Feb. 11, 1964 M. J. LEBOW 3,120,754

OVERLOAD PROTECTOR

Filed Feb. 12, 1960 2 Sheets-Sheet 1

FIG. 1

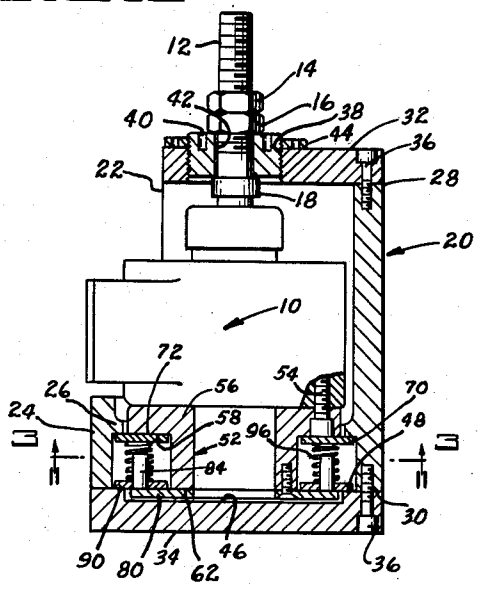
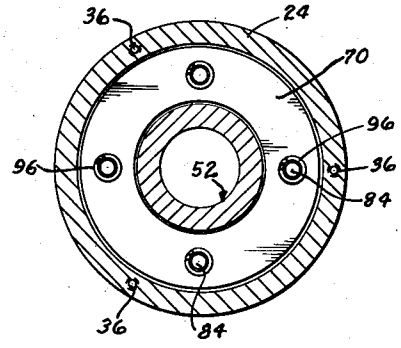


FIG. 3



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Filed Feb. 12, 1960 2 Sheets-Sheet 2

