Sept. 29, 1959 G. V. JEFFERSON 2,906,865

VEHICLE WEIGHING MEANS

Filed April 13, 1955 2 Sheets-Sheet 1

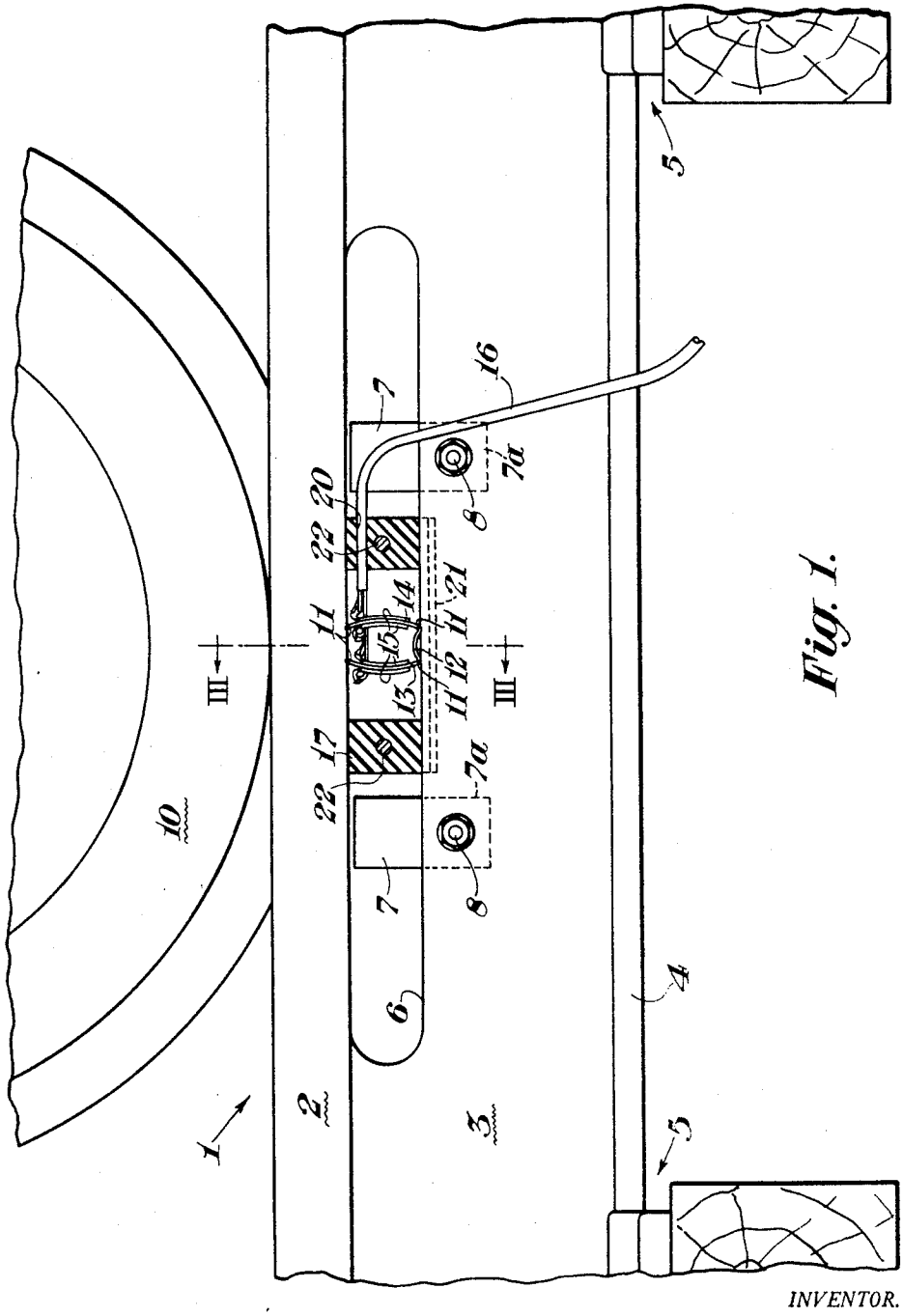

Fig. 1.

