Jan. 5, 1932. F. TRANSOM 1,840,177

VACUUM SNUBBER

Filed Feb. 5, 1927

Fig. 1.

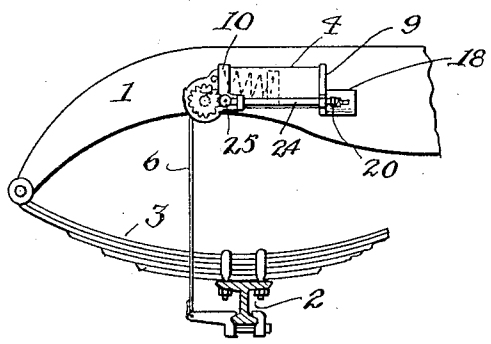


Fig. 2.

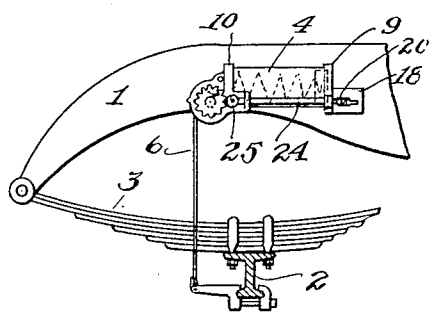


Fig. 3.

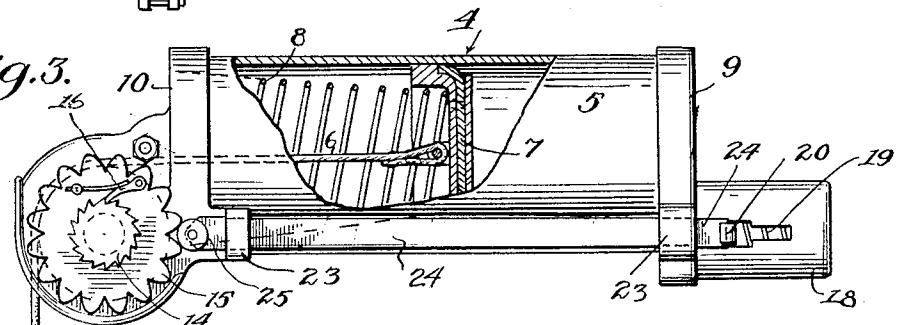


Fig. 4.

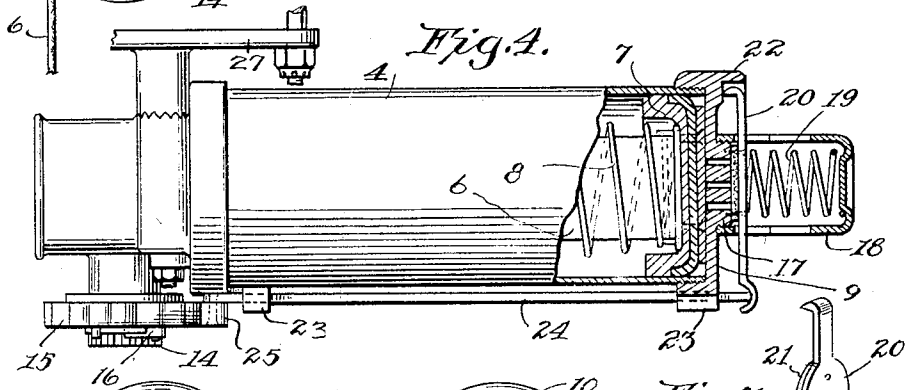


Fig. 5.

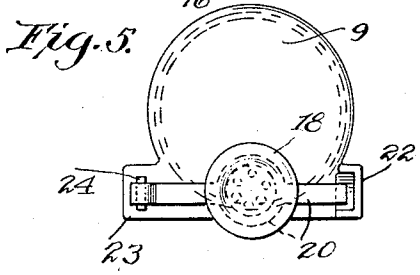


Fig. 6.

