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Fig.1

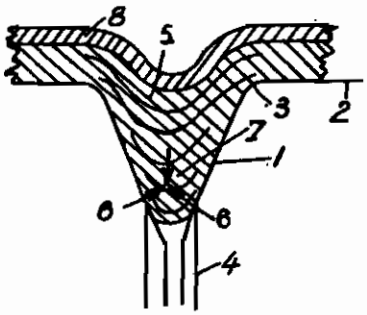



Fig.2

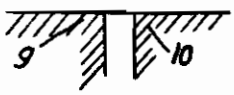



Fig.3

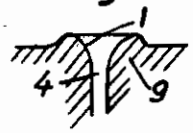
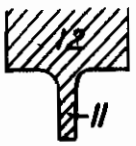



Fig.4

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# ALIEN PROPERTY CUSTODIAN

## VALVE SYSTEMS

Jean Louis Gratzmüller, Paris, France; vested in the Alien Property Custodian

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The present invention relates to seats for valves made of a plastic material or at least including a portion of a plastic material coming in contact with the seat and adapted to receive, on its free side, the action of a fluid pressure.

The invention is more especially, although not exclusively concerned with the valve seats to be provided in devices, such as oleo-pneumatic accumulators of energy, oleo-pneumatic shock-absorbers, etc., which include a part such as a bag the bottom portion of which, acting as a valve, comes to bear against the bottom of a container in which the seat in question is provided.

In devices of this kind, seats for the portion of the bag acting as a valve were constituted merely by the bottom wall of the container (for instance made of metal) provided with holes of a diameter sufficiently small for permitting the stopping thereof by the application thereon of the bottom portion of the bag, without the material which forms the bag or the bottom portion thereof being able, at least theoretically, to penetrate into these holes, which would injure the bag and cause it to burst.

However, in devices of this kind, difficulties of operation have often been experienced in view of the fact that the plastic matter of which the bag (or at least the bottom portion thereof) is made has a tendency, under the effect of the high pressures existing in this bag, and despite all the precautions that may be taken for the manufacture of said bag, to penetrate into the holes of the container and to be cut by the edges of said holes.

The chief object of the present invention is to provide seats for the valves of the type above referred to which are better adapted to meet the requirements of practice and in particular which avoid the very serious drawback just above mentioned.

With this object in view, according to a feature of the present invention, seats for valves of the type above referred to are constituted by holes of a particular shape capable of cooperating in a satisfactory manner with the plastic valve element, this particular shape being that of a frustum of a cone the inclined wall of which is joined by curved surfaces without sharp edges to the bottom of the container in which the valve seat is formed. As any sharp is avoided in the portion of the container wall adapted to cooperate with the bag or other plastic valve element, there is no danger of said bag being cut.

Thus according to the invention, each hole is given the shape of a conical pit prolonged eventually by a cylindrical hole, the plastic material of which the valve is made penetrating into the conical portion of the hole and settling therein without coming into contact with any projection or sharp edge that might injure and finally cut it.

With this arrangement, the holes, instead of having a cross section as small as possible, have a cross section, in the plane of the bottom surface of the container, which is relatively great, this cross section decreasing gradually until it reaches a minimum value which then remains uniform and corresponds to the cylindrical portion above referred to.

Contrary to what might be supposed, this increase of the area of the cross section at the top part of the hole is favorable to a good preservation of the matter of which the valve element is made and also to fluid tightness of the valve system.

Another object of the present invention is to provide an elastic or plastic valve well adapted to cooperate with valve seats as above described.

With this object in view, and according to a second feature of the invention, the valve element, constituted for instance by the bottom portion of a bag, is made of relatively important thickness, in view of the cross section of the holes, so as to form a mass adapted to cram or pack in the frusto-conical portion of the orifices.

According to still another feature of the invention, the bottom portion of the bag, reinforced in the usual manner by the addition of layers of fabric, by calendering, etc., is provided, on its outer face, intended to cooperate with the holes in the container, with a layer of relatively soft plastic material, which facilitates the packing of the bag in the orifices and prevents the resistant portion of said bag bottom from undergoing important deformation in these orifices.

Another object of the present invention is to provide a method of making holes of the desired shape as above mentioned in the bottom walls of the containers, which are generally made of hard metal.

