Sept. 17, 1968 G. L. SCHNEIDER 3,401,611

APPARATUS AND METHOD FOR REPAIR OF PAVEMENT

Filed April 25, 1966 2 Sheets-Sheet 1

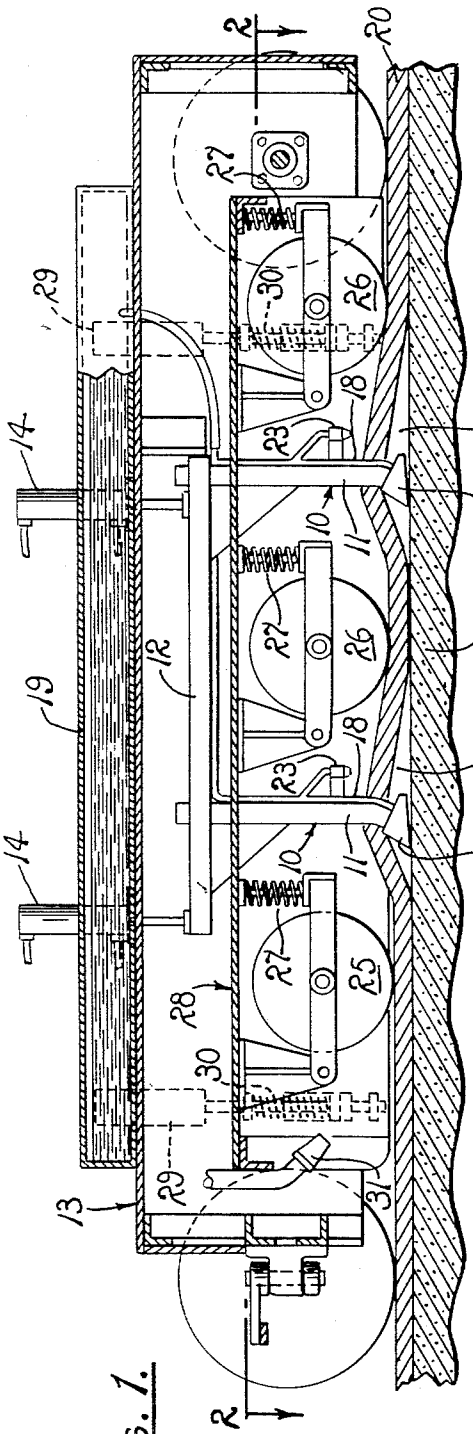


FIG. 1.

