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(54) Device for controlling the pressure upon the ground of a vibrating levelling unit of a vibratory finishing machine for road paving.

(57) A device for automatic control of the contact pressure of the levelling unit (1) of a finishing machine for road paving on the material to be spread, also comprising means for regulating the hydraulic fluid pressure and its circuit, comprising electro-distributors, non-return valves (44), maximum pressure valves (26) and at least one accumulating chamber (28), characterized in that the hydraulic circuit is assisted by an electric circuit for transmission of signals; that in said hydraulic circuit an electrically-controlled valve (45) for pressure adjustment and an electro-manometer (46), both connected to the cited electric circuit, are inserted. To the same electric circuit an amplifying comparator (47) and a trimmer (48) are also connected, while a sensing device (49) capable of measuring elongations is also connected to the electric system and measures continuously the width of the spread layer and transmits this value through the electric circuit to the comparator (47) which, in turn, acts upon the pressure regulating valve (45) for possible corrections, thus maintaining constant the pressure of the levelling device (1) on the material to be spread.

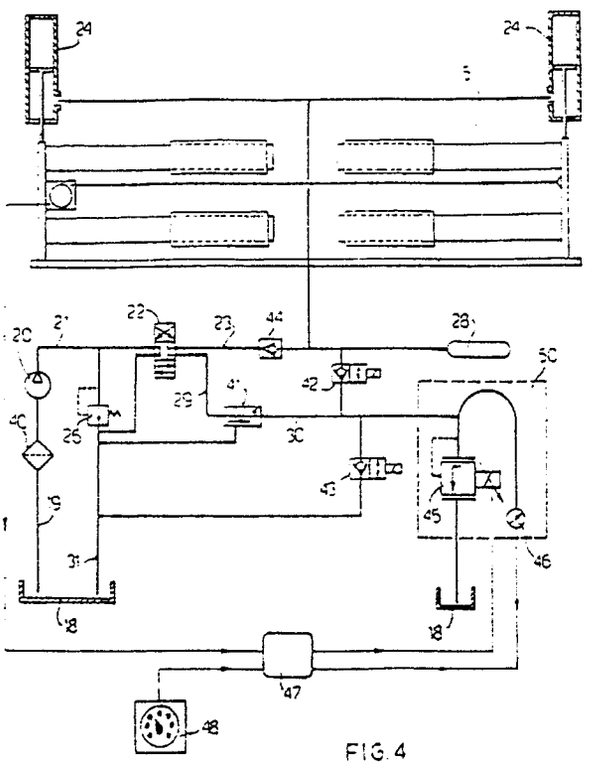

FIG.4

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DEVICE FOR CONTROLLING THE PRESSURE OF THE VIBRATING LEVELLING UNIT IN A VIBRATORY FINISHING MACHINE FOR ROAD PAVING.

The present invention relates to a device for automatic control of the pressure of the levelling unit in a vibratory finishing machine for road paving on the layer of bituminous mix on which said levelling unit rests.

In particular, the present invention is a considerable improvement on the device described in Italian Patent No. 741,035 of 17th September 1964 in that the adjustment of the pressure of the vibrating levelling unit is automatic, instead of being controlled, and provides also automatic control of the members which carry out these adjustments.

An examplary embodiment of the invention is shown in the enclosed drawings, in which reference is made to a finishing machine on tyred wheels.

Obviously the device can also be applied to other types of finishing machines, for example of the self-propelled crawler type.

In the enclosed drawings :

Fig. 1 is a side elevation view of the finishing machine with automatic controls.

Fig. 2 is an enlargement of the rear portion of the machine of Fig. 1.

Fig. 3 is a plan view of the machine of Fig. 1.

Fig. 4 shows the hydraulic diagram for oleostatic control of the inventive compensator device.

The 'finishing machine' for bituminous mixes, on which the device of the present invention is fitted, consists basically in a 'driving unit' of a type partially already known, but integrated by improvements, which bring great advantages, never applied to a road finishing machine. In fact, the new driving unit comprises a levelling unit (1) made up by two longitudinal arms (2) pivoted at their front end - about halfway (along) the driving unit, for example at point (3) -and having at the rear end a grading-levelling device (1), which nowadays is of the so-called 'hydraulically extensible' type, consisting of a central beam made up by two symmetric elements hinged to one another (so as to carry out the "rise" angle).

