

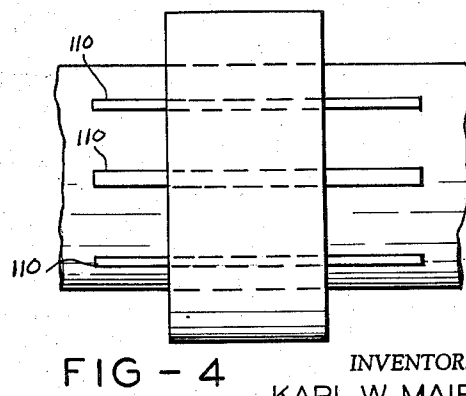
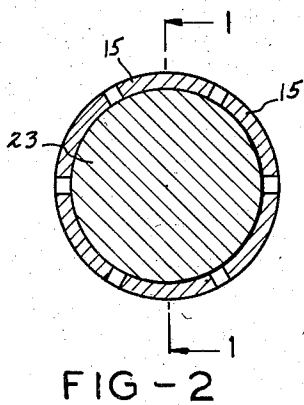
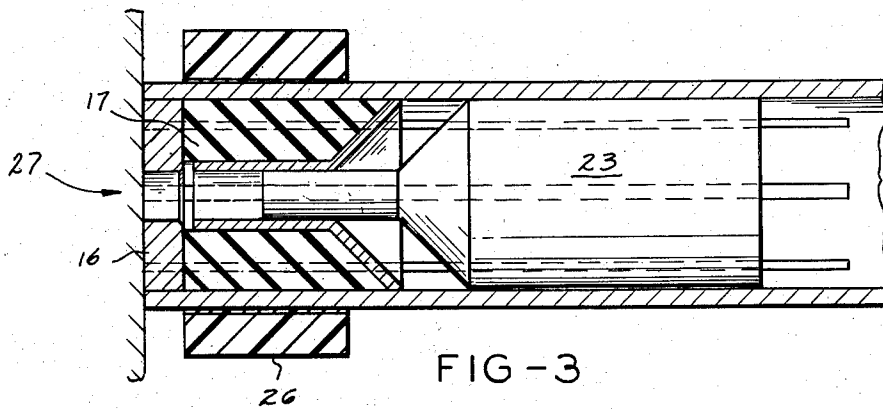
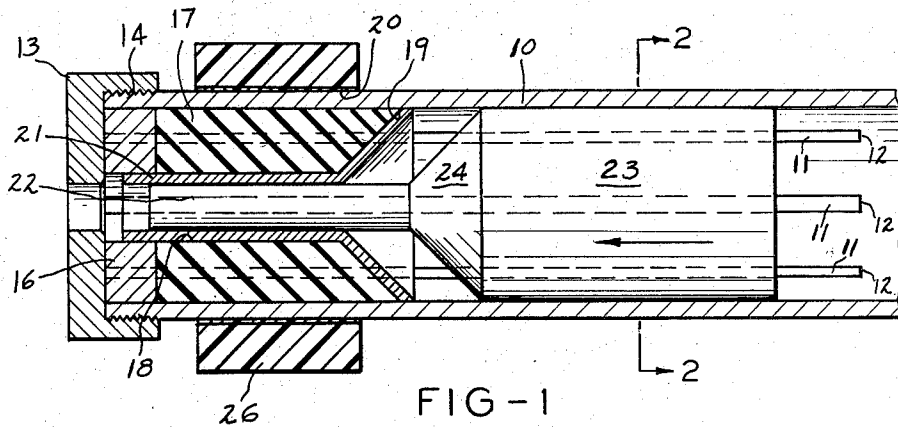
March 31, 1959

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2,879,986

BUFFER MECHANISM

Filed May 20, 1958



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2,879,986

BUFFER MECHANISM

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Application May 20, 1958, Serial No. 736,508

11 Claims. (Cl. 267—1)

The present invention relates to buffer mechanisms and in particular to a buffer mechanism whose basic element is a length of conventional tubing.

