Feb. 27, 1962 R. MARINDIN 3,022,832

SPRING CONTROL MECHANISM FOR HYDRAULICALLY CONTROLLED IMPLEMENT HITCH

Filed May 12, 1958 3 Sheets-Sheet 1

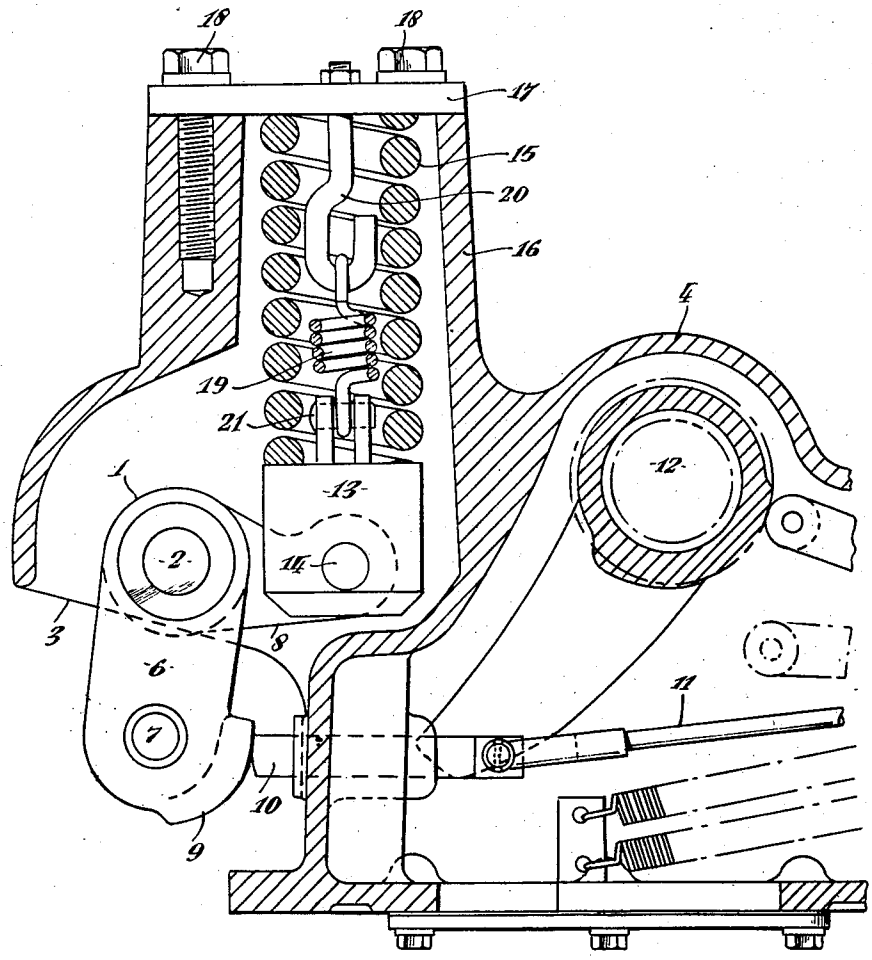


Fig. 1.

