

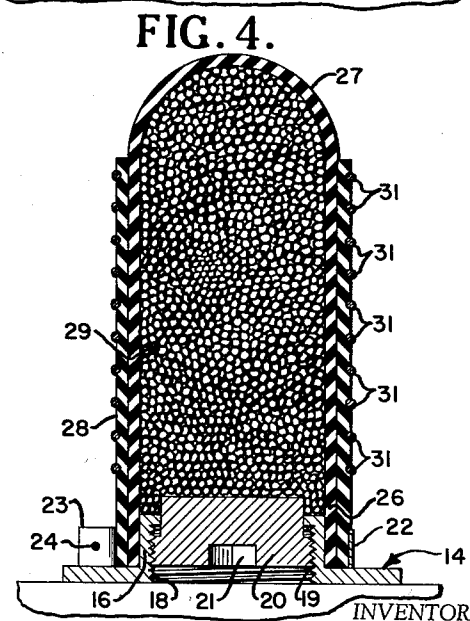
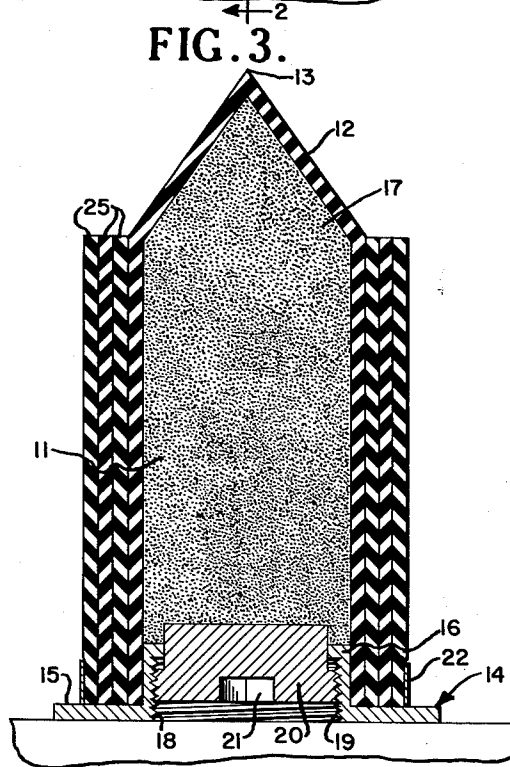
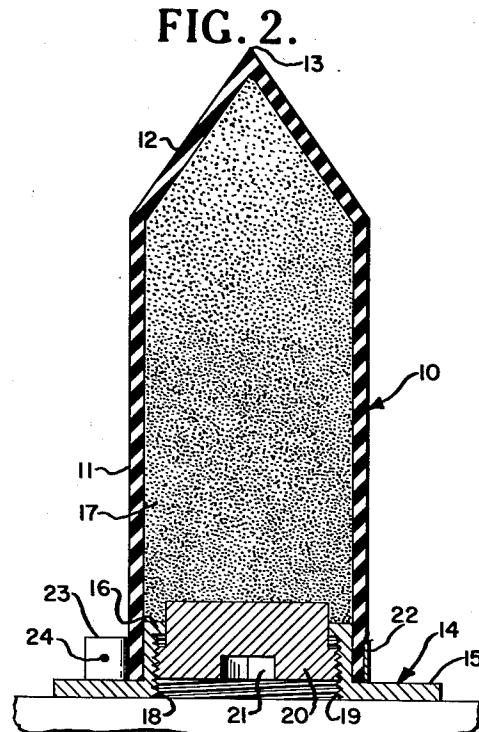
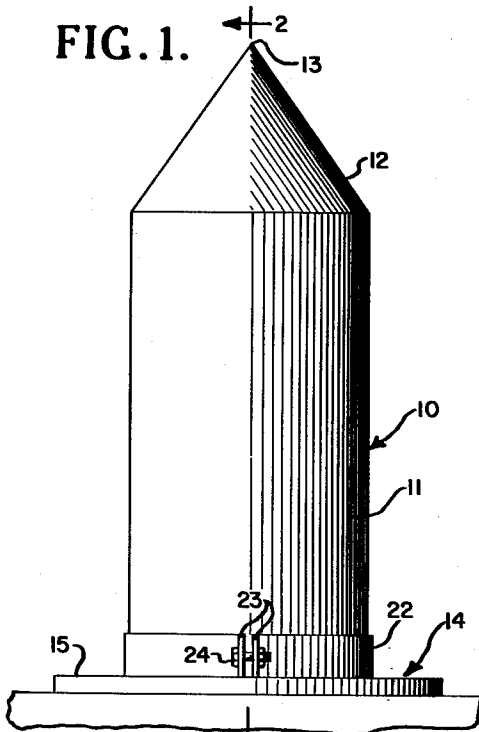
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CONSTANT RESISTANCE SHOCK ABSORBING DEVICE

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2,732,040

CONSTANT RESISTANCE SHOCK ABSORBING DEVICE

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6 Claims. (Cl. 188—101)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a new and improved constant resistance stopping element and more particularly to a high energy shock absorption device suitable for use with an impact apparatus.

