

Sept. 7, 1943.

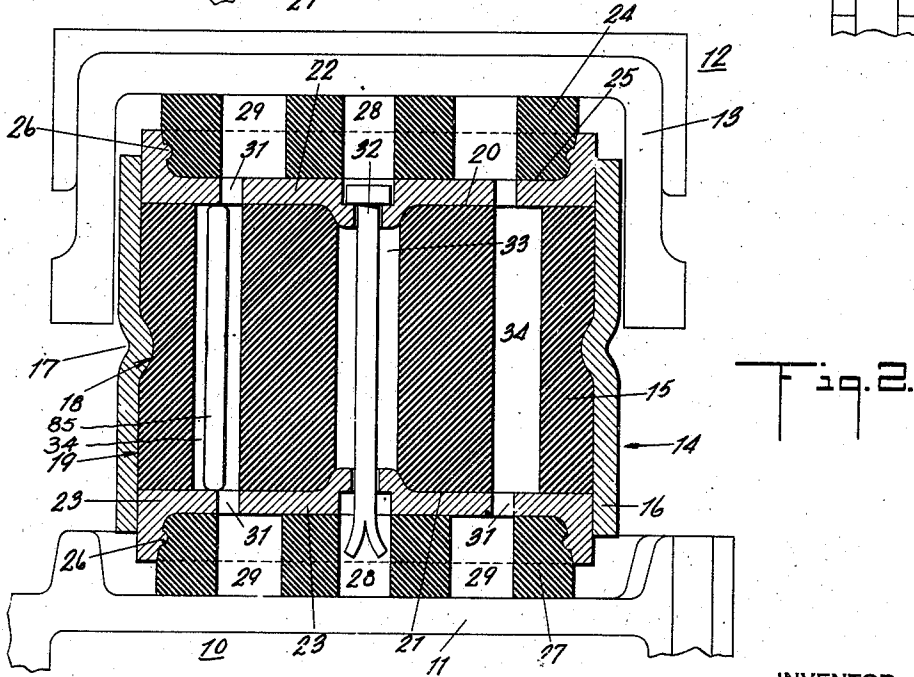
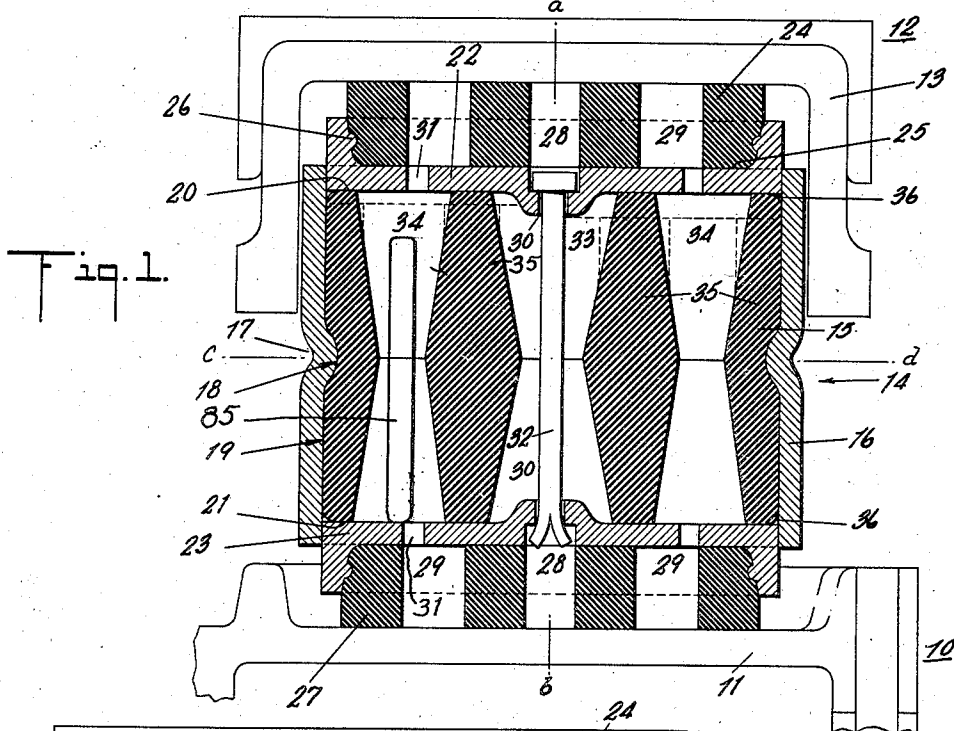
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2,328,877