A particular feature of the invention is the provision of a mechanism which is simple in design and economical to manufacture.

Another feature of the invention is the provision of a buffer mechanism which is operable to withstand exceedingly high stresses.

Another feature of the invention is the provision of a buffer mechanism operable to absorb large amounts of kinetic energy transmitted to the mechanism by an impacting mass moving at a high velocity.

Another feature of the invention is the provision of a buffer device whose basic element is a length of tubing, the buffer device being adapted for disposition at any point along the tubing at which buffering action is desired.

It is anticipated that the buffer device will be particularly useful in buffering pistons moving at ultra high velocities such as pistons of powder actuated tools, the pistons of ejector devices and massive elements generally where it is desirable to dissipate the kinetic energy of a high velocity mass within a short interval of stroke without damaging the cylinder, piston, or tool housing.

A buffer device embracing certain features of the present invention may include a generally tubular element, said element being formed with at least one through slot disposed in the wall of the periphery of the element, a tension ring fabricated of a plurality of fibers suitably bonded together carried by said tube in the region of said slot, and a removable plastic compression member disposed within the tube in the region of the slot, said compression member being deformable and thereby operable to transmit forces to the tension ring by bulging the tube momentarily in the region of the slot and in the region of the ring without exceeding the elastic limit of the material from which the tube is fabricated.

Other features and advantages of the present invention will become more apparent from a study of the succeeding specification when read in conjunction with the appended drawings, in which:

Fig. 1 is a longitudinal sectional view of a buffer device embracing the principles of the present invention;

Fig. 2 is a sectional view of the device of Fig. 1 as viewed in the plane of line 2—2;

Fig. 3 is a modified version of the device of Fig. 1; and,

Fig. 4 is a showing of the exterior appearance of the buffer device, specifically the tension ring when the ring is mounted at a point intermediate the ends of a given length of tubing.

Referring now in detail to the drawing, particularly Figs. 1 and 2, there is shown a length of metal tubing 10 formed with a plurality of circumferentially disposed through slots 11 extending from a point indicated by the reference numeral 12 to the left terminal of the tube 10.

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In effect, these slots divide the wall of the tubing 10 into a plurality of tines or prongs 15 operable to swell or expand in response to an internal pressure without exceeding the elastic limit of the material from which the tube 10 is fabricated.

A cap 13 threadedly engages the end 14 and acts as a support for a spacer 16 in turn supporting a cylindrical plastic bushing 17, hereinafter referred to as a compression member. The compression member may be fabricated of a semi-rigid material operable to deform slightly, such as hard rubber, effective to accomplish a force transmitting function in a manner which will become more apparent hereinafter.

The compression member 17 is shown formed with a central bore 18 terminating in a flared or tapered counterbore 19. The bore 18 and counterbore 19 are lined with a metallic liner 21 operable to receive a head 22 carried by a piston 23. The piston is formed with a tapered portion or neck as at 24 operable to mate with the counterbore 19. As is apparent, the piston is operable to move in a direction shown by the arrow whereupon the head 22 is effective to do work upon a work-piece, such as driving a fastener, punching a hole, or other work operation. The piston is propelled at an exceedingly high velocity by any suitable means, such as high pressure fluids and the like, effective to introduce kinetic energy into the piston.

Encircling the tube in the region of the slots is a band or winding 26, hereinafter referred to as the tension ring, fabricated of glass fibers wound in toroidal fashion bonded together with a suitable resin in order to make a composite structure. The ring makes a snug fit with the liner and may in some embodiments (Fig. 1) of the invention carry a shim 20 in the form of a circular foil disposed between the liner and the ring in order to avoid chafing as the tines 15 breathe in a manner which will become more apparent hereinafter.

The mechanism of Fig. 1 operates in the following fashion:

Assume that kinetic energy introduced into the piston 23 is effective to drive the piston downwardly in the direction of the arrow with the result that the tapered neck 24 engages the corresponding taper 19 formed on the compression member 17.

