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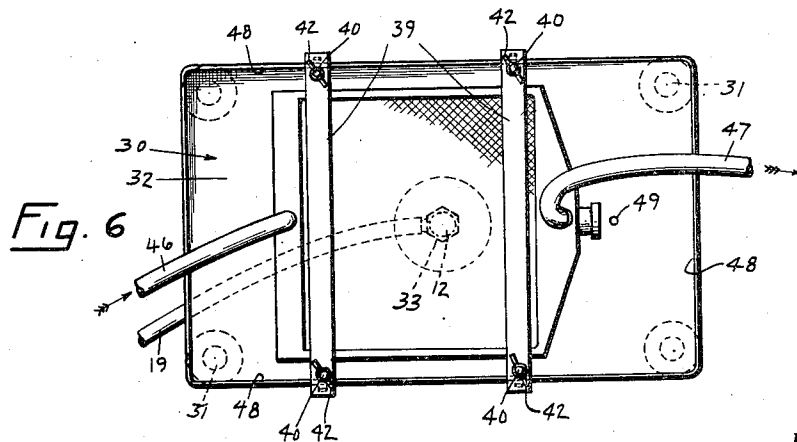
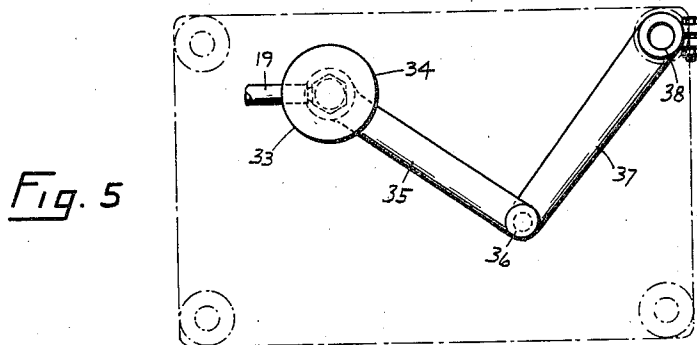
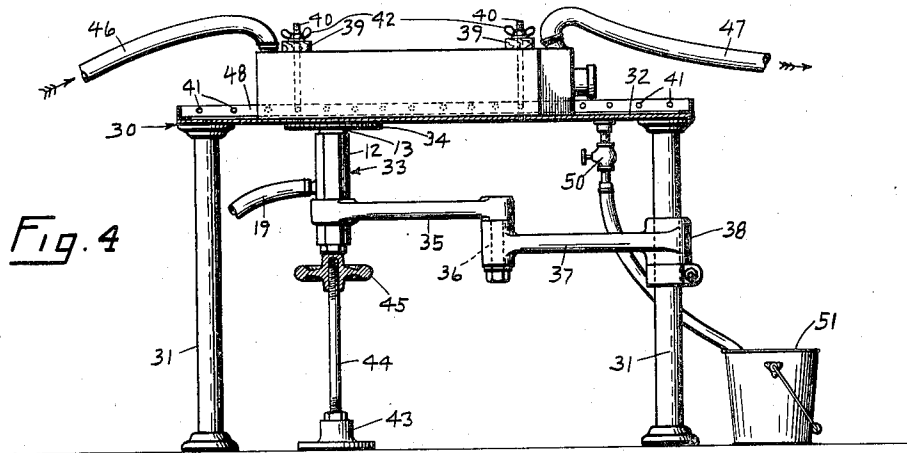
G. L. SEXTON

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METHOD OF CLEANING WATER CONDUITS

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INVENTOR.
BY *George L. Sexton*
Thomas G. Johnson
ATTORNEY

UNITED STATES PATENT OFFICE

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METHOD OF CLEANING WATER CONDUITS

George L. Sexton, Milford, Conn.

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7 Claims. (Cl. 15—269)

This invention relates to methods for cleaning of automobile radiators and other water conduits and passages to remove scale and oxide crystals formed on the walls thereof.

5 An object of this invention is to facilitate such cleaning operation to the end that the scale and oxides are quickly and thoroughly loosened and freed from the walls of the water conduits.

Heretofore, in cleaning radiators etc., it was customary to fill the radiator with a caustic cleaning solution and jar it bodily as by causing it to be alternately raised and allowed to fall on a solid surface or by pounding the radiator here and there with a rubber or other relatively soft mallet.

These methods and means while tending to loosen some of the foreign matter often damage the radiator by causing soldered seams to be opened up, thereby necessitating the resoldering to the radiator prior to its use.