Fig. 2

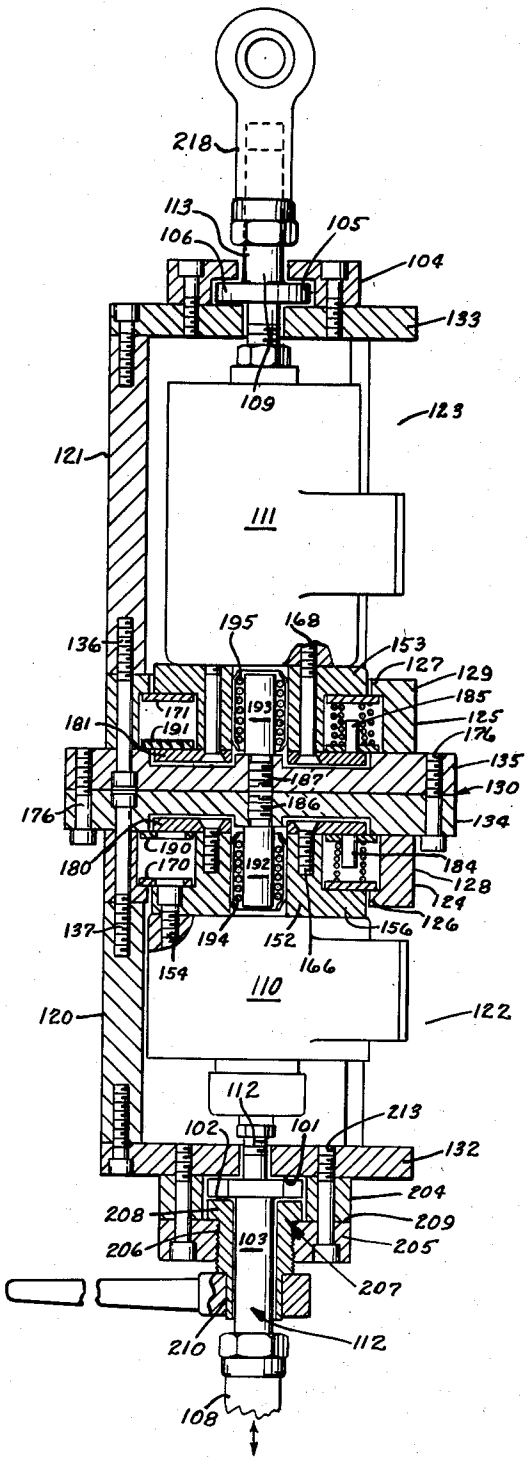


Fig. 4

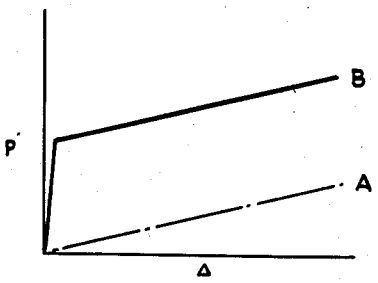
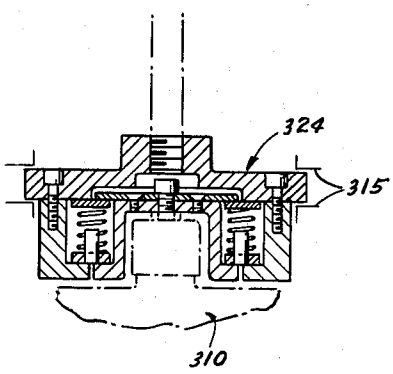


Fig. 5



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OVERLOAD PROTECTOR

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8 Claims. (Cl. 73—141)

The present invention relates to new and useful improvements in safety devices and particularly to an overload protector which is used in conjunction with a force measuring load cell.

Frequently force measuring load cells are damaged by excessive loads. Because of their high cost, it presents a serious problem.

It is therefore an object of the present invention to provide an overload device which will permit unhampered use of the load cell, while still providing an overload protector to prevent excessive loading.

Another object of the invention is the provision of an overload protector which can be used in tension or compression.

Still another object of the present invention is the provision of an overload device which can be used on very low or very high loads, the device being simple, durable and efficient.

Another object of the present invention is the provision of an overload safety device that can be used as a single unit or the individual units can be joined and used in tandem.

Still another object of the present invention is the provision of a device that is quickly adjustable and positive in action.

Another object of this invention is the provision of an overload safety device wherein preloaded springs cooperate to provide a low spring rate deflection and mechanical stops are provided within the assembly to carry any overload.

Still another object of the present invention is the provision of a safety device whereby the preloaded springs form a separate assembly which may be used as such.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIG. 1 is a cross sectional view of a single overload safety device embodying the present invention.

FIG. 2 is a cross sectional view of a tandem unit embodying the present invention.

FIG. 3 is a cross sectional view taken on lines 3—3 of FIG. 1.

FIG. 4 is a load deflection graph.

FIG. 5 is a modified form of the present invention.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to FIG. 1 of the drawings, a commercial load cell 10 is shown mounted in a housing 20. The body of the housing 20 is of generally cylindrical configuration. The top section 22 thereof is cut away to accommodate the irregular configuration of the load cell 10, while the lower section 24 thereof has an internal stop flange 26 integral therewith. The upper and lower flat ends 28 and 30 of the housing 20 have rigidly secured thereto, two flat end members 32 and 34. Each of the

end members being affixed with a plurality of threaded members 36 such as cap screws. The upper end member 32 is flat and formed of generally uniform thickness material and has a large threaded opening 38 located in alignment with the vertical housing axis. The threaded opening 38 therein is adapted to receive a flat threaded plug member 40. Plug 40 also has a central opening 42 therethrough which is adapted to be concentric with threaded opening 38.

Opening 42 is adapted to receive the threaded stem member 12 which extends from the load cell 10. Rotatably positioned on the stem member 12 are a pair of jamb nuts 14 and 16, while immediately below threaded portion of the stem 12 is a flanged or otherwise upset portion 18. Plug 40 is locked in position with the flat locknut 44.