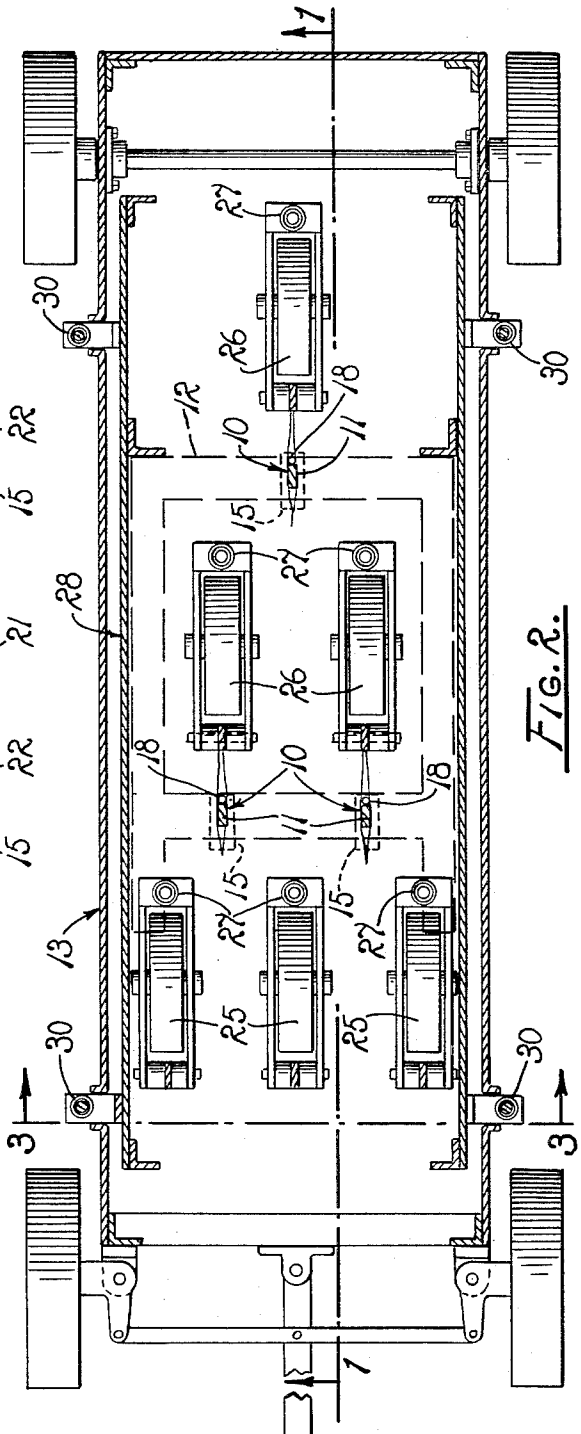


FIG. 2.

GORDON L. SCHNEIDER
INVENTOR

Hubner & Worel
ATTORNEYS

Sept. 17, 1968 G. L. SCHNEIDER 3,401,611

APPARATUS AND METHOD FOR REPAIR OF PAVEMENT

Filed April 25, 1966 2 Sheets-Sheet 2

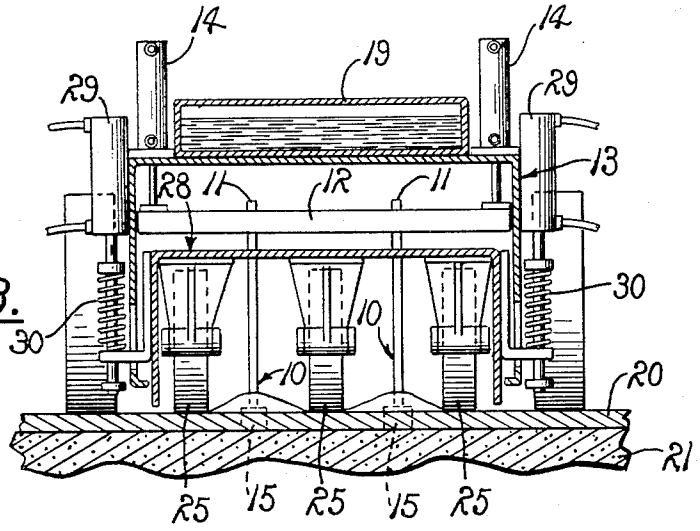


FIG. 3.

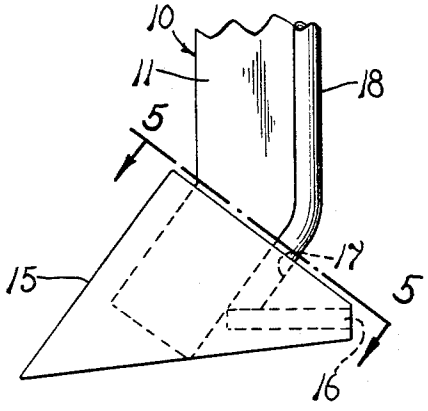


FIG. 4.

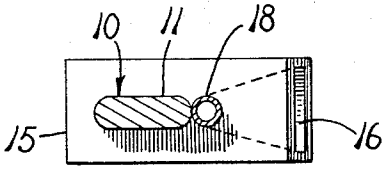


FIG. 5.