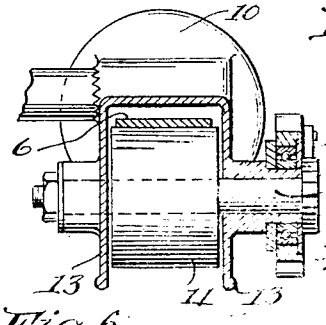
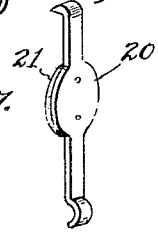


Fig. 7.



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UNITED STATES PATENT OFFICE

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VACUUM SNUBBER

Application filed February 5, 1927. Serial No. 166,209.

My invention relates to improvements in vacuum snubbers as used more particularly on an automobile as a rebound check. The general operation of these devices is well known to those skilled in the art; but see, for instance, patent to P. F. Halferty No. 1,392,-150, granted Sept. 27, 1921, as disclosing a vacuum rebound check, on which this invention may be considered to be further improvements.

One object of my invention is to co-ordinate the snubbing action of the device with the up and down movements of the car body after it has encountered a road obstacle.

Another object of my invention is to provide a device of this character which will be capable of applying almost full atmospheric pressure to arresting abnormal body movements.

Another object of the invention is to cause the full strength of the snubber to act immediately on the upward throw of the car body, and to cease to act immediately when the car body begins to drop towards its normal riding position on its leaf springs.

Another object is to substantially eliminate all snubbing action dependent upon mechanical springs.

Other objects and advantages of my invention will appear in connection with the following description of the several figures of the accompanying drawings which constitute a part of this specification, and in which:

Fig. 1 shows somewhat diagrammatically an automobile frame, or chassis, resting on leaf springs in normal riding position.

Fig. 2 is a similar view of these parts showing the leaf springs compressed, due to the wheel hitting a road obstacle.

Fig. 3 is a side elevation of my vacuum snubber.

Fig. 4 is a top plan view of the parts shown in Fig. 3.

Fig. 5 is a rear end elevation of the snubber cylinder.

Fig. 6 is a front end elevation of the snubber cylinder.

Fig. 7 is a detail view, showing part of the valve mechanism.

The snubber mechanism of this application comprises a cylinder 5, mounted on the chassis of a vehicle and provided with an air tight piston 7, slidably mounted in the cylinder, and constantly urged, or impelled, by a spring 8 towards one end of the cylinder, the other end of the cylinder serving as an abutment against which spring 8 thrusts.

My improvements begin with the design of the spring 8. Hitherto this spring has been designed to contribute materially to arrest the pull of strap 6 on the piston. The disadvantage of such an action is that when the car body has come to rest on its upward throw, and begins to descend, spring 8 is still pulling on strap 6 a full maximum pull, which has now become harmful, and there is no way to overcome such a result entirely, but it can be very greatly minimized, by restricting the function of the spring 8 simply to returning piston 7 to initial position, to enable it to promptly set up a new vacuum as needed, when strap 6 pulls to snub the next throw upwardly of the car.

As shown in Figs. 3, 4 and 6 the strap 6 passes over a pulley, or roller 11. The movement of this roller is governed in direction; i. e., clockwise or the reverse, by strap 6. As long as strap 6 is paying out of the cylinder, roller 11 will turn anticlockwise, the instant strap 6 reverses and works into cylinder 5 roller 11 will turn clockwise. In my invention this action is utilized to determine the precise instant at which the snubbing action of the device is to cease, so as not to put any harmful additional pressure on the chassis during its down stroke, or oscillation.

