J. DAHLSTROM.

SHOCK ABSORBER.

APPLICATION FILED JULY 16, 1919.

1,380,780. Patented June 7, 1921.

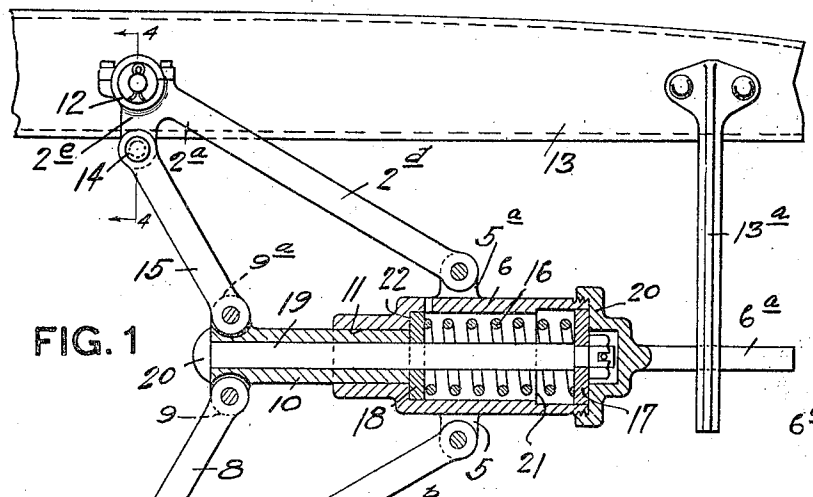


FIG. 1

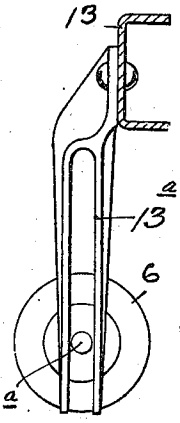


FIG. 5

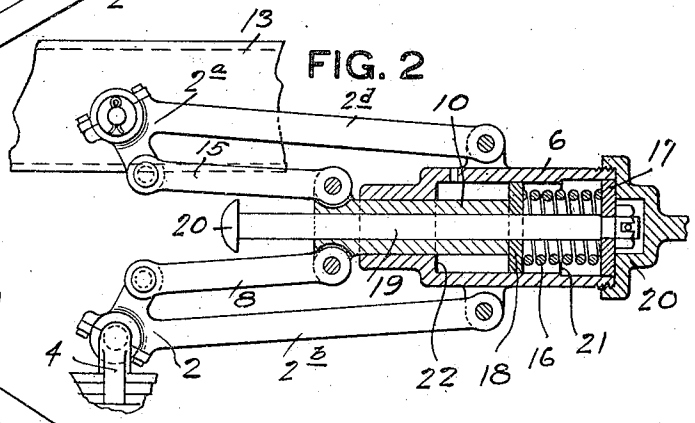


FIG. 2

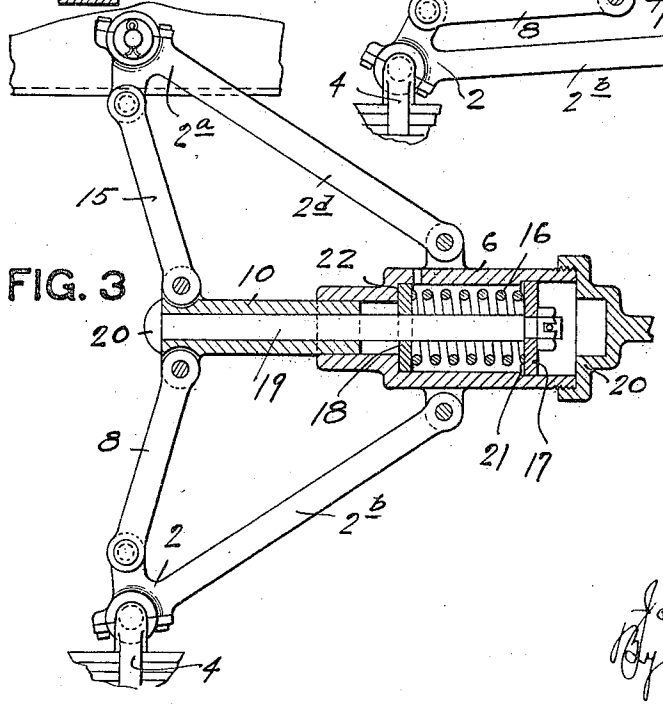


FIG. 3

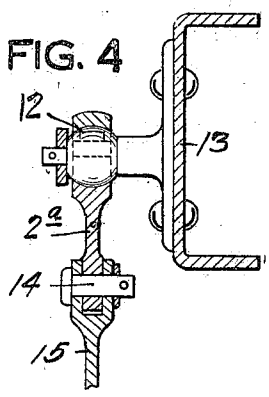


FIG. 4

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SHOCK-ABSORBER.

