March 30, 1965 W. G. PRICE ETAL 3,175,699

HYDRAULIC DRAFT GEAR

Filed March 26, 1962 4 Sheets-Sheet 1

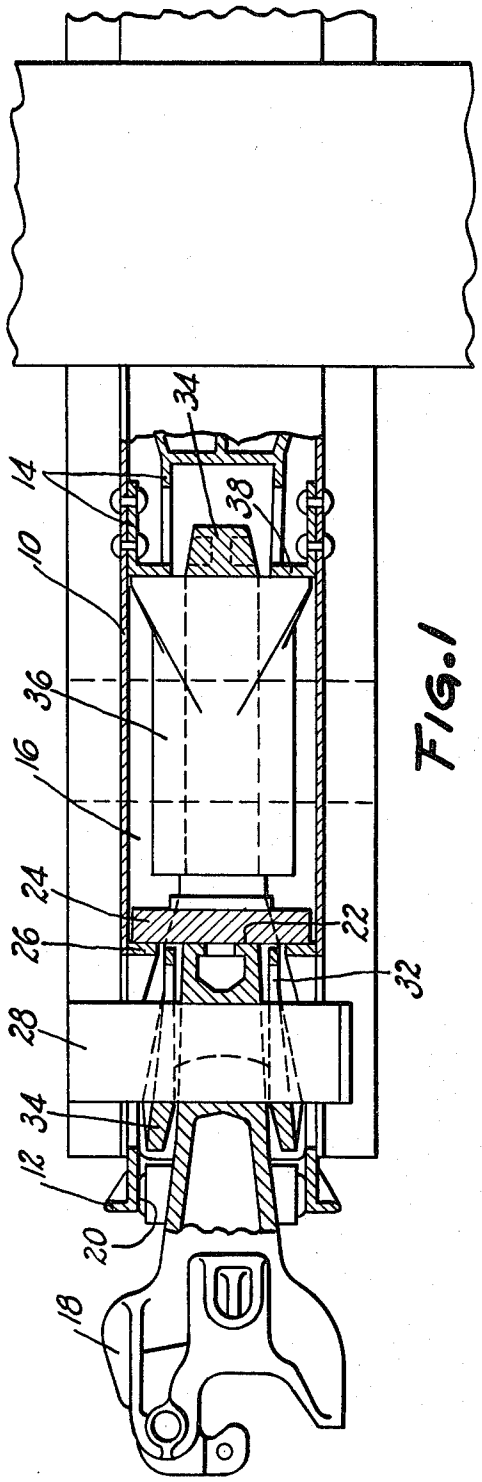


FIG. 1

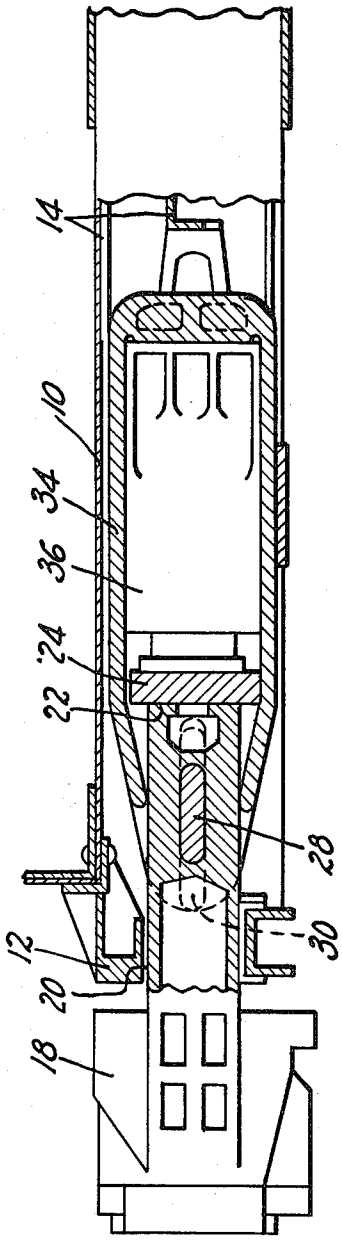


FIG. 2

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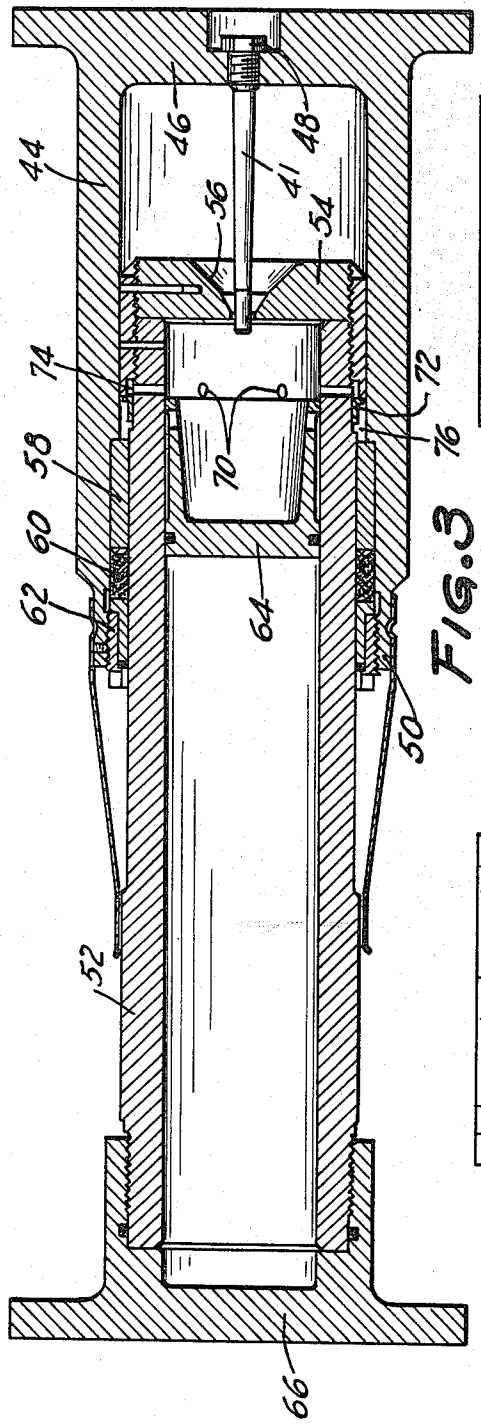


