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ROAD PAVING MACHINE WITH PRESSURE CONTROL MEANS

Filed Aug. 13, 1965

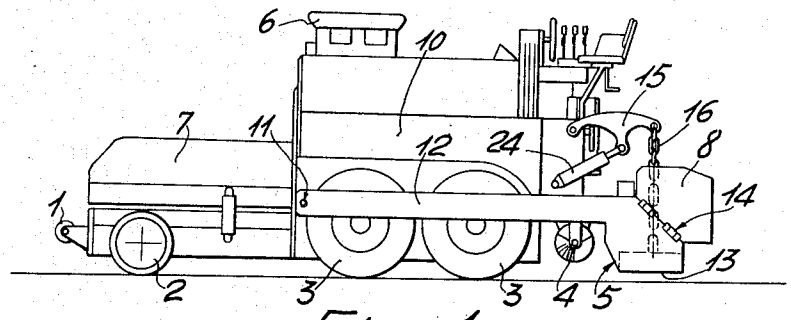

FIG. 1

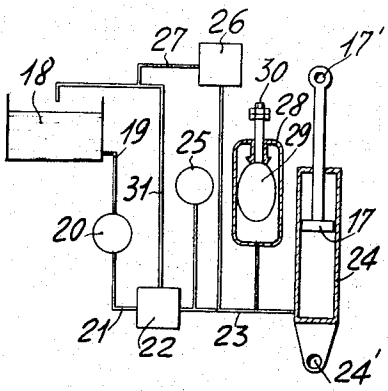

FIG. 4

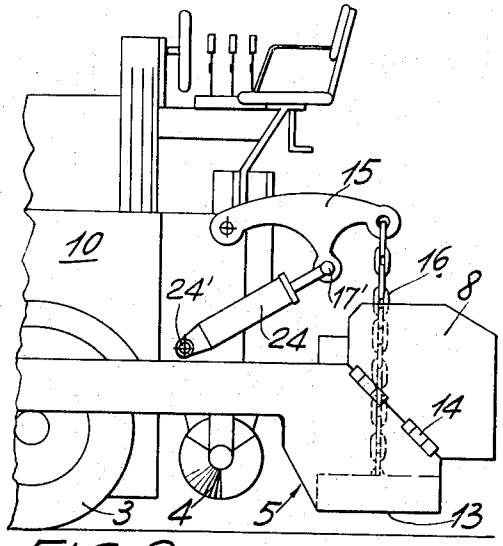

FIG. 2

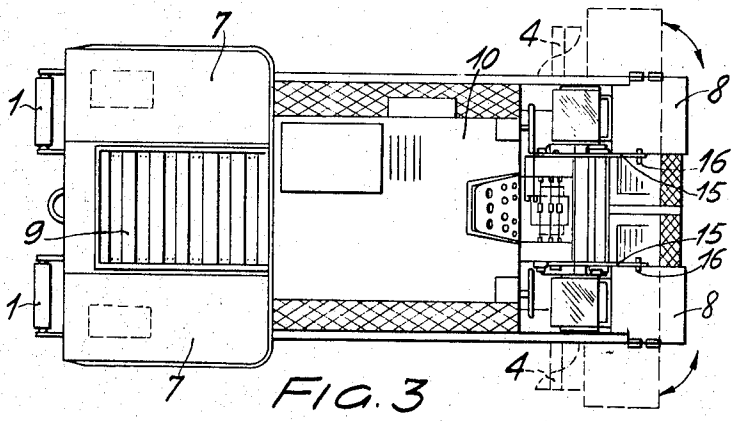

FIG. 3

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ROAD PAVING MACHINE WITH PRESSURE CONTROL MEANS

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ABSTRACT OF THE DISCLOSURE

An asphalt spreader has a smoother which is pivotally mounted for vertical swinging movement on two arms and which is adjustably raised and lowered by means of a cylinder and piston carried by the machine and acting on a further arm which is pivotally mounted on the machine for vertical swinging movement and that is flexibly interconnected at its outer end with the rear end of the smoother.

The present invention relates to a device for controlling the pressure produced by the smoothing unit of roadway paving machines, also called vibrating finishing machines, over the bituminous material layer on which said smoothing unit rests. This device, pivoted to the machine frame, is applicable to roadway paving machines provided with smoothing mechanisms of the self-leveling type, and is comprised of at least one arm and tie rod producing on the smoothing unit itself a lifting force through the action of a fluid pressure operating mechanism.

