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Hoermann

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[54] **APPARATUS FOR PRODUCING GROOVES IN SURFACES SUCH AS ROAD SURFACES**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **299/36**, 299/10, 299/88

[51] **Int. Cl.** **E01c 23/09**

[58] **Field of Search** 299/36, 37, 88, 10

[56] **References Cited**

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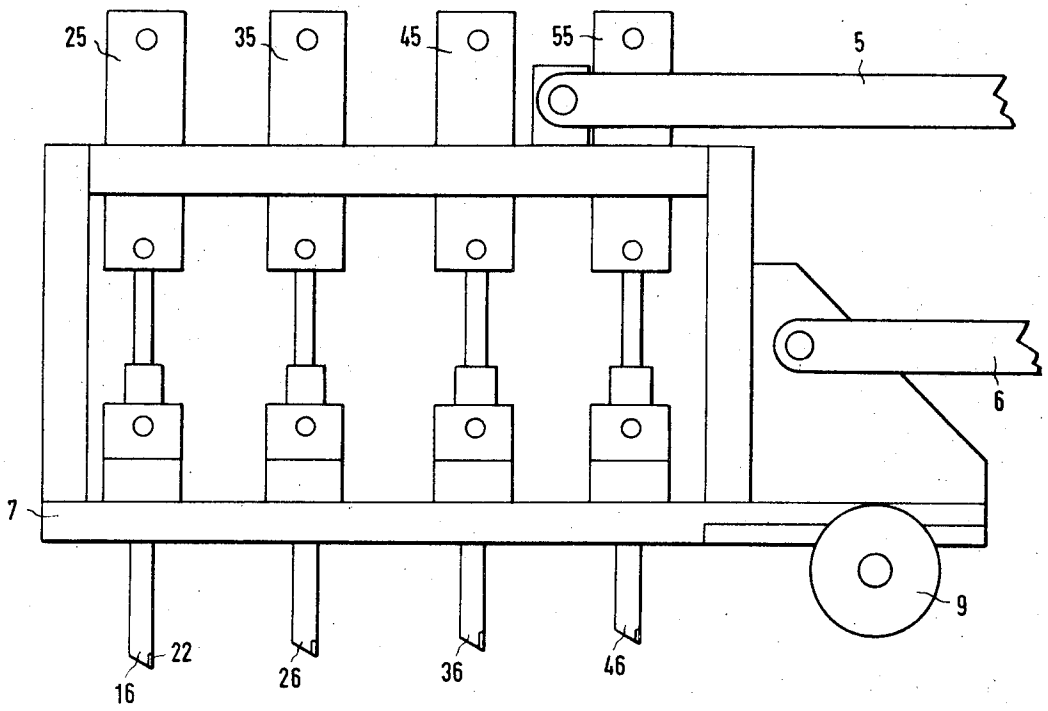
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[57] **ABSTRACT**

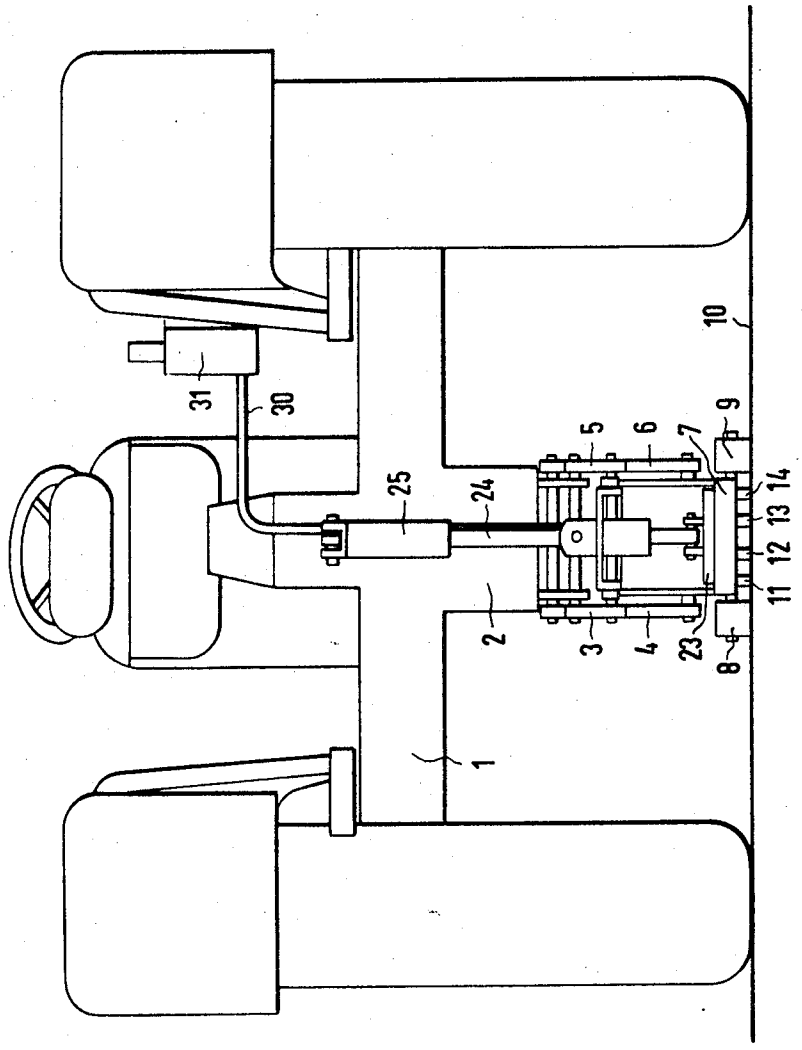
Grooves are formed in a pavement by means of planing chisels mounted on a tool holder carriage hitched to a tractor by means of a plurality of parallel bars to hold the carriage parallel to the surface to be grooved. The planing chisels are held stationary relative to the tool holder carriage and vertical or perpendicular relative to the surface to be grooved.