As a matter of fact, it is difficult to form in such metal walls holes of small section having rounded edges and a longitudinal section of the desired shape.

Now, I have found, from practical experiments, that it suffices, in order to avoid the drawbacks above mentioned, to provide a seat having no cutting or sharp edge in the part thereof in which the plastic material of the valve element is under tension even if, along portions of the

plastic element subjected merely to compression stresses, the seat includes projections.

This discovery is extremely important for practical purposes because if cylindrical holes are bored in a metallic wall and if these holes are subsequently punched in the usual manner so as to give a rounded shape to the edges, the metal driven toward the inside forms projections on the inner walls of the holes.

These projections are thus located in a particularly dangerous region.

In order to avoid this drawback, according to the present invention, after the holes have been drilled, the punching operation is effected by means of a punching tool the tail of which, intended to engage in the hole, is of cylindrical shape and of a diameter equal to the inner diameter of the hole in question.

It follows that the metal, instead of being driven toward the inside of the hole is pushed upwardly and outwardly and forms a kind of ridge around the mouth of the hole. Contrary to what might be supposed, this ridge involves no danger for the bag or other plastic valve element, because, in this region, the plastic material is in compression.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a diagrammatic cross section of a valve system, showing the ideal shape to be given to the orifice according to the invention and illustrating in what manner the plastic matter behaves in this orifice.

Fig. 2 is a diagrammatic section of a container wall with a cylindrical hole drilled therein;

Fig. 3 is a similar view showing the orifice after it has been shaped according to the present invention.

Fig. 4 is a cross sectional view of a punching tool for the obtainment of orifices of the kind of that shown by Fig. 3.

Referring to the drawings, I have shown on Fig. 1 an orifice the shape of which has, on the side corresponding to the inside of the container, a frusto-conical portion 1, joined to the bottom 2 of the container in question by a rounded portion 3. This frusto-conical portion 1 is prolonged by a cylindrical portion 4, without any sharp ridge or projection on the inner wall of the hole. The plastic matter which constitutes the valve element, for instance the bottom portion of the bag, is shown at 5.

As shown by the drawing, this matter, under the effect of the pressure to which is subjected, penetrates into the mouth of the hole and is wedged or packed therein. In the top portion of the hole, this matter is under tension and, moving downwardly, a point is reached where a state of equilibrium exists owing to the reaction of the wall of the hole (arrows 6) having the same value as the pressure, designated by arrow 7. From this point downwardly, the plastic matter of the bag is merely compressed and it has no tendency to be injured.

As above explained, I preferably provide, along the under surface of the valve element, for instance of the bag, a layer of soft plastic matter of a certain thickness so as to facilitate the packing of the mouth of the orifice and to avoid that the resistant portion of the valve should undergo unnecessary deformations.

In Fig. 1, the hard and resistant portion of the valve element is represented at 8 and the softer portion at 5.

However, it should be well understood that this construction of the valve element constitutes only a preferred embodiment and that the invention is in no way limited thereto.

As above explained, it is often difficult, for practical purposes, to make holes of the shape shown by Fig. 1, in view of the small section of said holes and of the hardness of the metal of which is made the bottom of the tank or other container in which said holes are to be made.

According to a feature of the present invention, I proceed in the following manner:

First, I make cylindrical holes, such for instance as shown by Fig. 2. In this drawing, reference numeral 9 designates the bottom of the container in which the orifices are made, and 10 designates the orifices or holes themselves. After this first operation, the orifices have a cylindrical shape.

The second step of the method consists in punching these holes by means of a punching tool the general shape of which is for instance that shown by Fig. 4. The tool shown on this Fig. includes a cylindrical portion 11, of a diameter equal to that of the hole to be made and a portion 12 the inner surface of which is joined to portion 11 by a rounded surface.

After the punching operation effected by means of this punching tool, the holes have the general shape shown by Fig. 3.

As shown by this view, each hole includes a cylindrical portion 4, a frusto-conical portion 1, corresponding to the theoretical shape illustrated by Fig. 1, and a ridge 13, constituted by a raised portion of the container bottom, this ridge being formed by the matter pushed upwardly and outwardly by the punching tool.

As above explained, the presence of this ridge involves no danger for the valve element because, in the region in which it is located, the plastic matter is only in compression.

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