

July 15, 1941.

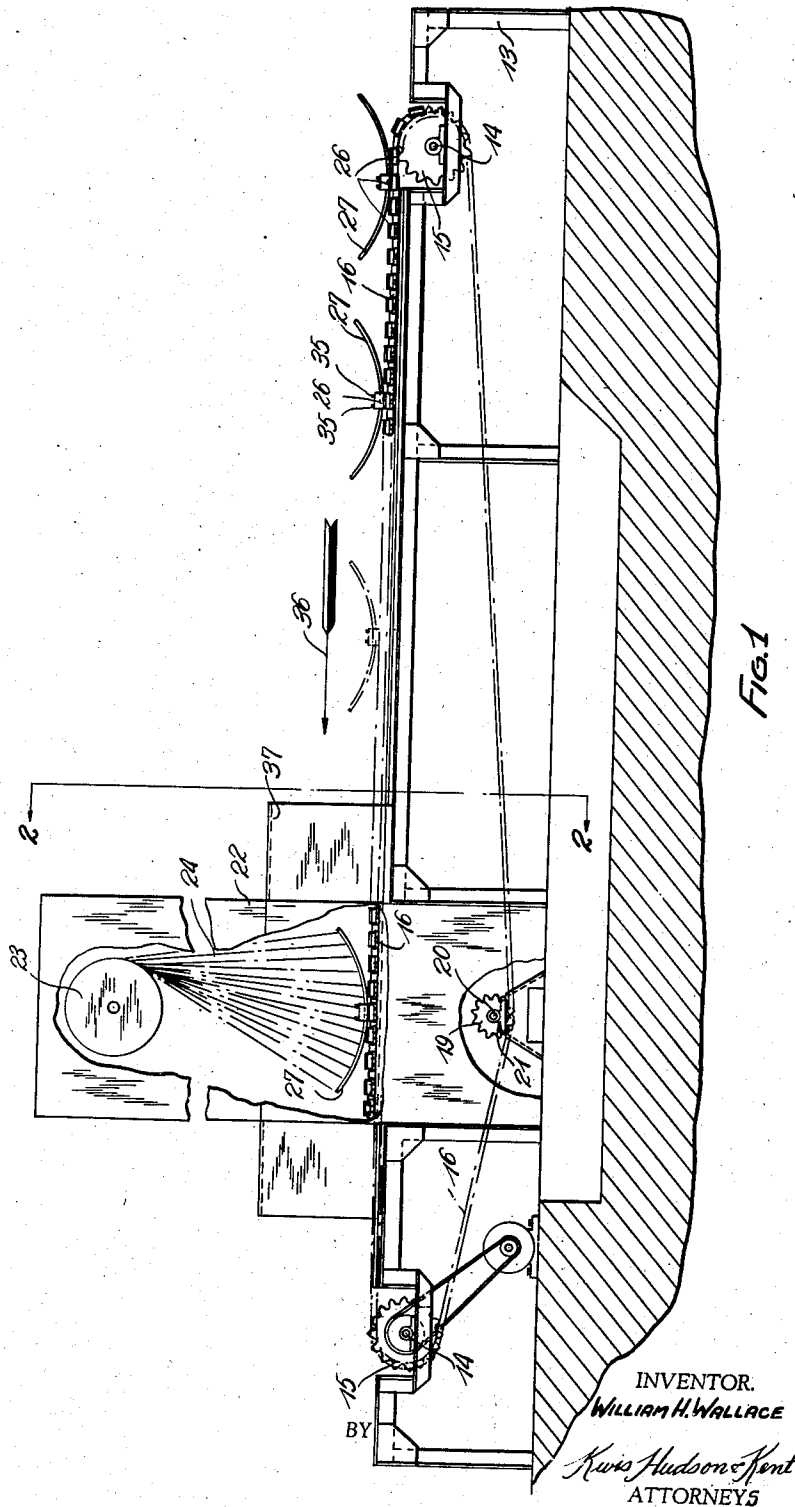
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2,249,678

