanisation treatment under a high gas pressure, which gas may penetrate into the mass, and then, after a free or controlled expansion of the prevulcanised mass into which the gas has penetrated, to a final vulcanisation treatment, the degree of which depends upon the nature of the product it is desired to obtain: cellular rubber or cellular ebonite.

According to a known process, permitting the manufacture of plates and of small objects, the mixture of crude rubber is brought in the form of a long plate which is rolled up in a spiral together with strips of sheet metal and paper, or it is brought in the form of small masses which are introduced into a pulverulent substance contained in not gas-tight moulds, that are placed into a vessel fitted with a gas-tight closing, acting both as an autoclave and a gasification chamber into which is introduced the gas under pressure and which is then heated. When the gas under pressure has diffused through the mass of crude rubber and the latter has been prevulcanised to a sufficient degree for retaining the gas, the rolls or the moulds are taken out of the autoclave and unrolled or opened; the rubber masses are freely expanded and then subjected to a final vulcanisation either in the free state or in a finishing mould.

According to another process, the gasification, the prevulcanisation, the expansion and the final vulcanisation of a moulded object are carried out in one single mould which is not gas-tight, the various moulds being placed inside an autoclave into which the gas is introduced either in the gaseous form or, before heating the autoclave, in the form of a liquid or a solid.

Both these processes however, present the drawback of being long and costly owing to the long time of heating and the great amount of heat which are required for bringing to the desired temperature the high pressure autoclave vessel that may be heated only from the outside and whose walls are very thick. The cooling down, likewise, demands a considerable amount of time.

In the second process, this drawback is further enlarged, in spite of the apparent simplification of the process, by the inefficient use of the useful volume of the high pressure autoclave vessel, due to the presence of individual moulds, the dimensions of which must correspond to the final dimensions, after expansion, of the objects to be manufactured. For this reason, the process has not received up to the present any practical applications.

The process according to the present invention has the object to remedy these drawbacks in order to permit effecting all the operations of treating the mass in the same mould, and it is characterized by the fact that the treatment is effected in gas-tight, individual moulds directly connected to a supply of gas under pressure, serving simultaneously as autoclaves and as shaping moulds.

According to an embodiment of the invention, the gas-tight moulds are held clamped during the treatment between the heating plates of a hydraulic press or between the plates of an autoclave press. However, the said moulds may also comprise closing means and be heated electrically or by circulation of steam through channels suitably provided in their mass.

By way of example, there has been described below an embodiment of the process object of the invention, with reference to the annxed drawing representing diagrammatically a device for carrying the process into practice.

The device represented on the drawing by way of example concerns the manufacture of spherical objects of gas-tight multicellular ebonite. The device comprises a number of individual moulds, such as 1, arranged between the heating plates 2, 3 of a hydraulic press in which are provided channels 4, 4', . . . for the circulation of steam, the arrangement being thermically isolated by means of heat insulating panels 5, 6. Each mould is constructed in two pieces assembled by means of an arrangement 7 comprising a gas-tight fitting joint 8, preferably in graphited asbestos, which is strongly compressed and crushed at the joint, the total force of the press being to this effect made higher than the maximum forces exerted by the gas inside the moulds, in order to provide a clamping pressure of the order of 5 to 10 kg/sq cm upon the surface of the joints. Each of these gas-tight moulds is provided with a bore 9 connected to a piping 10 which is in turn connected through a sectioning valve 11 to a supply 12 of gas under high pressure. The inner surface of the mould is prefer-

ably silicated for preventing the sticking of the treated mass.

The mass of crude rubber to be treated is introduced into the mould under the form of a spherical rough cast 13, preferably separated into a number of slices or portions not sprayed with talc, replaced together, in order to facilitate the penetration of the gas, and occupying, in the case of ebonite, about one twelfth of the inner volume of the mould 1 which corresponds to the final product to be obtained. A gas will preferably be used, which is inert under the treating conditions and which has a high capacity of penetration and diffusion through the rubber, as for instance carbon dioxide, this permitting the use of comparatively low gas pressures and therefore the reduction of the force required upon the press.

After the roughs have been introduced into the cold moulds, the latter are placed in the press and filled, by suitable operation of the valve 11, with cold carbon dioxide under a pressure of the order of 35 kg/sq cm. The valve is then closed again and the plates of the press heated. The moulds, and consequently the roughs, are not cooled down between the phase of prevulcanisation under pressure and the final vulcanisation stage, and a very short time interval separates these operations from one another; the result is that the prevulcanized mass at high pressure need not retain for a long time (before the final vulcanisation) the gas which it maintains emprisoned, so that the degree of prevulcanisation may be substantially less than in the usual process. Thus, it will generally suffice to heat the device up to 100° and maintain it at this temperature for about one hour and a half, after which time the rough will be brought, owing to its comparatively small dimensions, to a uniform temperature. Due to this comparatively short duration which is sufficient for a correct penetration of the heat into the innermost of the mass, there will be taken a rubber blend which is more accelerated, i. e. which will vulcanise more rapidly, than that used in the usual process. In any case, the temperature must not attain a value for which the pressure of the gas retained in the gas-tight mould would be higher than a figure of the order of 60 kg/sq cm, which is sufficient for producing the solution of the carbon dioxide in the rubber.

The prevulcanisation and the injection of gas having thus been effected, the valve 11 will be opened without stopping the heating, for evacuating the gas until the pressure inside the mould has been brought down to atmospheric, in order to permit the rough 13 to expand under the action of the contained gas and to fill up the mould entirely. The temperature is then gradually increased up to about 150° and maintained at this value during about one hour, after which the mould is allowed to cool down for half an hour and the rubber piece taken out of the mould. All the operations permitting the manufacture of multicellular ebonite by the process according to the invention have therefore only a duration of three hours as a whole, thereby reducing to a great extent the cost price of the product without in any way altering its quality.

MARIE CHARLES LÉON RICARD.