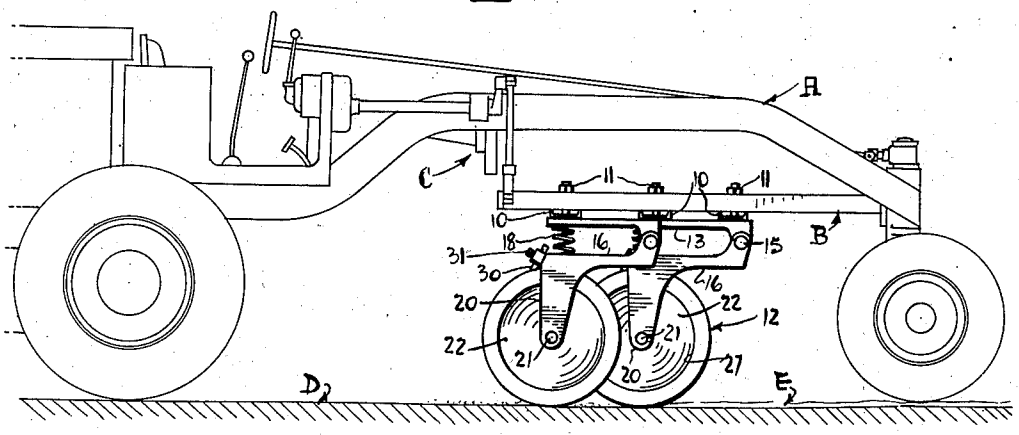
May 28, 1946. C. J. BECK 2,400,906

ICE REMOVER

Filed Feb. 19, 1944

Fig. 1.



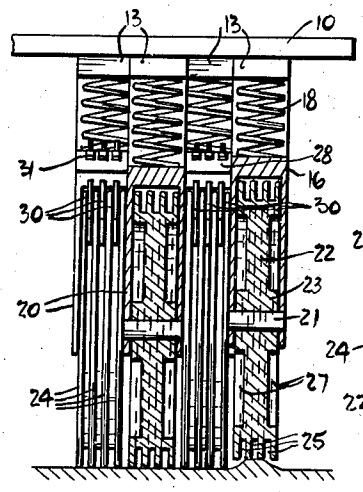


Fig. 3.

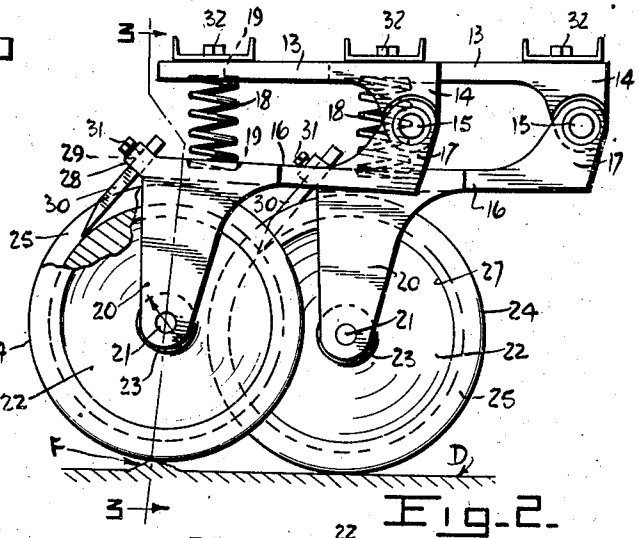
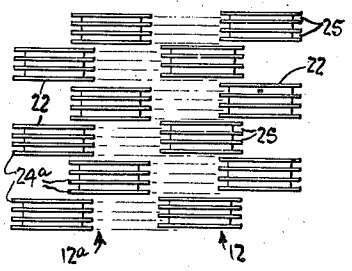


Fig. 2.

Fig. 5.