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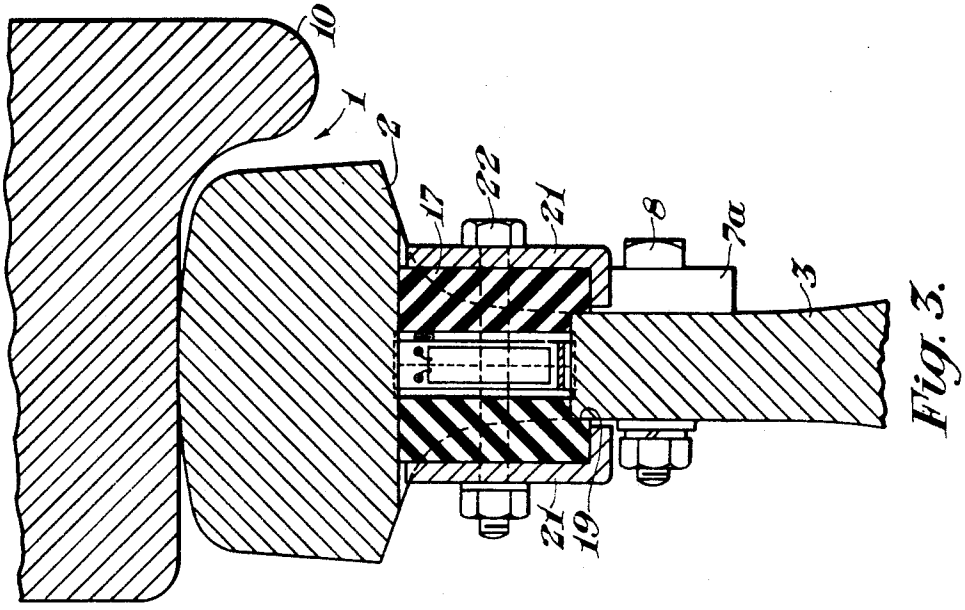

Fig. 3.

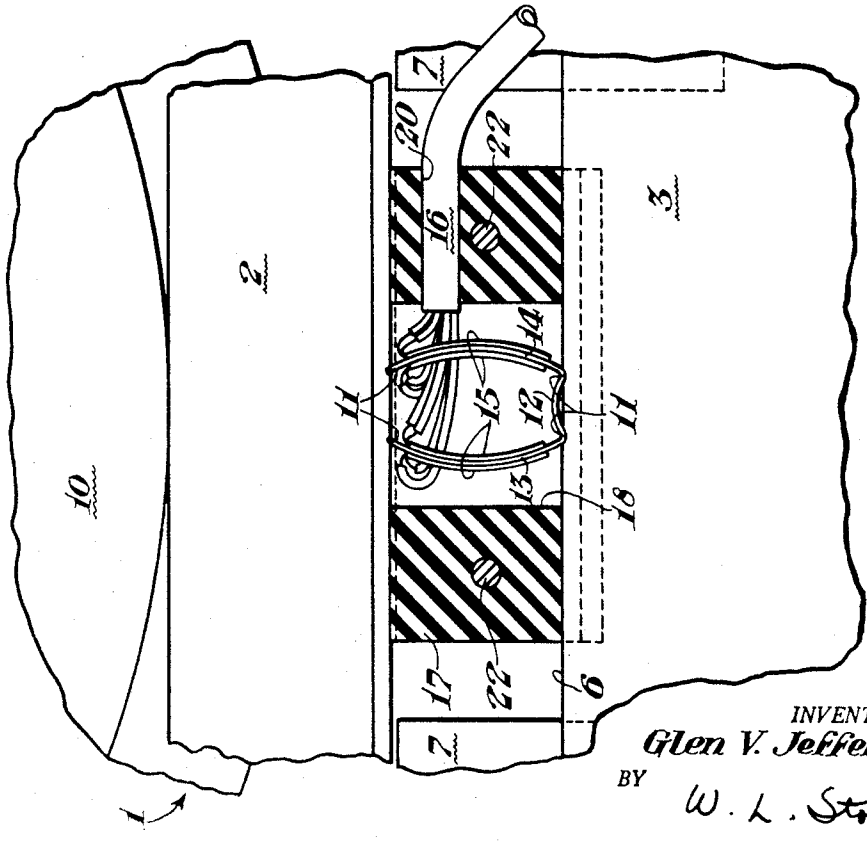

Fig. 2.