On each of these symmetrical central elements (4), (Fig. 2 and 3) a hydraulically extensible member (5) is fitted (normally at the back), sliding transversally (in respect to the machine's forward movement), which allows, under proper control, continuous variations in the spread width.

As it has been noted, the pressure that the bottom surface (6) of the levelling unit (1) brings on the material to be spread is of capital importance for the good functioning of the machine, in the aim to reduce waviness and to guarantee an optimum levelling of the layer spread on the road, without having to resort to subsequent adjustments.

In modern levelling units (hydraulically extensible) the pressure brought on the spread material by the bottom surface (6) of the levelling unit reaches its maximum value when the two extensible members are fully retracted and their weight bears totally on the central part (4).

When said elements (5) are fully extended, their weight is directly discharged from their bottom surface (6) to the spread material which forms carpeting. In this case we can suppose that the weight of the elements (5) is approximately equal to the weight of the central part (4) and that the same can be said of the respective bottom surfaces (6); therefore we could state that the pressure brought on the material can vary at the ratio 1:2 when the machine changes from the fully retracted to the fully extended position, or viceversa.

With the introduction of modern vibratory finishing machines fitted with hydraulically extensible levelling units, the problem of variation in the pressure of the bottom surface (6) of the finishing machine has become more acute, since in the case of elements extensible 'by tilting', the variation in pressure is kept within the ratio 1:1.5, thus causing less relevant problems than those met in using modern hydraulically extensible levelling units.

In order to keep under constant control the pressure on the material to be spread, the device according to the present invention foresees the use of two oleostatic actuators (24) (Fig. 2), connected at one end to the driving unit (Ø) and at the other end to the arm (2) of the levelling unit (1).

By injecting pressure oil in the actuator (24), and increasing said pressure till suitable values are reached, we come to obtain even the total lifting of the levelling unit, procedure which is already traditionally followed to facilitate the machine displacements.

To obtain the wished result of controlling the pressure on the material to be spread, it is sufficient to control automatically the pressure of the oil fed to the actuator (24).

For this purpose, an electro-hydraulic circuit of the type of Fig. 4 is needed, one part of it is elementary , while the remaining part shows an embodiment of the present invention.

To control, semi-automatically, the pressure of the levelling unit (1) on the bituminous mix during its laying, it is sufficient to check the pressure of the oil injected in the actuators (24).

The elementary part of the hydraulic circuit of Fig. 4 comprises a hydraulic fluid (oil) tank (18), a suction pipe (19) for said fluid, a filter (20), a pump (40), a high-pressure delivery pipe (21) and a disturbing faucet (22) which can feed the oil both into the delivery pipes (23) and (29) and into the return pipe (31) which sends the hydraulic fluid back into the tank (18).

The delivery pipe (23) is connected to the actuators (24).

A maximum pressure regulator (26), to be adjusted from time to time for correct setting, is inserted on the delivery pipe (21).

The valve (26) is fitted with a return pipe (27) which allows a part of the fluid to be discharged into the tank (18), so to carry out its regulating function.

An accumulator chamber (28) is mounted on the delivery pipe (23).

In the hydraulic circuit extending "downstream" of the distributor (22) a so-called 'priority' valve - (41), is foreseen; its function is to channel a predetermined amount of oil to the delivery pipe (30) and discharge the excess thereof by means of the return pipe (31).

Further on, two service distributors (42) and - (43), which are controlled together with the distributor (22), are foreseen.

Provision is also made for fitting a non-return valve (44) on the delivery pipe (23).

Continuing along the delivery pipe (30), the pressure oil reaches a pressure-regulating valve - (45), electrically controlled, and an electromanometer (46).

These last two electric-hydraulic devices are connected to an electric circuit, which reaches an amplifying comparator (47), a trimmer (48) and the elongation-measuring sensing device (49).

According to a particular embodiment of the present invention, the sensor (49) is composed of a wire, connected at one end of the extensible elements (5), while on the other end a coiler is mounted which constantly measures the total length of the extensible elements (5) and transmits it by means of the electric circuit to a comparator (47).