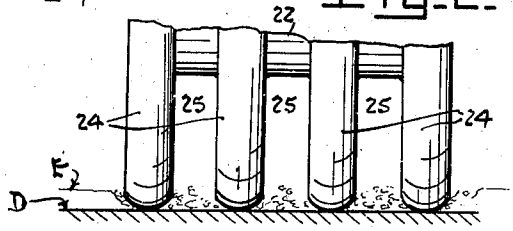


Fig. 4.

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UNITED STATES PATENT OFFICE

2,400,906

ICE REMOVER

Charles J. Beck, Fargo, N. Dak., assignor of one-half to Earl Armstrong, Fargo, N. Dak.

Application February 19, 1944, Serial No. 523,165

6 Claims. (Cl. 262—20)

This invention relates to means for sleet and ice removal on paved highways, airport landing strips and aprons, and various surfaces which accommodate vehicular traffic. Under present conditions, where sand has been placed upon the sleet or ice to provide a traction surface, it is found the winds usually accompanying a sleet condition remove the sand in relatively short space of time, and in addition to which sanding is a time consuming task, thus demonstrating the need for actually removing the sleet and ice.

The primary object of my invention, therefore, is to provide a device which, when used in conjunction with a road grader of standard manufacture or other suitable equipment, will pulverize the sleet layer. This pulverizing action will cause the layer to be broken into small particles which can easily be removed by the use of a revolving brush, driven by the grader, by passing vehicular traffic, or by the air turbulence normally accompanying a sleet condition.

An additional object is to provide a convenient method of mounting and demounting the device so as not to restrict the utility of the aforementioned grader or other machine with which it is used.

A further object is to insure adaptability of the device to various surface widths. This requirement is satisfied by providing for a plurality of individual units to be mounted in transversely aligned gangs and so designed that one or more of the individual units may be removed as required. Also, in this connection, there is provision for the addition of individual units in tandem with one another where the sleet layer is particularly tenacious and requires additional pulverization for removal.

Still a further object is to provide a manner of independent suspension of a series of narrow individual units, so that a surface irregularity encountered by one unit will not cause pressure to be removed from one or any other units. Each unit is further independently spring biased to the surface being contacted so as to provide constant pressure with respect to that surface.

The methods used in accomplishing these and other objects will be disclosed in the following specification, reference being had to the accompanying drawing in which—

Fig. 1 is a side view of a two gang sleet removing apparatus mounted on a road grader of standard manufacture.

Fig. 2 is an enlarged fragmentary side view of two units mounted in tandem, showing the method of mounting, the hinged members and the bias springs and also showing one of the units accommodating itself to a surface irregularity.

Fig. 3 is a fragmentary cross sectional, front view along the line 3—3 in Fig. 2, of four units showing the independent mounting and also showing one of the units accommodating itself to a surface irregularity.

Fig. 4 is an enlarged, fragmentary end view of a single unit showing the action thereof upon the ice layer.

Fig. 5 is an enlarged, diagrammatic plan view showing a series of units arranged in parallel and tandem in such fashion that the rollers of the second series of units will contact the surface not encountered by the leading series of units.

Referring now more particularly and by reference characters to the drawing, A represents generally a road grading machine shown here as being one type of machine to which my invention may be applied. This machine includes an A-frame or drawbar structure B and a mechanism C by means of which down pressure may be exerted on this element B and the same adjusted up and down. Ordinarily the grader blade (not shown) is attached to the drawbar C but this is, of course, removed when my invention is applied to the machine. Substituted then for the grader blade are three, more or less, transverse mounting beams 10 which are bolted to drawbar B as indicated at 11 and which are of such length as to support the disk or roller gang 12 which makes up my ice remover. This gang may be of any required width, transversely, in order to clear the lane along the highway or other surface D upon which the ice or sleet E has collected.