The way the control of the snubbing effect is brought about as referred to in the last paragraph will be understood by noting that roller 11 is keyed to a pin 12, which rotates in bearings in the cheeks cast with the front cylinder end 10. This pin 12 carries an integral head, shaped as a ratchet wheel 14. Mounted on a roller bearing, which is itself carried on a boss, cast with cheek 13, is a cam wheel 15. The cam wheel 15 is free to rotate on its roller bearing, except for pawl engagement with ratchet wheel 14. When ratchet wheel 14 turns clockwise it carries cam wheel 15 with it. When ratchet wheel

14 turns anti-clockwise, its movement does not affect cam wheel 15, which then rests idle.

The two end heads 9 and 10 are each provided with a lug 23. These lugs slidably support a tappet bar 24, which has a roller 25 at one end, engaging cam wheel 15. The other end of the bar 24 bears against a follower plate 20 on which is fixed a leather washer 21, adapted to make a tight joint with a valve seat 17, cast integral with cylinder end 9. The follower plate 20 is held up against seat 17 by a spring 19 housed in a cover cap 18, screwed to seat 17. The operation of the parts described will be obvious,—when bar 24 presses against plate 20 it will open the valve 17, thus causing free communication between the interior of the cylinder and the atmosphere. With valve 17 open only atmospheric pressure can exist in cylinder 5. With valve 17 closed a vacuum can be formed in cylinder 5 of nearly 15 lbs. per square inch, depending on altitude and temperature of the place a car may be. I have shown piston 7 made air tight by a cup leather, but obviously piston rings may be used for this purpose.

From the above detailed description of the mechanism used in my invention it will be seen, referring to Fig. 2, when the auto wheel hits an obstruction, leaf spring 3 will be flattened out, and the chassis will drop towards the axle. This allows strap 6 to work into cylinder 5, and if the shock is severe enough, spring 8 will drive piston 7 all the way back until it brings up against cylinder head 9, as shown in Figs. 2 and 4. Spring 3 then begins to resume its upward curvature, and in doing so throws the chassis away from it, simultaneously pulling strap 6 out of cylinder 5, and moving piston 7 away from cylinder head 9. This results in setting up a vacuum between the piston and the cylinder head it had been resting against. During this direction of motion of strap 6, roller 11 will be turning counter clockwise, and ratchet wheel 14 will slip over its pawl without engagement, leaving cam wheel 15 stationary, held by roller 25, acting as a detent. The instant spring 3 ceases its upward thrust, which will be beyond its neutral position (normal riding position) the strap 6 will reverse its direction of movement, and immediately pawl 16 will drop into a ratchet tooth and cause cam wheel 15 to turn clockwise. This will propel bar 24 against the follower plate 20 and thus open the valve 17. The effect of opening this valve will be to break the vacuum in cylinder 5 at the instant the chassis begins its down stroke, or oscillation, which occurs at the same time strap 6 reverses its direction of motion; furthermore bar 24 will tap the valve 17 open throughout the return stroke of piston 7, thus preventing the building up of a back pressure in the cylinder ahead of the piston. With the vacuum overcome the chassis is free to settle on its leaf springs, simply with a momentum due only to the weight of the car body, and the disturbance will come quickly to an end, instead of going into a series of oscillations.

It will thus be seen the invention gives an instantaneous snubbing action at the precise moment it is necessary to exert it, and this snubbing action is removed also at the precise moment in which it tends to become detrimental to the steadiness of riding of the car body. Also this operation is self graduating, if the shock is a slight one the piston 7 will be near its normal position as shown in Figs. 1 and 3, and there will be considerable air in cylinder 5. If the shock is a heavy one all the air in cylinder 5 will be expelled through valve 17, as piston 7 approaches cylinder head 9, valve 17 being held practically continuously open by a series of taps given to the follower plate 20, by tappet bar 24, as long as strap 6 is working into the cylinder. When piston 7 reaches head 9 it is in a position to cause an almost complete vacuum on its out stroke.