2 Claims, 4 Drawing Figures



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Fig.1



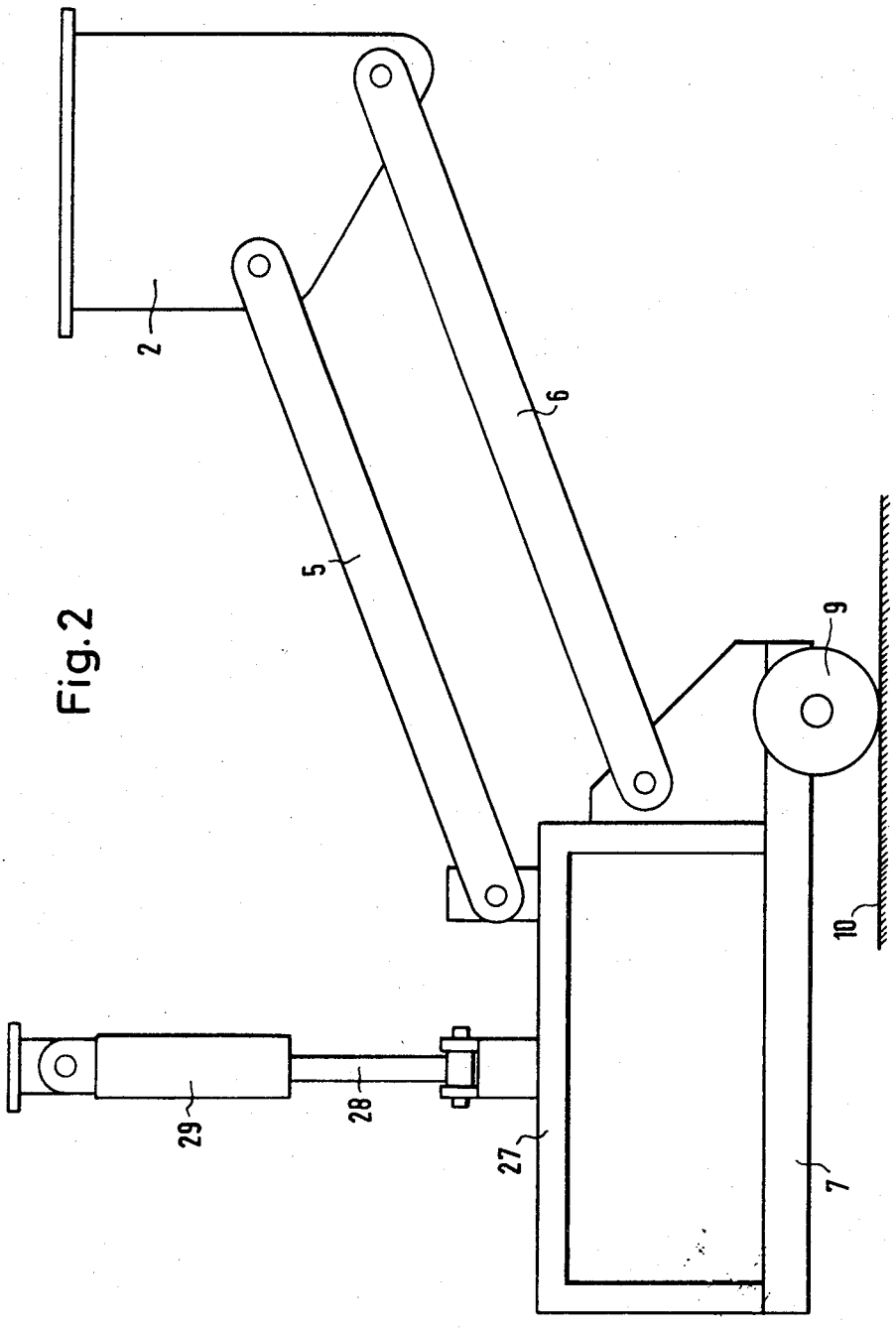


