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2,874,948

ROAD SURFACE COATING BREAKER HAVING A VIBRATED ROLLER

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2 Sheets-Sheet 1

Fig. 1.

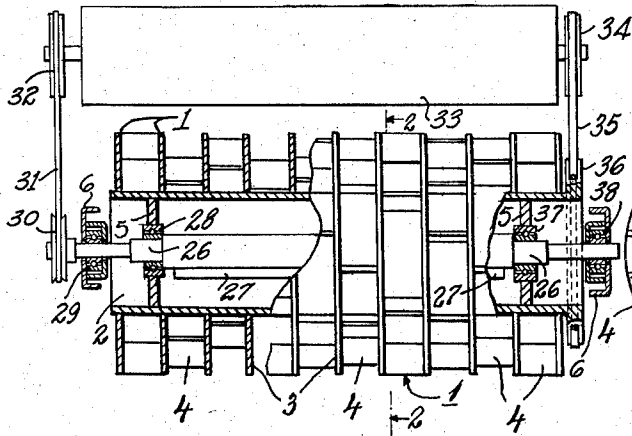


Fig. 2.

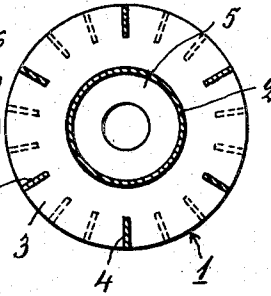


Fig. 4.

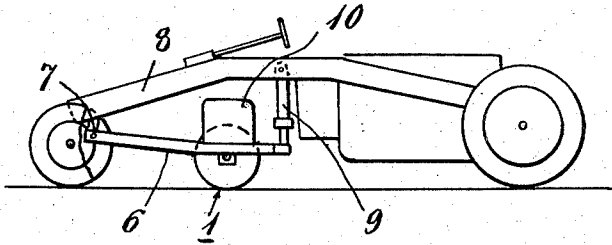
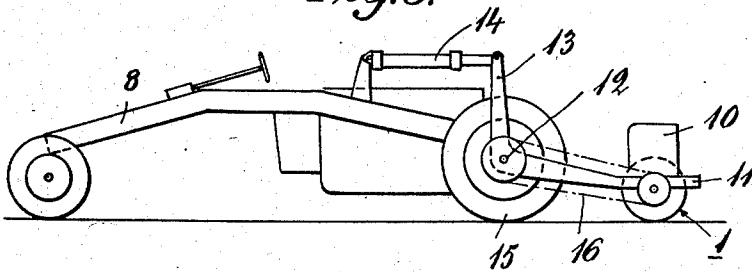


Fig. 5.



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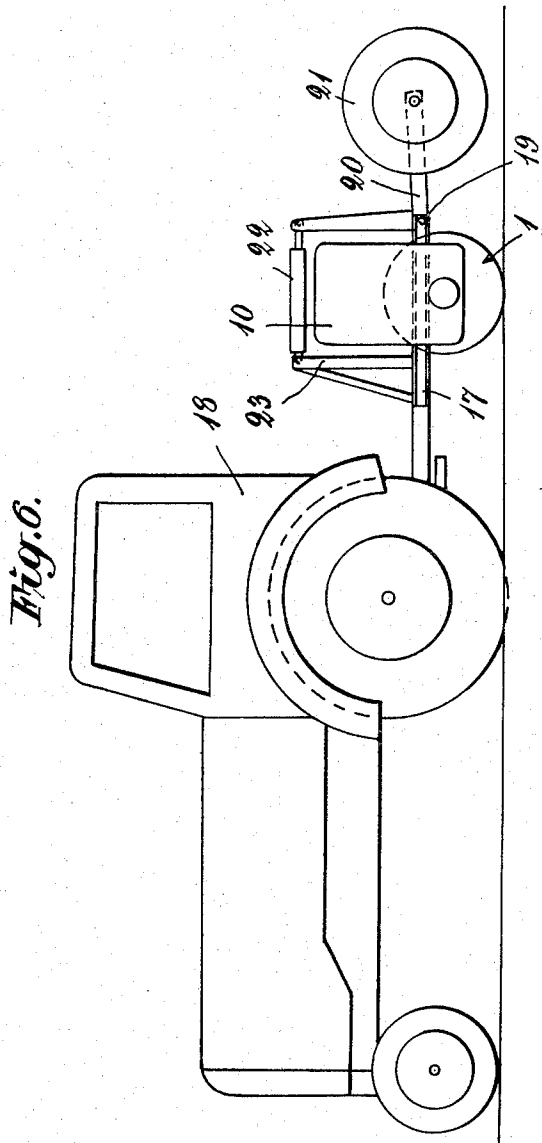
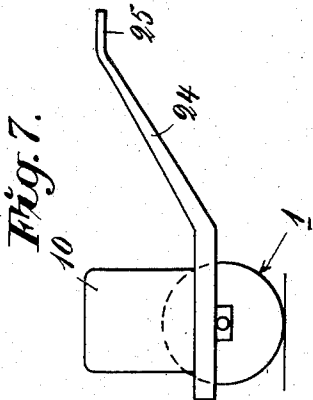
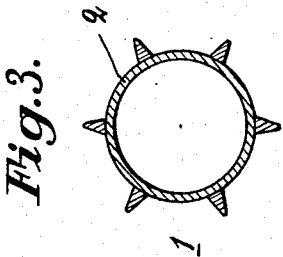
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2 Sheets-Sheet 2