An exemplifying embodiment of said device is shown in the accompanying drawings, in which reference is made to a self-propelled pneumatic tired finishing machine for the spreading of bituminous conglomerates. Of course, the equipment according to the invention can also be applied to other finishing machine chassis, such as the caterpillar self-propelled chassis.

In the accompanying drawings:

FIGURE 1 is an elevational side view.

FIGURE 2 is an enlargement of the rear portion of the machine shown in FIGURE 1.

FIGURE 3 is a plan view of the machine shown in FIGURE 1.

FIGURE 4 shows the hydraulic diagram for the oleopneumatic control of the compensating device comprising the present invention.

The bituminous conglomerate vibrating finishing machine, on which the device comprising the present invention is mounted, is essentially composed of a main body or frame **10**, carrying the engine and all the moving parts, in the front of which there is a space intended to accommodate a bituminous conglomerate being unloaded from supplying motor-vehicles and to be spread onto the road. Such a space is laterally defined by walls **7** and in the lower part by one or more conveying systems **9**.

The machine is mounted on tired driving wheels **3** and on semi-pneumatic guide wheels **2**. In the front of the machine there are provided thrust rollers **1**, against which the wheels of the supplying material dump truck (not shown) rest, so that truck can be gradually driven towards the front of the finishing machine during the material feeding step. Material being unloaded by the motor-vehicle into the collecting space defined by walls **7** and in the lower part by conveyor **9**, is by the latter conveyed at the desired speed and in the desired adjustable quantity to the rear of the machine, where the distributing Archimedian screw **4** and the smoothing equipment **5** are located, said smoothing equipment **5** being comprised of two longitudinal arms **12**, pivoted at their front end to an intermediate portion of the machine, such

as at **11**, and at their rear ending with a wide smoothing surface **13**, completed by at least one retractable smoothing extension **8**, connected to the smoothing surface **13** by means of a hinge **14**, the axis of which is preferably inclined with respect to the vertical.

Extensions such as **8** can be even more than one, sequentially arranged and connected to one another by hinges provided with means allowing said extensions to be locked at their final positions thereof. In addition, said inclined hinges **14** can be readily disassembled in order to remove or to apply said extensions according to need.

In the body **10** of the machine there is provided a longitudinal horizontal channel intended to have the material pass therethrough, a desired quanity of said material being subsequently deposited on earth and then transversely distributed by the distributing Archimedian screws **4**.

At this time, the smoothing unit **5** comes into operation, the function of said unit being essential since it has the function of regulating and keeping constant the thickness of the material layer spread by the machine.

Considering that while moving forward the whole body **10** of the machine may be subjected to vibrations due to the roadbed irregularities, the smoothing unit **5** is so designed as to eliminate as far as possible the effect of said vibrations on the finished layer.

To this purpose, the smoothing unit **5** is connected to the main frame **10** by means of two longitudinal arms **12**, pivoted at **11**. Thus, unit **5** trails the main driving unit **10**. The length of arms **12**, in combination with the suitable selection of the location of pivot **11**, allows smoothing unit **5** to eliminate in a nearly complete manner the undesirable reproduction on the finished layer of the vibrations of the main body **10**, due to the preexistent roadbed irregularities.

In order to obtain the desired effect, the smoothing unit **5** has to be constructed in a particular way, and precisely it has to be comprised of a wide smoothing surface **13**, which in many cases has to be internally heated, and which is fixed to the smoothing unit **5**.

It is readily understood that, in order to assure the automatic leveling effect of the smoothing unit **5**, it is essential that the smoothing surface **13** which, during the work, rests on the just spread material layer, produces a constant pressure on said material.

As a matter of fact, should said pressure not be constant, the material woudl be exceedingly compressed or deformed, and would tend to a lateral deflection. Thickness variations would occur which are roughly proportional to the supposed pressure variations.

To calculate the pressure exerted by surface **13** of the smoothing unit **5** on the bituminous material, it is sufficient to divide the total weight of said smoothing unit **5** by the total smoothing and bearing surface **13**, which can be simply expressed by the formula:

$$D=k\frac{G}{F}$$

wherein:

D=exerted pressure
k=constant
G=total weight of the smoothing unit
F=bearing surface on the bituminous material

According to the various workings of the machine both the value of G and the value of F will undergo changes. As a result, also the value of pressure D undergoes a change.

In fact G, in the case of vibrating finishing machines in which the enlargements **8** are detachable, varies depending upon whether said enlargements are mounted or not; G remains instead always constant in those vibrating finishing machines having the enlargements **8** of the

tiltable type; F increases according to the width of the layer it is desired to spread and its increase is generally not proportional to the eventual increase of G.