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VEHICLE WEIGHING MEANS

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Application April 13, 1955, Serial No. 501,123

4 Claims. (Cl. 246—251)

My invention relates to a vehicle weight responsive means, and particularly to a means mounted in a slot formed in the web of a railway rail and responsive to the deflection of the portion of the rail above the slot as car wheels pass over the slot.

In certain forms of weight measuring devices previously used, deflection of the entire rail between two support points is measured and translated into weight readings. This arrangement has the disadvantage of requiring a very rigid support and rigid rail anchoring means. Other types of weight measuring devices which have been used require entire rail sections to be supported on scales or a portion of the railhead to be cut away to provide clearance for a weight responsive lever. The supporting of an entire rail section on scales requires an installation which is expensive to make and maintain and the cutting away of the head of the rail is objectionable due to the resulting break in the wheel rolling surface.

It is therefore an object of my invention to provide a novel weight measuring device capable of operation under small railhead deflections.

Another object of my invention is to provide a novel weight measuring device capable of low installation cost.

Another object of my invention is to provide a novel weight measuring device that is capable of amplifying the small railhead deflection changes.

Another object of my invention is to provide a weight responsive device that is sufficiently compact to be contained within the area beneath the railhead.

Other objects, purposes and characteristic features of my invention will be in part obvious from the accompanying drawings, and in part pointed out as the description of the invention progresses.

In the following description the slotted member is referred to as a rail having an upper portion, an intermediate portion and a lower portion. However, it is to be understood that a rail is merely a particular type of beam member carrying a variable load.

My invention is therefore not to be restricted to a rail but is applicable to any beam member having an upper portion, an intermediate portion and a lower portion.

In practicing my invention I provide a circuit controlling device located within a slot provided in the web of a railroad rail or other load carrying device in a manner to be responsive to the deflection into the slot of the upper portion of the rail caused by a passing load. The circuit controlling device comprises strain gages arranged to amplify any deflection of the railhead or upper portion toward the bottom of the slot within the rail. The strain gage response may be used for any desired purpose, such for example, as to provide weight information for use in automatically controlling the braking action of car retarders in a classification yard in accordance with the weight of the car.

The provision of a circuit controlling device which can be mounted in a slot in the intermediate portion of a rail in the manner indicated eliminates the need for special and expensive rail supports. The type of circuit controlling device disclosed is also capable of being operated through small railhead deflections.

In describing my invention in detail, reference will be made to the accompanying drawings in which corresponding parts are generally identified by corresponding reference characters and in which:

Fig. 1 is an elevated view of my novel weight responsive circuit controlling device mounted in place in a rail slot in accordance with my invention and with certain parts sectioned to better show the deflection responsive device.

Fig. 2 is another elevated view of my novel circuit controlling device shown enlarged to better illustrate the details of the structure.

Fig. 3 is a cross sectional partial view taken along the line III—III of Fig. 1.

I shall describe one form of vehicle weighing means embodying my invention, and shall then point out the novel features thereof in claims.

In classification yards the need has arisen for a quick acting weight responsive circuit controlling device that will weigh a single wheel passing over a desired location without the other wheels affecting the response. The need has arisen due to the use of automatic retarders in which it is necessary for initial retarder shoe pressure to be established according to the weight per wheel of a passing vehicle. Hence, a lightly loaded vehicle would receive a low initial retarder pressure while a heavy vehicle would receive a high initial retarder pressure.

Referring to the drawings, the reference character **1** designates a rail having an upper portion **2**, an intermediate portion **3** and a lower portion **4**, and which is supported on typical ties and tie plates **5**.