These detrimental effects are not caused merely by carelessness or poor workmanship since the operations above described must be more or less violent in order to be at all effective in loosening the scale and oxides.

This is not the case when the present invention is employed, for it is based on regional or sectional vibrations of the radiator and not jars or jolts transmitted to the radiator, as was heretofore done.

The present invention is practiced by applying vibrations to a limited area of the radiator at a time and shifting the point of application of the vibrations from place to place and from time to time until the entire area is covered. If the radiator is clogged badly at a particular place indicated by what is known in the art as a "cold spot", the vibrations are imparted to that area for a longer period of time, preferably until that spot of the radiator becomes warm (when a warm cleaning solution is employed), thereby indicating that the obstructions have been at least partially removed.

Any suitable or convenient vibrator may be used according to the present invention, provided it be capable of producing and transmitting to the article treated minute high frequency, low amplitude vibrations without, however, necessitating actual physical impact between the vibrator and the article being treated.

These various forms and methods are each considered preferable according to whether the radiator is to be cleaned while on the chassis or when removed therefrom as will appear more

fully below. Suffice it here to say that a very important feature of this invention is the provision of vibrating means for the purpose referred to in which vibrations are set up in the radiator tubes by being transmitted through the material of the radiator rather than by being imparted thereto by bodily relative vibratory movements between the radiator and the vibrator, and for these purposes vibrations of high frequencies and low amplitude traveling to the article treated without impact are preferable.

In the accompanying drawings which illustrate some forms of apparatus which may be used for carrying out the present invention—

Figure 1 is a perspective view of a radiator showing the hand-carried vibrator of the present invention applied to the surface of the radiator.

Fig. 2 is a plan view of the vibrator shown in Fig. 1, but partly in section.

Fig. 3 is a side elevation of the vibrator shown in Fig. 1.

Fig. 4 is a sectional view of a table on which the radiator may be placed for treatment when removed from the chassis and showing the vibrator with its mechanical means for supporting it in engagement with the surface of the top of the table.

Fig. 5 is a detail of the means for mounting the vibrator in the device shown in Fig. 4.

Fig. 6 is a top plan view of another modification of this invention.

The method of the present invention consists essentially in setting up regional vibrations in a radiator to loosen scale, oxide crystals and other foreign matter clinging to the walls of the water conduits. Various suitable means may be employed for the purpose.

The vibrator illustrated in Figs. 1, 2 and 3 is in many respects considered preferable at the present time. It comprises a plate 10 of comparatively heavy metal which carries posts 11 between which is supported a vibration-producing motor 12. In the form shown, the motor 12 has heads 13 provided with holes 14 into which extend screws 15 carried by the posts 11, the assembly being rigidly held together by the pressure of said screws, the latter being fixed by lock nuts 16 applied to the screws 15.

In the form shown, the motor 12 is air-operated and has a bore 17 which is closed at the ends by the heads 13 and forms a chamber in which an elongated piston or plunger 18 is adapted to reciprocate. The piston 18 has limited longitudinal movement between the heads 13 and

is operated by a supply of air under pressure led thereto by a flexible pipe 19 engaging a nozzle 20 communicating with a circumferential air chamber 22 in the cylinder. The piston is provided at opposite sides of the center with radial ports 23 and 24 which, at times, communicate with ends 25 and 26 of a central opening provided in the piston. Within this opening there is provided a rod 27 having a valve portion 28 located in the vicinity of the ports 23 and 24 and adapted to open and close these ports alternately as the piston reciprocates. When the piston is at one limit of its movement as shown in Fig. 2, the ports 24 are open, i. e. beyond the end of the valve 28 so that air under pressure flows out of the port 24 through the end 26 of the central hole, then through a space between the end of the piston and the head into a chamber 29 formed by tapering the end of the piston. The air then acts on its tapered end and causes the piston to be moved to the left as viewed in Fig. 2. This causes the communication between the ports 24 and the hole-end 26 to be interrupted by the movement of the ports 24 over the edge of the valve 28. At the same time, the edges of the piston uncover exhaust ports 30 in the cylinder and allow the air in the chamber 29 to escape. At this time the ports 23 are opened by moving away from the valve 28 allowing air in the chamber 21 to flow through the ports 23, hole-end 25 into the chamber 31 to push the piston back again. After this occurs, the air in the chamber 31 at the end of the piston which is driving the piston may exhaust through outlet orifices 32.