The operator, using the trimmer (48) fixes the maximum value of the oil pressure which is considered acceptable to discharge at the most the weight of the grading levelling device (grader) when it is fully retracted.

This trimmer (48) sends, through the electric circuit, the preselected maximum value signal to the comparator (47), which compares electronically the three data and translates them into a command to the valve (45) for the necessary adjustments.

Consequently, any variation of the spread width is followed in actual time by a reaction of the electric-hydraulic equipment, which changes the oil pressure in the two actuators so as to keep constant the pressure of the grader bottom surface on the bituminous mix layer which is spread on the ground.

This contact pressure between the grader and the mix, which, thanks to the present invention, is kept rigourously constant independently of any variation in the spread width, can of course be changed and adjusting by acting on the trimmer - (48) so as to adapt the pressure to variable working conditions (plasticity, thickness, etc. of the layer to be spread).

The member (45), (46) and (48) are generally grouped on a 'control panel' (50) to allow the operator to control all the instrument which inform him of the adjusting process.

Claims

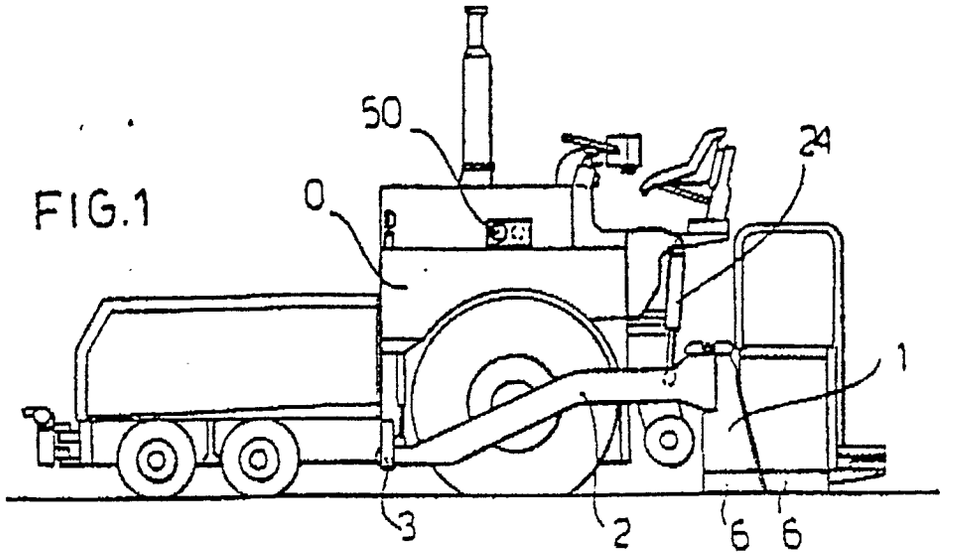
1. A device for automatic control of the contact pressure of the levelling unit of a finishing machine for road paving on the material to be spread, also comprising means for regulating the hydraulic fluid pressure and its circuit comprising electro-distributors, non-return valves, maximum pressure valves and at least one accumulating chamber, characterized in that the hydraulic circuit is assisted by an electric circuit for transmission of signals; that in said hydraulic circuit an electrically-controlled valve for pressure adjustment and an electro-manometer, both connected to the cited electric circuit, are inserted while to the same electric circuit a trimmer and an amplifying comparator are also connected, the latter, in turn, acting on the valve regulating the pressure for the necessary adjustments.

2. A device according to claim 1, characterized in that a sensiing device capable of measuring elongations is also connected to the electric device; that said device continuously measures the width of the layer spread and transmits through the electric circuit this value to the comparator, which acts upon the pressure regulating valve to make any needed correction so as to keep constant the pressure of the grader on the material spread, independently of the width of the layer to be spread.

3. Device according to Claim 1. or 2., characterized in that the sensing device is a wire wound around a rotating coiler with one end tied to

said coiler fastened at one end of the extensible element, while the other end of the wire is tied to the other end of the other extensible element of the grader.