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ROAD SURFACE COATING BREAKER HAVING A VIBRATED ROLLER

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7 Claims. (Cl. 262—19)

This invention relates to an apparatus or a machine for loosening and breaking up hard surface coatings on streets, roads, runways and the like, especially coatings of ice or tightly packed snow, but also asphalt and similar kinds of coatings.

As is well known, snow may become so tightly packed on streets and roads carrying heavy traffic that it forms a more or less hard coating which may be regarded as a film or a layer of ice which is very difficult to remove. Usually, manually operative crowbars must be employed for the purpose, but manual work of this type is of course very expensive and in view of the labour shortage the removal of the ice coating is frequently delayed, particularly in large communities.

The present invention has for its object to provide a mechanical apparatus by means of which such hard ice and snow coatings can be effectively loosened and broken up so that the ice and snow can then be easily removed by ordinary scrapers and scavenging machines.

The apparatus according to the invention comprises as main active implement a vibratory roller or drum having a number of radially directed flanges or knives or rows of spikes, distributed over its outer surface, the outwardly directed edges or points of said members being adapted to penetrate and pierce into and break up the coating, when the roller or drum is advanced over the coated surface. In said apparatus, it has been found particularly advantageous to place or locate the vibration generator centrally within the roller or drum, and to provide for positive rotation of the roller, even if the roller is to be hauled by a tractor vehicle.

In order to make the invention more readily understood two forms of construction of the vibratory breaker or drum and some preferred machines incorporating such a roller or drum will now be described with reference to the accompanying drawings. From this detailed description other objects and features of the invention will become apparent.

In the drawings:

Fig. 1 shows the roller or drum in side-view and partly in section, while

Fig. 2 is a cross-section of the roller in Fig. 1 taken along the view line 2—2 looking in the direction of the arrows, and

Fig. 3 shows another form of the roller in cross-section;

Fig. 4 shows a machine construction equipped with a roller of the type shown in Fig. 1 or Fig. 3;

Fig. 5 shows another embodiment of the machine construction equipped with a roller;

Fig. 6 shows a tractor equipped with an aggregate including a vibratory breaking roller, and

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Fig. 7 shows a hand-driven machine with a roller according to Fig. 1 or 3.

Referring to Figs. 1 and 2; the main part of the surface coating breaker is a roller or drum, generally indicated by the numeral 1 and comprising a central tube 2 of relatively large diameter. The tube 2 carries on its outside a plurality of axially spaced annular flanges or knives 3, which are interconnected by axially extending flange or knife members 4, the inner edges of which are spaced from the outer wall of the tube 2. The flange or knife members 4 between each pair of adjacent flanges 3 are angularly displaced in relation to the corresponding flange or knife members between the adjacent pairs of annular flanges, as may be seen from the figures, and both the outwardly directed edges of the flanges 3 and of the knife members 4 are suitably sharpened and toothed to facilitate their penetration into the coating, for example an ice layer. The central tube 2 is at its ends secured to suitable end members 5 which facilitate the mounting of the roller, and the tube 2 contains a vibration generating set including a shaft 26 carrying an eccentric weight 27 and journaled by bearings 28 on the end members 5 in the tube 2. The shaft 26 extends through support bearings 29 positioned on a frame 6. A pulley 30 on the end of the shaft 26 is rotated by a belt 31 driven by a pulley 32 on a motor 33. This arrangement permits rotation of the shaft 26 at any desired speed independent of the speed of rotation of the roller 1.