Formed within the intermediate portion **3** of the rail **1**, is an elongated slot **6** which is positioned directly beneath the upper portion **2** of the rail **1**. Inserted into the slot **6** is a pair of stop members **7** which, when secured in place by the bolts **8**, seat firmly down against the bottom of the slot **6**. The top of each of the stop members **7** is spaced from the lower surface of the upper portion **2** of the rail **1** a sufficient distance to allow deflection of the upper portion **2** into the slot **6** by a typical wheel **10**, without exceeding the fatigue limit of the upper portion **2**. The bolts **8** which secure the stop members **7** to the rail pass through clearance holes provided in downwardly projecting lugs **7a** formed on the lower ends of the stop members and through other clearance holes formed in the intermediate portion **3** of the rail **1**.

Formed in the upper and lower surfaces of the elongated slot **6** are a plurality of transverse grooves **11**. Inserted into the elongated slot **6** and within the transverse grooves **11** is a U-shaped resilient leaf spring **12**. In order to install the U-shaped leaf spring **12** within the slot **6** it is necessary to bow the vertical legs **13** and **14** of the U-shaped leaf spring **12**, thus placing the legs **13** and **14** under compression and causing the firm engagement of the U-shaped leaf spring **12** within the transverse grooves **11**. With the legs **13** and **14** of the U-shaped leaf spring **12** under compression and within the grooves **11** in the upper and lower surfaces of the slot **6**, it can be seen that a deflection of the upper portion **2** of the rail **1** (due to a load applied to the upper surface of the upper portion **2**) into the slot **6**, would cause the slot **6** to become narrower and the legs **13** and **14** of the U-shaped leaf spring **12** to become more bowed.

It should be pointed out at this time that a small deflection of the railhead **2** downwardly against the ends of the legs **13** and **14** of the U-shaped leaf spring **12** would cause an exaggerated or amplified deflection of the bowed legs **13** and **14**.

Secured to the inner and outer surfaces of the legs **13** and **14** are a plurality of resistance strain gages **15**.

The strain gages 15 are connected through an electrical conductor 16 to a control circuit (not shown, since this forms no part of my invention).

Surrounding the U-shaped leaf spring 12 is a resilient weather-tight sealing member 17 of a material such as rubber, for preventing the entry of foreign matter, such as dust or water, into the area of the U-shaped leaf spring 12. The weather-tight sealing member 17 is provided with a vertical opening 18 through its center sufficiently large to receive the U-shaped leaf spring 12 without interference. The upper and lower surfaces of the weather-tight sealing member 17 fit firmly against the upper and lower surfaces respectively which define the slot 6. In addition, the lower surface of the member 17 is provided with a groove 19 of sufficient width to receive therewithin the intermediate portion 3 of the rail 1 constituting the bottom of the slot 6. The weather-tight resilient sealing member 17 is split along a vertical longitudinal plane and through its center. This allows the weather-tight sealing member 17 to be installed in two halves after the U-shaped spring 12 and its strain gages 15 have been lodged in place. It can also be seen that the weather-tight sealing member 17 is provided with an opening 20 for allowing the electrical conductor 16 to enter into the opening 18 and connect to the strain gages 15.

The weather-tight sealing member 17 is retained in place by two securing clamps 21 which are in turn secured in place by the securing bolts 22. The clamps 21 are L-shaped in cross section and extend approximately the full length of the weather-tight sealing member 17. When secured in place by the securing bolts 22, the horizontal portion of each L-shaped clamp extends along that portion of the lower surface of the weather-tight sealing member 17 which extends out beyond the width of the intermediate portion 3 of the rail 1.

Upon tightening the securing bolts 22 the clamps 21 are forced inwardly against the weather-tight sealing member 17 forcing it to expand upwardly and downwardly against the upper portion 2 and intermediate portion 3, respectively, of the rail 1. It is to be noted that when the securing clamps 21 are firmly in place, there is no metallic connection between the clamps 21 and the upper portion 2 or intermediate portion 3 of the rail 1. This is to provide freedom of motion of the upper portion 2 of the rail 1 due to a passing load over the upper portion 2.