CUSHIONING DEVICE

Filed July 14, 1939

2 Sheets-Sheet 1



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2,328,877

CUSHIONING DEVICE

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Application July 14, 1939, Serial No. 284,386

21 Claims. (Cl. 267-63)

The invention relates to a cushioning device of general application for use in those situations where cushions and springs have heretofore been used, and the invention specifically relates to a cushion, shock absorber or similar motion retarding device designed to cushion, stop, retard or soften the movements of bodies, particularly bodies having large vertically directed momentum as in the case of the resilient mountings of railroad car bodies on their trucks, or, in the case of horizontally directed momentum, such as bumpers or the retarding elements of draft gears designed to cushion powerful impacts between adjacent cars.

More specifically defined, the invention relates to a rubber cushion which may be used alone, or in combination with metal springs, or with friction elements, to form an improved character of cushioning device which will not possess certain defects inherent in such devices which depend alone upon metal springs as their cushioning elements.

The primary object of the invention is to provide a simple form of cushioning element which will provide for a progressive and definitely uniform accumulation of resistance to compression forces acting on the same and at the same time to provide a form of cushioning element in which the recoil action thereof when released from such compression forces will not set up in the cushion the oscillatory vibratory movement inherent in metal springs of equivalent cushioning capacity.

Broadly this invention features the use of a block of resilient material, such as rubber, as a cushioning element and which block is provided with internal cavities or core holes having configurations designed to obtain optimum results in building up resistance to compression forces acting on the block.

It has been known heretofore to provide rubber cushions having a straight cylindrical bore extending therethrough and into which the rubber may protrude under compression of the cushion especially where the same is confined against outward distention. Such cushions have not proved entirely satisfactory among other reasons because they did not provide for any uniformity in, or, any means for regulating, the accumulating resistance.

The present invention constitutes an improvement over these forms of rubber cushions in that the cavities or core holes extending therethrough are not of the known pencil-like cylindrical form which have a uniform diameter throughout their lengths but are carefully de-

signed with a non-cylindrical form to provide for such a variable cross sectional area in the different zones of compression as will develop selectively either a gradually and uniform accumulated resistance to being distorted, or to provide for a variable degree of resistance to meet those situations where the desired rate of increase in resistance to distortion is not strictly uniform.

In its specific application to a body mounting for a vehicle, the invention has for an object the providing of a cushioning device which will tend to resist transmission of short vibratory actions such as truck or underframe vibration to the supported body, and at the same time to provide a form of cushion which will resist gross bodily movement between the vehicle body and the truck or underframe supporting the same as these parts tend to approach each other and which will not effect any sudden recoil action between the parts should the compression forces be suddenly removed and on the contrary will ease the return movement of the car body up to its normal position without setting up prolonged oscillations.

In its specific application to a bumper, snubber, draft gear or similar mechanism, particularly those designed to resist powerfully acting movements over short distances, the invention has for an object the providing of a simple form of cushioning device which will be free of the disadvantages inherent in the present known form of such devices which depend upon metal springs and will possess not only the advantages inherent in the rubber block as above outlined, but will also utilize the rubber block as a force translating device for actuating the friction shoes of a friction brake so that the complete structure will be a combination of rubber resistance and friction resistance to the actuating force to be cushioned.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of car mounting embodying the invention and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:

Fig. 1 is a vertical sectional view taken axially through a car body mounting and including a cushion constituting a preferred embodiment of the invention shown in its normal distended position and illustrated in connection with vibratory insulators to form a cushioning unit located be-

tween a vehicle truck and a car body shown in ghost outline, and also showing a dotted outline at the left and right sides of the figure two succeeding forms of the end portions of the core holes as the cushion is compressed to the extent indicated by the dotted outline;

Fig. 2 is a view similar to Fig. 1 showing the relation of the parts and particularly the final configuration of the core holes beyond the dotted line positions and when the block has been compressed to a desired limit;

Fig. 3 is a view in axial section of a form of the invention featuring the use of a rubber block utilized in combination with friction shoes to provide a bumper, snubber, or shock absorber; and

Fig. 4 is a transverse sectional view taken on the line e—f of Fig. 3.

