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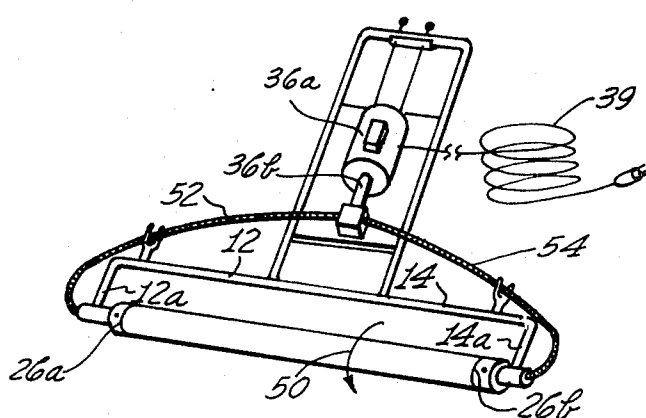
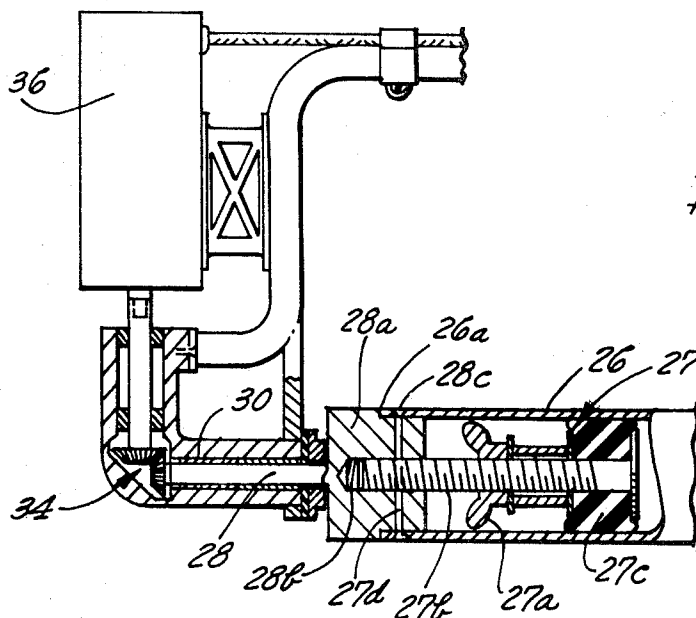
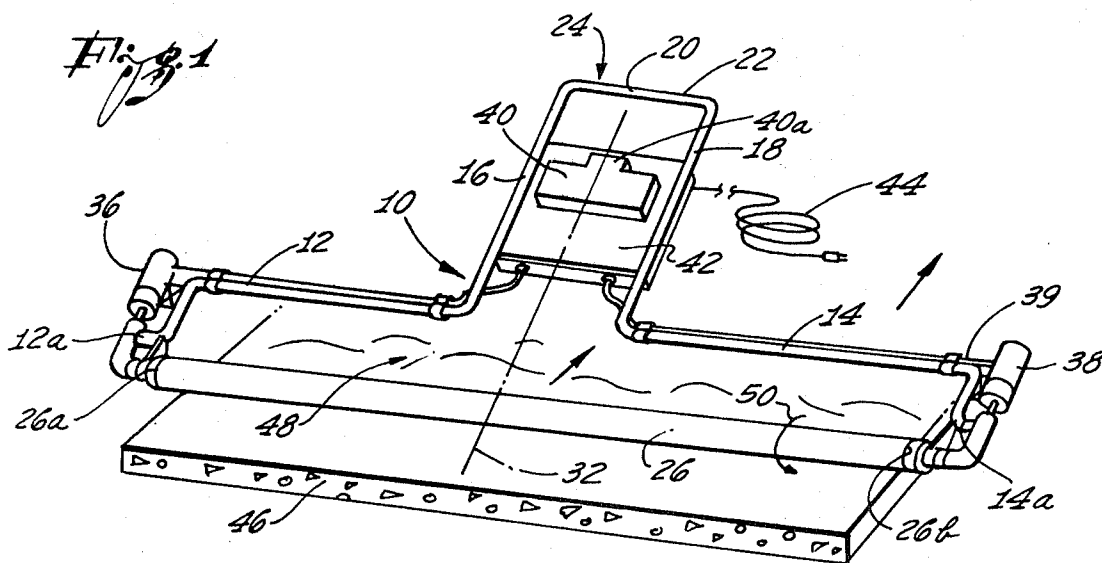
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CONCRETE AND CEMENT PLANERS