In this way, the piston is caused to rapidly move back and forth and at the end of each stroke strikes one of the heads 13 with the result that high frequency and relatively low amplitude vibrations are transmitted through the heads 13 and posts 11 to the plate 10.

From the foregoing, it will be seen that, when the air is turned on, the plate 10 receives vibrations from the motor 12. These vibrations may not be visible to the eye since they are relatively minute and, due to the inertia of the plate 10 and the motor casing, do not cause perceptible movement of the motor casing or the plate. However, these minute vibrations may be transmitted to other bodies by applying part of the motor casing 12, as, for instance, the cap 13, against the other body as shown in Figs. 4, 5 and 6; or, they may be transmitted to other bodies through a plate, such as the plate 10 in Figs. 1, 2 and 3, on which the motor casing is mounted. In either case, the vibrations are produced in the article being treated without impact between the vibrator and the article and merely as a result of the vibrator being held in contact with the article.

It will be noted that in the vibrator above described and illustrated in Figs. 1, 2 and 3, the body of the motor 12 constitutes the handle by means of which the device may be manipulated and that any surface against which the plate 10 is held will receive vibrations from the plate in the same manner as sound vibrations are transmitted through solid bodies.

When the vibrator shown in Figs. 2 and 3 is used for carrying out the method of the present invention, the plate 10 is made of such size as to only cover a relatively small area of the radiator to be cleaned, as indicated in Fig. 1, and when held against the radiator as shown, causes the portion of the radiator in its immediate vicinity

to vibrate at relatively high frequency, although, of course, with small amplitude, which diminishes as the vibrations are dissipated through the body of the radiator. These vibrations are produced without impact against the radiator and are not sufficient in intensity to loosen soldered joints or seams. They are, however, intense enough so that the scale and other foreign matter adhering to the walls of the water conduits are gradually loosened and finally drop off. In other words, these vibrations when they actually reach the scale are of too little amplitude or otherwise too feeble bodily to vibrate the scale, but do act on the scale with sufficient intensity to set up a mechanical disturbance of or strain on the molecules thereof effective to weaken and then break down the natural physical attraction between these molecules which normally maintains the scale as a difficultly removable excrescence on the walls of the water passages. Such a molecular disturbance is that meant whenever reference is made herein to a molecular disturbance.

In practicing the method of the present invention, the vibrator is held on one spot for a time and then is moved to another place on the radiator and so on from place to place until the entire surface of the radiator has been covered. If the radiator is known to have a "cold spot", that is a spot which is so badly clogged that the water of the cooling system does not circulate through it at all or very little, the vibrator is held against the radiator around that spot for a longer period of time to give the scale an opportunity to be loosened and drop off.

The method is preferably practiced in conjunction with a cleaning solution which may be caused to circulate through the radiator during the operation of vibrating the same and assist in loosening and carrying away scale and other foreign matter which are shaken off the water conduits by action of the vibrator.

It should be clearly understood that while the vibrator illustrated is considered extremely convenient and has many advantages in itself, other forms of vibrators may be used.

Further, the vibrator need not be hand-held and manipulated, for the invention may be practiced by a device such as is illustrated in Figs. 4 and 5.

This device is adapted to be used in cleaning a radiator when, for some reason or other, it is preferable or desirable to dismount the radiator from the chassis for cleaning it. Accordingly, it comprises a table 30 having legs 31 and a top 32 formed of a metal plate which is of such thickness as to avoid substantial sagging but which is no thicker than is necessary for that purpose. Under this plate is mounted a vibrator 33. This vibrator may have a motor 12, like that shown in Figs. 1, 2 and 3, but preferably has one end 13 provided with a plate 34 adapted to rest against the underside of the table top 32. The vibrator motor 12 is preferably mounted on an arm 35 having a swivel connection 36 with another arm 37 pivotally secured at 38 to one of the legs 31 of the table. The arms 35 and 37 constitute a toggle and permit the plate 34 of the motor to be moved to any position on the underside of the table top 32.

The air connection for the motor may be made in any suitable way. As shown, the flexible pipe 19 is connected directly to the motor.