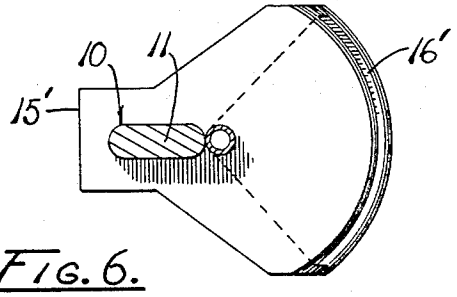


FIG. 6.

GORDON L. SCHNEIDER
INVENTOR

Huebner & Worrel
ATTORNEYS

United States Patent Office 3,401,611 Patented Sept. 17, 1968

3,401,611

APPARATUS AND METHOD FOR REPAIR OF PAVEMENT

Gordon L. Schneider, 1407 E. Olive Ave., Fresno, Calif. 93728

Filed Apr. 25, 1966, Ser. No. 545,011
10 Claims. (Cl. 94—39)

ABSTRACT OF THE DISCLOSURE

The invention consists essentially of a blade mounted on an arm or shank and adapted to slit and cut under a layer of paving and lift it for the injection thereunder of a paving treating material which is applied by a nozzle discharging from the rear of the blade. Ahead and to the sides of the blade are rollers which prevent excessive lifting and lateral sliding or tipping of the lifted paving. A nozzle on the back of the blade shank discharges paving treating material on the cut faces of the slit and a following roller presses the layer and closes the slit for trapping and sealing in the paving treating material injected beneath the paving.

This invention relates to an apparatus and method for the treatment of paving, such as asphalt road surfacing, and more particularly to such an apparatus and method for repairing paving in situ.

Often it is desirable to repair paving, such as the pavement of a heavily travel road or highway, with great speed to reduce to a minimum the amount of detouring or congestion of traffic, the interference with the transaction of business, or the transport of supplies and services. Most conventional means and methods of paving repair involve a great deal of time and concomitant delay and interference with traffic, business transactions and the general welfare of people relying upon the free use of the avenue of commerce being repaired.

Accordingly, it is an object of this invention to provide a convenient and efficient method and apparatus for rapidly repairing paving in place upon an avenue of traffic or the like.

Another object of this invention is to provide a method and apparatus for repairing defective pavement in place upon a roadbed or the like so that interference with the use of the right of way during the repair period is minimized.

Additional objects of the invention will become apparent from the following description, which is given primarily for purposes of illustration, and not limitation.

Stated in general terms, the objects of the invention are attained by providing an apparatus including means for separating, slitting, cutting, grooving, furrowing, or the like, paving surfaces; means for lifting or elevating the separated portions of paving from the adjacent surfaces of the right of way; and means for applying, spraying, injecting, or the like, paving and/or paving bed treating material beneath the separated pavement and/or the adjacent bed surface region. The slitting and lifting means preferably are arranged or mounted upon a single movable vehicle so that the paving separating and lifting operations are performed simultaneously as the tool is moved continuously along a path of treatment. The spray means preferably also is arranged or mounted upon the same vehicle upon which the paving separating means and separated paving lifting means are arranged or mounted. It will be seen that by the use of the apparatus of this invention, a method of repairing pavement is provided wherein the paving is cut through, the separated paving portions located laterally of the cut are lifted and a treating material is applied beneath the lifted paving portions

to the under side thereof and upon the exposed upper surface of the paving bed, as desired.

A more detailed description of a specific embodiment of the invention is provided for purposes of illustration and exemplification with reference to the accompanying drawings, wherein:

FIG. 1 is a side elevational view, partially in section, taken as along line 1—1 of FIG. 2, showing a plurality of units of the pavement cutting, lifting and treating apparatus of the invention mounted upon a suitable vehicle and in use upon an asphalt paved road.

FIG. 2 is a plan view, partially in section taken as along line 2—2 of FIG. 1, showing the orientation of the apparatus units upon the road vehicle relative to a system of auxiliary rollers.