Fig.2

Fig.3

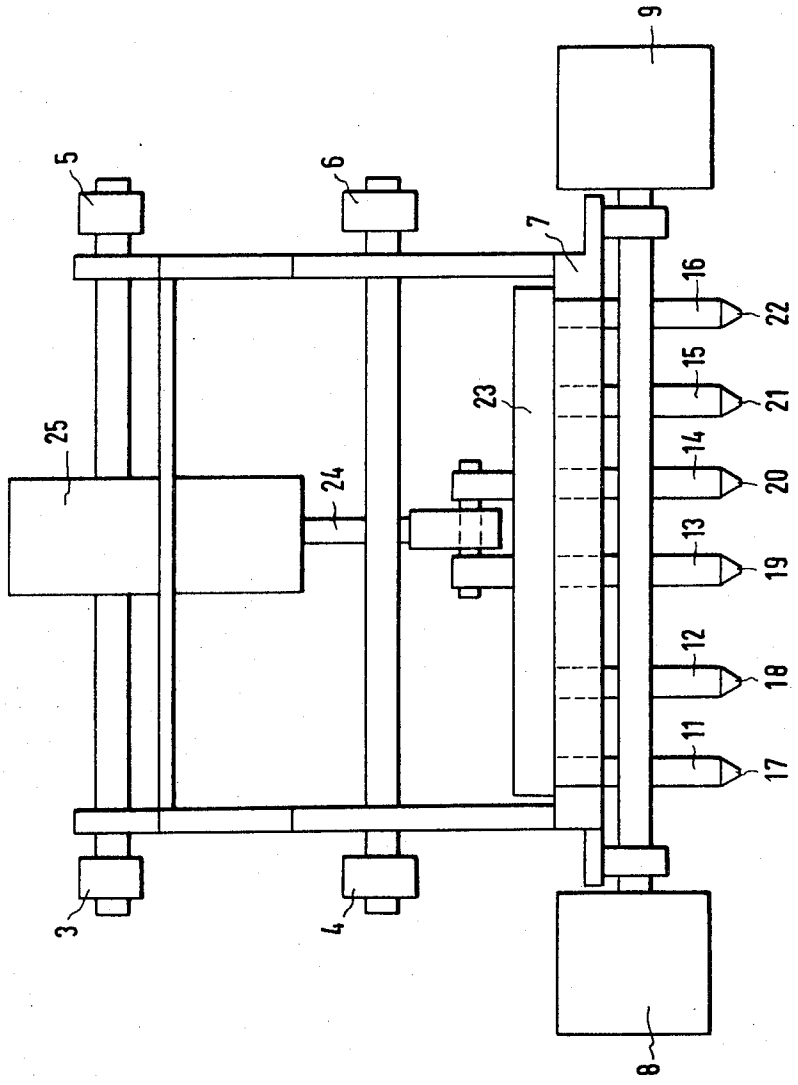
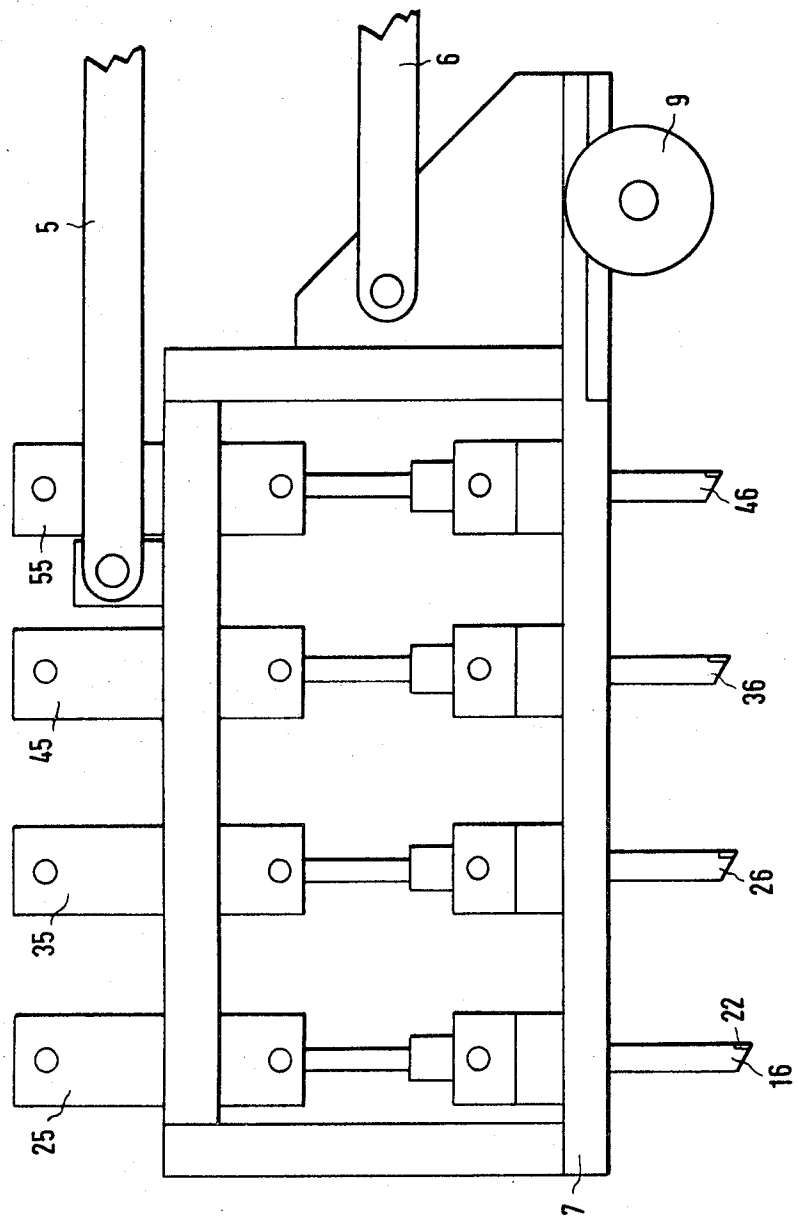