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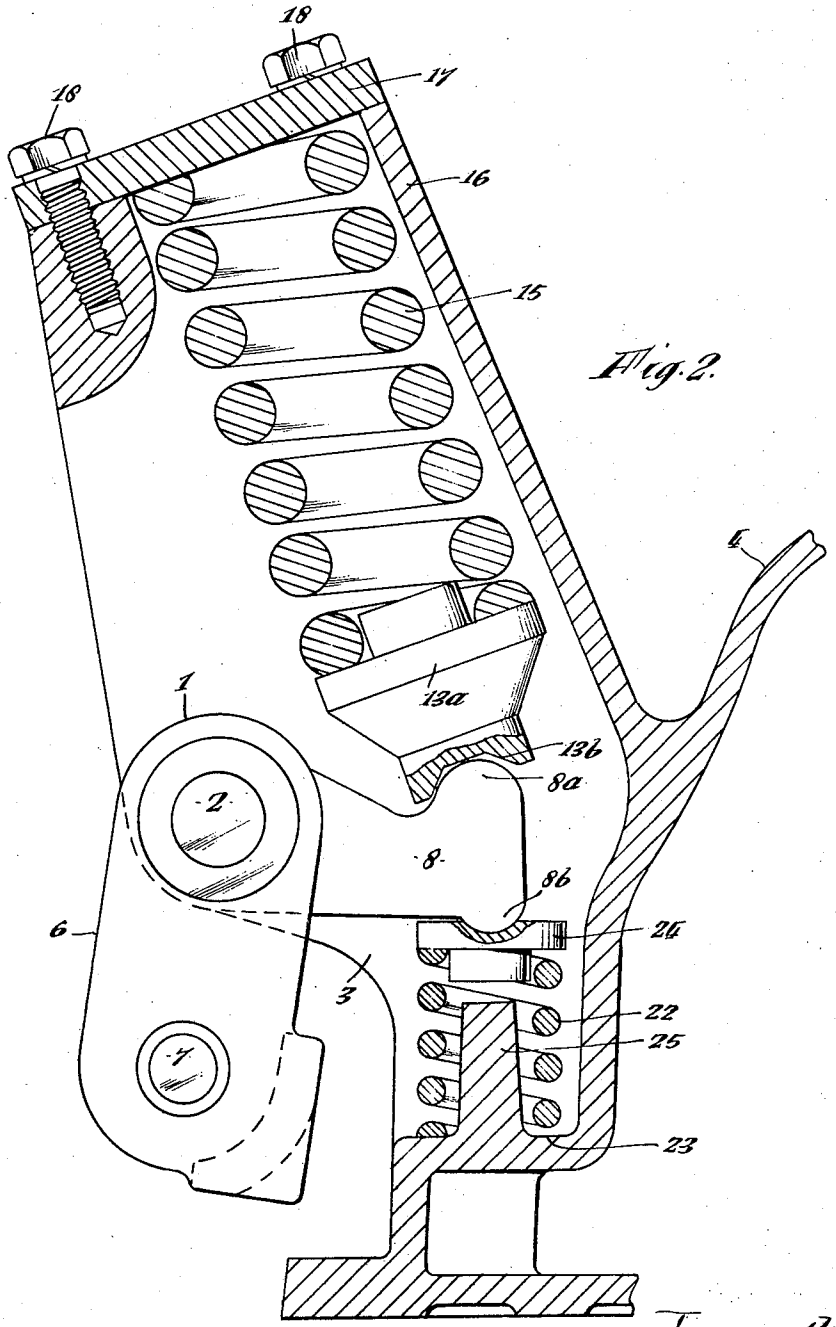


Fig. 2.

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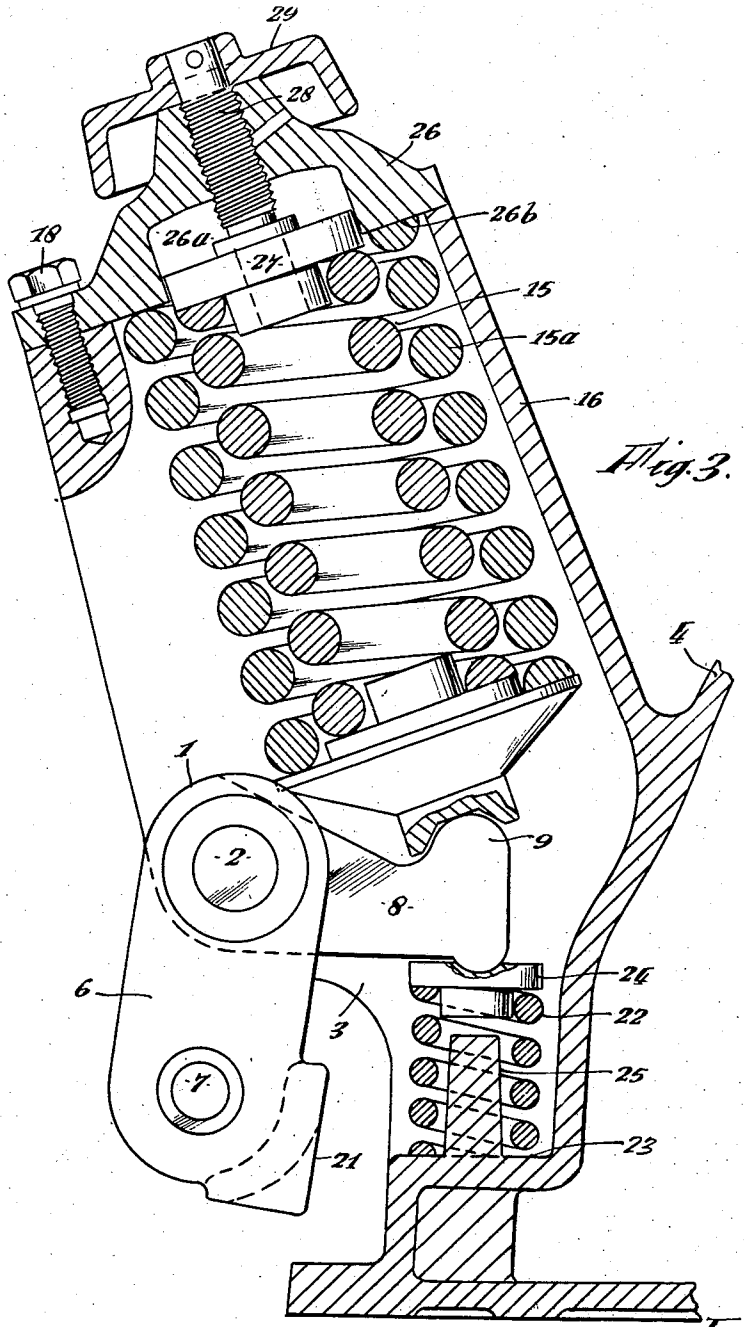


