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(54) **Device for speed synchronisation of two vibrators**

(57) The device for the speed synchronisation of two vibrators consisting of the first and second closed hydraulic circuits (13 and 14) to which two control pumps (11 and 12), two hydromotors (15 and 16) and one proportional throttle valve (18) are connected, when the mentioned closed hydraulic circuits (13 and 14) with one by-pass piping (16) drive two vibrators (20 and 21) with the eccentric weights (22 and 23) and are equipped with two position sensors (24A and 24B) the signals of which are sent to the control unit (19).

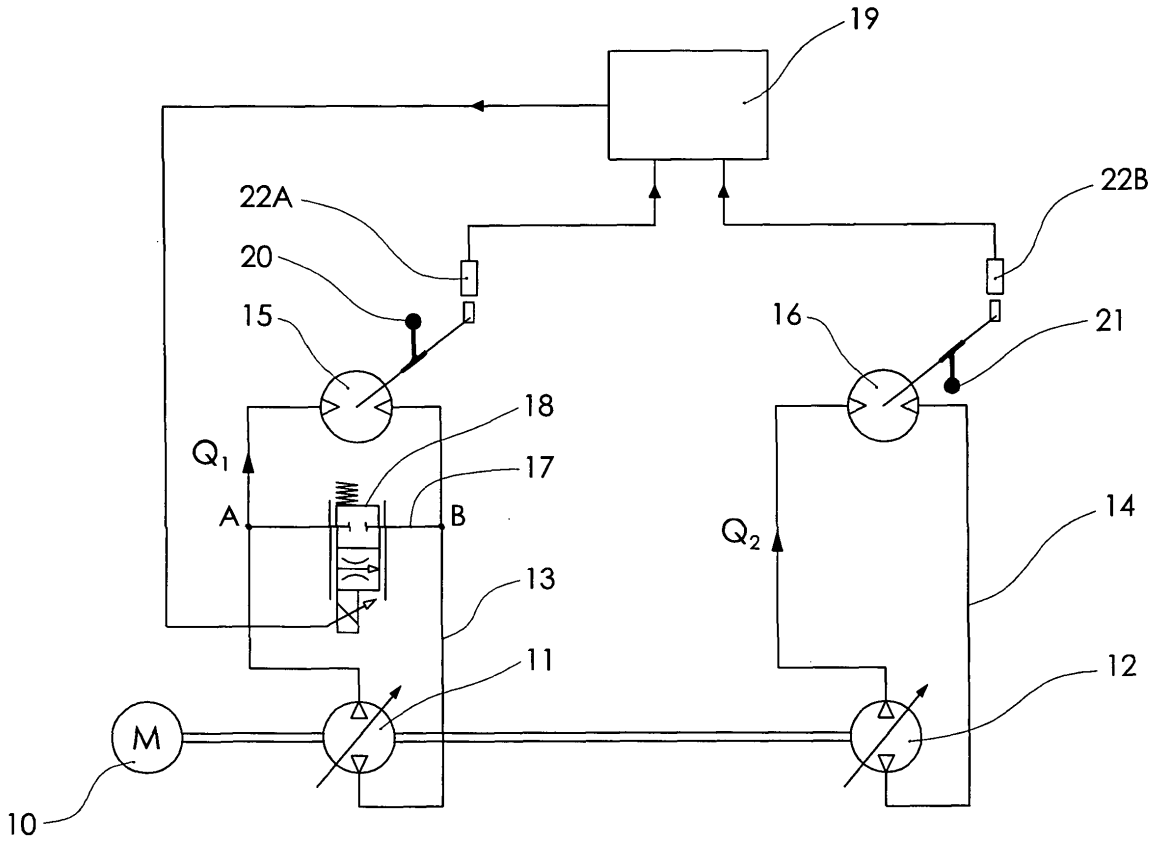

fig.1

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Description

Field of Technology

[0001] The invention concerns the arrangement of the device for the speed synchronisation of two vibrators.

Present Level of Technology

[0002] The currently produced vibratory rollers have mostly their drum vibrator drive designed as a hydrostatic drive with the hydromotors of vibrators connected in series. This series connection generates different speeds of the first hydromotor and the second hydromotor. The second hydromotor rotates more slowly due to leakages of hydraulic oil on the first hydromotor. The different speeds of vibrators cause the interference of residual oscillation on the frame of vibratory roller and of acoustic waves from the oscillating surfaces of drums, which inconveniently manifests itself in an undesired increase of noise level emitted to the machine surroundings, as well as an increase of vibrations at the driver's place.

[0003] This problem described above is tackled by Patent WO No. 02/099199 11 the principle of which is that the first of the hydromotors connected in series is overbridged by a by-pass with a connected valve by means of which the flow rate of hydraulic oil is controlled on the basis of the signals from the sensors of the position of the vibrator eccentric weights over the control unit.

[0004] The disadvantage of the described solution is the necessity to use two by-passes for the bidirectional flow of hydraulic oil in the case of the use of two-amplitude vibrator when the by-pass over the first hydromotor in the direction of flow is always in operation.