Fig.4



APPARATUS FOR PRODUCING GROOVES IN SURFACES SUCH AS ROAD SURFACES

BACKGROUND OF THE INVENTION

The invention relates to a method and apparatus for forming of grooves having sharp boundaries in the surfaces of roads, runways, or the like, for example for the insertion of markers or similar devices in said grooves.

The forming of strip like grooves in the pavement of roads, runways, or the like by milling the grooves into the material of the pavement is known. However, the milling permits only very low working speeds. On the other hand, it is also known that such grooves may be formed by means of a device in which several rings provided with teeth are arranged on a shaft with spacings between the rings. The shaft is supported between two wheels and the teeth penetrate into the pavement by rotating said wheels. However, this method has the disadvantage that only a small penetration depth is possible, especially if the pavement material is hard. Here again, essentially a milling operation takes place.

OBJECTS OF THE INVENTION

It is an object of this invention to solve the above problems, and to provide a method and apparatus by means of which grooves may be produced in the surface of a road independently of the characteristics of the road surface and with the necessary penetration depths, while simultaneously achieving high working speeds.

Another object is to facilitate the formation of such grooves to any desired depth and breadth.

A still further object is to avoid, in the formation of grooves and ditches in the ground, in pavements or the like, a milling operation.

It is also an object to assure sharp boundaries of the grooves to be formed.

SUMMARY OF THE INVENTION

According to the invention the grooves are produced in pavements or the like by planing the respective material out of the pavement. The planing may be accomplished at high operational speed, and the material of the pavement may be removed to any desirable depth and width.

In accordance with the invention an apparatus is provided for forming grooves having sharp boundaries in the surfaces of streets, roads, runways or the like, for example for inserting markers into the grooves. The apparatus has a tool holder which is moved over the pavement and spaced therefrom. One or more chisels are attached in fixed positions to the tool holder. The chisels may be attached to the tool holder adjacent to each other.