1,380,780. Specification of Letters Patent. Patented June 7, 1921.

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To all whom it may concern:

Be it known that I, JOHN DAHLSTROM, a citizen of the United States, and resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Shock-Absorbers; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to shock-absorbers.

The object of my invention is to provide a simple and efficient form of shock-absorber by means of which the jar and shock of a vehicle moving over an obstruction in the roadway will be taken up and absorbed so as to provide a smooth running vehicle.

To these ends my invention comprises the novel features hereinafter more fully set forth and claimed.

In the accompanying drawing Figure 1 is a sectional elevation of my improved shock-absorber showing the parts in neutral position; Fig. 2 is a like view showing the parts under compression; and Fig. 3 is a like view showing the position of the parts on the rebound; Fig. 4 is a detail of the ball joint connection between the absorber and the frame of the vehicle; and Fig. 5 is a detail of the bracket for steadying the absorber against side-sway.

In the drawing the numerals 2 and 2^a designate bell-cranks. The bell-crank 2 is mounted by a ball and socket joint 3 on the shackle 4 which connects the springs 5 to the axle 6. The long arm 2^b of the bell-crank 2 is pivotally connected to the lug 5 on the casing 6. The short arm 2^c of the bell-crank 2 is pivotally connected at 7 to the link 8. The link 8 is pivotally connected to the lug 9 on the movable sleeve or member 10 which is adapted to slide back and forth in the bore 11 of the casing 6.

The bell-crank 2^a has its long arm 2^d pivotally connected to a lug 5^a on the casing 6, and at its other end said bell-crank is mounted by a ball and socket joint 12 on the frame 13 of the vehicle. The short arm 2^e of the bell-crank 2^a is pivotally connected at 14 to the link 15 which is pivotally connected to the lug 9^a on the sleeve or movable member 10.

Within the casing 6 is the spring 16, said spring being interposed, and at all times compressed to a greater or less degree between the followers 17 and 18. The follower 17 is connected to the rod 19 which extends through the sleeve 10 and is provided at its outer end with the head 20. The movement of the rod 19 is controlled by the casing-head 20 and the shoulder or stop 21 formed on the inside of the casing.

The follower 18 normally rests against the shoulder 22 of the casing, and is in the path of the movement of the sleeve 10, being advanced by said sleeve to compress the spring as will more fully hereinafter appear.

The casing 6 is provided with an arm 6^a which moves in a guide 13^a secured to the frame to hold said casing against excessive side sway.

When my improved shock-absorber is in use, and the body of the vehicle is depressed or lowered due to an obstruction in the roadway, the parts shown in neutral position in Fig. 1 will assume the positions shown in Fig. 2 when under full compression. The long arms 2^b and 2^d of the bell-cranks 2 and 2^a will advance the casing longitudinally, in the direction in which the spring is being compressed, thereby delaying the full compression of the spring. At the same time, due to the connection of the short arms 2^c and 2^e of the bell-cranks with the links 8 and 15, the sleeve 10 will be moved inwardly to a greater distance than the movement of the casing, whereby the follower 18 is advanced and the spring 16 compressed between said follower and the follower 17. On the rebound the spring 16 expands and the parts are brought back to neutral position, and beyond neutral or to the position shown in Fig. 3 where the follower 17 is moved into engagement with the stop 21 due to the pull on the rod 19 caused by the end of the sleeve 10 engaging the head 20 of said rod. In this manner the spring is compressed between the follower 17 and the follower 18 and the shock due to the rebound is absorbed, and the parts gradually settle back to neutral position as shown in Fig. 1.

It will be observed that the levers 2^b and 2^d compose substantially a toggle joint, and that the links 8 and 15 similarly compose another toggle joint, and that this arrangement has the effect of causing the leverage exerted by the spring 16 upon the vehicle frame and axle to diminish in proportion as the spring is compressed. For example, reference to Fig. 2 will show that although the spring is under its maximum compression, and is therefore pressing with maximum force upon the follower 18, nearly all of this

force is exerted in a direction parallel to the axis of the spring and the follower, and has almost no tendency at all to separate the vehicle frame and the axle. Therefore, the vehicle frame at this time rests wholly upon the elliptical springs 5 and the shock absorber has no effect in causing the frame to rebound. This is a feature of special advantage in this device, and renders it superior to other forms of spring-operated shock absorbers in which the rebound caused by the strong spring imparts a shock to the vehicle which is more violent than the original shock taken up by the absorber. When the rebound occurs or the frame and axle are otherwise caused to separate, tension on the spring 16 increases progressively and is at its maximum when the frame and axle are in their positions of greatest separation. If this movement of separation takes place when the shock absorber is in its neutral position, as shown in Fig. 1, the initial resistance to such separation is that provided by the original compression of the spring which may amount to, say, 100 pounds. As the spring is further compressed during the rebound by the action of the toggle arms 2^b and 2^d, the compression of the spring increases to a value of say, 700 pounds. By reason of the longitudinal yielding movement of the casing during the compression of the spring, the large increase in spring tension produces no shock, since the period of compression is materially increased by the bodily movement of the floating casing.

