June 7, 1955 Q. FRAZIER ET AL 2,710,218

PRESSURE SENSITIVE RELEASE DEVICE

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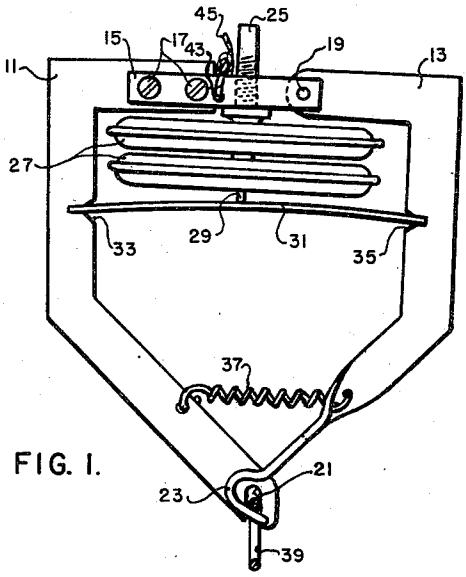

FIG. 1.

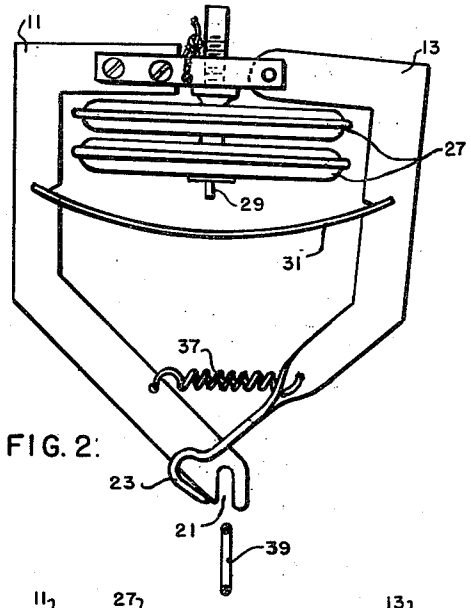

FIG. 2.

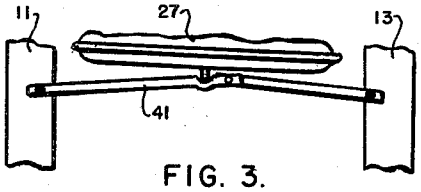

FIG. 3.

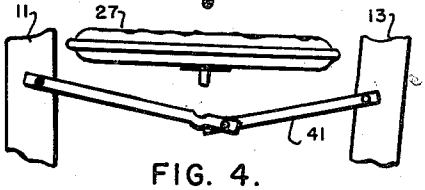

FIG. 4.

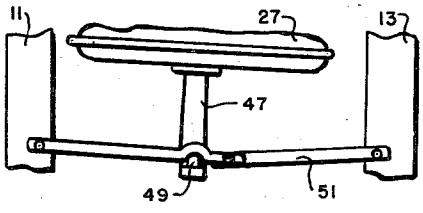

FIG. 5.

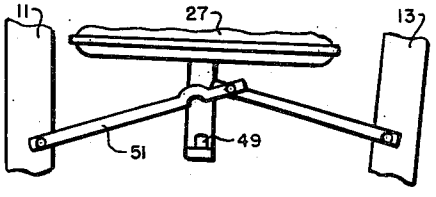

FIG. 6.

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PRESSURE SENSITIVE RELEASE DEVICE

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5 Claims. (Cl. 294—83)

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

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

The present invention relates to a pressure sensitive release device.

In the utilization and testing of certain meteorological equipment, the necessity often arises that certain equipment be elevated to a certain predetermined altitude and then released. This is particularly true when it is desired to release certain equipment at a predetermined atmospheric pressure above the pressure at sea level.

Accordingly, it is an object of this invention to provide a pressure sensitive release device that will function to release a piece of test equipment or any desired load at a certain predetermined atmospheric pressure.

Another object of the invention is to provide a device with a minimum of moving parts that can be readily and inexpensively assembled.

Another object of the invention is to provide a pressure sensitive release device whose action is positive and instantaneous.