It is especially practical to arrange several chisels one behind the other so that each chisel penetrates the pavement to a greater depth than the preceding chisel. In this arrangement the first chisels plane the material with a small penetration depth whereas the succeeding chisels plane the material at a greater depth, although preferably with the same relatively small penetration.

The chisels may be arranged in a staggered relationship relative to each other vertically as well as horizontally. The penetration depth of the chisels may, for example, be adjustable by hydraulic means.

Each chisel is able to plane a single groove having a width corresponding to that of the respective chisel.

However, it is preferable to plane a wider groove by means of a plurality of chisels arranged adjacent to each other so that the portions of the pavement between two adjacent chisels will break away by themselves, even though such portions are not directly planed by the chisels. Thus, the total width of the groove will be determined by the spacing between the outer chisels.

BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings; wherein,

FIG. **1** is a rear view of a tractor having attached thereto a planing apparatus according to the invention;

FIG. **2** is an enlarged side view of a portion of the apparatus of FIG. **1** without the chisels;

FIG. **3** is an enlarged rear view of a portion of the apparatus of FIG. **1** in which the tractor has been omitted; and

FIG. **4** is another enlarged side view of a portion of the apparatus showing the arrangement of the chisels.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, and more in particular to FIG. **1**, tool carrier **7** is attached to a support member **2** by means of pivot rods **3,4,5** and **6**. The support **2** is mounted on the underside of a tractor **1**. The apparatus is movable along the pavement **10** by means of wheels **8** and **9**. As seen in FIG. **1** four transversely spaced chisels **11, 12, 13,** and **14** are secured to the tool carrier **7**.

In the arrangement of FIG. **3** six chisels **11, 12, 13, 14, 15,** and **16** are provided which have tips **17, 18, 19, 20, 21** and **22** respectively. The chisels are interconnected by means of a yoke **23** (FIGS. **1** and **3**), which in turn is connected by means of a piston rod **24** to the hydraulic cylinder **25**, so that the elevations of the chisels above the ground are adjustable.

In the arrangement of FIG. **4** several rows of chisels **16, 26, 36,** and **46** are provided, one behind the other. The penetration depth of each row differs from that of the other rows in such a manner that the back chisel **16** has the largest penetration depth whereas the front chisel **46** has the smallest penetration depth. The front chisel **46** planes the top surface of the pavement, and the chisels **36, 26,** and **16** plane respectively deeper layers of the pavement in that order. The different adjustments of the penetration depth of the chisels is accomplished by means of hydraulic cylinders **25, 35, 45** and **55** connected to the respective chisels.

The tool carrier **7** comprises a frame **27** (FIG. **2**) which in turn is connected by way of a piston rod **28** to the hydraulic cylinder **29**, so that the entire apparatus may be lowered at the start of a planing operation, and raised at the end of the planing operation.

The actuation of the hydraulic cylinder is accomplished through pressure conduits and through valves which are actuated by the driver of the tractor **1**. For the sake of simplicity, only one pressure conduit **30** and one valve **31** are shown in FIG. **1**.

The apparatus according to the invention may also be used for leveling the surface of road pavements, for example, if due to the use of spiked tires, different wear and tear has resulted, necessitating repair of the pavement.

Although the invention has been described with reference to specific embodiments, it is to be noted that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. In an apparatus for forming a groove having sharp boundary walls all around in the surface of roads, runways or the like wherein a tool holder is mounted on a carriage, whereby the tool holders are vertically adjustable so that a plurality of tools which are arranged one behind the other as viewed in the direction of advance of said carriage, may be adjusted to different penetration depths relative to said surface, the improvement wherein said tools are chisels and wherein means are provided for maintaining said chisels stationary relative to said carriage and vertical relative to said surface, and

means for pulling said carriage along said surface whereby said stationary vertically extending chisels form the groove by planing so that said boundary walls are also vertical even at the beginning and end of a groove.

2. The apparatus according to claim 1, wherein said carriage comprises front wheel means only, and wherein said means for pulling said carriage comprise a tractor and means for connecting said carriage to said tractor, said connecting means comprising a plurality of parallel bars, means for hinging one end of each parallel bar to said carriage, and means for hinging the opposite end of each parallel bar to said tractor whereby said chisels are maintained in their vertical working position at all times.

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