Filed June 2, 1969

2 Sheets-Sheet 1



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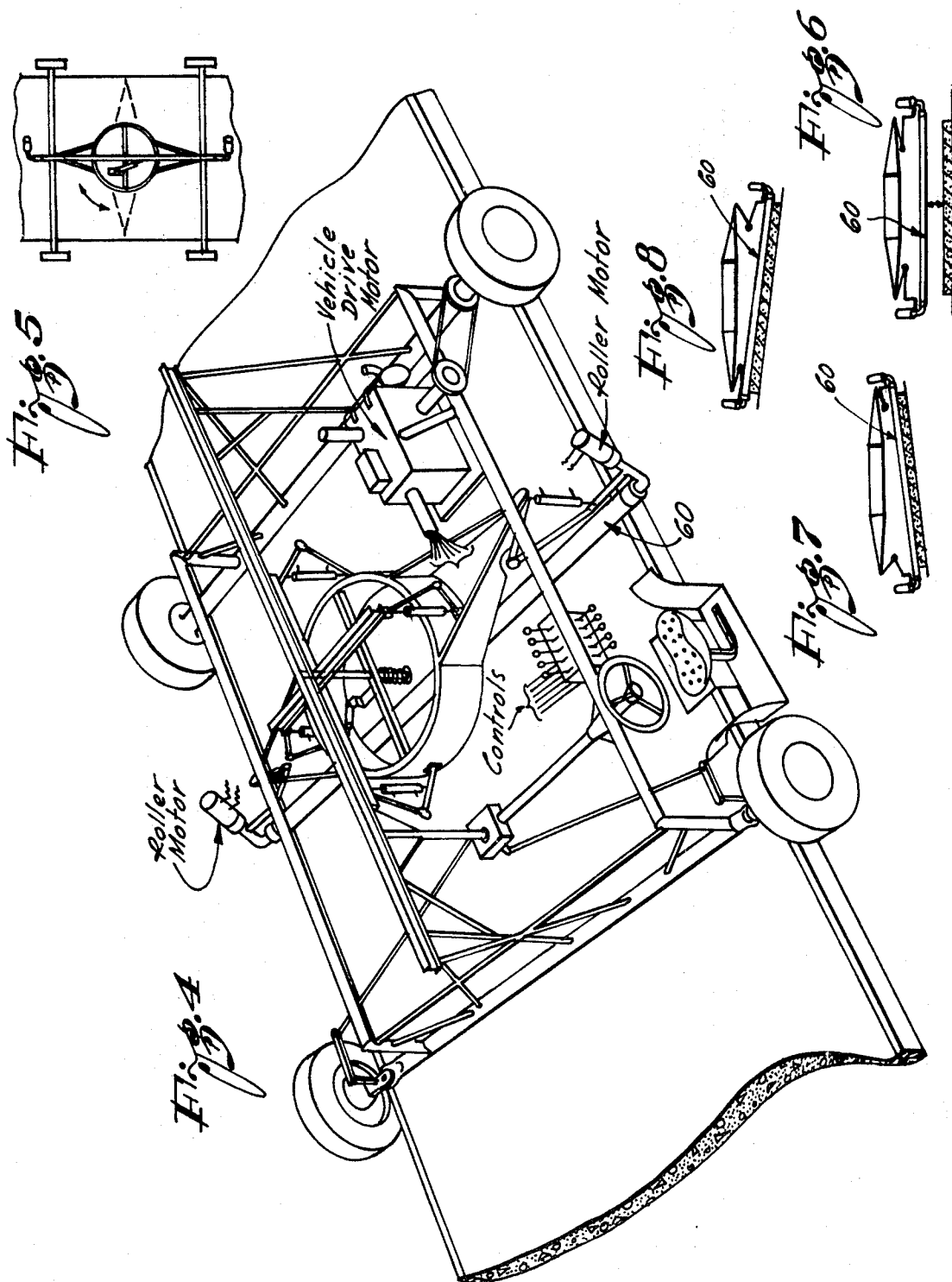
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CONCRETE AND CEMENT PLANERS

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2 Sheets-Sheet 2



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CONCRETE AND CEMENT PLANERS

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1 Claim

ABSTRACT OF THE DISCLOSURE

A concrete and cement planer comprised of a bifurcated frame between the extremities of the arms of which is rotatably disposed a roller member. Means are provided to apply substantially identical torque to each end of the roller member to cause rotation thereof in the same direction, the actuation of said means being controlled from a central location on the frame. The planer may be constructed small enough to be moved and operated by one person, or it may be made of such size for highway concrete laying as to acquire mounting on a vehicle frame.