FIG.1



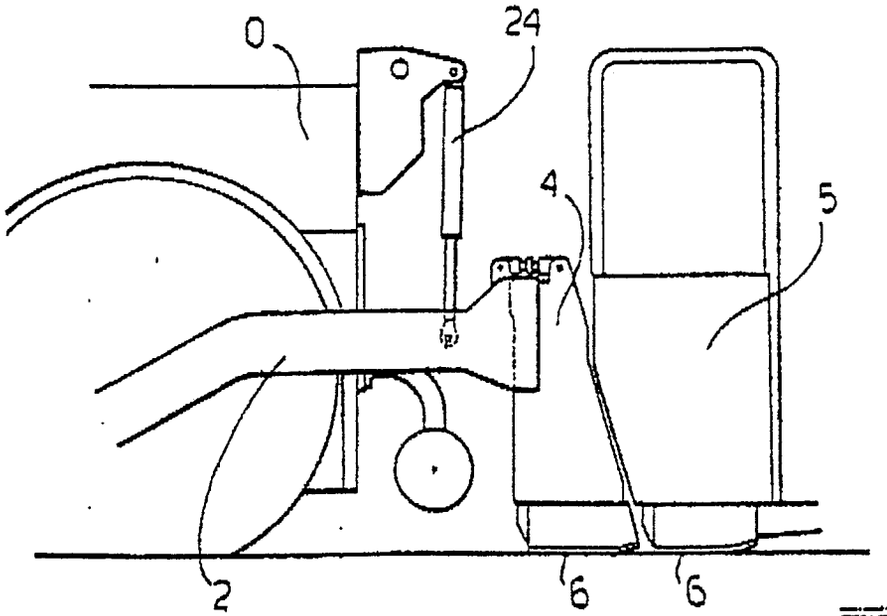
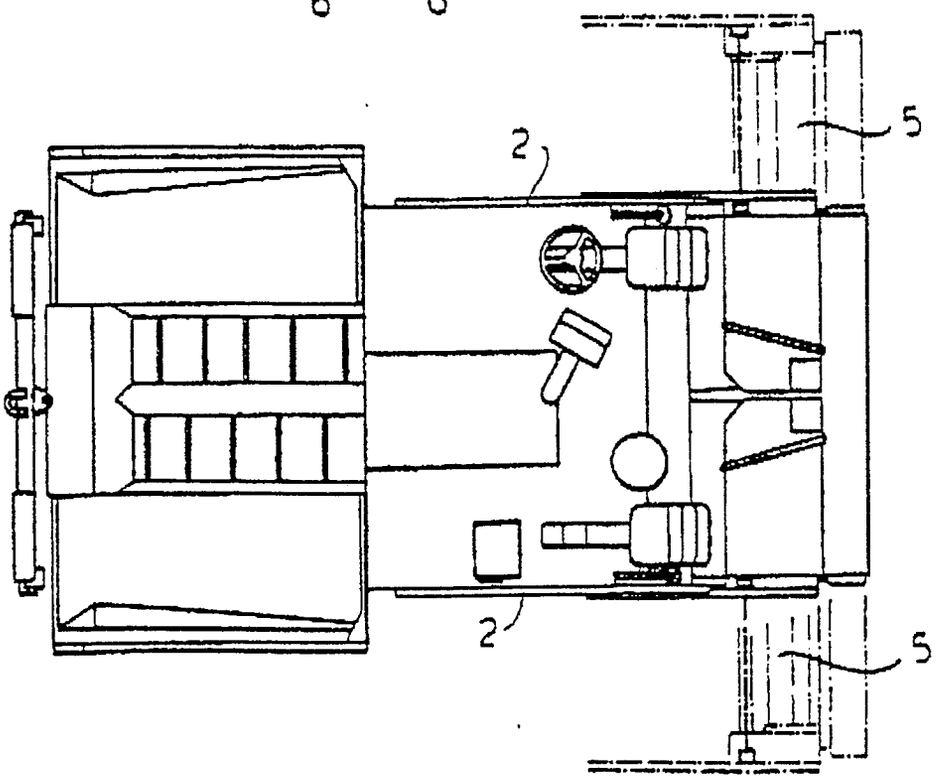