To drive the roller 1, another pulley 34, geared in any desired manner to the motor 33, drives via a belt 35 a pulley 36 fastened to one end of the roller 1. The shaft 26 also supports that end of the roller 1 by a bearing 37 and extends to further support bearings 38 on the frame 6.

In the modified form of construction shown in Fig. 3, a number of spikes arranged on the outside of the tube 2 have been substituted for the flange or knife members in Figs. 1 and 2. The spikes project radially from the tube 2 and may be of different kinds. To provide for sufficient strength, however, it is preferred to use tapering spikes having a somewhat greater cross-section at their secured inner ends than at their points.

Referring to the machine according to Fig. 4; the vibratory roller 1 is mounted in a frame 6, the front end of which is pivotally suspended at 7 near the front end of a frame 8 of a wheeled vehicle which may be a road scraper. The rear end of the frame 6 is linked by a hydraulic jack 9 to the vehicle frame 8 at a point located further back. Above the roller 1 there is arranged a driving unit 10 including the motor 33 supported by the frame 6. The primary purpose of this power source 10 is to drive the vibration generator enclosed in the roller but it is also employed in a manner known from vibrating road rollers to impart a rotary movement to the roller 1. The lifting jack 9, by pivoting the frame 6, permits the roller 1 to be raised from the roadway or to be pressed down against the latter when the breaking up of the coating is to take place.

In Fig. 5 the vehicle is the same as in Fig. 4 but the roller 1 is mounted in a frame 11 which is pivotally supported to swing vertically about an axis 12 which coincides with the vehicle's rear-wheel axle. The frame 11 is provided with arms 13 projecting upwards from the fulcrum 12, and the upper ends of said arms are connected by one or more jacks 14 to the vehicle frame 8. As in the previous case, the vibration generator of the roller

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1 is driven by a separate power unit 10 arranged above the roller 1 on the frame 11, and this power unit may, if desired, also be adapted to set the roller 1 in a rotary movement. The roller 1 may, however, alternatively, be set in rotary movement by being coupled to the rear driving wheels 15 of the tractor vehicle by means of a transmission 16 which may be of a very simple type, since the roller 1 swings about an axis coinciding with the axis of rotation of the driving rear wheels 15 of the vehicle. By means of the lifting jack 14 the roller 1 can be raised from the ground or roadway, or be pressed down against the latter, with the necessary power.

It has frequently been found desirable to impart a rotary movement to the roller 1 corresponding to a peripheral speed which differs from the speed at which the roller is moved forward over the roadway, that is to say, the speed of the roller's tractive vehicle. In this way a skidding effect is produced so that the pieces of the coating broken out, for example ice, can be more effectively detached from the underlying support, but in certain other cases the requirements are fully met when the roller 1 is rolled forward over the coated roadway, since the penetration of the knives or spikes into the coating already in itself exercises a loosening action. The arrangement described above with reference to Figs. 4 and 5 of course possesses the advantage that the roller 1 can be pressed with considerable force against the coated roadway, since a part of the vehicle's weight can be transmitted to the roller 1 by means of the jacks. In other cases this is unnecessary, which naturally simplifies the machine construction.

As an example of this, a tractor-driven breaker aggregate is illustrated in Fig. 6. This apparatus is more or less designed as a trailer and consists of a frame 17 in which the roller 1 and the driving unit 10 are mounted. The front end of the frame 17 is connected to the tow-hook (not shown) of the tractor 18 in any known manner, and at the rear end of the frame 17 there is provided a transverse shaft 19 carrying a number of bell crank levers 20 having rearwardly directed arms provided with supporting wheels 21. The upwardly directed arms of the bell crank levers are connected by a lifting jack 22 to a support 23 at the front part of the frame. In operation, when an ice coating is to be broken up, for example, the supporting wheels 21 are raised from the ground so that substantially the entire weight of the aggregate will rest on the roller 1, but when necessary the supporting wheels 21 can be pressed down against the ground by extending the lifting jacks 22 so that they take over the weight of the aggregate from the roller 1 while at the same time the roller 1 is raised into an inoperative position. As in the preceding case, the driving unit 10 may be arranged to drive the vibration generator of the roller 1 only, or at the same time impart a rotary movement to the roller 1.