FIG. 3 is a vertical section, taken on line 3—3 of FIG. 2, showing the relationship of the apparatus units and the auxiliary rollers to a treating material supply tank and hydraulic rams for adjusting the apparatus units and the auxiliary rollers relative to the surface of the paved road.

FIG. 4 is a partial side elevation showing a tool of the invention combining means for simultaneously cutting asphalt paving, lifting the cut portions of paving, and applying treating material below the lifted paving portions as the tool is moved along the asphalt paving.

FIG. 5 is a section, taken on line 5—5 of FIG. 4, showing details of the mounting arm of the tool and the supply line and spreading nozzle of an embodiment of the invention.

FIG. 6 is a view similar to that of FIG. 5 showing an alternative configuration of the spreading nozzle of an apparatus unit of the invention.

The asphalt pavement separating or cutting tool **10**, details of which are shown particularly in FIGS. 4 and 5, is mounted as three separate units, in the specific embodiment of the invention shown in FIGS. 1 to 3. Tool **10**, in each of the three units, includes an arm **11** suitably attached at its upper end to a tool support plate or member **12**. Any suitable attachment of arm **11** to plate **12** can be used which will rigidly hold or fix arm **11** in plate **12**. Plate **12** is, in turn, suitably mounted on a carriage **13** for controlled vertical movement and adjustment by means of hydraulic rams **14** operatively mounted on the carriage in any suitable manner. Such mountings are well known in the road machinery arts.

Tool **10** also includes an asphalt paving separating or cutting blade **15** suitably mounted, or fixed, on the lower end of arm **11**. It will be noted that arm **11** is bent forwardly at a suitable angle so that blade portion **15** is urged backwardly onto arm **11** while in use for separating or cutting pavement. Cutting portion **15** resembles a plow share, or blade, or the blade of a shovel. In addition to its separating or cutting function, it serves to lift the separated pavement by prying the portions of pavement to either side of blade **15** upwardly by virtue of the upwardly extending and angular inclination of the front and side surfaces of the blade. This action is indicated in FIGS. 1 and 3.

To the rear of blade **15**, tool **10** is provided with a fan-shaped nozzle or port **16**, which communicates, through a bore **17**, with a conduit **18**. Conduit **18**, in turn communicates with a treating material supply tank **19**, mounted on top of vehicle or carriage **13**. While carriage **13** is drawn forwardly and tools **10** separate and lift the asphalt pavement, treating material, such as oil, solids, aqueous chemical solutions, or mixtures of oil, aqueous solutions and solids, are applied to the under side of the asphalt pavement **20** to the exposed surface of a roadbed **21**, as at **22** in FIG. 1. An additional treating material nozzle or port **23** may be included in each tool **10** for the purpose of spraying or applying treating material

to, or on, the sides of the slits produced in the pavement and/or on the surface of the pavement.

Carriage **13** also is provided with leading rollers, such as three leading rollers **25** forwardly of tools **10**. In addition, carriage **13** is provided with following rollers, such as shown at **26**, so that a following roller **26** is located rearwardly of each tool **10**. The purpose of leading rollers **25** is to prevent excessive lifting, lateral sliding, or lateral tipping over an excessive area of the separated asphalt pavement and the purpose of the following rollers **26** is to press the separated and lifted portions of the asphalt pavement back down upon the treated surfaces of the roadbed to complete the treatment and repair operations. In this manner any treating chemicals and materials are promptly trapped and locked in position in the roadbed soil beneath the asphalt pavement to produce long-lasting pavement repairs.

Leading and following rollers **25** and **26** may be provided with biasing coil springs **27** for the purpose of maintaining suitable pressures of the rollers upon the surface of asphalt pavement **20** as carriage **13** is drawn over the road by a suitable prime mover, not shown. Rollers **25** and **26** are mounted beneath a roller frame **28** which, in turn, is adjustable vertically relative to the surface of pavement **20** by means of hydraulic rams **29** mounted in the carriage **13**. Biasing coil springs **30** serve to apply uniform pressure to roller frame **28** to cushion the effects of unevennesses in asphalt pavement **20**.