The gang 12 comprises a series of individual units of substantially identical construction and each of which comprises a mounting member or bracket 13 extending generally forwardly and rearwardly and having at its forward and lateral corners, depending hinge ears 14 which are apertured to receive a transversely extending hinge pin 15. Supported from this pin 15 is a roller support member or bar 16 which is spaced below the mounting bracket 13 in the same upright plane as that bracket and which at its forward end has upwardly turned ears 17 apertured to pivotally engage said pin 15. Adjacent the rear ends of the members 13 and 16 is an expansion coil spring 18 braced between the members and exerting a yielding downward or biasing pres-

sure upon the lower member 16. The spring may be held against displacement by any suitable means such as the shallow recesses 19 in which its ends are shown as disposed.

Depending from the sides of the member 16 adjacent the rear end thereof are transversely spaced and vertically elongated lugs 20 and adjacent their lower ends these lugs carry an axle pin 21. Between the lugs 20 is positioned a narrow roller 22 having a hub 23 journaled upon the axle pin 21 and which hub may if desired be provided with any suitable form of anti-friction bearings (not here shown). The peripheral surface of the roller 22 has a number, here shown as four, of transversely spaced and annular ribs or fins 24 between which the diameter of the roller is reduced forming annular spaces or grooves 25. The sides of the roller 22 are shown as dished out at 27 to reduce the amount of material required and obviously the roller may be provided with a replaceable tread surface in a conventional manner to facilitate replacement when the ribs 24 become worn.

The rear end of the support member 16 of each unit is angled upwardly at 28 and provided with openings 29 to slidably receive stripper fingers 30 which extend into the grooves 25 substantially tangent thereto and at the upper rear portion of the roller. The stripper fingers 30 are adjustably secured in the openings 29 by set screws 31 and may be adjusted to proper position in the grooves 25 to clean out ice therefrom as the roller rotates.

In use the units constructed as described are arranged in two transversely aligned rows, one slightly forward of the other and with alternate units spaced forwardly and rearwardly to such distance that the respective lugs 20 will clear each other as seen in Figs. 1 and 2. In this manner the rollers 22 may be brought closely together (see Fig. 3) without interference from the lugs 20 and so that the spaces between individual rollers will be substantially equal in width to the spaces 25 in the rollers and the paths traveled by the webs 24 will thus be equally spaced across the full width of the rows. As thus arranged the forward ends of the mounting bars 13 of the rear units will fit alongside the rear ends of forward units and beneath the center beam 10, while the opposite ends of the bars will fall beneath the forward and rearward beams, as clearly seen in Fig. 1. The bars 13 may be secured to the beams 10 by bolts as seen at 32 in Fig. 2.

Now as the machine moves forwardly over the surface D, be it a highway, apron or whatever, the rollers 22 will turn while exerting relatively tremendous downward pressure on the ice coating E. This pressure is secured by the springs 18 and the pressure exerted downward on the drawbar B by the usual mechanism of the machine A. The narrow, disc-like webs 24 will crush the ice as they roll over it and the crushing effect spreads laterally from each web as seen in Fig. 4 so that the ice will be crushed or pulverized across the full width of the gang 12. The spaces 25 between the webs 24 are substantially equal to the width of the webs so that one-half of the ice surface is contacted by the rollers. It is found that the ice is completely crushed in this manner and much more thorough clearing accomplished than would be possible were the spaces any wider. The rounded edges of the webs, as seen in Fig. 4, further contribute to complete crushing by causing a lateral pressure or "side busting" effect on the ice. The ice thus reduced is found to be blown aside either by the wind or the air turbulence set up by passing traffic. Or a scraper or rotary brush (not shown) may be used for this purpose as will be understood.

The plurality of narrow rollers 22 and the individual suspension of each provides for the complete accommodation of the apparatus to irregularities in the surface on which it travels. On even the smoothest appearing highways minor and small irregularities or bumps are common and as clearly seen in Figs. 2 and 3 one of the rollers meeting such an obstruction F will rise to roll thereover and then immediately return to the same level as the others under influence of the spring 18 when the obstruction is cleared. This action takes place without in any way interfering with the effective crushing action of all of the other units. This individual suspension of a great number of narrow units obviously is thus far superior to a single elongated roller which if lifted at any point by a bump on the road surface will angle upward and leave a great part of the surface uncleared of the ice.

