March 23, 1937. N. E. JERSEY 2,074,962

GRADER

Filed July 9, 1935 2 Sheets-Sheet 1

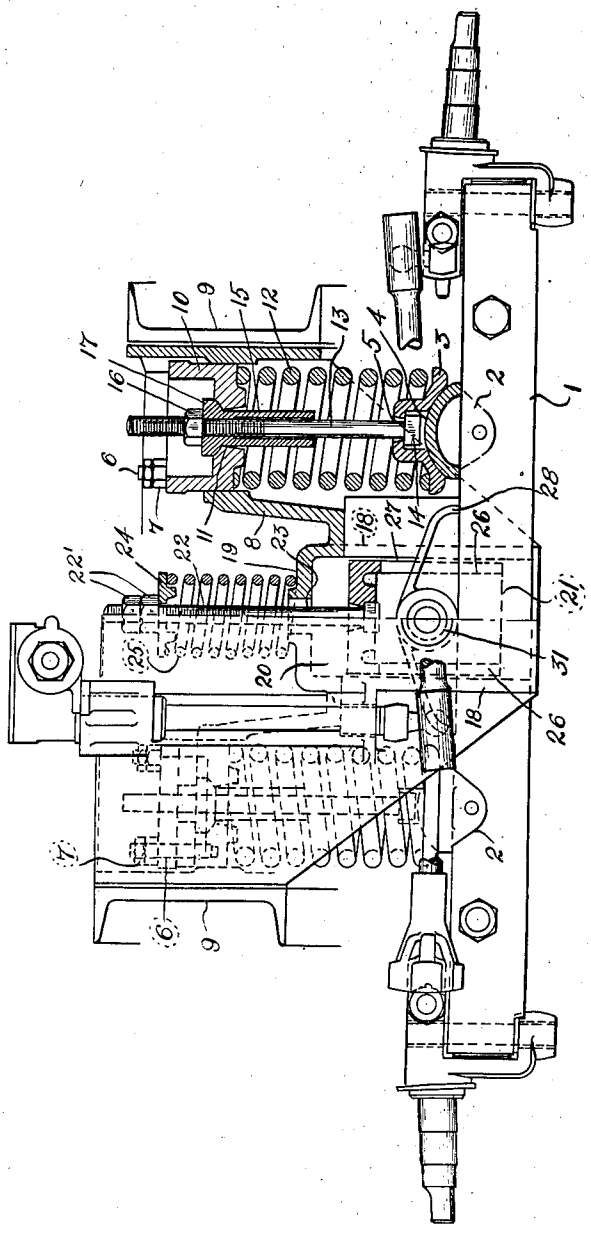


Fig. 1

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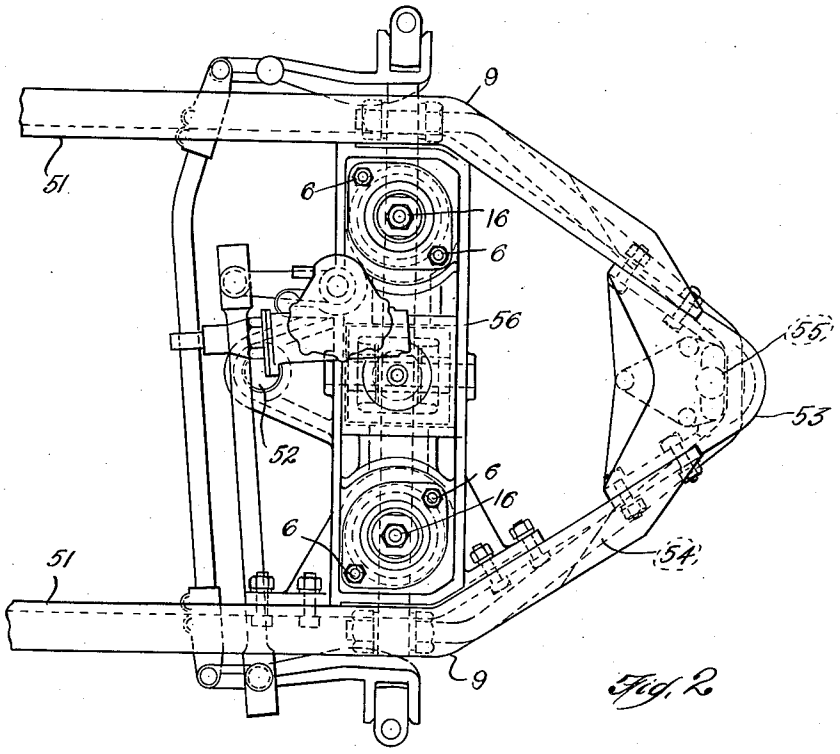