In cases where a tractor or other tractive vehicle cannot be employed for advancing the roller 1, the road machine may be constructed as shown in Fig. 7. Here the roller 1 is mounted in a frame 24 which is similar to an ordinary hand roller frame and is provided with a handle 25 for guiding and moving it manually. Also in this case the frame supports a driving unit 10 which is primarily adapted to drive the roller's vibration generator but which can also be used for imparting a rotary movement to the roller, as indicated above, whereby the propulsion of the breaker over the ice-coated roadway is appreciably simplified. No appreciable skidding effect can be counted on in this case, however. On the other hand, it may be advantageous to provide the driving unit with a gearbox or the like arrangement permitting a variation of the speed of the roller which may, of course, also be found advantageous in the three embodiments described hereinbefore.

The invention is not limited to the forms of construction illustrated and described above, since in the light

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of the teachings included in the preceding description, it will be obvious to those skilled in the art that the apparatus or machine can be designed in a number of different ways to meet varying demands. Nor is the construction of the active roller or drum limited to the forms of construction shown, since both the dimensions of the roller and the mutual location of the knives or spikes can be varied partly on manufacturing grounds and partly for the more favorable adaptation of the roller to the actual clearing work. Furthermore, although described above especially in connection with the removal of ice and snow coatings, the machine according to the invention may also be employed for breaking up other coatings, such as asphalt or the like.

It will be readily understood that the vibration generator incorporated in the vibratory roller may be of any suitable known construction. Thus it may comprise an unbalanced shaft extending through the roller and being connected to power drive 10 by any suitable transmission such as a V-belt. Instead thereof, it may comprise a rotatable driver forcing, when being rotated, a heavy ball or roller body around a circular race secured to the inside of the tube 2, so that the latter is caused to shake vigorously. A combination of both these arrangements may also be useful. Since such arrangements are previously known in the art of vibratory road rollers and vibratory soil compacting rollers, illustration thereof is considered unnecessary. Also the manner in which the power unit may be coupled to the vibratory roller for imparting a rotary moment thereto is previously known per se from the above-mentioned field of art and does not form part of the invention and is, therefore, not shown in detail.

What we claim is:

1. A machine to loosen and break hard surface coatings on streets, roads and the like, comprising a roller, axially spaced annular flanges extending radially from the surface of the roller, circumferentially spaced knife members extending radially from the surface of the roller and interconnecting the annular flanges, the outer edges of the flanges and the knife members being equidistant from the roller surface and flush at their junctures, and a vibration generator disposed in the roller to impart vibratory movement thereto independent of its rotation to provide a plurality of chopping movements during each revolution of the roller to cause the annular flanges and the knife members to penetrate and break the hard surface coatings.

2. A machine as defined in claim 1, wherein the outer edges of the flanges and knife members mounted on the roller are toothed.

3. A machine as defined in claim 1, wherein drive means are provided to rotate the roller.

4. A machine as defined in claim 1, wherein the knife members interconnecting each pair of annular flanges are angularly displaced around the roller in relation to the knife members contiguous to the other side of said flanges.

5. A machine to loosen and break hard surface coatings on streets, roads and the like, comprising a roller, a frame structure carrying the roller, axially spaced annular flanges extending from the roller surface, circumferentially spaced knife members extending radially from the surface of the roller and interconnecting the annular flanges, the outer edges of the flanges and the knife members being equidistant from the roller surface and flush at their junctures, a vibration generator disposed in the roller to impart vibratory movement thereto independent of its rotation to provide a plurality of chopping movements during each revolution of the roller to cause the annular flanges and the knife members to penetrate and break the hard surface coatings, tractor means to advance the roller carrying frame structure, and means to rotate the vibratory roller at a peripheral speed different from that caused by the advancement of the roller over the road surface by the tractor means, whereby a skidding effect is produced be-

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tween the roller and the road to detach and remove effectively the hard surface coatings.

6. A machine as defined in claim 5, wherein the outer edges of the flanges and knife members mounted on the roller are toothed.

7. A machine as defined in claim 5, wherein the knife members interconnecting each pair of annular flanges are angularly displaced around the roller in relation to the knife members contiguous to the other side of said flanges.

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