The improved device comprising our invention consists essentially of a pair of arms forming a frame, each of the arms pivotally movable relative to each other, and cooperating to form a releasable locking mechanism at one end, and having within the frame a pressure sensitive responsive element, and further provided with a leaf spring, or similar device acting as a strut between the frame members so as to confine or restrain the arms of the frame through a certain range of pressures, thus maintaining the locking means closed, and permitting the arms to be unsupported at some determinate pressure area, allowing the locking means to open and release a load confined in said locking means.

Other features and advantages of the invention will be apparent from the following description to be read in the light of the accompanying drawings in which:

Fig. 1 is a front elevational view of a preferred form of release device in closed position;

Fig. 2 is a front elevational view of the release device in open position;

Fig. 3 is front elevational fragmentary view of the device with another type of center supporting means in closed position;

Fig. 4 is a front elevational view of the device shown in Fig. 3 in open position;

Fig. 5 is a fragmentary view of an alternative form of release device embodying the principles of this invention in closed position; and,

Fig. 6 shows the device of Fig. 5 in open position.

Referring to the drawings, in Fig. 1, there are shown two adjoining arms **11**, **13**; arm **11** having secured thereto one end of a crossbar **15** by means of screws **17**, while the other end of the crossbar **15** is provided with a pivot pin **19**, about which the arm **13** is freely pivotable as hereinafter described.

The free end of the arm **11** terminates in a slot **21**, while the free end of the arm **13** terminates in a claw-like

hook **23**, which, when the device is in locked engagement as shown in Fig. 1, form a confining slot for retaining a ring **39** to which is secured the test equipment or any desired load to be dropped.

Laterally positioned through the crossbar **15** is an adjustment screw **25**, serving as a means for supporting a pressure sensitive element **27**. In the particular adaptation shown herein, the pressure sensitive element **27** is in the form of a pair of aneroid cells, in series, of conventional design which expand upon decrease in pressure. By raising or lowering the adjustment screw **25**, the aneroid cells can be longitudinally positioned within the frame so as to permit the device to function at varied pressures.

To the bottom of the lowermost aneroid cell, there is suitably secured, as by welding or the like, a knife-edged stud **29**, beneath which there is positioned a leaf spring **31** which is fitted between the arms **11** and **13** within notches **33** and **35** respectively. The leaf spring **31** serves to constrain the arms **11**, **13**, against inward movement, toward each other, when the spring is slightly arced when in engagement with the stud **29**, as shown in Fig. 1. It is to be noted that the notches **33**, **35**, have angulated sides which will permit the leaf spring **31** to assume arcuate positions as shown in Figs. 1 and 2. Proximate to the locking means, formed by the converging arms **11**, **13**, is a coil tension spring **37** which tends to draw the arms **11** and **13** toward each other. In the position shown in Fig. 1, the device is shown in locking position wherein the leaf spring **31**, serving as a strut, supports the arms whereby inward movement is prevented, thus permitting claw **23** to close the open end of slot **21**, restraining ring **39** and the load secured thereto.

For a more detailed view of the functioning of the device, reference is made to Fig. 2, where the release device is shown in releasing position. As the device ascends into the atmosphere, into regions of progressively lower pressure areas, the cells **27** will expand, thereby carrying the stud **29** in a downward direction. When the predetermined pressure area is reached, for which the cells were preset by control of their position within the frame, the leaf spring **31** will snap past dead center position, leaving the arms of the frame unsupported, whereby the coil spring **37** is free to pull the arm **13** inwardly, and thereby displace claw **23** from its locking position, as in Fig. 2, permitting ring **39** to fall freely and carry the load or equipment secured thereto.

In the modification shown in Fig. 3, in lieu of the leaf spring **31** there is shown a beam **41** that is center hinged and secured to each of the frame members **11** and **13** by means of pivot pins or the like. The beam operates in a manner similar to that of the leaf spring **31**, in that downward displacement caused by the expansion of the aneroid cells will cause beam **41** to assume the position shown in Fig. 4.

For raising the release device into the atmosphere, the device can be secured to a gas-filled balloon. For securing the device to a balloon, we provide an opening **43** in the crossbar, through which a cord **45** can be placed, which in turn is secured to the balloon.