Fig. 3.

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3,022,832

SPRING CONTROL MECHANISM FOR HYDRAULICALLY CONTROLLED IMPLEMENT HITCH

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Claims priority, application Great Britain May 13, 1957
3 Claims. (Cl. 172—10)

This invention relates to tractors, and is particularly concerned with improvements in tractors of the kind provided with an implement-attaching linkage of the three-point type and wherein a hydraulic power lift connected to the linkage is operable by control valve means actuated by movements of a draft-responsive member for obtaining what is known as "automatic draft or depth control." In such tractors, the top link of the three-point linkage is connected to the tractor by a movable anchorage member and is displaceable against reaction spring means in accordance with changes in draft load transmitted through the top link. The control valve means for the hydraulic power lift is actuated through suitable mechanism by means of a draft-responsive member connected to or actuated by the top link or movable anchorage thereof.

In draft control mechanism of this kind as heretofore proposed, the reaction spring means usually consists of a single spring reacting against compressive forces in the top link, or in some cases reacting in both directions against compressive and tensile forces in the top link.

Some implements, such as ploughs, exert a heavy draft load involving substantial compressive force on the top link of the three-point linkage, while other implements operate with the top link in tension, or varying between tension and compression, in which case the forces exerted on the top link may be comparatively light. For this reason a single double-acting spring offering the same resistance to both high compressive forces in the top link and comparatively light tensile forces may be unsatisfactory for sensitive operation of the control valve means when operating with implements imposing relatively light tensile forces in the top link.

The present invention has for its object to provide an improved reaction spring arrangement whereby sensitive draft control may be obtained with various types of implements, and which may be readily adaptable for sensitive automatic draft control with higher or lower ranges of draft load with the top link in compression. A further object is to provide an improved reaction spring arrangement whereby sensitive draft control may be obtained when an implement exerts very little draft load, or in which the draft load causes changes between tension and compression in the top link.

According to the present invention, a reaction spring arrangement for draft control mechanism of the kind referred to comprises the spring units arranged and adapted to act in opposition on the movable anchorage member for the top link, one spring unit reacting against compressive forces in the top link, and the other spring unit acting against tensile forces in the top link. Preferably the spring units are constructed or arranged so that in a neutral position of the anchorage member there is no load, or substantially no load, in either spring and so that one spring can operate independently of the other.

In one arrangement the spring unit reacting against compressive force in the top link may be a compression spring, and the spring unit reacting against tensile force in the top link may be a tension spring disposed concentrically within the compression spring.

In a modified arrangement, both spring units may comprise compression springs acting in opposition on the

movable anchorage member. Each spring unit may comprise a single or multiple spring.

By arranging the oppositely acting springs to be under no load, or to have only a small amount of pre-load in the neutral position of the anchorage member, small changes in draft load in either direction will result in sufficient movements of the anchorage member for effective operation of the control valve means.

The rate of the oppositely acting spring units is selected according to the compressive and tensile forces involved in the operation of various implements. Generally speaking, the spring unit reacting against tensile forces will be of lighter rate than the spring unit reacting against compressive forces but, depending on factors such as the design of the three-point linkage and of the mechanism operating the control valve means, the relative rates of the two spring units may be varied as desired.

The spring unit reacting against compressive forces in the top link may comprise at least two springs, and manually operable means may be provided for adjusting the spring unit so that said springs operate either in combination for use with heavy draft loads, or with one spring operating at full loading and the remaining spring or springs put out of action or operating at reduced loading.