The leaf spring system of an automobile can withstand a heavy shock tending to compress, or flatten out, the leaf springs, the design of these springs being such that the closer they are pressed together the stiffer the resistance becomes to further compression. On the other hand when the rebound takes place the entire energy of these powerful springs is exerted to hurl the car body away from its axles and after the springs have once passed their normal riding position the further motion of the car body becomes dangerous because instead of compressing the leaves of the springs on each other the momentum of the car body, upwardly directed, tends to pull the springs apart and they become progressively weaker instead of progressively stronger as when under compression. The remedy is to begin to snub instantly and proportionally to the upward thrust of the springs and to desist from snubbing the instant the upward momentum of the car body has been overcome, letting it settle easily to normal position again.

The operative principle of the invention has been illustrated as applied to the design of a standard form of vacuum snubber mechanism, comprising a cylinder provided with a slidable piston, constituting in effect a chamber with a movable wall, but it will be seen that the essential principle involved can be carried out in other forms of construction giving a chamber with variable cubic air contents, and adapted to be filled either with air at atmospheric pressure, or alternately, to develop a more or less pronounced vacuum within its walls, according as the shock to be resisted is great or small, all as explained in detail in this specification, in considering the

effect of different lengths of piston stroke.

Also, while the invention has been described in connection with the up and down oscillations of an automobile car body with respect to its axles, obviously the snubber principle involved need not be restricted to the arrest of up and down movements, nor need the mass in oscillation be that of a car body, for instance a movement of displacement of any heavy body, developing a strong rebound towards a neutral position, may be arrested without causing a harmful addition to the rebound action.

Having fully described my invention, what is claimed as novel is:

1. In a snubber device, a vacuum cylinder, a piston therein, a valve mounted on said cylinder, means associated with a vehicle chassis for actuating said piston to induce a vacuum in the cylinder in one direction of piston movement and a trip mechanism designed to open said valve the instant the piston reverses its motion.

2. In a vehicle snubber, a cylinder, a piston reciprocated therein by means responsive to up and down movements of the vehicle body and cam mechanism actuated by said means and provided with parts designed to fix a point of vacuum release for said cylinder at one end of each piston reciprocation.

3. In a vacuum snubber, a cylinder, a spring pressed piston therein, a strap connected to said piston, a valve at one end of the cylinder, and means actuated by the said strap while running into the cylinder for opening said valve.

4. In a vacuum snubber device, a vacuum chamber comprising an element designed to be mounted on a car body and a complementary element designed to be attached to a car axle, in combination with vacuum valve means on one of said elements, operable by engagement with the other element, whereby all movements of separation between the car body and its axle take place under a snubbing action, while all movements of approach of those parts take place free from snubbing action.

5. An automobile rebound check comprising an air cylinder, designed to be mounted on a vehicle chassis, a piston therein, driving means for said piston, a valve and valve operating means associated with said cylinder designed to open the cylinder to atmospheric pressure under the control of the piston driving means and synchronously with up and down movements of the vehicle chassis.

6. A vacuum snubber device for vehicles comprising a cylinder attached to the vehicle, a piston therein operating to form a vacuum in said cylinder through the agency of a one-way drive connection with a part of the vehicle relatively movable with respect to the cylinder attachment, and vacuum release means including a valve and operating means therefor designed to establish atmospheric pressure within the cylinder the instant the piston reverses its motion, in combination with resilient means acting to constantly thrust the piston with zero clearance against one end of the cylinder.

7. In a vacuum snubber device, a vacuum chamber comprising an element designed to be mounted on an oscillatory body, in combination with a complementary element designed to be mounted on a support for said body, vacuum valve means on one of said elements and one-way acting valve operating means on the other of said elements, whereby all movements of separation between the oscillatory body and its support are resisted by a snubber action set up by said vacuum chamber, and all movements of approach between those parts take place free from snubbing action.

8. In a vacuum snubber, a cylinder, a piston adapted to form a vacuum in said cylinder, and vacuum release means acting under the control of a mechanical connection with said piston for terminating the vacuum period in the cylinder on a reversal in direction of piston movement.

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