FIG. 3

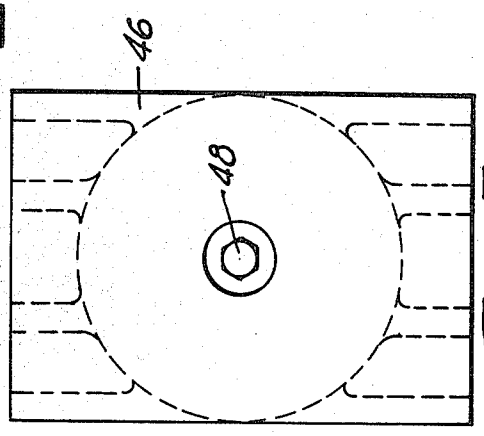


FIG. 5

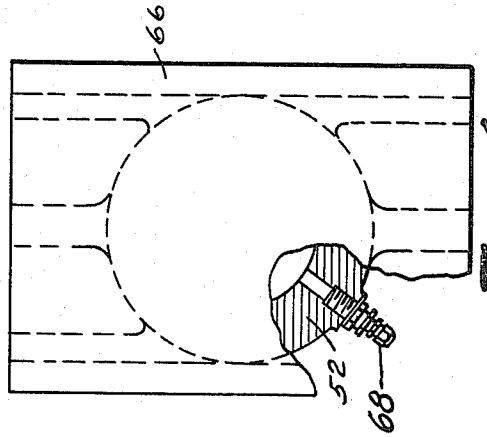


FIG. 4

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