A hollow flanged section 52 is rigidly secured to the bottom of the load cell body 10 by means of a plurality of cap screws 54, the heads of which are recessed below the lower flat surface 58 of flange 56. The generally flat surface 58 of the flange 56 is adapted to engage the upper inside surface 72 of the flat spring ring 70. The outer or circumferential portion of the spring ring 70 is adapted to engage flange 26, located in the housing 20.

Retainer flange 80 is secured by screws to the lower surface 62 of the hollow flanged member 52. Flange 80 is located in horizontal spaced relationship to the spring ring 70. A plurality of locators or pilots 84 extend upwardly either from the retainer flange 80 or the spring ring 90 to position as well as center a plurality of compression springs 96 between the spring rings 70 and 90 mounted intermediate thereof.

The lower end member 34 is positioned on the housing 20 by cap screws 36 and the central portion thereof is undercut at 46 to accommodate flange 80. The top surface of the end member 34 forms the stop flange 48 and limits the movement of spring ring 90.

The operation of the above described device will be discussed in conjunction with the operation of the modified forms of the invention, shown in FIG. 2 of the drawings.

Basically, the device illustrated in FIG. 1 is the same as the device shown in FIG. 2. However, the embodiment illustrated in FIG. 2 utilizes two of the devices shown in FIG. 1, slightly modified.

Two commercial load cells 110 and 111 are mounted on the axis of two similar cylindrical housings 120 and 121. The housing members, although shown of cylindrical configuration, could of course be of many shapes and the body portion could be made up of a plurality of rib members (not shown).

Portions of the housings 120 and 121 are open at 122 and 123 to accommodate the load cells 110 and 111. The central sections of the housing bodies 124 and 125, although not integral with the housing are of the same flanged configuration as that illustrated in FIG. 1. The internal flanges 126 and 127 provide the stop means for the spring rings 170 and 171. The inner spring rings 190 and 191 are positioned by the spring pilot locators 184 and 185 which are secured to the retaining flanges 180 and 181. The retaining flanges 180 and 181 are rigidly secured to the body of the cylindrical flanged members 152 and 153 by screws 166 and 168.

In the lower unit, one row of screws 166 secures the retainer flange 180 to the cylindrical flanged member 152, while a second row of screws 154 secures the flange 156 to the body of the load cell 110. In the top unit, one row of screws 168 extends through the retainer flange 181 and the body of the cylindrical flanged member 153 to hold the complete assembly onto the load cell body 111.

The central portion 130 of the assembly is formed from two flat flange members 134 and 135. Both flange mem-

bers are joined to the housing proper by a plurality of screws which extend therethrough. A first row of screws **136** extend upwardly through the flange member **134** and the housing body **121**. A similar row of screws **137** extends downwardly through flange **135** and into the housing **120** to join the lower assembly. Both assemblies are joined by screws **176**.

The configuration of flanges **134** and **135** is similar to that first described. However the central portion of both flanges are raised and have threaded openings **186** and **187** therethrough. Each of the openings **186** and **187** positioning centering rods **192** and **193** which in turn center ball bushings **194** and **195**. The ball bushing **194** is located in the central opening of the flanged member **152** in the lower unit while a second ball bushing **195** is positioned in the central opening in flanged member **153** in the lower unit. This keeps both the upper and lower unit in accurate alignment.

The end members **132** and **133** are mounted on the housing bodies **120** and **121**. Each member **132** has mounted on its central portion a uniform thickness spacer ring **204** to which is secured a second circular ring member **205**. The second circular ring member **205** has a threaded portion **206** in the center, into which a threaded flange member **207** is positioned. The flange portion **208** thereof, engages the underside **209** of the second ring member **205**. The end **210** of the flanged member **207** is squared or flattened so that it can be rotated with respect to the second ring member **205**, which is affixed to the end plate **132** with a plurality of screws **213**.