Heretofore, stopping elements such, for example, as lead pads of varying types and diameters were mounted on an anvil and interposed between the striking surface of the movable carriage or test vehicle to give some control over the duration of the shock when the carriage forcibly struck the lead pads.

In actual practice such devices have not proven entirely satisfactory for the reasons that after each drop test it was necessary to remove the pads from the test machine and remould them for subsequent use which involved considerable time and expense. Furthermore, with such pad arrangements it has been found that the duration of the acceleration time pulses produceable at velocity changes less than 25 feet per second were entirely too short and the pulse shape at high velocities were not constant or smooth.

The present invention contemplates the provision of a new and improved stop device which overcomes all the disadvantages of the prior art devices and which is efficient and economical in operation, reproducible, and further provides means of absorbing considerable high energy with relatively constant resistance producing decelerations up to 500 g., from 15 to 100 milliseconds duration.

An object of the present invention is to provide a new and improved constant resistance stopping device suitable for an apparatus or mechanism requiring high energy absorption and reproducible acceleration time pulses.

Another object of the invention is the provision of a cushioning device adapted to absorb energy with relatively constant resistance.

Still another object of the invention is the provision of absorption device for controlling the shock durations of an accelerated vehicle.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is an elevational view of the device of the present invention in accordance with a preferred embodiment thereof;

Fig. 2 is a central longitudinal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a central longitudinal sectional view of an alternate arrangement of the device of Fig. 1; and,

Fig. 4 is a central longitudinal sectional view of another arrangement of the stopping device.

Referring now to the drawings wherein like reference characters designate like parts throughout the several views and more particularly to Fig. 1 thereof, the numeral

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10 generally indicates the constant resistance stopping device. The device comprises a cylindrical container 11 formed of any yieldable material suitable for the purpose such, for example, as rubber or the like.

The container 11 has formed thereon at the impact receiving end thereof a conical portion 12, the apex 13 thereof being adapted to receive the impact of a movable object thereby to control the shock duration thereof. While the aforesaid device may be employed with any apparatus or machine requiring high energy absorption and reproducible acceleration time pulses it is particularly adapted for use in a test machine such, for example, as the type similar to the device shown and claimed in the copending application of John H. Armstrong et al., filed March 27, 1953, Serial No. 345,272 and titled Drop Tester.

As more clearly shown on Fig. 2, the stopping device is provided with a base plate generally indicated by the reference character 14, comprising a flange 15 having a centrally disposed boss 16 integrally formed therewith and snugly fitted within the open end of the container 11, the container being filled as at 17 with sand shot or any other suitable dense particulate medium. The base plate 14 is provided with a centrally disposed well or bore 18, threaded as at 19 for threaded engagement with a plug or compressing element 20. By the plug arrangement the material 17 may be thoroughly packed within the container without the formation of any air pockets therein as the plug 20 is threaded into the bore 18, the plug acting as a ram to force the aforesaid materials into engagement with the inner wall of the container. The plug 20 has formed therein a socket 21 for a suitable wrench or tool thereby to facilitate threading of the plug into the bore 18.

As shown more clearly on Fig. 2, the lower end portion of the container 11 is clamped to the boss 16 by a split ring or strap 22, the strap comprising a pair of mutually spaced ears 23 and a clamping bolt 24 whereby the strap may be drawn sufficiently tight to clamp the container to the boss 16.

The stopping element may be employed with any type of mechanism requiring high energy absorption and reproducible acceleration time pulses and the energy absorption rate thereof may be regulated, if desired, by increasing or decreasing the thickness of the cylindrical wall of the container or by increasing or decreasing the resistance characteristics of the rubber.

In regard to Fig. 3, it will be noted that the general arrangement thereof is similar to the device of Fig. 1. However, to increase the absorption rate and resistance characteristics of the device the container 11 thereof is provided with a plurality of resilient bands or sleeves 25 composed of any material suitable for the purpose such, for example, as rubber or the like. The bands or sleeves are arranged one about the other and disposed about the container, the length thereof being the same as the length of the parallel wall of the container 11. In this arrangement it will be understood that by increasing or decreasing the number of bands 25, the absorption rate of the device of Fig. 3 may be controlled.