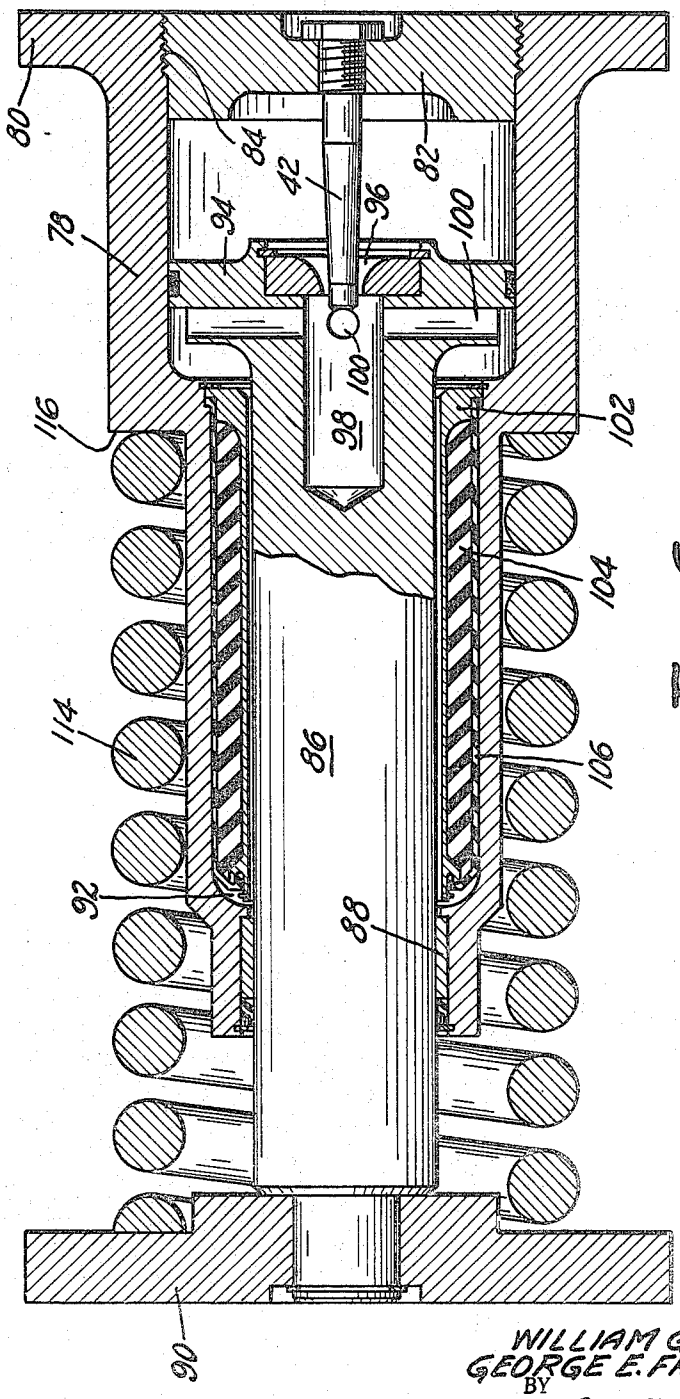


Fig. 6

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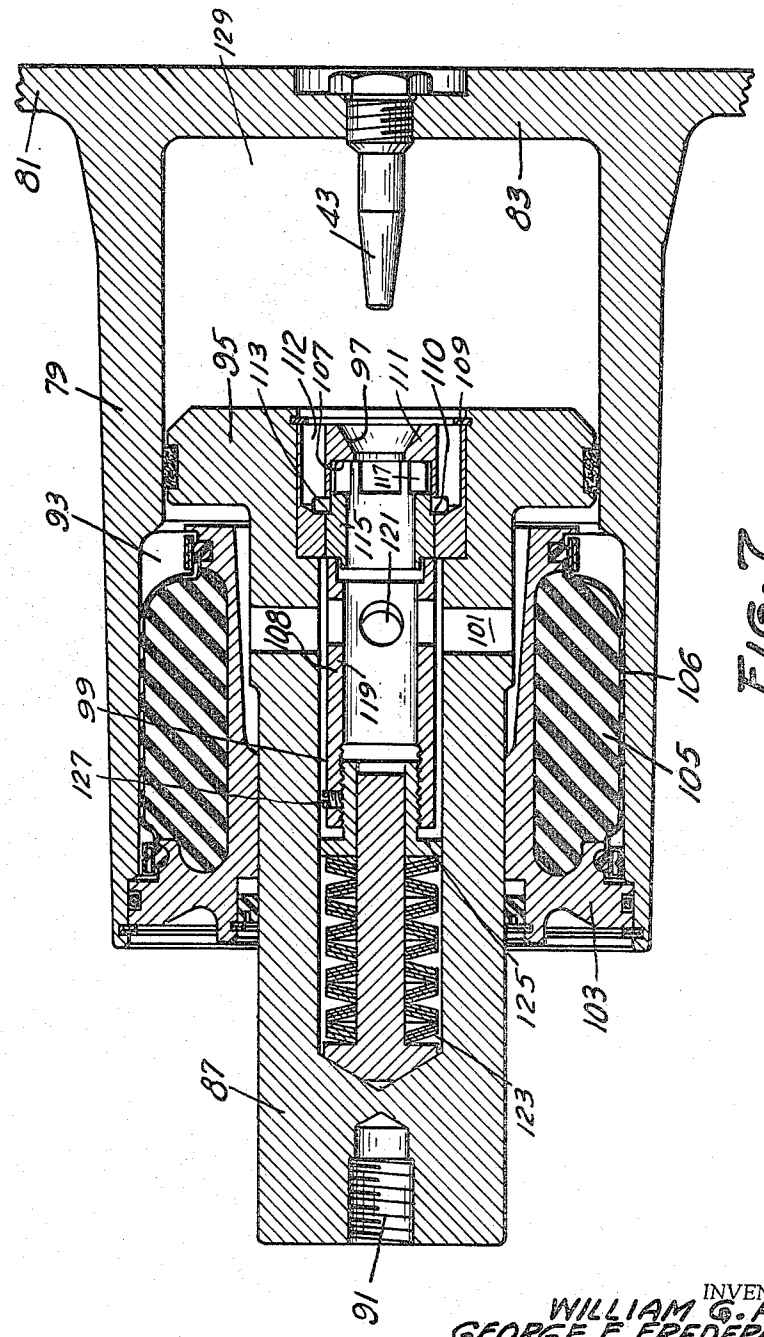