The liner element 21 can be fabricated as a rigid member or can be slotted longitudinally. In fact, in some embodiments of the invention the liner element may be eliminated entirely. In any of the above arrangements, the impact of the piston, etc. with the compression member 17 is operative to deform the compression member causing it to swell radially outwardly.

This effect causes the tube tines to swell, in turn, transmitting a force to the tension ring placing the ring under a tension stress.

Since the member 17 is deformable, but semi-rigid, and noting that the stem 22 fills the aperture 18, the great percentage of deformation occurs in a direction which tends to swell the slotted tube or the tines 15, in turn, placing the tension ring 26 under a hoop stress.

Thus, the piston is brought to rest within an exceedingly short length of stroke and the total kinetic energy of the piston is transferred by means of the compression member to the tension ring without exceeding the elastic limit of the tube or any other element of the buffer device.

The prime feature of the combination of elements disclosed and claimed in the present invention is that fiberglass is effective to assume a tension stress in excess of 250,000 p.s.i. and exhibits an elongation of more than 3% in the elastic range.

In the Fig. 3 embodiment of the invention, the cap 13 is eliminated.

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In this arrangement, the buffer device and in particular the spacer 16 and the compression member 17 are held intact by the contact between the buffer and the work surface 27 against which the tool is applied or held.

Fig. 4 is an illustration of the exterior of the buffer device when the slots 110 are formed in a tubular member at a point intermediate the ends of the tube. In other words, it is entirely within the scope of the present invention to place the buffer device at any desired point along the length of the tube and in this arrangement of the invention the slots 110 need not intersect the ends of the tube. They must be made long enough consistent with the elasticity of the material from which the tube is fabricated to permit the slotted tube to swell, bulge or breathe in the area of the tension ring without exceeding the elastic limit of the material from which the tube is fabricated.

In the embodiments of the invention depicted in Fig. 4, it is necessary, of course, to provide a cap 13 on one end of the tube plus a spacer 16 of appropriate length so as to maintain the compression member 18 positioned in the region of the slots.

The buffer device of the present invention is a supplement to and an improvement over the device shown and described in a copending application S.N. 652,506, filed April 12, 1957, now Patent No. 2,845,908, by Karl W. Maier.

In general, it should be kept in mind that the compression member of the present invention is a semi-rigid material and functions to transmit energy while the external fiberglass sleeve or tension member is operative to absorb energy.

It is anticipated that a variety of modifications and designs of the present invention may be fabricated without departing from the spirit and scope of the invention.

What is claimed is:

1. A buffer assembly for absorbing and dissipating

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kinetic energy of a high speed mass upon impact with said assembly comprising: a generally tubular element, said element being formed with at least one through slot, a tension ring fabricated compositely of a plurality of fibers bonded together by a suitable resin and carried by said tube in the region of said slot, and a removable plastic compression member disposed within the tube in the region of the slot, said compression member being deformable and thereby operable to transmit forces to the tension ring by bulging the tube momentarily in the region of the slot and in the region of the ring without exceeding the elastic limits of the material from which the tube is fabricated.

2. The assembly of claim 1 wherein the fibers are glass.

3. The assembly of claim 1 wherein the tubular element is metallic.

4. The assembly of claim 1 wherein the compression member is hard rubber.

5. The assembly of claim 1 wherein the compression member is formed with a central aperture having a tapered counterbore.

6. The assembly of claim 1 wherein the aperture and counterbore have a liner.

7. The assembly of claim 1 wherein the slot intersects at least one end of the tube.

8. The assembly of claim 1 wherein the compression member is held in place by a cap secured to the tube.

9. The assembly of claim 1 wherein the tube is formed with a plurality of slots.

10. The assembly of claim 1 wherein the fibers constitute about 80 percent by weight of the tension ring.

11. The assembly of claim 9 wherein all the slots intersect at least one end of the tube.

References Cited in the file of this patent

UNITED STATES PATENTS

2,846,211 Taylor ----- Aug. 5, 1958.