In the drawings and referring first to the disclosure in Figs. 1 and 2, there is disclosed a vehicle truck 10 shown symbolically by its spring plank 11 and which truck is designed to support a car body 12 shown symbolically by its bolster 13, the support being effected through a cushioning device 14 including a rubber block 15 particularly constituting the novel feature of this disclosure.

The cushioning device 14 includes an open end tubular band or cylinder 16 and which in the Fig. 1 disclosure is of cylindrical form and preferably is formed of steel or some other rugged material having sufficient structural strength to restrain radially, outwardly directed distortions of the rubber block 15 fitted therein. For the purpose of resisting any tendency of the rubber block from creeping out of its centered position in the cylinder, the cylinder is provided adjacent its mid-height with an inwardly extending annular rib 17 forming a locking means in its engagement with the corresponding annular groove 18 encircling the outer cylindrical wall 19 of the rubber block and formed therein as an incident of the molding of the rubber in the cylinder forming band. The cylindrical rubber block terminates at its upper end in a flat pressure receiving end face 20 spaced slightly inwardly and downwardly from the adjacent end of the cylinder 16 and, similarly, the bottom end face 21 of the rubber block is spaced slightly inwardly and upwardly from the lower end of the cylinder.

Fitted in opposite ends of the cylinder is an upper head 22 and a lower head 23 of similar construction and in this form of the invention both heads constitute plungers snugly but slidably mounted in opposite ends of the cylinder. It is within the scope of the disclosure, however, to secure one of the heads to the cylinder, to form a closed end to one end of the cylinder, leaving the other head to function as the compression effecting plunger.

Fitted within the upper head 22 is a layer 24 of relatively hard rubber molded into a shallow recess 25 formed in the head and secured in place by a rib locking engagement 26. The layer 24 projects a short distance above the head 22 to engage the underside of the bolster 13 which rests firmly on the layer 24. Similarly a layer of relatively hard rubber 27 is fitted in or molded into, locked in, and projects below the lower head to rest on top of the spring plank 11. Both layers are provided with a centrally located bolt hole 28 and with a plurality of air vents 29 extending therethrough for a purpose hereinafter described. These two layers of rubber are not primarily intended to function as devices for cushioning gross body movements but rather as insulators to de-

feat or at least minimize the vibrations of small amplitude and thus interrupt the flow of vibrations between the wheel truck and the car body and to this extent function in a manner similar to the rubber bearings now in use on railroad trucks.

The two heads are each provided with a central bolt hole 30 forming a continuation of the associated bolt holes 28 in the insulators and with a plurality of air vents 31 arranged in a circle about the axis of thrust indicated by the line a—b and open to the external air through the air vents 29. A tie bolt 32 connects the centers of the two heads and is arranged to limit the relative separating movements of the heads. The rod is mounted in position, passed through the bolt holes and has its lower bifurcated end spread to provide a stop at the end opposite the bolt head. In mounting the tie rod in position, care is exercised to insure a firm, snug engagement of the heads 22 and 23 with opposite ends 20 and 21 of the rubber block.

The rubber block is provided with an axially located core hole 33 surrounded by a plurality of elongated cavities or supplemental core holes 34, at least four in number, extending with the hole 33 lengthwise of the axis of thrust a—b, and arranged in a circle of which the axis a—b is the center. It is the particular feature of this disclosure that the core holes 33 and 34 are of double frustum, hour-glass or Venturi tube form but not necessarily of frusto-conical form. Differently described, the holes are of minimum cross sectional area adjacent their mid-lengths in the plane indicated by the line c—d and gradually increase in cross sectional area progressively towards their opposite ends in the faces 20 and 21. This form of cavity or hole through the rubber block forms in effect strain transmitting columns 35 of rubber which have relatively small masses of material adjacent opposite ends, that is, in the top and bottom zones which are the regions which first become compressed. The cross sectional area of rubber gradually and progressively increases in cross sectional areas in the direction of compression progressively involving succeeding zones of compression until the opposing compressive forces meet along a transverse plane approximately equidistantly spaced from the opposite end faces 20 and 21 of the block and in the zone centered about the plane c—d. The outlining circular edges of both faces are rounded as indicated at 36 to defeat any tendency of the rubber to creep into the joint formed between the cylinder and the plungers.