In using this apparatus, the radiator to be cleaned is laid on the table and the operator us-

ing the body of the motor as a handle like in the device shown in Figs. 1, 2 and 3, moves the motor 12 which is supported on the arms 35 and 37 from spot to spot on the underside of the table. The vibrations of the motor 12 are transmitted by the plate 34 thereof to the table top 32 and from the latter to the radiator. The vibrations are, of course, transmitted through various portions of the table top 32 and by the latter to various portions of the radiator, but they are intense at that area or zone directly over the motor 12, even though the table top 32 is interposed between the motor 12 and the radiator.

In this form of the invention, it will be seen, the radiator is protected from any possible damage which might be done to it by sliding the plate on the motor directly over its surface, and the same result may be accomplished by interposing a suitable plate between the radiator and the plate 10 in the form of the invention shown in Figs. 1, 2 and 3.

If desired, the vibration-producing motor 12 may be permanently mounted in fixed position under the table top. In such case, to concentrate the vibrations at the various zones or areas of the radiator, it would merely be necessary to slide the radiator on the table top 32 to bring the desired portions directly over the motor 12.

While being treated with vibrations as above outlined, the radiator may also be treated with a constantly flowing cleaning solution. For this purpose, as shown in Figs. 4 and 5, the radiator may be connected to inlet and outlet pipes 46 and 47 for the solution. When this is done, should a leak in the radiator develop because of the fact that some sediment or foreign matter has opened a crevice which it previously closed, the cleaning solution may escape from the radiator. Accordingly, it is preferable that the table 32 be provided with flanges 48 and an escape orifice 49 which may have a suitable valve and hose connection 50 to a receptacle 51.

The radiator may be clamped securely onto the table as shown. For this purpose, a pair of preferably wooden bars 39 may be placed across the top of the radiator. These bars are provided with holes through which bolts 40 may pass. These bolts preferably have hook-shaped lower ends which may be caught into apertures 41 provided on the flanges 48, after which the bolts may be tightened in place by wing nuts 42.

The motor 12 may be manipulated by hand as above pointed out, but, if it is desired to hold it firmly against the table 32, the arrangement shown in Fig. 4 may be employed. In this figure, there is shown a jack having a base 43, a standard 44, and at its upper end a hand wheel 45 having a screw-threaded connection with the standard 44. This jack may be placed under the motor so as to engage the end thereof and hold it up. When it is desired to shift the position of the motor, the hand wheel 45 is turned, and the jack and motor then are adjusted to the new position. The use of the jack is particularly advantageous when the vibrator is to be placed on a bad spot on the radiator, such, for instance, as a "cold spot", where it should be held for some little time, the jack relieving the operator of the

necessity of holding the motor firmly against the table top.

The methods of the present invention may be applied at various other points in the cooling system of automotive engines. For instance, scale and oxides may be loosened from the water jackets of the engine by applying the plate 10 of the device shown in Figs. 1 to 3 on the surface of the jacket, and the same is true for the bottom and top radiator tanks.

The apparatus and methods of the present invention above described have been found very efficient in practice. While I have elected to claim per se the apparatus illustrated in Figs. 1, 2 and 3, it is clear from the illustration of the apparatus shown in Figs. 4 and 5, that other apparatus than that shown may be used for carrying out the methods of the present invention. The apparatus shown in Figs. 4 and 5 is intended to be claimed per se in another application.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

Having thus described the invention, what is claimed as new and for which I desire to obtain Letters Patent is:—

1. The herein described method of loosening scale from the walls of radiator water conduits which consists in applying vibrations without impact to a relatively small portion of the area of the radiator.

2. The herein described method of loosening scale from the walls of radiator water conduits which consists in applying vibrations without impact successively to adjoining relatively small portions of the area of the radiator, until the entire area of the radiator has been covered.

3. The herein described method of loosening scale from the walls of water passages in automotive cooling systems which consists in applying without impact minute vibrations of relatively high frequency and low amplitude to external portions of the system.

4. The herein described method of loosening scale from the walls of water passages in automotive cooling systems which consists in setting up continuous vibrations in said scale limited in intensity to that sufficient to cause breaking up of the scale.

5. The herein described method of loosening scale from the walls of water passages in automotive cooling systems which consists in applying without impact continuous minute vibrations to the particles of the water passages of the system.

6. The herein described method of loosening scale from the walls of water passages in automotive cooling systems which consists in applying without impact and setting-up regional continuous minute vibrations in the particles of the water passages of the system.

7. The step in the method of cleaning scale and oxides from the walls of water passages which consists in externally producing and physically transmitting relatively high frequency low amplitude vibrations to the exterior of the passage to be cleaned.

GEORGE L. SEXTON.