BACKGROUND OF THE INVENTION

Field of the invention

This invention pertains to roller type planing devices which are particularly useful in the levelling and planing of freshly poured concrete or cement. The device of the present invention may be utilized to level or plane concrete immediately following pouring and to plane it prior to its initial setting.

Description of the prior art

As those persons who are familiar with the laying of concrete and cement readily appreciate, the aggregate or slurry upon pouring proceeds through five (5) stages before it is finally cured, so that it may support the weights of vehicles, persons or articles for which it is intended.

The first is known as the "dormant stage" during which the water in the aggregate or cement slurry tends initially to settle toward the bottom. Secondly, there follows the "primary set" of the material during which the water content tends to rise toward the top surface of the laid material. After the primary set, the material has acquired sufficient firmness to support a certain degree of weight without damage. It is at this point that cement finishers can lay boards across the setting material, upon which boards they can kneel (and thereby more widely distribute their weights over the material) and begin their finishing of the surface. This is sometimes referred to as the "knee-board stage." Next, the material goes through its "initial set" stage during which the risen water content is evaporated from the surface of the material. Lastly, the material undergoes its final curing stage.

The art of concrete finishing extends back many decades and roller devices of various kinds have been employed in numerous ways to effect a levelling or finishing of the concrete material which is laid in a given area. An example of such prior art devices may be seen in the patent to Krehbiel No. 2,252,188. In some prior art patents it is intended that rollers operate over some type of screed or other rail which supports the roller in a predetermined relationship to the setting concrete. On the other hand, it has also been taught to have the roller supported directly upon the concrete surface which it is intended to finish or level.

In general, these prior art roller type machines appear to be intended for use principally at the time the concrete is poured or during its dormant stage, and hence are classed as primary set or dormant machines. Thus, these

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machines are designed to operate on rails (screeds) or form walls and to be utilized to effect a levelling of unset concrete within the form. None of these or other machines is known to be particularly adapted for planing concrete, after the primary set has occurred and before any initial set has taken place. Nor do such prior art machines lend themselves to being adapted as a concrete leveler or planer capable of being operated by a single individual who must provide all the force needed to move and relocate the leveler or planer.

One difficulty with the prior art machines is that the rotation of the roller or rollers in these machines has always been accomplished by providing a drive connection to only one end of the roller. While this single-ended drive may present no problem where the roller is a heavily constructed one which turns slowly and is intended for use in a large machine designed mainly to level a concrete slurry, as for example in highway construction, it has been found that when a single-ended drive has been applied to a device with a fast turning roller—particularly in light, hand operated planing devices—certain unanticipated problems have resulted. For example, with a single-end device, the heat generated by the friction of the rotating tubular roller when planing concrete, will result in a warping or distortion of the roller to such an extent that it will be unable to provide an even or level surface for the concrete upon which it is being passed.

In addition, the single-ended drive rollers have been found to be difficult to control evenly by an operator who normally must hold the leveler centrally with respect to the roller. Since it is important that during the setting of concrete, the concrete below the exposed surface not be disturbed, any erratic control of the roller may result in undesired disturbance of the subsurface concrete with adverse effect upon the setting material.

Another problem with single-end drive rollers is that they do not lend themselves well to use at higher speeds of rotation. The greater the number of revolutions per minute (r.p.m.), the better and more accurate the planing effect. However, where the drive is single-ended it will be found that at a higher r.p.m., the tubular roller, if long, tends to twist with respect to the undriven end and thereby develops a centrifugal whip with a flywheel effect. The eccentric motion of the tubular roller then tends to produce an irregularly planed surface.

It is also more difficult to effect an even levelling or planing of concrete with a single-end driven roller where the water distribution in the aggregate varies widely. The drier material tends to set first and provides a lesser contact surface for the roller than the wetter material, and hence, offers a difference in frictional resistance to the roller. This variance in the frictional resistance tends to create a special problem of unevenness of rolling effect with a single-end driven roller.

Still another problem which appears neither to have been recognized nor solved by the prior art machines, and particularly arises when the roller is driven from both ends, arises from a lack of flexibility in the coupling of the power drive to the end of the roller. If this coupling is too rigid, it will be found that a stress develops upon the tubular roller through the application of torque at both ends, which stress results in a heating and warping of the roller.