A flanged stem member **112** extends from the load cell **110**. The flanged portion **101** of stem **112** is disposed intermediate the bottom surface of end plate **132** and the top surface **102** of flange **208**. The stem section **103** extends through the hollow threaded flange member **207** and has adjustably affixed thereto a unibal member **108**.

A similar structure exists on the upper end plate **133**. However, only the undercut ring **104** is secured to end plate **133**. The central portion **105** being adapted to receive the flanged portion **106** of the stem member **113**, while the stem extension **109** positioned therebetween has a unibal member **218** adjustably affixed thereto.

In the first embodiment, the operation is as follows. The complete unit is assembled as shown. If we assume that the load cell **10** is of a particular capacity, the spring assembly is preloaded an equivalent amount. Once the preload is reached, the load cell will be deflected at the spring rate. Since a particular load will deflect the load cell a predetermined amount, mechanical stops are provided to prevent overload. The stops are in the form of flanges or jamb nuts positioned on the threaded stem **12**. Flange **18** in the present instance working in cooperation with the adjustable plug **40** limits the load cell movement in tension, while jamb nut **16** cooperates with plug **40** to limit the movement of the load cell in compression. The graph illustrated in FIG. 4 shows a typical load deflection curve with and without the present invention. Line A indicates a typical load cell deflection curve, while line B indicates the deflection curve when the present invention is applied. Adjustment of the system is made through rotation of plug **40** and jamb nuts **14** and **16**.

The embodiment illustrated in FIG. 2 operates in the same fashion. The load cells **110** and **111** in this case being of different capacities. The preloaded spring units **128** and **129** in effect are individual assemblies, each of which is preloaded to cooperate with a particular capacity load cell. Mechanical stops **101** and **208** are provided in the lower load cell for limiting movement of the flanged stem member **112**. Adjustment in the system is made by rotation of the flanged stop member **207**.

On the upper unit, mechanical stops are provided by the end of member **133** and the inside undercut face of ring member **104**. Engagement of the flange **106** with these surfaces limits the movement thereof. One surface limiting the movement in tension, while the other surface limits the movement in compression. The ball bushing maintaining both assemblies in alignment.

Should it be found necessary to use only one load cell in the tandem device, the flanged member **207** is rotated to render movement of load cell **110** inoperable.

An individual preloaded spring assembly **324** can be used in cooperation with a separable load cell **310** as shown in FIG. 5. In this structure, mechanical stops **315** are provided to limit movement of the unit.

Having thus described my invention, I claim:

1. In an overload protector for limiting the force applied to a load cell, the combination of a force measuring load cell; an unyielding housing around said load cell; a hollow flanged cylindrical member secured to said load cell; the flange on said hollow member has positioned thereon a pair of circular rings; retainer means for retention of said rings; a plurality of preloaded compression springs positioned in spaced relationship intermediate said pair of rings; stop means on said housing for engagement with said circular rings; additional stop means on said housing for limiting compression of said springs upon application of a load.

2. A device as in claim 1 wherein the compression springs are piloted to prevent cocking.

3. A device as in claim 1, wherein a double row of springs are used.

4. A device as in claim 1 wherein two compression springs are nested together on the pilot.

5. A device as in claim 1 wherein the spring pilots are located on the retainer.

6. A device as in claim 1 wherein two similar assemblies are joined together, one of high load capacity, one of low load capacity; and pilot means positioned in said hollow flanged cylindrical members for axial alignment of the two assemblies.

7. A preloaded spring device having a housing forming an outer body; an upper and lower retainer flange on said housing outer body; an inner flanged body positioned in spaced relationship with said outer body; a pair of axially positioned rings on said inner flanged housing; a plurality of compression springs located between the rings; retainer means for holding and preloading said springs; and mechanical stop means on said housing for limiting compression of said springs upon application of a load; said device to be used in connection with a separable load cell.

8. A device as in claim 1 wherein the springs are piloted on the spring ring proper.

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