In operation and assuming that compression forces acting between the truck and car body causes the heads 22 and 23 to approach each other, the initial movement of both heads will be to compress at least the rubber which forms the adjacent end zones or layers. The axially directed compressive forces acting on each end zone will resolve themselves into radially directed components which will tend to distort the end zones and as the rubber which is noncompressible is restrained from outward movement it must necessarily move inwardly into the cavities or core holes. This has the effect of causing an inwardly or radially directed distortion of the rubber into the end portions of each of the core holes so that they tend to assume first the form shown in dotted lines at the left of Fig. 1. It is appreciated that at this time the plungers are acting upon the end portions of the rubber block or rubber columns where there is the least amount of

rubber and thus the block is offering its least resistance to distortion and its least resistance to the action of the compression forces present. It therefore follows that the initial cushioning action in resisting the compressive forces is relatively weak.

As the plungers continue to move towards each other, progressively more and more interior zones of the rubber will become involved and as radially outward movement is restrained by the cylinder wall 16 the rubber block will become more and more distorted internally and will in effect flow or rather distend into the spaces provided for the same by the core holes as indicated in the dotted line showing to the right of Fig. 1. Eventually the limit of compression will be reached and at which time the core hole will have the substantially uniform diametered and cylindrical form shown in Fig. 2. Unless the core holes have been designed with variable cross sectional areas along their lengths as herein suggested, this final cylindrical form will not be attained. The degree of incline or slope to the frusto-conical ends of the core holes is dependent upon the size and material of the block and this in turn depends upon the character and intensity of the compression forces which the device is intended to resist. In the illustrated showing, the sides of the cone shaped ends form a ten degree (10°) angle with their axis.

In order to insure the gradual accumulation of resistance, care is exercised in designing the core holes, relative to plunger travel, so that they will accommodate all of the rubber displaced into the same and approach but not pass beyond the cylindrical form shown in Fig. 2 by the time the plunger has reached the limit of its travel. It is not desirable to have the walls outlining the core holes pass inwardly beyond the cylindrical form as any such further inward movement would produce an irregular accumulation of resistance and develop disintegration of the rubber.

It is seen that the core holes are of the double frustum form; with the widest base at the two pressure receiving faces and the smaller base along the common plane e-f.

On the release of the compression forces in any of the illustrated forms of the disclosure, the rubber block will, of course, restore itself automatically to its original configuration. As it is a characteristic of rubber to restore itself gradually without going beyond its initial form, there is eliminated the repeated series of gradually diminishing recoils or oscillations which would characterize the device if a metal spring was substituted for the rubber block.

It is suggested that a non-compressible substance preferably a liquid which may be water or liquid rubber may be introduced in such pre-measured amounts that it will completely fill its associated cavity when its desired final form has been reached, after which the liquid core will act in effect as a solid to resist any further inward distortion of the portion of the rubber which outlines the core holes.

As an illustration of such a structure, reference is made to Fig. 3 where a measured amount of fluid rubber 52 is contained in cavity 102 and which cavity has its opposite ends closed by plugs 54 either cemented or vulcanized in place.

In the several disclosures as thus far described reference has been made to the rubber block as single units having their ends exposed and arranged to be squeezed between the pres-

sure imposing elements such as the plungers 22 and 23. It is suggested that in place of a single block there be substituted two or more such blocks arranged as replaceable units in columnar form one on the other. In such case, it is preferable that the rubber of one unit be separated from the rubber forming the adjacent unit or units so as to avoid a rubber-to-rubber contact and at the same time to permit each unit to function as if it were alone. This is best attained by facing the pressure receiving faces of the rubber blocks with metal face plates secured thereto so that a unit will comprise a rubber block and two face plates one for each of the opposing faces of the rubber block sandwiched therebetween.