In a preferred embodiment, two concentric helical springs are employed, the outer spring operating permanently at full loading, and the inner spring being adjustable by manually operable means, such as a screw device, so that it can be put out of action or caused to operate with reduced loading. Preferably, the inner spring, which can be put out of action for use with light draft loads, is of stronger rate than the outer spring. When both springs are used in combination, an effective reaction spring arrangement for use with very heavy draft loads is provided. When the inner spring is put out of action for use with light draft loads, the lighter rate outer spring remaining in operation gives more sensitive response. Instead of putting the inner spring entirely out of operation, the screw device may be adjustable to reduce its loading to a suitable degree according to requirements.

The reaction spring arrangement according to the invention is of particular application for use with the automatic draft control arrangement according to the co-pending application Serial No. 728,016, filed April 11, 1958, in which the top link is connected to a downwardly depending arm of a pivoted bell crank lever arrangement, a forwardly extending arm of which is operatively engaged by the reaction spring arrangement.

The invention is hereinafter described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a sectional side elevation illustrating one embodiment of reaction spring arrangement according to the invention;

FIG. 2 is a similar view illustrating a modification; and

FIG. 3 is a similar view illustrating a further modification.

In carrying the invention into effect according to one embodiment, and with reference to FIG. 1 of the accompanying diagrammatic drawings, the invention is shown as applied to an automatic draft control arrangement in accordance with the co-pending application before referred to, wherein a movable anchorage member 1 is constituted by a bell crank lever arrangement mounted on a transverse pivot 2 between side walls 3 projecting from the rear end of a housing 4 for the automatic draft control mechanism. A downwardly extending arm 6 of the bell crank lever arrangement provides a movable anchorage for the top link of a three-point linkage which is connected

to the arm 6 at 7. A forwardly extending arm 8 of the bell crank lever arrangement co-operates with the reaction spring arrangement and an abutment 9 at the lower end of the arm 6 coacts with a slidable member 10 pivotally connected to a rod 11 for operating control valve means (not shown) whereby movement of a power lift cross-shaft 12 by a hydraulic ram unit is effected for obtaining automatic draft control.

In the embodiment shown in FIG. 1, a cap member 13 is pivoted to the arm 8 by means of a pivot pin 14, and a compression spring 15 is arranged within an upwardly extending housing 16 between the cap member 13 and a top plate 17 secured to the housing 16 by studs 18. A tension spring 19 extends between a hook 20 and pin 21 secured respectively to the top plate 17 and the cap member 13.

In the position shown in the drawing, the movable anchorage member 1 is in a neutral position and neither of the springs 15 and 19 is under load. If compressive force is exerted through the top link to cause movement of the anchorage member 1 in an anti-clockwise direction, the spring 15 will be compressed, the elongated formation of the hook 20 permitting the spring 19 to rise and fall with the arm 8. If the movable anchorage 1 moves in the clockwise direction from the neutral position shown on occurrence of tensile forces in the top link, the tension spring 19 will be extended and the spring 15, which has little or no load on it, is free to move up and down with the cap member 13.

In the modification illustrated in FIG. 2, the compression spring 15 is disposed, as in the construction of FIG. 1, to extend between the top plate 17 and a lower cap member. The cap member 13*a*, however, instead of being pivoted to the arm 8, may be formed with a recess 13*b* engageable by an upper head portion 8*a* at the end of the arm 8. The spring reacting against tensile forces in the top link comprises a compression spring 22 arranged to extend between an abutment 23 and a cap member 24 suitably recessed to engage a lower head portion 8*b* of the arm 8. A stop member 25 may be arranged to coact with the cap member 24 to provide a positive neutral or hold position for the control valve means when the implement is raised to transport position and the increased tension in the top link compresses the spring 22.

As tensile forces in the top link are normally much smaller than the compressive forces, the spring 19 or 22 reacting against tensile forces may be of lighter rate than the spring 15 to provide improved sensitivity of control as compared with the known arrangement in which a single double-acting spring is used to react against both tensile and compressive forces in the top links.

In the modification illustrated in FIG. 3, the spring unit reacting against compressive forces in the top link comprises two concentric helical springs 15, 15*a*. The outer spring 15*a* preferably is of lighter rate than the inner spring 15 and extends between the cap member 13*a* and an abutment 26*b* at the underside of a cover member 26 secured to the top of the housing 16 as by studs 18. The inner spring 15 extends between the cap member 13*a* and a thrust member 27 which is axially adjustable within a recess 26*a* by means of a screw 28 manually operable by means of a hand wheel 29 or the equivalent.