In order to avoid this drawback, the device according to the present invention provides for the use of one or more arms **15**, at one end pivoted to the main frame **10** of the machine, whereas the other end is connected through a chain **16** or other type of tie rod to the body of the smoothing unit **5**.

A hydraulic cylinder **24** (FIGURES 2 and 4) pivoted at its end **24'** on frame **10** and, by the end **17,'** of piston **17** to the arm **15**, exerts on the latter a force which causes chain **16** to be subjected to tension.

On admitting oil under pressure into the cylinder **24** and increasing said pressure until suitable values are reached, it is above all obtained that the lifting stress exerted by chain **16** on the smoothing unit **5** reaches and exceeds the weight of the latter, causing same to be lifted a considerable amount by rotation about pivot **11**, which greatly facilitates all the working and transfer movements of the machine.

Then, in order to achieve the desired result of controlling the pressure exerted by the smoothing unit **5** on the spread bituminous material, it is sufficient to control the pressure of the oil admitted into the unit formed of cylinder **24** and piston **17**. To this purpose, the invention provides a hydraulic circuit as shown in FIGURE 4, in which reference numeral **18** designates a hydraulic fluid tank, **19** an intake conduit for said fluid, **20** a pump, **21** a high pressure delivery conduit, **22** a distributing valve capable of delivering oil both into a delivery conduit **23** and into an exhaust conduit **31**, which sends the hydraulic fluid back into the tank **18**. The delivery conduit **23** is connected to the cylinder **24** of the piston **17**. In the delivery conduit **23** or in conduit **21**, there are inserted a pressure-gauge **25**, a pressure regulator **26**, manually adjustable by the machine operator and having the purpose of controlling the maximum pressure of fluid inside conduit **23**; said regulator being provided with an exhaust conduit **27**, to discharge part of fluid into the tank **18** so as to be able to perform its regulating function. In the delivery conduit **23** or in conduit **21**, there is also mounted an accumulating lung **28** containing a bladder **29** with inert gas, the volume of which is only slightly larger than the volume of cylinder **24**. The pressure of the inert gas, contained in bladder **29**, is eventually adjustable as desired by means of valve **30**.

The herein described arrangement of the hydraulic circuit obviously allows the operator to adjust to his liking, any pressure inside cylinder **24**, and thus to exert on chain **16** (FIGURES 1 and 2) a tension of any desired value and in any case such as to compensate possible unbalances among the various parameters of the above cited equation, said parameters determining the value of pressure exerted by the smoothing unit **5** on the bituminous layer.

Furthermore, the existence of the accumulating lung **28** and the correct dimensioning of bladder **29**, the volume of which has to be larger than that of cylinder **24** (in FIGURE 4 it is shown to be less because of space limitations), assure that the pressure inside cylinder **24** and hence the tension of chain **16** remain nearly constant in spite of the effected relative movements between smoothing unit **5** and frame **10**. (These movements may be due both to the pre-existent roadbed irregularities and to the possible thickness variations required for the finished layer.)

This hydraulic system allows the operator, by controlling indications of pressure-gauge **25**, to keep under control with maximum ease and accuracy the hydraulic fluid pressure inside of cylinder **24**, the tensile stress transmitted from chain **16** to unit **5** and hence, according to the proposal of the present invention, pressure exerted by unit **5** in the various working conditions on the layer of bituminous material being spread by the machine.

What is claimed is:

1. In a road paving machine having a machine body, a leveling unit having a smoothing surface, forwardly extending arms that support said leveling unit and that are pivoted to the sides of the machine body above said smoothing surface, an arm pivoted to the rear of said machine body and located above said forwardly extending arms, connecting means between said arm and said leveling unit, a hydraulic cylinder and piston pivoted one on said machine body and the other on said arm, and means for supplying hydraulic pressure to said cylinder comprising a pressure accumulator, said pressure accumulator comprising a lung and a gas-filled bladder therein, a pressure regulator for controlling the maximum pressure in said cylinder, and a gage for indicating said pressure in the hydraulic system.

2. Apparatus as claimed in claim **1**, and a valve to control the volume of said bladder thereby to control the volume in said accumulator.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,362,307 January 9, 1968

Domenico Domenighetti

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, after line 6, insert -- Claims priority, application Switzerland, Sept. 5, 1964, 11617/64 --.

Signed and sealed this 3rd day of June 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

William E. Schuyler, Jr.
Commissioner of Patents