It has been found especially in the case where one of the heads is fixed in the plunger cylinder that the mid-portion of the rubber block creeps back and forth along the inner wall of the cylinder with a resulting abraiding action on the rubber.

It is accordingly suggested that a protective sleeve or shoe encircle the rubber block at the place where such abrasion is most apt to occur. It has also been found that it is difficult to avoid the creeping of the rubber past the joint between the rubber and the plungers and in order to avoid this the end edges of the rubber were cut away as shown at 36 in Fig. 1. Another way to avoid any such seeping of the rubber out of the compartment in which it is contained is to fit rugged retaining rings at the joint.

When it is desired to limit the approach of the pressure heads towards each other, it is suggested that a rigid metal tube or rod 85 be located in one or more of the holes as indicated in Fig. 1. By varying the length of the rod 85, the approach of the heads may be regulated as desired. Likewise, the diameter of the rod will limit the contraction and final shape of the core hole in which it is contained and thus will function as has been described for the liquid core 52. Further, as the rubber engages the rod 82 particularly during the final stages of its compression it will grip the rod and thus create a frictional resistance to relative movement between the metal rod and the rubber block.

In the showing of the springless combined rubber and frictional resistant device shown in Figs. 3 and 4, there are disclosed two metallic heads 86 and 87 of identical construction and disposed in looking-glass symmetry on opposite sides of the medial plane e-f. Each head includes an outlining barrel-like projection 88 of cylindrical form, the inner face of which is on a raised wearing portion which provides a friction surface. The friction surface may be replaced when worn and for this purpose the raised portion is shown to be a sleeve 89 of wear resistant material. Each head is also provided centrally thereof with an inwardly extending boss 90 which forms between itself and the wall 88 an annular recess 91. Fitted between the bosses 90 of the two heads is a block or core 92 of rubber and which may be of any of the forms hereinbefore described and likewise located to resist relative movement of the heads towards each other. In the form illustrated, the rubber block is provided with a hole 93 extending axially there-through. A tiebolt 94 is passed through the hole 93 and through the bosses 90 to limit the separating movement of the heads from each other as is common in draft gear and similar known

snubber structures. The rubber block is surrounded completely by a sleeve forming structure which projects at opposite ends into the recesses 91 and has its ends spaced from the bottoms of the recesses a distance sufficient to provide for the requisite amount of approach permitted the heads under the circumstances surrounding the use to which the device is to be put. This sleeve is split to form a plurality, in this case shown to be three, friction shoes 95, 96 and 97, having their opposite ends in at least a light bearing engagement with the friction surfaces at 89. There is thus provided a frictional brake which resists the approach of the heads 86 and 87 with an intensity of engagement between the movable shoes and the fixed cylinder walls at least approximately proportionate to the forces which are causing the heads to approach each other. The adjacent edges of the shoes lap one another as shown at 98 to permit the desired freedom of relative movement between the shoes considered circularly as shown in Fig. 4 and at the same time to defeat any tendency of the rubber of the block to creep into the joints formed between the shoes. Split rings 99 and 100 are located at opposite ends of the rubber block in the corners provided by the bosses 90 and the ends of the shoes in order to prevent creeping of the rubber into the joints formed therebetween when the rubber block is subjected to the compressive forces which such devices are intended to cushion.

Each shoe is provided centrally thereof with an inwardly extending projection 101 fitted in a similarly shaped recess 102 formed in the adjacent cylindrical side of the rubber block adjacent its mid-waist portion. A plurality of core holes numbered 103—106 similar to those shown at 34 in Fig. 1 extend through the block and are arranged in concentric order about the axis of the assembly. It is also suggested that restraining rings 107 and 108 be fitted into opposite ends of the block to encircle the bolt 94 and prevent seeping of the rubber out through the joints at these places.