By my invention I am able to provide for the absorbing of the shock by the use of a single spring by a push and pull action, the spring being put under compression by the advanced movement of the sleeve 10 and also put under compression on the rebound by the follower 17 pulling against the spring in the opposite direction, and compressing the spring between the follower 17 and the follower 18.

What I claim is:

1. In a shock absorber, the combination of a guide secured to the vehicle frame, a single casing having an extension received in the said guide, a single pair of followers disposed in said casing, a spring interposed between said followers and normally maintained under predetermined compression and connections from said casing and said followers to the vehicle frame and axle whereby on deflection of said frame one of said followers moves in said casing to compress said spring and on rebound the other follower moves in said casing to compress the said spring from the opposite direction.

2. In a shock absorber, the combination of a longitudinally movable casing, a spring contained therein, followers in said casing between which said spring is interposed, a movable member entering said casing to move one of said followers, a rod connected to the other follower passing through said movable member, a stop on said rod to control the movement of said movable member, connections between said casing and the axle and vehicle frame, and means for moving said followers in said casing alternately as the vehicle frame moves up and down.

3. In a shock-absorber, the combination of a casing a spring contained therein, followers in said casing between which said spring is interposed, a movable member entering said casing in the path of one of said followers, a rod connected to the other follower passing through said movable member, a stop on said rod adapted to be engaged by said movable member, and connections between said casing and said movable member and the axle and vehicle frame, whereby said casing is advanced under deflection of said frame, and said movable member is advanced to a greater extent than said casing.

4. In a shock-absorber, the combination of a casing, a spring contained therein, followers in said casing and between which said spring is interposed, a movable sleeve entering said casing in the path of one of said followers, a rod connected to the other follower extending through said sleeve, a stop on said rod, bell-cranks with short and long arms pivotally connected to said casing, and links pivotally connected to the short arms of said bell-cranks and to said sleeve.

5. In a shock-absorber, the combination of a casing, a spring therein, followers between which said spring is located, a sleeve entering said casing in the path of one of said followers, a rod connected to the other follower passing through said sleeve, a stop on said rod, a stop in said casing in the path of said follower connected to said rod, bell-cranks with short and long arms pivotally connected to said casing, and links pivotally connected to the short arms of said bell-cranks and to said sleeve.

6. In a shock absorber, the combination of a single casing, a single pair of followers disposed in said casing, a spring interposed between said followers, and toggle connections from said casing and said followers to the axle and frame of the vehicle whereby the said spring is compressed by relative movement of said axle and frame toward or away from each other, and the said casing is advanced longitudinally in the direction of compression of the said spring, and whereby the leverage exerted by said spring upon the vehicle frame and axle diminishes as the compression of the spring increases.

7. In a shock absorber, the combination of a single casing, a single pair of followers in said casing, a spring interposed between

said followers and toggle members connected to support said casing and said followers and pivotally attached to the axle and frame of the vehicle whereby on deflection of said frame one of said followers moves in said casing to compress said spring and on rebound the other follower moves in said casing to compress said spring from the opposite direction.

8. In a shock absorber, the combination of a casing, a spring contained within the said casing and means for supporting the said casing from the frame and axle of a vehicle and for causing simultaneous compression of the said spring and longitudinal movement of the said casing in the direction of compression of the said spring in response to relative movement of the said frame and axle toward or away from each other.

9. In a shock absorber, the combination of a casing, a spring contained therein arms connecting the said casing to the frame and axle of a vehicle, and means associated with the said arms for causing the said spring to exert a diminishing resistance to the downward thrust of the vehicle frame and exert a progressively increasing resistance to the rebound of the vehicle frame.

10. In a shock absorber, the combination with a vehicle frame and axle, a casing, arms pivotally mounted on said frame and axle and pivotally connected to said casing, followers disposed in said casing, a spring interposed between said followers, and connections for operating said followers whereby, on the deflection or rebound of said frame, the casing moves in one direction together with one of the followers and the other follower moves within said casing to compress said spring.

In testimony whereof I, the said JOHN DAHLSTROM, have hereunto set my hand.

JOHN DAHLSTROM.

Witnesses:

A. E. CLANEY,

ROBT. D. TOTTEN.