PUBLISHED
MAY 25, 1943.
BY A. P. C.

M. F. A. JULIEN
RESILIENT SUPPORTS
Filed Nov. 15, 1939

Serial No.
304,633

Fig. 1.

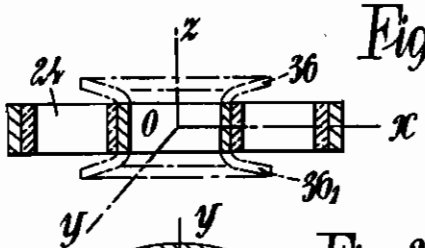


Fig. 2.

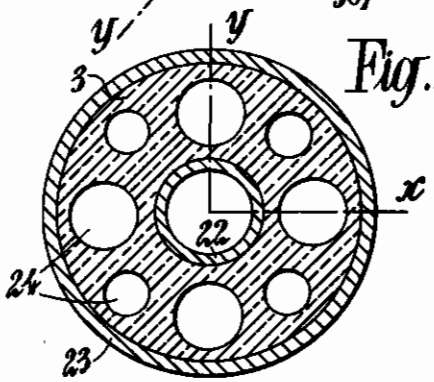


Fig. 3.

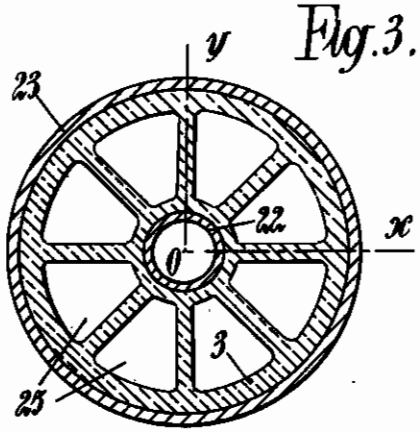
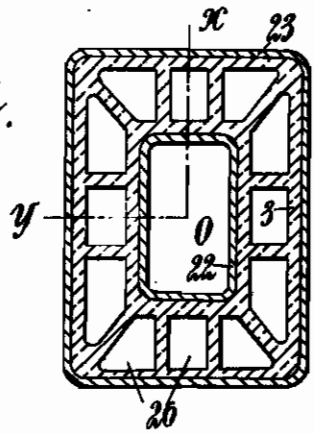


Fig. 4.



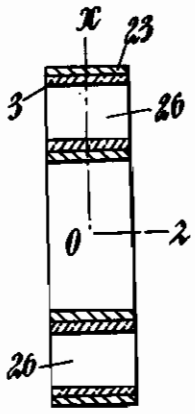
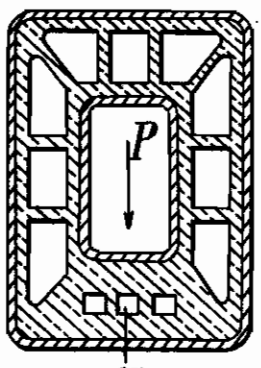


Fig. 5.

Fig. 6.



Inventor,
M. F. A. Julien

By: Mascock Downing & Seebold
Attys

Published May 25, 1943 Serial No. 304,633

ALIEN PROPERTY CUSTODIAN

RESILIENT SUPPORTS

Maurice Francois Alexandre Julien, Paris, France;
vested in the Alien Property Custodian

Application filed November 15, 1939

The present invention relates to supports of resilient material which are capable of providing a rigidity or stiffness regulated in certain directions, these different variations of stiffness being either of a positive or negative character. If desired, accessory devices may be employed which will permit of a progressive limitation of the deformation of the resilient material.

The supports of resilient material, and more particularly those in which the material adheres to metal members such as frames or the like which are attached to the article to be supported, such as internal combustion engines have in general well defined resiliences in different directions but such are not capable of obtaining or providing different elasticities in certain directions that are necessary. In the various applications or uses of these resilient supports it is necessary to have a very great or very small elasticity in quite a definite direction, as compared with the natural elasticity of the resilient material.