In operation and assuming that the heads are caused to approach each other by the forces which are intended to be cushioned, the bosses 90 will act on the rubber block to distend the rubber outlining the holes 103—106 inwardly into the same as has been previously described in discussing the Fig. 1 showing. At the same time the compressive forces acting on the heads will be resolved into an outwardly directed component and this outward distention of the rubber will act to move the three shoes radially outward each into engagement with the friction surfaces provided by the cylinders 88 if these shoes are not already in engagement with their friction surfaces in the original set up of the assembly. In either case the shoes will be pressed into a firm bearing engagement with the friction surfaces provided by the two heads. This radially directed force will increase as the heads approach each other and until it reaches its maximum when the heads reach the limit of their desired travel. It follows then that any movement of the heads toward each other, even from the very beginning of their approaching movement and certainly after the frictional engagements have become effective, the shoes, which under these circumstances are held substantially fixed in space relative to the plane *e-f* will impose a frictional resistance to the approach of the heads 86—87 so that the heads

are cushioned in their relative movement not only by the resistance to distortion or change of configuration inherent in the rubber block but this movement is also resisted by the accumulating frictional resistance between the shoes and the heads.

While this description assumes both heads to be moving, it is obviously possible to fix one head say the head 87 and move only the head 86. Considering the condition at any instant of time while the heads are approaching each other, it will be obvious that the force acting on the rubber block will be the force inherent at that time in the approaching heads. This is the force which resolved into two components acts on the block in two radial directions, one component acting to overcome the resistance offered by the rubber to being distorted and the other component acting to move the friction shoes into their squeezing position so that the squeeze pressure of the brake is a function of the force being resisted by the brake.

When the compressive forces which have been acting on the heads are released, the rubber block will restore itself to its original condition incidentally forcing the heads apart as far as is permitted by the tiebolt 94. At the same time, the radially outwardly directed forces acting upon the shoes have either been entirely released or at least relieved, depending upon whether or not the rubber block is at all times under distorting stresses to keep the shoes in their bearing engagement.

While the wear sleeve 89 may be mounted in place simply by means of a snug drum fit which will permit its removal and replacement when worn, it is suggested that the associated head be heated to effect the necessary expansion to permit the insertion of the sleeve so that, in cooling, the head will grip the sleeve 89 firmly in place. It is also suggested that the sleeve be locked in place in the head by welding the sleeve to the head as indicated at 122 in Fig. 4.

In this disclosure, the term "rubber" is used in a generic sense to include any elastic material capable of imposing resistance to being distorted and which will automatically restore itself to its original form when free of the forces which caused its distortion, irrespective as to whether in solid or divided form and which will restore itself automatically to its initial configuration without setting up vibrations therein as in the case of metal springs, and, further, the expression "rubber" includes not only the usual homogeneous India rubber or similar products containing caoutchouc or equivalent rubber compositions but also includes non-homogeneous and non-metallic elastic materials as well as air containing elastic materials such as sponge rubber.

I claim:

1. In a vehicle cushioning device, the combination with a spring plank and a bolster above the plank, of a cushioning device resting on the plank and on which device the bolster rests, said device including a rugged metal open band, a block of rubber fitted in the band, means for locking the rubber block in the band against axial movement therein, a lower head fitted in the band, an upper head fitted in the band, said heads mounted in the band for relative axial movement, a layer of rubber forming a vibratory insulator fitted within the lower head, depending therefrom and forming a cushion for dampening vibrations between the lower head

and the spring plank, another layer of rubber forming a vibratory insulator fitted within the upper head projecting above the top thereof and forming a cushion for dampening vibrations between the upper head and the bolster, and said rubber block and insulators provided with internal air pockets.

2. In a device of the class described, the combination of a metal band provided mid-length with an inwardly projecting rib and into which band a block of rubber has been fitted, a pair of plungers slidably mounted in opposite ends of the band, each of said plungers provided with air vents extending therethrough, and said block provided with a plurality of holes extending therethrough, open at opposite ends to the vents in the plungers and having greater cross sectional area in the portions adjacent the plungers than in the portions adjacent their mid-portion to provide an hour-glass-like construction to the several holes intermediate their ends.

3. A cushioning device including an outer tubular member, a block of rubber having end faces and fitted in said member, a plurality of holes extending axially therethrough and through the end faces, said holes each having a double conical form providing a volumetric area sufficient to remain open from end to end at all times up to the point where the end faces have been moved by compression to approach each other to cause each hole to assume substantially a cylindrical form as the end faces approach the possible limit of such movement.