Where a single two-row gang 12 is found to be insufficient to completely clear the entire surface of ice a second, similarly arranged two row gang 12a (Fig. 5) may be placed in tandem to the first and forward gang and offset slightly in the transverse plane so that the ribs 24a of the rear gang will travel the path of the grooves 25 in the forward gang. The complete surface is thus contacted by the ribs as will be evident.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. Apparatus of the character described for crushing an ice coating on a surface carrying vehicular traffic, comprising a wheeled frame adapted to travel that surface and having a transversely arranged mounting means, a front row and a rear row of rollers arranged transversely of the frame, mounting assemblies for connecting the rollers to the said supporting means and each assembly including an upper member and a lower member movably connected so that the lower member may move upwardly and downwardly, spring means biasing said lower member in a downward direction, said lower member of each assembly having lateral depending lug members between which the roller is journaled, and the rear row of rollers and their mounting assemblies being so spaced behind the forward row that the adjacent lateral lug members on the respective lower members will clear each other and lie in substantially the same upright longitudinal plane to permit close spacing of the rollers.

2. Apparatus of the character described for crushing an ice coating on a surface carrying vehicular traffic, comprising a wheeled frame adapted to travel that surface and having a transversely arranged mounting means, a front row and a rear row of rollers arranged transversely of the frame, mounting assemblies for connecting the rollers to the said supporting means and each assembly including an upper member and a lower member movably connected so that the lower member may move upwardly and downwardly, spring means biasing said lower member in a downward direction, said lower member of each assembly having lateral depending lug members between which the roller is jour-

naled, and the rear row of rollers and their mounting assemblies being so spaced behind the forward row that the adjacent lateral lug members on the respective lower members will clear each other and lie in substantially the same upright longitudinal plane to permit close spacing of the rollers, the said rollers all having a series of transversely spaced peripheral webs separated by peripheral grooves, and the said spacing between adjacent rollers being substantially the same as the width of said grooves.

3. In an apparatus of the character described, the combination with a frame, of at least one roller adapted to be carried by the frame and rolled thereby over an ice coated surface, said roller having a plurality of spaced narrow webs, and the outer annular surfaces of the webs being rounded off transversely to thereby exert lateral pressures upon the ice.

4. Apparatus of the character described for crushing an ice coating on a surface carrying vehicular traffic, comprising a wheeled frame adapted to travel that surface and having a transversely arranged mounting means, a front row and a rear row of rollers arranged transversely of the frame, mounting assemblies for connecting the rollers to the said supporting means and each assembly including a member having lateral depending lug members between which the roller is journaled, and the rear row of rollers and their mounting assemblies being so spaced behind the forward row that the adjacent lateral lug members will clear each other and lie in substantially the same upright longitudinal planes to permit close overlapping relation of the front and rear rollers.

5. In an apparatus of the character described for crushing the ice coating upon a road surface, a frame adapted to travel over said surface, a series of rollers arranged side by side and adapted to be rolled upon the ice coating to crush the same, a mounting assembly for each of said rollers comprising an upper member rigidly secured to the frame, a lower member pivotally connected at its forward end to the forward end of said rigid member and extending rearwardly therebeneath, means at the rear end of said lower member rotatably supporting the roller, and a spring disposed between the said upper and lower members immediately above the said roller and operative to exert a yielding downward pressure upon the said lower member.

6. In an apparatus of the character described, the combination with a frame of at least one roller adapted to be carried by the frame and rolled thereby over an ice coated surface, said roller having a plurality of spaced peripheral webs the width of which is substantially equal to the spaces between them, and the outer peripheral surfaces of the webs being rounded off transversely to thereby exert lateral crushing pressures on the ice between the webs.

CHARLES J. BECK.