Reference will now be made to the accompanying drawings, in which:

Figures 1 and 2 show views of a support illustrating the invention.

Figure 3 is a sectional plan view of a modification of the invention.

Figures 4 and 5 show respectively a sectional plan view and a side elevation in section of a further modification.

Figure 6 shows a sectional plan view of a further modification of the invention.

In order to increase the elasticity of the support in certain directions, while still maintaining the same order of magnitude of the various directive elasticities, suitably arranged cavities or apertures are according to the invention provided in the elastic mass of the support, so that at the time of functioning, new movements of the elastic mass are rendered possible by modifications of the volume of the voids or spaces made.

Figures 1 and 2 show an embodiment of a support in which the presence of holes produces a low rigidity along two radial directions $0x$ and $0y$ and consequently, it may be, in all directions inlined to the plane $x0y$ as for instance $0y^1$ of Figure 1. A resilient mass of material **3**, connecting the two reinforcements **22** and **23**, is pierced with cylindrical holes **24**, arranged on circles for example, and not necessarily of the same dimensions. These holes enable the india-rubber as a whole to rise or flatten with freedom, in the relative displacements of the reinforcements **22** with respect to the reinforcements **23**, in directions contained in the plane $x0y$. It will be noted that the rigidity of the resilient mass, when the reinforcements are urged in a direction $0z$ perpendicular to the plane $x0y$, is also diminished, but in a much smaller ratio than in the directions contained in the plane $x0y$, where it would be considerable if the holes were not provided. By this means, therefore, it is possible to obtain a rigidity of the same order of magnitude in the three main or rectangular directions.

Figure 3 represents a preferred form of the invention in which the support comprises an india-rubber washer **3** resembling a wheel with spokes, the latter being of india-rubber. This has the advantage over the form shown in Figure 2 in that the proportion of voids **25** in relation to the solid parts of the elastic mass is increased.

In the form of the invention illustrated in Figures 4 and 5 the reinforcements **22** and **23** are not circular in shape as in the previous example. This renders it possible to proportion the elasticity at will in the various directions according to the shape and number of holes **26** of the plane $x0y$, the elasticity along the perpendicular $0z$ to this plane being affected, but in a smaller proportion to that of the plane $x0y$.

Figure 6 shows a further modification of the invention where, with a view to supporting a permanent load P with less deformation of the support, an asymmetry has been obtained by providing the lower holes **27** of a much smaller size, so as to augment the rigidity in the direction of the load.

The invention provides moreover, as has been stated, means for giving rise to resilient recoils which are not proportionate but increase more rapidly with the amplitude. Hitherto, in the majority of cases of the use of india-rubber supports, rigid stops were employed to limit the amplitudes suddenly. In the event for instance of deterioration of the elastic mass. In the present invention stops which would result in an abrupt or sudden limitation of the amplitudes are avoided and this involves important practical advantages.

This progressive stoppage as distinct from sudden stoppage is obtained in certain directions by the cavities or voids as will be explained. The limitation of the amplitudes is produced progressively in the directions in which the voids expand or are compressed, for the mass offers more resistance when it is approaching the limit of deformation of the voids. In particular, when the resilient mass has completely filled or almost filled the volume of the holes, it cannot be further compressed and it can no longer work except by lateral expansion. But in the other directions, for

instance **0z** for the supports of Figures 1 to 6, it is necessary to have recourse to new means.

For this purpose two metal members or reinforcements (or one only) of the supports may be provided with members capable of limiting, in the neighbourhood of these metal members, the angular deformations of the india-rubber and two collars **36**, **36'** shown in dotted lines are provided.

The collars shown are represented in connection with the metal members, but the invention includes the case in which they are directly connected to the frame-work or to the article to be supported. They would then have more clearly the character of progressive stops, on account of their flared shape, acting directly to limit the amplitude of the deformations of the india-rubber itself.

MAURICE FRANÇOIS ALEXANDRE JULIEN.