The modified reaction spring arrangement above described is used in the following manner: For operation with implements imposing heavy draft load in compression in the top link, the hand wheel 29 is screwed down to the position shown in the drawing so that both the springs 15 and 15*a* apply full loading on the cap member 13*a* and then to the arm 8 of the bell crank lever arrangement. In response to compressive forces on the top link sufficient to overcome the reaction of the combined springs 15 and 15*a*, the arm 6 will be moved about the pivot 2 to actuate the draft control mechanism.

For operating with implements imposing a relatively light draft load in compression in the top link, the hand wheel 29 is rotated to withdraw the thrust member 27 into the recess 26*a* so that the inner spring 15 is put out of operation and the outer spring 15*a* of lighter rate operates alone to give more sensitive operation of the automatic draft control by causing said draft control to respond to relatively light draft loads which would be insufficient to actuate the draft control mechanism if both springs 15 and 15*a* were in operation.

For draft loads in an intermediate range, the hand wheel 29 may be operated so as to partially withdraw the thrust member 27 to reduce the loading on the inner spring 15 to a suitable degree depending on the particular draft load conditions.

A further important advantage of this arrangement is that a safety overload pressure or clutch release operable to come into action on movement of the arm 6 anti-clockwise beyond a predetermined point, as shown in the above referred to co-pending application, may be caused to come into action with high or low top link loading, or at a selected intermediate top link loading.

The arrangement described gives more sensitive draft control over a wide range of top link loads in compression.

To render the arrangement suitable for use with implements in which the top link loads are in tension or are liable to vary between tension and compression, a spring 22 of comparatively light rate is arranged, as in the embodiment shown in FIG. 2, to extend between an abutment 23 and a lower head portion 24 of the arm 8 so as to react against tension forces in the top link. In the neutral position shown, the springs acting in opposition have very little pre-load and consequently small changes in top link loading will be sufficient to effect movements of the arm 6 for operation of the draft control mechanism.

It will be understood that the invention is not limited to the particular embodiment hereinbefore described. For example, the reaction spring arrangement according to the invention is applicable to other constructions wherein automatic draft control mechanism is actuated by a draft-responsive member. Furthermore, the springs reacting against compression loads in the top link may be otherwise arranged in any suitable manner and more than two springs may be provided.

I claim:

1. A reaction spring arrangement for draft control in a vehicle of the type provided with an implement hitch having a top link having horizontally directed compression and tension forces acting therethrough and a hydraulic implement lifting control means, the improvement comprising a support structure on the vehicle, a movable member mounted on the structure and having a generally horizontal forwardly extending arm and having a generally vertical downwardly extending arm providing an anchorage with the top link on one side thereof and engageable with the hydraulic control means on the other side thereof, a first spring seat being pivotally attached to and atop the forwardly extending arm, a second spring seat on the support structure above said first seat, a first spring disposed between the seats and having its longitudinal axis in a generally vertical position and compressible in an upward direction upon application of the compressive force in the top link, a second spring disposed within and concentric to the first spring and having its longitudinal axis in a vertical position and having an upward portion connected with the second seat and a lower portion connected with the first seat and being placed in tension in a downward direction upon application of a tension force in the top link.

2. A reaction spring arrangement for a draft control in a vehicle of the type provided with an implement hitch having a top link having generally horizontally directed compression and tension forces acting therethrough and having a hydraulic implement lifting control means, the improvement comprising a support structure on the vehicle, a movable member having a pivot connection with

the vehicle, the member having a generally forwardly extending arm ahead of the pivot connection and having a generally downwardly extending arm having an anchorage with the top link below the pivot connection and on one side of the downwardly extending arm and engageable with the control means below the pivot connection and on the other side of the downwardly extending arm, a first spring seat being connected to the forwardly extending arm and ahead of the pivot connection, a second spring seat on the support structure above said first seat, a first vertically acting spring disposed between the seats and in engagement therewith and compressible in an upward direction upon application of the compression force in the top link, a second vertically acting spring disposed within the first spring and having means connecting the second spring with the seats and being in tension in a downward direction upon application of the tension force in the top link.

3. The invention according to claim 2 and the means connecting the second spring to the seats providing a lost motion coupling upon application of the compression forces in the top link.

References Cited in the file of this patent

UNITED STATES PATENTS

2,222,146	Jonsson	Nov. 19, 1940
2,440,550	Martin	Apr. 27, 1948
2,460,847	Schwarz	Feb. 8, 1949
2,663,239	Rapp et al.	Dec. 22, 1953
2,714,346	Valin	Aug. 2, 1955
2,864,295	Du Shane	Dec. 16, 1958
2,871,963	Harris et al.	Feb. 3, 1959

FOREIGN PATENTS

1,133,819	France	Apr. 2, 1957
2,024,740	Germany	Feb. 20, 1958