Fig. 2

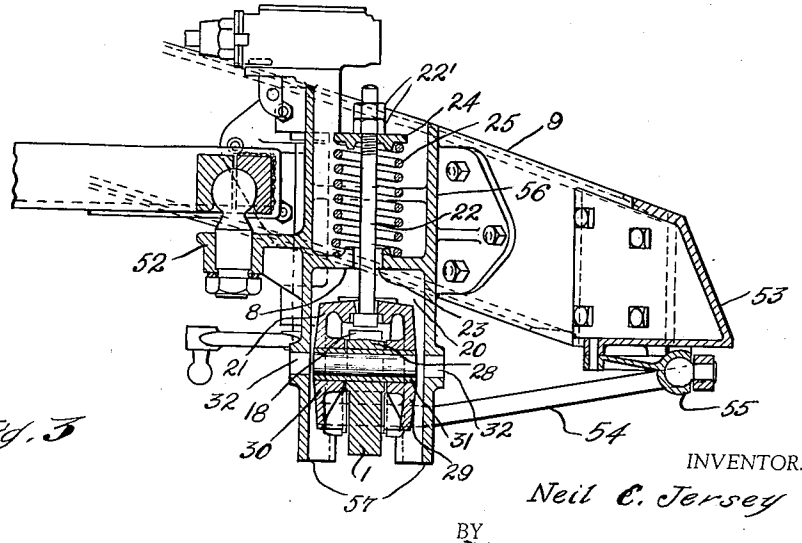


Fig. 3

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2,074,962

GRADER

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Application July 9, 1935, Serial No. 30,529

11 Claims. (Cl. 280—112)

This invention relates to means for mounting the forward end of the frame of a motorized grader in relation to an axle which carries the steering wheels. In such a road grader it is usual to mount the frame, carrying the grader blade, on a tractor and in advance thereof. Such frame extends forward of the blade and the forward end is supported upon an axle upon the ends of which are mounted steerable wheels in the usual manner. To permit the front axle to accommodate itself to irregularities of surface without disturbing the cut made by the blade, the conventional mounting has been by means of a horizontal pin longitudinally placed, as in the well understood oscillating type of front axle. Such mountings were accepted in graders of the early motorized development, but serious faults developed as improvements were made in the tractor-grader combination which permitted operation at higher speeds. Though the axle accommodated itself to the irregularities of the work, it did not do so without imparting forces to the frame, which forces developed into a tendency to side-whip. These same forces also affected the cutting blade causing it to chatter and function irregularly. The substitution of a spring suspension for the conventional oscillating mounting resulted in an improved operation, but such suspension is not effectual at the full speeds desired in the use of present day graders.

The object of the present invention is the provision of a dual front axle mounting which may be used at the pleasure of the operator either as an oscillating mounting or as a spring supported mounting.

Another object is the provision of means in connection with an oscillating mounting which overcomes the tendency to side-whip and chatter.

Another object is the provision of a spring mounted front end which may be so adjusted, as to tension, that the weight of the entire axle and wheel assembly will be effective in holding a blade or scarifier in contact with the ground.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims. The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting however, but one of the various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is an elevational view of the front end of a grader showing, partly in cross-section, a mechanism mounting a grader frame on a front axle and embodying my invention.

Fig. 2 is a plan view in cross-section of the structure shown in Fig. 1.

Fig. 3 is a vertical cross-sectional view of the structure shown in Fig. 2 taken on the line 3—3.

The drawings show the front end of a tractor grader of a type well understood, having a frame 51 extending forward and resting upon a front axle and having a sub-frame, not shown, suspended from said frame, which sub-frame carries the blade or other working tool and is adjustable relative to said frame 51. The forward connection of said sub-frame with said frame 51 is through a ball and socket joint 52 mounted on the head-casting 56, hereinafter described, in the longitudinal median line of the grader. In the grader shown the side members 9 of the frame 51 have been carried forward past the front axle and then bent together and united by a casting 53 which is tied to the front axle by a yoke 54 through a ball and socket joint 55. Transverse of the frame 51 above the front axle is a head-casting 56 joining the two side members 9. This head-casting is formed with two spaced vertical plate-members 57, disposed transversely of the grader, which are connected by a web member 8 which is horizontally disposed between said vertical members. Referring to the drawings, on the front axle 1, saddle members 2 are mounted equidistant from the center point of the axle. These saddle members 2 present semi-spherical surfaces upon which are seated caps 3, each of which has a centrally located recess 4 and aperture 5. Removably mounted by bolts 6 and nuts 7 in holes in the horizontal web-member 8 of the grader frame 51 are cup-like members 10 having apertures 11 centrally located through the bottoms thereof. Spiral springs 12 are mounted between cup-like members 10 and caps 3. Threaded bolts 13 within the spiral springs 12 connect the caps 3 and the cup-like members 10 through the apertures 5 and 11, respectively. The heads 14 of the bolts are held in the recesses 4 of the caps and the threaded ends pass upward through sleeves 15 slidably mounted in the apertures 11 of the cup-like members 10. Nuts 16 on the threaded end of the bolts 13 bear against collars 17 on the sleeves 15 which restrict downward movement of the sleeves through the apertures 11. Through adjustment of nuts 16 relative positions of the caps 3 and the cup-like members 10 are determined and the tension of the springs 12 regulated.