In certain instances, where it is desired to reverse the operation of the pressure sensitive release device, that is, for example, where it is desired to release the device at a relatively high altitude, in a low pressure area, and release the test equipment, or any desired load, at a lower altitude or higher pressure area, we propose to use a pressure sensitive release device such as is shown in Figs. 5 and 6. The device shown in Fig. 5 is substantially similar to that as shown in Figs. 1-4, except that there is provided an arm **47**, which is secured to the lowermost pressure responsive element, terminating in a claw **49**, which claw is in releasable engagement with the under-

side of a hinged beam 51, which functions in a manner similar to the hinged beam 41 of Fig. 3. However, as the release device is dropped from a plane, at a relatively high altitude, with a parachute attached thereto, the aneroid cells will be expanded and as the parachute descends, reaching higher pressure areas, the cells will progressively decrease in size, raising arm 47 upwardly, carrying with it the hinged beam 51. At a certain atmospheric pressure, the hanged beam 51 will be upset and assume the position shown in Fig. 6, thereby permitting the coil spring 37 to function as hereinbefore described. It is to be understood that in lieu of the hinged beam 51, of the modification shown in Figs. 5 and 6, a leaf spring, similar to the leaf spring 31, may be utilized.

While there have been described what are at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. Automatic means for causing a load to be released at a predetermined pressure, comprising a pair of joined arms hinged at one end and forming a frame, one of said arms having affixed thereto, and within said frame, a pressure responsive element that is variable in size to variations in pressure, said arms forming a locking means for the load to be released, spring means for urging said arms toward each other, and a leaf spring between said arms to constrain said arms against inward movement and responsive to action of said pressure responsive element whereby said arms will be in locked or unlocked position upon variations in atmospheric pressure, said leaf spring having an arcuate length greater than the straight line distance between the arms when said locking means is in locked position and the load is supported.

2. Automatic means for causing a load to be released at a predetermined pressure, comprising a pair of joined arms forming a substantially tong shaped frame, a pressure responsive element within said frame and affixed to one of said arms, spring means for urging said arms toward each other, one of said arms having a slot therein, the other of said arms having a claw that cooperates with said slot to form a locking means for the load to be released, and a leaf spring between said arms to constrain said arms against inward movement and responsive to action of said pressure responsive element whereby said arms will be in locked or unlocked position upon variations in atmospheric pressure, said leaf spring having an arcuate length greater than the straight line distance between said arms when said locking means is in locked position and the load is supported.

3. Automatic means for causing a load to be released at a predetermined pressure, comprising a pair of joined arms forming a substantially tong shaped frame, a pressure responsive element within said frame and affixed to one of said arms, spring means for urging said arms toward each other, one of said arms having a slot therein, the other of said arms having a claw that cooperates with said slot to form a locking means for the load to be released, and a multi-membered center hinged beam between said arms responsive to action of said pressure responsive element whereby said arms will be in locked or unlocked position upon variations in atmospheric pressure the sum of the lengths of the members of said beam being greater than the straight line distance between the arms when said locking means is in locked position.

4. Automatic means for causing a load to be released at a predetermined pressure, comprising a pair of arms pivotally joined at one end and forming a frame, a pressure responsive element that is variable in size with variations in pressure, affixed to one of said arms and within said frame, said arms forming a locking means for the load to be released, spring means for urging said arms toward each other and means to constrain said arms against inward movement, said last mentioned means being responsive to action of said pressure responsive element whereby said arms will be in locked or unlocked position upon variations in atmospheric pressure, said constraining means having an arched length greater than the straight line distance between the arms when said locking means is in locked position and the load is supported.

5. A pressure sensitive release device for releasing a load comprising a pair of arms pivotally joined at one end forming a frame, a pressure responsive element that is variable in size with variations in pressure, affixed to one of said arms and within said frame, said arms cooperating to form a locking means for supporting said load when in locked position and for releasing said load when in open position, spring means for urging said arms into open position, a restraining member having a variable effective length between said arms, said member having an effective length great enough to constrain said arms against inward movement when said arms are in locked position and said load is supported, said restraining member being adjacent said pressure responsive element and responsive thereto whereby upon variations in atmospheric pressure the effective length of said member will be reduced to permit said spring means to urge said arms toward each other into open position thereby releasing said load.

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