APPARATUS FOR SHOT-BLASTING LEAF SPRINGS

Filed Aug. 28, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

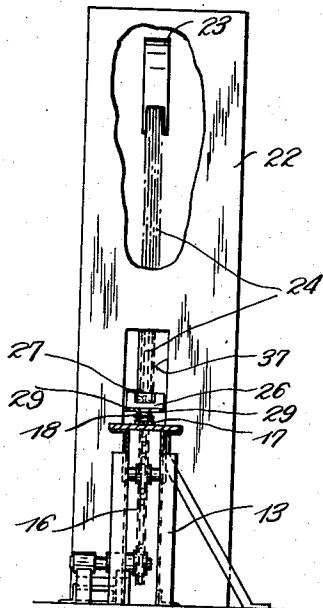


FIG. 2

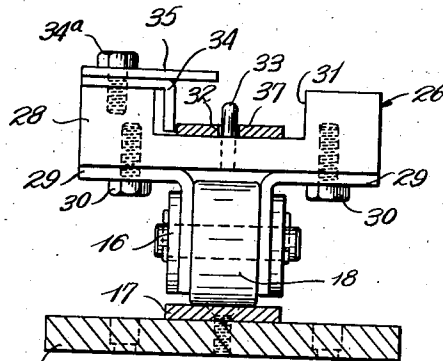


FIG. 3

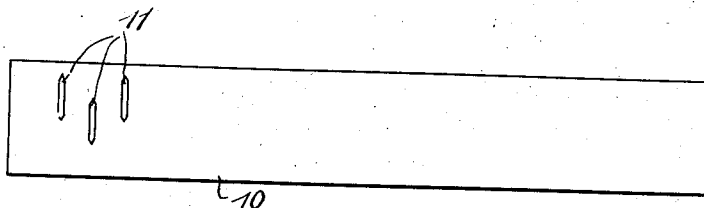


FIG. 4

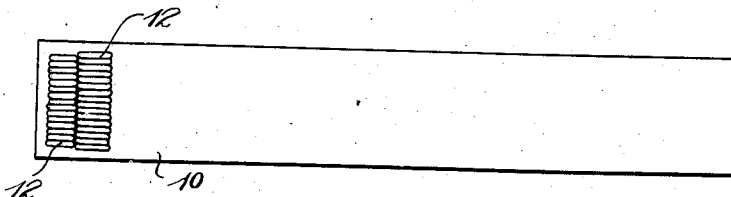


FIG. 5

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APPARATUS FOR SHOT-BLASTING LEAF SPRINGS

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4 Claims. (Cl. 29—90)

This invention relates to the manufacture of leaf springs such as are commonly used in motor vehicles and has to do particularly with the shot-blasting of the tension side of the leaves for the purpose of increasing their resistance to fatigue.

In my prior application, Serial No. 286,880, filed July 27, 1939, I disclosed the advantages resulting from the shot-blasting of the tension side of spring leaves and the present invention relates to apparatus for shot-blasting the leaves so as to effect the elimination of surface defects and be able to shot-blast the entire tension side of the leaf in a substantially uniform manner from one end to the other.

It is generally known and recognized that the number of oscillations up to fatigue or fracture of leaf springs is directly related to the characteristics of the surface of the leaves and particularly the surface of the tension side. It is also known that small scores in the surface of the leaves, such as result from rolled-in scales or grooves, and small crevices in the surface, give rise to points of incipient premature fatigue or failure.

The present invention is based on the discovery that, in the elimination or reducing of such grooves and crevices by shot-blasting, the relation of the direction of impingement of the shot to the longitudinal dimension of the surface of the leaf being treated, is a very important factor in the improvement in the fatigue life obtained by the shot-blasting.

In the accompanying drawings I have illustrated a form of apparatus embodying my invention. In these drawings,

Fig. 1 is a side elevation of a machine for conveying the leaves through a stream of shot, certain parts being shown in section;

Fig. 2 is a transverse section thereof on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail of one of the carriers for the leaves;

Fig. 4 is a plan view of a portion of a spring leaf with transversely extending scores or grooves as they might exist in a leaf before being shot-blasted according to the method herein described; and

Fig. 5 is a similar view showing the effect of the shot-blasting on the scores or grooves.

Referring to the drawings and more particularly to Fig. 4, the spring leaf 10 after being cambered and heat treated may have, at its tension surface, which ordinarily is on the concave side of the cambered leaf, minute scores or grooves running transversely of the leaf as indicated at

11. In shot-blasting apparatus the shot are usually discharged at a very high velocity from a wheel in a stream which is fan-shaped in planes at right angles to the axis of rotation of the wheel and if the leaf is passed through the stream of shot in such a direction that the scores 11 are parallel with the planes in which the stream is fanned out the effect of the shot will be to lengthen the scores whereas if the leaf is passed through the stream of shot with the longitudinal dimension of the leaf parallel with the planes in which the stream is fanned out, then the effect on the scores 11 is to flatten them out or widen them by a hammering or peening action as shown at 12 in Fig. 5. The result will be to improve the fatigue life of the leaves and the apparatus to be described carries out this principle.

In this apparatus there is an elongated frame 13 which may be built up of structural steel or in any other preferred manner. Adjacent the ends of the frame 13 are shafts 14 mounted in suitable bearings and carrying sprocket wheels 15 over which runs a chain conveyor 16. One of the shafts 14 may be driven by any suitable source of power not shown. The upper part of the frame 13 (see Fig. 3) carries a track 17 on which the rollers 18 of the chain 16 run and, to guide the lower portion of the chain a sprocket 19 may be provided, this sprocket being mounted on a shaft 20 which is supported in suitable bearings one of which is indicated at 21. Extending upwardly from the frame 11 is a sheet metal housing 22 for the stream of shot, a shot-throwing wheel 23 of well known construction being provided and suitably supported in the upper part of the housing 22 and being adapted to throw a stream of shot as indicated by the lines 24, this stream being fanned out longitudinally of the chain 16.