FIG. 7

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3,175,699

HYDRAULIC DRAFT GEAR

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Filed Mar. 26, 1962, Ser. No. 182,428
3 Claims. (Cl. 213—43)

This invention relates to shock absorbing units for use on railway vehicles to absorb impact shocks during shunting and/or to provide an energy dissipative type draft connection between vehicles during running.

The impact cushioning ability of the draft gear is approximately equivalent to the amount of energy that it can absorb during a closure movement of the gear. In addition resilient draft gears, such as rubber cartridges, springs, etc., have the disadvantage of returning a major part of the energy which was initially applied to the draft gear by recoil to the train or cars.

As for energy dissipative devices in the past, they have been generally concerned with a combination of frictional and hydraulic mechanisms which has resulted in highly sophisticated units having, in general, a problem of too much structure. It is also true that there have been attempts to use one or the other of these mechanisms and particularly hydraulic devices to the exclusion of the other, which attempts at least as to the hydraulic devices have not to date proven successful due to problems such as rebound, and rupture of the units. It is therefore a principal object of this invention to provide a hydraulic draft gear free of these problems.

More particularly, it is an object of this invention to provide a structurally sound hydraulic shock absorber for a standard draft gear pocket which is capable of controlled automatic recovery from a compressed condition.

It is another object to provide an all hydraulic draft gear so that a high initial resistance to buff or draft forces is developed at the inception of such forces, which resistance is maintained at a substantial value throughout the duration of such force.

Still another object is to snub the return of said hydraulic draft gear from its compressed condition to eliminate recoil forces in the hydraulic draft gear.

A further object is to prevent rupture of the hydraulic draft gear upon the occurrence of excessive buff and draft forces.

Other objects and features of our invention will become apparent from a detailed description of the device which follows with reference to the accompanying drawings wherein:

FIGURE 1 is a plan view of a railway car sill structure mounting a coupler and an all hydraulic draft gear of the present invention;

FIGURE 2 is a side view of the assembly of FIGURE 1;

FIGURE 3 is a sectional view of a shock absorber designed in accordance with the present invention;

FIGURES 4 and 5 are views of the end plates of the shock absorber of FIGURE 3;

FIGURE 6 is a sectional view of a modified shock absorber; and

FIGURE 7 is a sectional view showing another arrangement for the modified shock absorber of FIGURE 6.

Referring now to FIGURE 1, there is shown a railway car center sill 10 having a striker face 12 and a center filler 14 between which is found a draft gear pocket 16. A coupler 18 is passed through an opening 20 and bears, as at 22, against a follower plate 24 which in turn bears against stop flanges 26 provided by the rearward structure of the striker 12 thereby preventing

movement of the follower plate 24 leftwardly from the position shown in FIGURES 1 and 2.