A conventional flame thrower **31**, or battery of flame throwers, can be mounted forwardly on carriage **13**, as indicated in FIGS. 1 and 2, for heating and softening asphalt pavement **20** so that it can be more easily separated and lifted continuously by tools **10** as carriage **13** is continuously drawn over the road, highway, or other paved surfaces. Carriage **13** can be any suitable type adapted for the work to be done and the prime mover to be used. Similarly, the structural details of tool **10** and the number of such tools used on the carriage can be varied widely to best suit the job requirements of the paving repairs to be made. For example, the structural details of blade **15** can be varied as shown in FIG. 6, where blade **15'** is provided with a wider nozzle or port **16'** than that shown for blade **15** in FIGS. 4 and 5, to more widely spread the applied treating material.

In some cases large amounts of oil or chemicals are applied to the separated asphalt pavement to assist in breaking or disintegrating the pavement, by the use of the alternate form of tool **10** shown in FIG. 6, or by the use of other suitable variations of tool **10**. Various shapes of shields may be attached to blade **15** of tool **10** to achieve various desired results, as will appear to those skilled in the art. More than one treating material distribution system can be mounted on each tool **10**. For example, both solid treating material and liquid treating material systems, respectively, can be mounted on a tool **10** to make it more versatile and efficient for more types of work.

Operation

The operation of the described embodiments of the present invention is believed to be readily apparent and is briefly summarized at this point. The carriage **13** is drawn over an area of pavement **20** to be treated. The rams **29** are adjusted to lower the frame **28** to bring the rollers **25** and **26** into downwardly compressive engagement with the pavement under the urging of the springs **27**. The rams **14** are adjusted to lower the tool supporting member **12** so that the cutting tools **10** are forced into the pavement and the blades **15** assume a plane of operation coincident with the innerface of the asphalt pavement **20** and the roadbed **21**. The flame thrower **31** is preferably actuated to heat and to soften the pavement. As the carriage moves from right to left, as viewed in FIGS. 1 and 2, each of the rollers **25** and **26** maintains a downward pressure on the pavement. The tools **10** slice through the pavement and the blades **15** wedge and buckle it upwardly. The downward pressure of the forward rollers **25** limit the forward extent of lifting of the pavement as well as the lateral extent of lifting thereof so that slabs of the pavement which are lifted are limited in the extent of their areas to amounts conveniently handled by the power available. Similarly, the pair of forward rollers **26** limit the extent of forward and lateral lifting of slabs by the rearward most tool **10**.

Concurrently, treating material is flushed under the lifted slabs of pavement from the tank **19** through the conduits **18**, the bores **17**, and the ports **16**. The flushing action is preferably sufficiently extensive so that the treating material moves laterally from each of the tools **10** to positions rearwardly aligned with their respectively forwardly adjacent pair of rollers. At the same time, the treating material is sprayed out of the nozzles **23** on the sliced portions of the pavement so as to permeate the cuts between the slabs to achieve additional treating effect and further to enhance the capturing action of the slabs on material flushed beneath the slabs or generated by chemical activity therebelow.

Each of the tools **10** is followed by a rearwardly aligned roller **26** which rolls along a path coincident to that traversed by its respective forwardly adjacent tool. Such rollers depress the slabs of pavement downwardly against the treating material, and serve to level the pavement.

In many instances, the described operation is adequate to have a sufficiently beneficial effect upon the pavement. However, it may be advantageously followed with additional treating operations. For example, in many instances a roller is utilized in following relation to the described apparatus in order to smooth and compact the treated pavement. In other instances, the material used to treat the pavement is permitted to interact with the pavement and/or the roadbed to achieve a desired result, the pavement then scarified, pulverized, or otherwise comminuted, leveled, and again compacted with or without additional surface treating material, as circumstances may suggest.