SUMMARY OF THE INVENTION

The present invention overcomes the difficulties experienced with concrete levelers or planers of the prior art by providing synchronous torque driving power at both ends of a tubular roller. This may be accomplished either by disposing a motor at each end of the arms of the bifurcated frame, with each motor being coupled to drive one end of the roller and being synchronized to drive such

roller end at the same speed and torque, and control of the motors being accomplished from an area of the frame conveniently accessible to the operator; or by disposing a single motor centrally of the frame and providing a pair of flexible drive shafts which are coupled one to each end of the roller, to drive the ends in synchronism. In each arrangement, each end of the tubular roller is connected to a horizontally driven rotating shaft by a coupling which includes an element extending coaxially into the end of the tubular roller but having its inner end held resiliently to permit some deviation from the tube axis.

By such double-ended driving of the roller it will be found that the tendency of the roller to twist—particularly at higher r.p.m.'s—is avoided, so that the planing roller can be operated at such higher r.p.m.'s to provide a better finishing effect. Moreover, a double-ended driven roller, particularly when coupled to the driving shafts in the manner herein disclosed, will be found not to heat up and distort upon use. Further, the small manual model, can be more readily controlled and operated so as not to disturb the subsurface material, by one individual who moves across the poured surface and draws the yoke-held roller with him in the direction of his movement. It is also a feature of the present invention that the roller is driven by the motors to rotate in a direction opposite to the direction in which the roller is being drawn by the operator over the plastic concrete material.

The device of the present invention is particularly adapted for use as a planer of concrete or cement after the primary set has occurred and before the initial set occurs, i.e., during the "kneeboard stage."

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a concrete planer constructed in accordance with the present invention.

FIG. 2 is an enlarged view of one end of the roller of the leveler of FIG. 1 showing the disposition and attachments of one of its two driving motors.

FIG. 3 is a perspective view of an alternative embodiment of the invention.

FIG. 4 is a perspective view, partly schematic, of an invention designed for use in planing concrete as laid strips during highway construction.

FIG. 5 is a schematic plan view of the embodiment of FIG. 4.

FIG. 6 is a schematic view of the roller of FIG. 4 and its tilting apparatus with the roller disposed in horizontal position.

FIG. 7 and FIG. 8 are schematic views similar to FIG. 6, but showing the tilting of the roller to different orientations.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the concrete planer of the preferred embodiment of the invention is shown, constructed of a bifurcated frame 10, having a pair of arms 12, 14, which are actually integral extensions of a pair of parallel tubular members 16, 18, which are joined together at 20 and by a crosspiece 22 to constitute a handle 24 for the planer. A roller 26 is disposed transversely to extend between the extremities 12a, 14a of the arms 12, 14. In this manually operated embodiment, the roller may be constructed of $\frac{3}{4}$ inch aluminum tubing $3\frac{1}{2}$ " in diameter. Protruding from each end 26a, 26b of the roller 26 is a drive shaft 28 disposed coaxially with the roller 26 and secured against rotational movement relative to the roller.

In putting together the roller 26 and its drive shafts 28, a 3" standard plumber's ball assembly 27 is first inserted in each end 26a, 26b of the tube and its wing nut 27a is turned on the threaded element 27b until the rubber element 27c is expanded tightly against the inside wall 26c of the pipe which constitutes the roller 26. A piece of cold rolled stock, which is machined to the shape shown includes both the actual drive shaft 28 and a plug head 28a,

and is threadably bored coaxially at 28b to matingly engage and receive the threaded end of the element 27b. When the head 28a is screwed over the end of the element 27b to where the pipe end 26a or 26b is seated tightly in the peripheral recess 28c in the head 28a, the drive shaft 28 will be disposed coaxially with respect to the tubular roller 26, but because of its anchoring in the pipe through the plumber's ball assembly 27, a degree of resiliency is provided to relieve stresses which may be set up by the application of the torque to opposite ends of the roller 26 in the manner hereinafter explained. The assembly is diametrically bored at 27d to receive a pin 27e which secures the drive shaft against any rotation relative to the tube 26.