FIG.2

FIG.3



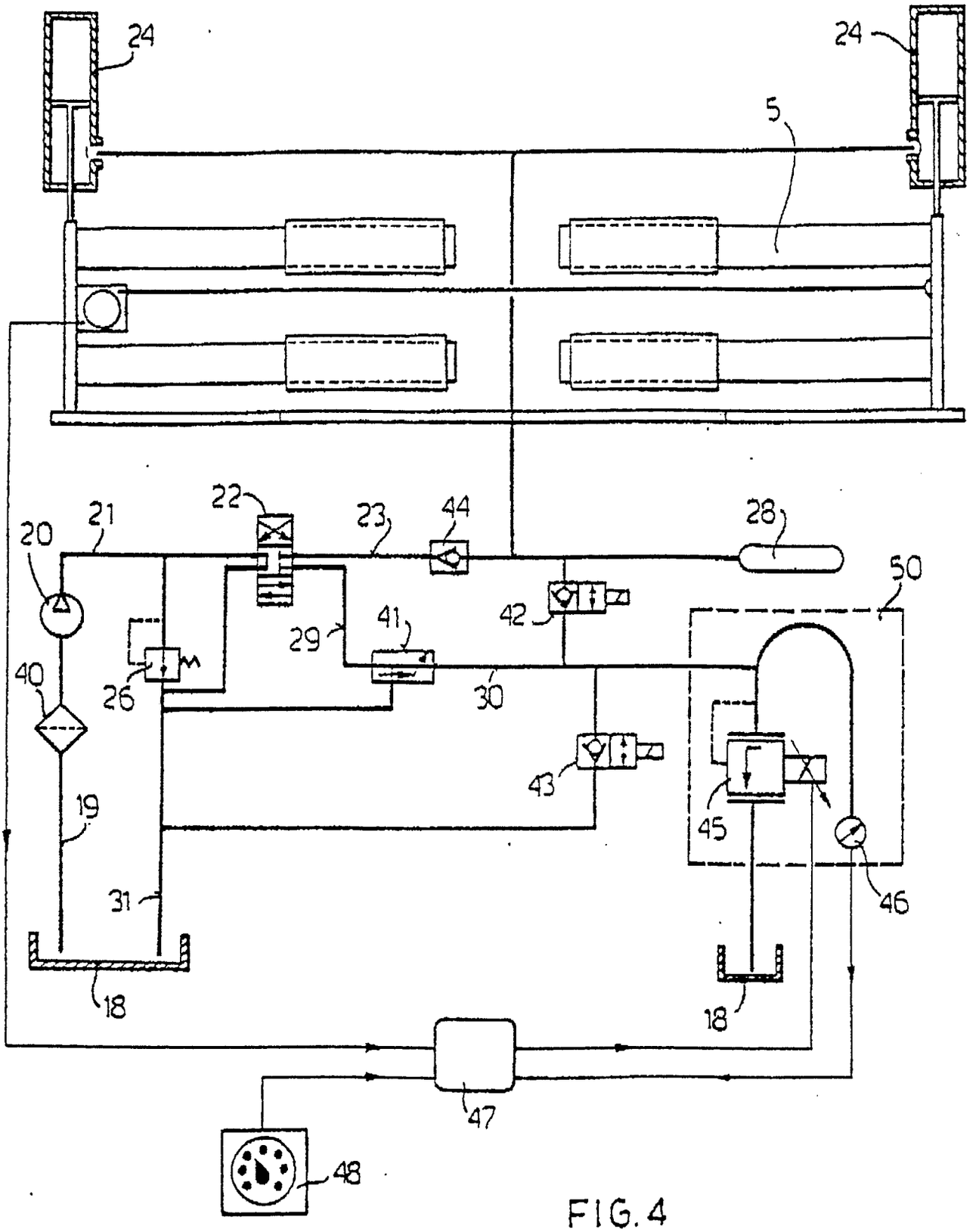


FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 10 2825

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	GB-A-1 090 224 (DOMENIGHETTI) * The whole document *	1	E 01 C 19/48 E 01 C 19/40
A	US-A-4 026 658 (NEUENDORF) * The whole document *	1	
A	DE-A-2 447 760 (RENNER CO.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 01 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-05-1987	DIJKSTRA G.

CATEGORY OF CITED DOCUMENTS

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