4. A cushioning device including a block of rubber having end faces, a plurality of holes extending therethrough and through the end faces, said holes having a looking-glass symmetry on opposite sides of a transverse plane and varying in cross sectional area therefrom from an area circular at said plane to a maximum area circular at each end face, each having a volumetric area sufficient to remain open from end to end at all times up to the point where the end faces have been moved by compression to approach each other to the possible limit of such movement, and said block provided with an annular locking groove encircling the same in spaced relation to said end faces and reducing the mass of rubber at the part so encircled.

5. A cushioning device including a drum, a block of rubber snugly fitted in the drum, provided with opposing pressure receiving faces and provided on its side with an annular groove facing the drum, and said block also provided with a plurality of core holes of a double frustum form extending therethrough and through the opposing faces and grouped about and equidistantly spaced from the axis of the block.

6. In a cushioning device, a block of rubber having a cavity therein providing space into which the rubber may extend when subjected to compressive forces acting on the same, and a body of liquid in the cavity present in an amount to fill the cavity when the block has reached a desired state of compression and thus a desired degree of resistance to the compressive forces.

7. A cushioning device including a rubber block provided with a plurality of external faces, two of said faces forming parallel pressure receiving faces, said block having a cavity therein defined at least in part by two frusto-cones having their smaller ends in juxtaposition adjacent the center of the block and means engaging all external parts of the block except the two pressure receiving faces for restraining the block from any out-

ward distortion when the pressure faces are subjected to a squeeze pressure.

8. A cushioning device including a block of rubber provided with a cavity having a wall inclined at an angle to the direction of action of the compressive forces and a metal ring inset in one end of the block, surrounding one end of the cavity, and acting to resist outward distortion of the rubber at said end.

9. A cushioning device including a side wall forming structure having a plunger, a cushioning device for resisting the plunger, said device including a block of rubber snugly fitting in the structure and provided with a cavity and a sleeve fitted in the rubber block, slidably engaging the inner face of the structure and acting to prevent abrasion of the rubber as it shifts on the same.

10. A cushioning device including two pressure elements adapted to approach each other, a block of rubber therebetween for resisting said movement, said block provided with a hole extending therethrough and forming the block also into a ring, said block provided with an internal cavity of variable cross-sectional area along its length, restraining means snugly encircling the block at all times to resist radially outward distention thereof and rigid means within the cavity for resisting radially inward distention thereof when the pressure elements approach each other and for limiting the approach of the pressure elements.

11. A cushioning device including a cylindrical block of rubber having a cavity therein at least a portion of which is of frustum form and provided at opposite ends with pressure receiving faces and a metal element inset in and defining at least a portion of the cylindrical face of the block.

12. In a cushioning device, the combination of two members movable relatively towards each other, a block of rubber therebetween resisting such movement, restraining means tending to resist outward distention of the block when compressed between said members, said block provided with a double-frustoconical hole extending therethrough in the direction of such relative movement and means within the hole of less diameter than the minimum diameter of the hole and of less length than the normal length of the hole for limiting such relative movement of said members.

13. A cushioning device including two end members capable of relative movement, a block of rubber filling the space therebetween and at all times tending to resist the approach of said members toward each other, means in which the block is fitted at all times engaging the block for substantially its entire distance between the end members and acting to restrain outward bulging of the block substantially throughout its entire length, said block provided with a cavity substantially circular in cross section in all operative conditions of the device and initially of greater diameter adjacent opposite ends than at a mid-length portion, said cavity outlined by a flexible wall capable of being distorted inwardly into the cavity under the compressive action of said end members and acting solely by virtue of inherent resistance of the rubber block to become distorted inwardly to impose resistance to the approach of said end members.

14. A cushioning device including a single, one-piece block of rubber, two end engaging members between which the block is squeezed, means at all times in engagement with all other sides of the

block for preventing or at least restraining any freedom of outward distention of the block, the contacting faces of the block and said engaging means being substantially of the same contour and said block provided interiorly with at least one hole of minimum cross sectional area at its midlength and progressively increasing in cross sectional area towards opposite ends thereof when under minimum load and maintaining circular cross sectional areas in all operative positions of the block.