With the strain gage controlling device constructed and arranged in the manner described, it will be obvious that each car wheel 10 passing over the upper portion 2 of the rail 1 will cause the upper portion 2 to deflect downwardly, resulting in a narrowing of the slot 6. The narrowing of the slot 6 in turn causes the bowed legs 13 and 14 of the resilient U-shaped spring 12 to increase their bowed condition and consequently causes a change in the resistances of the strain gages cemented to each of the legs 13 and 14. It can be clearly seen that the greater the load being applied to the upper portion 2 of the rail 1, the greater its deflection and the greater the bowing of the legs 13 and 14 of the U-shaped spring 12. The effective change in the resistance of each of the strain gages due to different loads being applied to the upper portion 2 of the rail 1 is carried through the conductor 16 which is connected to a detecting circuit (not shown).

Should the load of the passing vehicle greatly exceed the expected load to be carried by the upper portion 2 of the rail 1, the upper portion 2 would deflect downwardly and strike the stop members 7, thus avoiding any upper portion 2 or strain gage structure damage.

It is to be understood that it is within the scope of my invention to vary the rail slot position, shape and size to obtain the amount of railhead deflection desired.

It is to be further understood that it is within the scope of my invention to use other types of strain gage controllers within a slotted rail.

Although I have herein shown and described only one form of rail slot and strain gage controller embodying my invention, it is to be understood that various changes and modifications may be made therein, within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination with a load carrying member comprising upper, intermediate and lower portions and having a slot formed in the intermediate portion, said slot being in the form of an opening extending from side to side of said intermediate portion and being located sufficiently close to the upper portion to permit upper portion deflection into the slot upon the application of a force on the upper portion above the slot, a U-shaped leaf spring in said slot having bowed leg members between the upper and lower surfaces of the slot, and strain gages secured to said spring leg members to provide a measure of the deflection of the upper portion of the load carrying member, half of said strain gages being placed under tension and the other half of the gages under compression upon deflection of the upper portion of the load carrying member.

2. In combination with a load carrying member comprising upper, intermediate and lower portions and having a slot formed in the intermediate portion, said slot being in the form of an opening extending from side to side of said intermediate portion and being located sufficiently close to the upper portion to permit upper portion deflection into the slot upon the application of a force on the upper portion above the slot, stop means for said slot to limit the deflection of the upper portion of the load carrying member within its fatigue limits, a U-shaped leaf spring in said slot having bowed leg members between the upper and lower surfaces of the slot, and strain gages secured to said spring leg members to provide a measure of the deflection of the upper portion of the load carrying member, half of said strain gages being placed under tension and the other half of the gages under compression upon deflection of the upper portion of the load carrying member.

3. In combination with a load carrying member comprising upper, intermediate and lower portions and having an elongated slot formed in the intermediate portion, said slot being in the form of an opening extending from side to side of said intermediate portion and being located sufficiently close to the upper portion to permit upper portion deflection into the slot to cause a narrowing of the slot upon the application of a load on the upper portion above the slot, stop means for the slot to limit the deflection of the upper portion of the load carrying member within its fatigue limits, bowed leaf spring members, the upper and lower ends of said spring members arranged to respectively bear against the upper and lower surfaces of the slot and being supported thereby, said upper portion when deflected into the slot causing an additional and relatively amplified bowing of said leaf springs, and strain gages secured to the sides of said spring members to provide a measure of the deflection of said upper portion, half of said strain gages being placed under tension and the other half of the gages under compression upon deflection of said upper portion.

4. In combination with a load carrying member comprising upper, intermediate and lower portions and having an elongated slot formed in the intermediate portion, said slot being in the form of an opening extending from side to side of said intermediate portion and being located sufficiently close to the upper portion to permit upper portion deflection into the slot to cause a narrowing of the slot upon the application of a load on the upper portion above the slot, bowed leaf spring members, the

upper and lower ends of said spring members arranged to respectively bear against the upper and lower surfaces of the slot and being supported thereby, said upper portion when deflected into the slot causing an additional and relatively amplified bowing of said leaf springs, and strain gages secured to the sides of said spring members to provide a measure of the deflection of said upper portion, half of said strain gages being placed under tension and the other half of the gages under compression upon deflection of said upper portion.

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