In the head-casting 56 dependent webs 18 below the middle section 19 of the horizontal web members 8 form with the front and back vertical members 57 of the head-casting 56 a vertical guide box 20. Within this guide box is a guide block 21 in close-fitting sliding relation between said dependent webs 18. A threaded bolt 22 slidably mounted through an aperture 23 centrally located in the top of the guide-box 20 is connected to and supports the guide-block 21. Mounted on the upper end of bolt 22 is a washer 24 between which and the head of the guide-box, or section 19 of the web member 8, is seated a spiral spring 25. Nuts 22' on the bolt 22 adjustably control the tension in the spring 25.

The guide-block 21 is formed with an extended slot 26 therethrough opening in the faces 27, which faces are in close-fitting contact with the dependent web-members 18 in the head-casting 56. A yoke member 28 fixedly mounted on the upper face of the axle 1 passes through the slot 26 in the guide-block 21. Through concentric apertures in the yoke 28 and the front wall 29 and the rear wall 30 of the guide-block, a bushing 31 is mounted holding said block and said axle in fixed vertical relation, but permitting limited rotation of said block about the axis of said bushing.

When it is desired to operate the grader with an oscillating front axle, a center pin may be so mounted through said bushing 31 as to engage apertures 32 in the front and rear vertical members 57 of head-casting, which apertures are so positioned in said vertical members as to align with said bushing when the guide-block is in the desired position. When so used with an oscillating front axle, the operation thereof will be the same as when standard oscillating front axle mounted except that by properly tensioning the spiral springs 12, they are given the function of stabilizers and will counteract the tendency of the frame and blade to side-whip in operation.

When used without a center pin tying the frame and the front axle together as described, the grader functions as one with the frame, spring mounted upon the front axle. This mounting is through the two spiral springs 12 which may be properly tensioned for such a mounting. Instead of oscillation between the frame and front axle about a center pin which oscillations are controlled by the springs 12, the movement between frame and axle is vertical through the springs 12. The guide block in the guide box maintains constant lateral relation between the frame and axle and the yoke 54 maintains constant longitudinal relation. Vertical relation between the front axle and the frame may be controlled by adjustment of the spiral spring 25 which resiliently connects the frame to the front axle. This spring may be so tensioned as to compensate for the weight of the entire front axle and wheel assembly when forward driving pressure is applied to the working tools of the grader. When so tensioned spring 25 will take all recoil out of the front end of the grader which would otherwise result from riding on the springs 12.

The improved front mounting when used with a center pin provides means adapted to counteract and restrain oscillations about such pin caused by variation in movement between axle and frame. This prevents side-whip of the frame which is a cumulative result of such oscillations.

When used without a center-pin the new mounting provides a side spring suspension between axle and frame. This inherently avoids side whip and the tendency in such a mounting for the frame to lift off the axle assembly is restrained by the resilient vertically sliding connection between frame and axle provided through the slide-box and its connecting rod. This resilient connection may be adjusted as to tension by means of the nuts mounted on said rod.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; springs, adjustable as to tension, positioned one at either side of said frame and supporting same on said axle; an element connecting said frame and said axle, said element being in advance of the axle and connected to the frame in the longitudinal median line thereof by a connection which restrains movement between said frame and said axle except movement rotative with respect to said connection; and means, adjacent said axle in the longitudinal median line of said frame, connecting said frame to said axle, said means restraining all relative movement therebetween except rotative movement about an axis passing through said first stated connection and resiliently restrained vertical movement in an arc about said first stated connection.

2. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; springs, adjustable as to tension, positioned one at either side of said frame and supporting same on said axle; an element connecting said frame and said axle, said element being in advance of the axle and connected to the frame in the longitudinal median line thereof by a connection which restrains movement between said frame and said axle except movement rotative with respect to said connection; means, adjacent said axle in the longitudinal median line of said frame connecting said frame to said axle, restraining all relative movement therebetween except rotative movement about an axis passing through said first stated connection and resiliently opposed vertical movement in an arc about said first stated connection; and removable means preventing said vertical movement last stated.

3. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; springs, adjustable as to tension, positioned one at either side of said frame and supporting same on said axle; and an element connecting said frame and said axle, said element being in advance of the axle and connected to the frame in the longitudinal median line thereof by a connection which restrains relative movement between said frame and said axle except movement rotative with respect to said connection.

4. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; a connection supporting said frame on said axle, said connection including a removable element which permits said frame and said axle to oscillate thereabout in a plane transverse to said frame; and springs, mounted at either side

of said frame between same and said axle, resisting such oscillations and supporting said frame when said element is removed from said connection.

5. In apparatus as described, an adjustable resilient connection between a grader frame and a front axle carrying steerable wheels, comprising a guide-box rigidly mounted on such frame and having lateral internal bearing surfaces with vertical slots therethrough; within said guide-box, a guide-block having a slot therethrough transverse to the grader frame, having lateral bearing edges in contact with said bearing surfaces in said guide-box, and having aligned apertures in the front and rear walls; an element rigidly mounted on the axle, which element enters the said slot in said guide-block and has an aperture in alignment with said apertures in the walls thereof; a bushing through said apertures whereby said block is rotatably connected to the axle; and a resilient mounting suspending said guide-block from the grader frame, said mounting having means whereby to tension the resiliency thereof.

6. In apparatus as described, a convertible connection between a grader frame and a front axle carrying steerable wheels, comprising a guide-box rigidly mounted on such frame, having lateral internal bearing surfaces with vertical slots therethrough, and aligned apertures in the front and rear walls; within said guide-box a guide-block, having a slot therethrough in the plane of the axle, having lateral bearing edges in contact with the bearing surfaces in said guide-box, and having aligned apertures in the front and rear walls; an element rigidly mounted on the axle, which element enters said slot in said guide-block and has an aperture in alignment with the apertures in the walls thereof; a bushing through said apertures whereby said block is rotatably connected to the axle; a resilient mounting suspending said guide-block from the grader-frame, said mounting having means whereby to tension the resiliency thereof; and a center pin removably inserted through the apertures in said guide-box and through the said bushing.

7. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; springs positioned one at either side of said frame and supporting same on said axle; and means, adjacent said axle in the longitudinal median line of said frame, connecting said frame to said axle, said means translating relative movement therebetween into resiliently restrained movement substantially vertical and substantially within a plane transverse to said frame.

8. In apparatus as described, in combination, an axle carrying steerable wheels; a frame adjustably supporting a work tool such as a grader blade; springs, adjustable as to tension, positioned one at either side of said frame and supporting same on said axle; means adjacent said axle in the longitudinal median line of said frame connecting said frame to said axle, said means restraining all relative movement therebetween except resiliently opposed rotative movement transversely of the grader and resiliently restrained vertical movement; and removable means preventing said restricted vertical movement.

9. In apparatus of the character described, the combination with a wheel supporting axle and a tool supporting frame, of means supporting said frame on said axle and securing the latter to the former, said means comprising springs extending between opposite sides of said frame and said axle, and means intermediately of said springs connecting said frame and axle rotative movement therebetween permitting and translating all other movement therebetween into resiliently limited relative movement therebetween substantially vertical and substantially within a plane transverse to said frame.

10. In apparatus of the character described, the combination with a wheel supporting axle and a tool supporting frame, of means supporting said frame on said axle and securing the latter to the former, said means comprising a removable element centrally positioned and disposed longitudinally of the said frame restricting relative movement between said frame and said axle to rotative movement thereabout and cooperating elements permitting vertical movement and restraining other movement therebetween; and means resiliently opposing such rotative movement, said means comprising springs located between said frame and axle on either side of said first stated means which springs support said frame when said element is removed from said supporting means first stated.

11. In apparatus as described, in combination, an axle carrying steerable wheels, a frame adjustably supporting a work tool such as a grader blade, a connection supporting said frame on said axle, said connection including elements restricting horizontal relative movement between said frame and said axle and freely permitting vertical relative movement therebetween, and a removable element restricting relative movement between said frame and said axle to oscillations about said last-named element in a vertical plane transverse to said frame; and springs, mounted at either side of said frame and between same and said axle, operative to resist such oscillations and operative to resiliently support said frame when said last-named element is removed.

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