15. A cushioning device including a hollow rubber block, a plurality of means each engaging the block and coacting to form a housing at all times completely enclosing said block and acting to resist any outward distention of all external surfaces of the block, at least one pair of said means forming pressure elements for squeezing the block therebetween as they approach each other and said block provided with a plurality of openings of hour-glass form with their smallest diameters or necks in the medial transverse plane and constituting the means for causing the rubber to distend inwardly into its hollow interior at a rate greatest adjacent the pressure elements and progressively decreasing therefrom towards said medial plane.

16. In a device of the class described, the combination of means forming an encircling restraining band, a block of hollow rubber fitted in the band with the major portion of its perimeter at all times snugly engaging said band and substantially held thereby from outward distortion, means at opposite ends of the block to squeeze the block therebetween and cause the rubber to distend into the hollow space in the block, the perimeter of the block at its opposite ends being bevelled to space the extreme ends of the block inwardly from the band and thus tend to eliminate the flow of the rubber into the spaces between the band and said squeeze means as the rubber block is squeezed.

17. In a cushioning device, the combination of a hollow block of rubber having opposing pressure receiving ends, pressure means acting on at least one of said ends to squeeze the block in the direction of a line of thrust perpendicular to said ends, means snugly encircling the block in all positions of the same and thus resisting all outward distortion of the block in all directions radially of said line, said block provided with an opening extending coaxially with said line of thrust, said opening outlined by an annular wall of rubber of greater cross section of material adjacent its midheight than at opposite ends and providing means responsive to the squeeze force from said pressure means for causing solely inward distortion of the rubber towards said line with minimum radial distortion in a medial plane spaced from and parallel to both ends and progressively increasing in radial distortion from said medial plane towards both of said ends.

18. In a device of the class described, the combination of a rubber block symmetrical relative to an axis of thrust and provided with pressure receiving ends at opposite ends thereof, each of

said pressure receiving ends provided with a plurality of recesses normally of conical form with their greater cross sectional area at their respective end faces and with their axes parallel to said axes of thrust, and said block having a maximum cross sectional area of material in spaced relation to its pressure receiving ends and decreasing in cross sectional area of material therefrom towards its adjacent end, two pressure members between which the block is squeezed and means snugly encircling at least the pressure receiving ends of the block in all operative positions thereof to resist outward distortions thereof when under the squeeze action of said pressure members.

19. In a cushioning device, the combination of a rubber block defined at opposite ends by parallel pressure receiving faces and adapted to be squeezed by opposing compressive forces acting on said faces, said block provided at each of said faces with a plurality of conical cavities, each with its larger end at its respective pressure receiving face, said block having its maximum cross sectional area of material in a medial plane parallel to said receiving faces and reducing in cross sectional area of material in succeeding parallel planes at least towards one of said faces and restraining means encircling said ends of least cross sectional area of material to resist any outward distortion of said pressure receiving ends.

20. In a cushioning device, the combination of two pressure creating members arranged to approach each other along an axis of thrust, a block of rubber positioned between said members and at all times tending to resist said approach, said block provided with opposing pressure receiving end surfaces engaged by said members, each end portion of the block having a plurality of cavities therein opening through their adjacent end surfaces, the cross sectional area of material in a plane at the inner end of the cavities in each end being maximum and gradually decreasing therefrom in cross sectional area of material in succeeding planes towards the ends of the cavities at said surfaces and restraining means encircling the block at each end in all positions of the adjacent pressure creating member, said means extending therefrom for at least the major portion of the lengths of the associated cavities, said restraining means acting to resist outward distortion of the material of least cross section forming the two end portions of the block in all operative positions of the cushioning device.

21. In a cushioning device, a cylindrical block of rubber provided with a receiving face and an outlining cylindrical side perpendicular to said faces, said block provided with a cavity opening into said face, said cavity being conical in all axial cross sections in all operative positions of the block and said cross sections being normally of greater circular area at said face than in all other planes parallel thereto and said cavity tending as the block becomes compressed to assume a substantially cylindrical form for the greater portion of its length.

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