The coupler has a draft key 28 which is passed through a slot 30 of the coupler 18 and through an elongated opening 32 in a yoke 34. The yoke 34 surrounds a shock absorber 36 centrally of the stop flanges 26 and a similar peripheral stop 38 formed with the center filler 14.

When undergoing a buff load the coupler displaces the plate 24 to compress the shock absorber against stops 38; whereas a draft force on coupler 18 causes the yoke 34 to compress the shock absorber against stops 26.

As for the shock absorber details, two general types are hereinafter discussed, namely a hydraulic shock absorber with an air return chamber and a hydraulic unit with a spring return. However, both of these units incorporate several common features such as end plate design, see FIGURES 4 and 5, and a capacity to cushion forces being applied to cars having a wide range of load conditions. This latter feature is accomplished by incorporating a metering pin into each of the various units which is capable of obtaining the above results. In more detail, it is our intent to provide a metering pin for each of the units that takes into consideration the minimum load and the maximum load of the railroad car, and such a pin could be described as one which has a step taper form. This means that the metering pin closes the orifice at one rate for a lightly loaded car and at another or faster rate with a heavier car load.

With regard to the air return type of shock absorber as shown by FIGURE 3, a cylinder 44 is shown having an integral wall 46 at one end through which the metering pin 41 is mounted, as at 48. The wall 46 is formed as a rectangular structure that fits within the draft gear pocket such that it is in contact with one of the sill stop means above mentioned. The cylinder 44 is also provided with an open end 50 through which a tubular member 52 may be inserted. At one end of member 52 a wall 54 is mounted, said wall having an orifice 56, which orifice is operatively associated with pin 41. The member 52 is held centered in the cylinder by a bearing 58, and the cylinder has its open end closed around member 52 by means of a packing gland 60 held in said open end by a gland nut 62. Behind the wall 54 within member 52 is a floating piston 64. The member 52 is closed by an end cap 66 which is also formed as a rectangular structure to cooperate with the stops of the draft gear pocket as does wall 46. In addition, member 52 is provided with a charging valve 68, as seen in FIGURE 4, so that proper return pessure may be realized and that air leakage may be compensated for.

The cylinder 44 is substantially filled with an incompressible fluid; whereas the tubular member 52 is charged with a compressible fluid, such as air by means of valve 68. The floating piston 64 separates the two fluids. Between the wall 54 and the piston 64 the tubular member 52 is provided with a plurality of annularly spaced bores 70 about which an annular collar 72 having a metering orifice 74 is placed such that compression of the shock absorber ports fluid to an annular chamber 76 by displacing the collar 72, and extension of the unit, by release of the stored energy in the compressible fluid, causes the collar to cover the bores 70 and meter the flow from chamber 76 to within the tubular member 52. This effectively snubs the extension of the shock absorber.

As for the shock absorbers of FIGURES 6 and 7, they represent the preferred shock absorber arrangement in that return forces of the spring are not as intense as in the compressed air unit of FIGURE 3. With reference to the unit shown in FIGURE 6, a tubular member 78 is provided having integral radiating flanges 80 at one end

thereof. A filler plug 82 is joined to said tubular member 78 centrally of the flanges 80, as by the screw threads 84 shown in FIGURE 6; and plug 82 mounts the metering pin 42 along the central axis of tube 78. A rod 86 is reciprocally mounted within member 78 as by a bearing seal 88, and rod 86 has a rectangular plate 90 joined therewith. A tapped hole 91 shown in FIGURE 7 may be provided for joining plate 90 to rod 86. Plate 90 and flange 80 are operatively associated with the stops 26 and 38 of the draft gear pocket 16. The diameter of rod 86 is such as to form an annular space 92 between it and the inner diameter of tube 78; and the rod 86 is provided with a piston face 94 having centrally located orifice 96 opening into a bore 98 within the rod 86 adjacent its piston face. The bore 98 is provided with radial passages 100, which passages communicate the bore 98 with space 92 about the rod 86. In addition, a sleeve 102 is mounted to tube 78 within space 92, and sleeve 102 in turn mounts a compressible member 104, such as a neoprene sponge rubber, occupying a major portion of the space 92. The compressible member should be made of a material capable of operation throughout a temperature range of from —50° F. to 200° F. In order that the compressible member may be protected an impervious membrane 106 encloses the member.