Referring to Fig. 4 the device comprises a container 26 having a rounded or semispherical impact end portion 27. A tubular element or sleeve 28 is disposed about the container 26, the aforesaid container and sleeve being composed of any suitable resilient material such, for example, as rubber or the like. In the device of Fig. 4, it will be noted that the base plate, plug and split strap arrangement is identical to the structure disclosed in Figs. 2 and 3, the split strap being adapted to clamp the container 26 and sleeve 28 to the boss 16. Furthermore, to increase the absorption rate of the device of Fig. 4 the container 26 is filled with pellets 29 composed of any metallic material suitable for the purpose such, for example, as

brass, lead, iron, or the like shot. The wire elements 31 are wound or otherwise disposed about the sleeve 28. The pellets may be of uniform size, or varying sizes depending upon the energy absorption characteristics desired. Furthermore, if desired, the aforesaid containers may be filled with metallic shavings, or a viscous liquid such as heavy oil or mercury.

The stopping device herein described provides means of absorbing a large amount of energy with relatively constant resistance, producing decelerations of the desired magnitude and duration in response to impact of a test vehicle or other moving body therewith. Furthermore, a body striking the stopping device axially at high velocity will be subjected to a negative acceleration characterized by a time pulse rectangular in shape and varying in magnitude dependant upon the striking velocity of the body and the resistance characteristics of the stopping device. The energy absorption rate may be related, if desired, by increasing or decreasing the resistance characteristics of the rubber by varying the wall thickness thereof or by varying the filler 11 or 29.

The constant resistance stopping devices of this invention are admirably suited for use with an accelerated test vehicle such, for example, as the type used in a drop test machine producing acceleration time pulses resulting in velocity changes of 80 feet per second. Furthermore, while the stopping devices have been described with particular reference to a drop tester it will be obvious from the foregoing that the device may be employed with any type of vehicle or mechanism requiring high energy absorption and reproduceable acceleration-time pulses.

From the foregoing, it will be apparent that a new and improved stopping means has been devised for absorbing high energy shocks with relatively constant resistance for the duration of the shock.

Obviously many other modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent in the United States is:

1. A constant resistance shock absorbing device of the character disclosed comprising a cylindrical container characterized by elasticity, a particulate mass disposed within and filling said container, a base plate, a centrally disposed boss integral with said base plate and disposed within one end of the container, means including a strap disposed about one end of the container for clamping the container to the boss, and an adjustable ram in engagement with said mass and in threaded engagement with said boss for packing the mass sufficiently to cause the container to be filled therewith.

2. A constant resistance shock absorbing device of the character disclosed comprising a cylindrical container composed of resilient material, a particulate mass disposed within and filling said container, a plurality of resilient sleeves disposed about said container, a base plate, a centrally disposed boss integral with said base plate and arranged within one end of the container, and means including a strap clamped about said sleeves for clamping the sleeves and container to said boss.

3. A constant resistance shock absorbing device of the character disclosed comprising a cylindrical container

composed of resilient material, a particulate mass disposed within and filling said container, a plurality of resilient sleeves disposed about said container, a base plate for supporting said sleeves and container, a centrally disposed boss integral with said base plate and arranged within one end of the container, means including a strap clamped about said sleeves for clamping the sleeves and container to said boss, clamping means for said strap, and adjustable means in engagement with said mass for compressing the mass sufficiently to cause the mass to completely fill the container in response to movement of said adjustable means.

4. A device of the character disclosed comprising a container filled with a particulate mass for absorbing high energy shocks resulting from impact of an accelerated body therewith and having relatively constant resistance to said shock, resilient means on said container for increasing the absorption rate of said container, a base plate for supporting said container and resilient means, a centrally disposed boss integral with said base plate and disposed within one end of the container, means including an annular strap in engagement with said resilient means for clamping the resilient means and container to said boss, and a ram in threaded engagement with the boss and disposed within the container for compressing the mass sufficiently to cause the mass to completely fill the container as the ram is threaded into said boss.

5. A device of the character disclosed comprising constant shock resisting container composed of elastic material having a particulate mass disposed therein and filling said container, means including an elastic sleeve in engagement with and encompassing the container for increasing the shock resisting characteristics of the container, means including a base plate for supporting said container and sleeve, and a ram in threaded engagement with the base plate and disposed within the container in engagement with said mass for compressing the mass sufficiently to cause the mass to completely fill the container as the ram is threaded into the base plate.

6. A device for absorbing high energy shocks resulting from impact of an accelerated body therewith and having relatively constant resistance to said shocks comprising a cylindrical container composed of elastic material, a particulate mass disposed within and filling said container, a sleeve composed of elastic material disposed about said container for increasing the absorption rate of said device, a flexible element wound about said sleeve for controlling the elastic characteristics of said sleeve, supporting means for said container and sleeve, and means for clamping the container and sleeve to said supporting means.

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