Although the invention has been herein shown and described in what are conceived to be the most practical and preferred methods and apparatus, it is recognized that departures may be made therefrom within the scope of the invention, which is not be be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent methods and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A paving treating apparatus comprising a traveling frame, a tool mounted in the frame having a cutting portion for slicing through paving and an inclined portion disposed beneath paving so sliced for lifting it laterally adjacent to the slice, laterally spaced paving pressing means mounted in the frame for paving engagement forwardly and laterally of the tool for limiting the lifting of the paving laterally adjacent to the slice, means associated with the tool for injecting a flowable paving treating material beneath the lifted paving and a paving pressing device mounted in the frame disposed in following trailing relation to the tool for pressing the slice closed and confining the injected material beneath the paving.

2. The apparatus of claim **1** in which the paving pressing means and the paving pressing device comprise rollers in paving engagement.

3. The apparatus of claim **1** in which the paving pressing means and the paving pressing device are mounted in the frame for independent vertical movement relative to the frame.

4. The apparatus of claim **1**, further including a nozzle mounted directly behind said tool for applying paving treating material to the cut faces of said slice, passage of said trailing paving pressing device pressing the cut faces of the slice together and confining the injected material beneath the paving.

5. The apparatus of claim 1, further including additional like tools mounted in said frame, one of said additional tools being disposed alongside said first-named tool in laterally spaced relation and forming therewith a pair of tools, another of said additional tools being disposed between and rearwardly of said pair of tools, each of said additional tools having a trailing paving pressing device for engagement with the paving and closing the slice formed by the tool, the trailing paving pressing devices of the pair of tools also serving to limit the lateral extent of paving lifting by the rearward tool.

6. The apparatus of claim 5 in which each of said pressing devices is a roller.

7. An apparatus for treating paving comprising a vehicle having predetermined relative direction of earth traversing movement; a tool borne by the vehicle adapted to engage paving during earth traversing movement of the vehicle, said tool having a shank adapted to slice the paving, a wedge borne by the shank beneath the paving adapted to elevate the paving at each side of the slice, and a conduit extended through the wedge having an outlet beneath the lifted paving; rolls borne by the vehicle for rolling engagement with the paving ahead of and on opposite lateral sides of the tool to limit lateral lifting action of the paving by the wedge; a source of flowable paving treating material borne by the vehicle connected to the conduit of the tool adapted to force such material through the tool and outwardly beneath the lifted paving; and a roller borne by the vehicle in following relation to the tool for rolling engagement with the paving along the slice adapted to press the lifted paving downwardly against the injected material.

8. The apparatus of claim 7, further including a nozzle mounted on said tool shank and adapted to apply paving

treating material to the cut faces of said slice, passage of said following roller pressing the cut faces of the slice together and locking in the injected material beneath the paving.

9. A method of treating a layer of paving comprising slitting the layer, lifting the layer along side the resultant slit, applying a treating material beneath the lifted layer and to the faces of the slit, and compressing the layer downwardly against the applied treating material for closing the slit and confining the material beneath the layer.

10. Apparatus for treating a layer of paving comprising means for slitting the layer, means for lifting the layer on opposite sides of the slit while retaining the layer-like integrity thereof, means for applying a treating material through the slit and beneath the lifted layer, means for applying a treating material to the sides of the slit means for compressing the paving downwardly to close the slit and confine the treating material, volatile constituents thereof, and chemicals released by action of the material beneath the paving, and means mounting the slitting means, lifting means, applying means, and compressing means for corresponding paving traversing movement.

References Cited

UNITED STATES PATENTS

1,952,452	3/1934	Monroe	94—39.5
1,976,857	10/1934	Poulter.	
2,134,245	10/1938	Carswell	94—44
3,066,582	12/1962	Cutler	94—39

JACOB L. NACKENOFF, *Primary Examiner.*