Each drive shaft 28 is journaled for rotation in a bushing 30 which is fixedly disposed on one of the extremities 12a, 14a of the arms 12, 14 and is properly aligned so that the roller 26 is held perpendicularly to the center line 32 of the frame 10. In addition, each drive shaft 28 is coupled by gearing 34 to a motor 36 or 38, also fixedly supported by one of the extremities 12a, 14a of the arms 12, 14. In this embodiment, the motors 36, 38 are electrically actuated so that an electrical power cord 39 extends from the motor to a central switch 40 disposed on the panel 42. The latter is supported by the tubular members 16, 18, so that the switch 40 may be conveniently operated by the person using the planer. This switch 40 is of the double pole type in order that electrical current from the flexible cord 44 may be applied simultaneously to both motors 36, 38. The motors 36, 38 are preferably of at least $\frac{3}{10}$ horsepower with a speed range of from 1000 to 1500 r.p.m. Desirably a speed control rheostat 40a may be placed in series with the switch 40, thereby enabling the operator to vary the speed at which the motors drive the roller 26.

In operation, the person using the leveler moves it to the edge 46 of the primary set concrete or cement 48 which is to be levelled, turns on the switch 40 to actuate both motors 36, 38 simultaneously; then commences carefully walking over the concrete or cement surface, drawing after him over the surface of the setting concrete or cement 48 the frame 10 with its roller 26 rotating in the direction of the arrow 50. The effect of thus drawing this rotating roller 26 across the surface of the cement or concrete 48 is to provide an excellent planing and smoothing of such surface prior to the initial set of the concrete. When the concrete surface 48 is still quite wet, the operator desirably may lower the speed of the motors 36, 38 to the lower end of their speed range. Conversely, where the concrete surface is lower in water content, the motor speed may be desirably increased.

The embodiment of FIG. 3 dispenses with separate motors 36, 38 on the extremities 12a, 14a of the arms 12, 14, substituting therefor the centrally disposed single motor 36a. The drive shaft 36b of this single motor is geared to drive two flexible shafts 52, 54 in opposite directions so that when one shaft 52 is connected to roller end 26a and the other shaft 54, to roller end 26b, both ends of the roller are driven in the same rotational direction. Since the drive is provided by the common motor 36a, both ends of the roller 26 are driven in synchronism. The FIG. 3 embodiment of the invention can be made lighter than the two motor embodiment of FIG. 1 and is somewhat easier to manipulate since the principal weight of the motor 36a is centrally disposed on the frame 10. However, the FIG. 1 embodiment is capable generally of providing more power to drive the roller ends 26a, 26b, and a better distribution of weight of the entire leveler over the roller surface which is in contact with the concrete being levelled. Therefore, in those situations particularly, where a heavier unit is desirable, the FIG. 1 embodiment is to be preferred.

The embodiment of the invention illustrated in FIGS. 4-8 is one in which the basic design of the FIGS. 1, 2 embodiment has been adapted to constitute a large size

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roller unit 60 carried by a hydraulically operated turret 62 and linkage 64 mounted on a vehicle type frame 66 which can move the roller over and in contact with strips of concrete as they are freshly laid by highway type concrete-laying machines.

In a large machine of this character it is necessary to provide hydraulic means (shown schematically) whereby the roller may be not only raised or lowered vertically, as shown in FIG. 6, but tilted to accommodate the specified grading of the highway strips (e.g. as shown in FIGS. 7 and 8). In addition, the roller unit should be capable of being rotated 90° by its turret carrier 62 as shown in FIG. 5. The details of the hydraulic and other motive means for accomplishing the objects thus illustrated may be readily devised by any person skilled in the art of constructing heavy machinery of this type and form no part of the present invention. Except for being larger and more heavily constructed, however, the roller unit 60 follows substantially the same principles of construction as have been described in connection with the FIGS. 1, 2 embodiment.

I claim:

1. A cement planer, said planer comprising:

(A) an elongated cylindrical tubular roller;

(B) a pair of drive shaft members,

(i) each of said drive shaft members being of a smaller diameter than the diameter of the roller;

(ii) each of said drive shaft member being

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mounted to extend coaxially from an end of said roller and being secured against rotation relative thereto, the means providing such mounting including a resilient support whereby under stress some deviation is permitted from the common axis.

(C) a symmetrical bifurcated frame:

(i) the ends of the arms of said frame being spaced apart from each other by a distance slightly in excess of the length of said roller;

(ii) each of said arms including bushing means to receive and hold rotatably one of said drive shaft members;

(iii) means mounted on said frame for applying substantially equal amounts of torque at the ends of the frame arms to cause rotation of said shafts in a common rotational direction.

References Cited

UNITED STATES PATENTS

1,538,550	5/1925	Hamilton	94—50
2,101,150	12/1937	Moore	94—50
2,132,059	10/1938	Tremby	94—50
2,154,720	4/1939	Biles	94—50X
2,252,188	8/1941	Krehbiel	94—45
2,757,587	8/1956	Mentes	94—46

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