In the shock absorber shown in FIG. 7, a rod 87 is provided with a piston 95 at one end adapted to slide in a cylinder or tube 79. Tube 79 is provided with a flange 81 and an end wall 83 in which a variably tapered metering pin 43 is removably mounted. A compressible material 105 similar to material 104 in FIG. 6, occupies chamber 93. Sleeve 103 forms the bearing seal between rod 87 and tube 79. A nozzle or valve body 111 is held by a retaining ring 109 in a central aperture of piston 95. Valve body 111 is formed with a seat 107 and with a plurality of axial passages 112 leading to groove or opening 113. Opening 113 is normally closed by valve spool 115 having notched portions 117 at the outer end thereof and arranged to abut sleeve 119 at its other end. Sleeve 119 has openings 121 to the bore 99 and chamber 93. Valve spool 115 has a stepped configuration providing an annular pressure responsive face 110 whose area is such as to enable a predetermined pressure in chamber 129 to overcome the force of spring 123, which acts against bearing plate 125. Plate 125 is threaded to sleeve 119 and is locked thereto by set screw 127.

When a load or force is applied to the shock absorber, piston 95 moves further into chamber 129 and during the course of travel metering pin 43 enters orifice 97 and controls the flow through it into chamber 93. If excessive pressure is developed in chamber 129, due to excessive buff or draft forces, the fluid in passages 112 acting on face 110 of valve spool 115 overcomes the force of spring 123 on spool 115 and moves spool 115 so as to place passages 112 in communication through tubular network 108 with chamber 93. The path between chambers 129 and 93 is via passages 112, opening 113, notches 117, opening 121 and passage 101. The length of spool 115 is such as to provide bearing support for the spool when it moves to the left to open notches 117 to opening 113. Thus, the tubular network 108 and spool 115 and their assorted elements form a spring loaded bypass valve that relieves excess pressure within chamber 129.

In order to return the shock absorber to its normal extended position after buff or draft forces are relieved, a spring 114, as seen in FIGURE 6, is provided, which

spring is compressed between plate 90 and a shoulder 116 of the tube 78. A similar shoulder and spring may be provided with the unit of FIGURE 7. Such a spring return is, however, aided by the compressible member 104 or 105 which forces the fluid from space 92 or 93 through passages 100 or 101 and bore 98 or 99 into orifice 96 or 97 and out into tube 78 or 79.

It may be readily appreciated that other structural variations may be encompassed by our invention. Therefore, we do not intend to be limited by the above description, but rather by the appended claims.

We claim:

1. In a railroad draft gear pocket, a kinetic energy absorbing device comprising:
- a fluid containing cylinder;
- a piston dividing said cylinder into two variable volume chambers, said piston having a tubular extension with radial passageways which in association with passageways in said piston provide fluid communication for said variable volume chambers;
- a fluid pressure responsive means in one of said variable volume chambers, which fluid pressure responsive means controls ejection of a fluid from one of said variable volume chambers upon relief of loads on said energy absorbing device;
- a spring loaded valve in said tubular extension of said piston to relieve excess pressures in the other of said variable volume chambers by opening one of the passageways in said piston to permit an increased fluid flow therethrough; and
- means mounting said energy absorbing device in an operative arrangement within said draft gear pocket.

2. A kinetic energy absorbing device according to claim 1 further comprising a step taper form metering pin removably mounted within said cylinder in axial alignment with one of the passageways in said piston to close the area of the passageway at a varying rate.

3. In a railroad draft gear pocket, a kinetic energy absorbing device comprising:
- a fluid containing cylinder;
- a piston dividing said cylinder into two variable volume chambers, said piston having a tubular extension with passageways in said piston which provide fluid communication for said variable volume chambers;
- a fluid pressure responsive means in one of said variable volume chambers, which fluid pressure responsive means controls ejection of a fluid from one of said variable volume chambers upon relief of loads on said energy absorbing device;
- a spring loaded valve in said tubular extension of said piston to relieve excess pressures in the other of said variable volume chambers by opening one of the passageways in said piston to permit an increased fluid flow therethrough; and
- means mounting said energy absorbing device in an operative arrangement within said draft gear pocket.

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