At intervals along the chain 16 there are provided carriers or holders for the leaves these being indicated in Fig. 1 at 26 and being suitably spaced to support the spring leaves which are indicated at 27. Referring to Fig. 3, it will be noted that each of the carriers or leaf holders 26 comprises a block 28 which is secured to horizontal extensions 29 of the chain links by bolts 30. The blocks 28 have a recess 31 of sufficient width to accommodate various sizes of spring leaves, one of which is shown in section at 27 in Fig. 3. The leaves 27 are usually provided with a hole 32 for a center bolt and there is an upwardly projecting locating pin 33, in the recess 31 which projects through the hole 32 when the leaf is in position. An angle bracket 34 is ad-

justably secured through slotted openings therein lengthwise to one side of the upper face of the block 28 by fastening means 34a. The bracket 34 has a depending leg extending into the recess 31 a sufficient distance to provide a lateral guide for the spring plate so as to permit it to rock on its transverse axis but to prevent any angular rotation about the pin 33. Fingers 35, which in this instance are secured to the lateral surface of the bracket 34, are located fore and aft of the carrier 26 so as to have their outer free ends overlie one side of the recess 31 and a portion of the spring leaf 27 therein, but being spaced from the leaf as shown to permit deflection of the end thereof to a position where the surface of the leaf is substantially at right angles to the shot stream. The pin 33 should be sufficiently smaller than the hole 32 to permit the leaf to freely rock thereon.

The direction of movement of the leaves is indicated by the arrow 36 in Fig. 1 and as they enter the housing 22 through the opening 27 the leading end of the leaf will first enter the shot stream and the force of the impact will cause the leading end of the leaf to be depressed or, in other words, the leaf will rock on its carrier so that the upper side of the leaf will be more nearly normal to the direction in which the shot are moving. As the leaf continues its movement into the shot stream the shot will finally impinge upon the whole upper surface of the leaf and as the leading end of the leaf emerges from the shot stream the leaf will be rocked in the opposite direction by the force of the shot acting upon the trailing portion of the leaf. In this manner practically the entire upper surface of the leaf will be presented in a substantially uniform manner to the shot stream and thus receive substantially uniform treatment by the shot-blast.

In the practical operation of a machine of the type illustrated and described steel shot were employed having a size known as No. 40 and being about .020 inch in diameter. The shot were thrown from an impeller wheel 19½ inches in diameter by 2½ inches wide revolving at a speed of 2300 R. P. M. The conveyor chain upon which the leaves were carried through the shot stream traveled at the rate of approximately 55 feet per minute and about 250 pounds of shot were discharged from the wheel per minute and it was found that the leaves thus shot-blasted on the concave or tension side had a fatigue life that was very much improved in comparison with that of leaves shot-blasted in other ways. It will be

understood of course that shot of larger or smaller size could be used and that the delivery speed and volume of the shot, as well as the conveyor speed, can be varied and that values could be selected above or below those mentioned.

While I have illustrated and described what I now consider to be a preferred form of apparatus for practicing my invention, it will be apparent that changes may be made in the details of construction which have been illustrated and described, without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention I claim:

1. In apparatus for shot-blasting cambered spring leaves, the combination of means for discharging shot in a fan-shaped stream, conveying means for moving the spring leaves endwise through said stream in the plane in which the stream is fan-shaped, and means on said conveying means for so holding the spring leaves that they are permitted to rock as they pass through the shot stream whereby the different portions of the leaf surface to be shot-blasted will be substantially uniformly acted upon by the shot stream.

2. In apparatus for shot-blasting cambered spring leaves, the combination of means for discharging shot in a continuous stream, conveying means for moving spring leaves endwise through said stream with their concave sides presented to the action of the stream, and means on said conveying means for so holding the spring leaves that they are permitted to rock on their convex surfaces as they pass through the shot stream whereby the different portions of the concave side of each leaf will be substantially uniformly acted upon by the shot stream.

3. In apparatus for shot-blasting the concave side of cambered spring leaves; the combination of means for discharging shot in a continuous stream, an endless conveyor passing through said stream, and holders for the spring leaves arranged at spaced points on said conveyor for so supporting the leaves that they extend longitudinally of the conveyor and are permitted to freely rock on their convex side.

4. In apparatus for shot-blasting spring leaves the combination of means for discharging shot in a fan-shaped stream, and means for conveying the leaves endwise in succession through said stream in the plane in which the stream is fan-shaped.

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