[0005] Another known solution uses for the drive of vibrators of compaction rollers two separate closed circuits with control pumps for the drive of front and rear vibrators mounted in individual drums. The advantage of this solution consists in the simplicity of selecting a vibrating drum when the synchronisation of vibrators is possible through the proportional control of the capacity of one or both pumps.

[0006] The disadvantage of this solution is an extreme demand for the precision of the control of small changes in the pump flow rate, as in the case of the described arrangement there is a necessity to control the change of flow rate in cm^3 at a flow rate of around 100 l/min.

Principle of the Invention

[0007] The above-mentioned disadvantages will be removed by a new arrangement of the device for the speed synchronisation of two vibrators the principle of which is that the by-pass piping of the hydromotor that is a part of the closed hydraulic circuit is throttled by a proportional throttle valve. Further, the first hydromotor as well as the second hydromotor have the same capacity, when the first control pump has a higher capacity by approximately 1 to 4% than the second control pump. And further, the control unit synchronises the mutual position of one eccentric weight against the other eccentric weight by means of two separate position sensors, as well as by directing the hydraulic liquid to the by-pass piping by means of the throttle valve.

Layout of Illustrations

[0008] The invention shall be further more closely explained with reference to the enclosed drawing, where Fig. 1 shows schematically one of a number of arrangements of the device for the speed synchronisation of two vibrators.

Examples of the Implementation of the Invention

[0009] The device for the speed synchronisation of two vibrators, e.g. on the compaction roller, consists of the drive formed by e.g. a combustion engine 10 driving two control pumps, namely the control pump 11 and control pump 12. Both mentioned control pumps are arranged in tandem. The control pump 11 and the control pump 12 together with the hydromotors 15 and 16 are parts of the separate closed hydraulic circuits, namely the closed hydraulic circuit 13 and the closed hydraulic circuit 14. The first closed hydraulic circuit 13 includes the by-pass piping 17 interconnecting points A and B situated on both branch pipes of the closed hydraulic circuit 13 between the hydromotor 15 and the control pump 11. The by-pass piping 17 is closed by the proportional throttle valve 18 that is operated by means of the control unit 19.

[0010] The hydromotor 15 drives the vibrator with the eccentric weight 20 not identified in the drawing, when the hydromotor 16 drives the other vibrator with the eccentric weight 21 that is also not identified in the drawing. The mutual position of both mentioned eccentric weights 20 and 21 is monitored through the position sensors 22A and 22B by means of the mentioned control unit 19.

[0011] The operation of the device for the speed synchronisation of two vibrators of the compaction roller is based on that the control pump 12 of the second closed circuit 14 has the value of the flow rate of hydraulic liquid Q2 set by means of a stop (not identified in the drawing) on a servo-cylinder (not identified in the drawing) for the required speed of the hydromotor 16. The control pump 11 has the value of the flow rate of hydraulic liquid Q1 set to the value that is higher than the flow rate of hydraulic liquid Q2 approximately by 1 to 4%. The capacity of the hydromotor 15 is equal to the capacity of the hydromotor 16.

[0012] Upon the opening of the proportional throttle valve 18, the hydromotor 15 begins to rotate more slowly as a part of the flow quantity of hydraulic liquid Q1 passes through the by-pass piping 17 between the mentioned points A and B outside the hydromotor 15. After the required mutual position of both eccentric weights 20 and 21 has been achieved, the mutual position of the men-

tioned eccentric weights 20 and 21 is maintained by the proportional control of the throttle valve 18 and by means of the comparison of the signals from the position sensors 22A and 22B that are evaluated in the control unit 19.

Industrial Utilisation

[0013] The device for the speed synchronisation of two vibrators can beneficially be used with all the vibratory compaction rollers equipped with hydrostatic drive of the vibrator with circular vibration and two vibrating drums. The mentioned device significantly reduces the noise level emitted to the vibratory roller surroundings, as well as the value of vibrations at the attendant's place in the machine cab. The mentioned device also facilitates increasing the parameters of vibration, amplitude, and frequency of heavier vibratory compaction rollers as for which the machine outside noise limits the mentioned vibration parameters.

Claims

1. The device for the speed synchronisation of two vibrators consisting of the first and second closed hydraulic circuits (13 and 14) including two control pumps (11 and 12), two hydromotors (15 and 16) and one proportional throttle valve (18), when the mentioned closed hydraulic circuits (13 and 14) with one by-pass piping (16) drive two vibrators (20 and 21) with the eccentric weights (22 and 23) and are equipped with two position sensors (24A and 24B) the signals of which are sent to the control unit (19), **is characterised in that** the by-pass piping (17) of the hydromotor (17) that is a part of the closed hydraulic circuit (13) is throttled with the proportional throttle valve (18).

2. The device for the speed synchronisation of two vibrators according to paragraph 1 **is characterised in that** the hydromotor (15) and the hydromotor (16) have the same capacity, when the control pump (11) has a higher capacity by approximately 1 to 4% than the control pump (12).

3. The he device for the speed synchronisation of two vibrators according to paragraphs 1 to 2 **is characterised in that** the control unit (19) synchronises the position of the eccentric weight (20) to the eccentric weight (21) by means of the position sensor (22A) and the position sensor (22B), as well as by directing the hydraulic liquid to the by-pass piping (17) by means of the throttle valve (18).

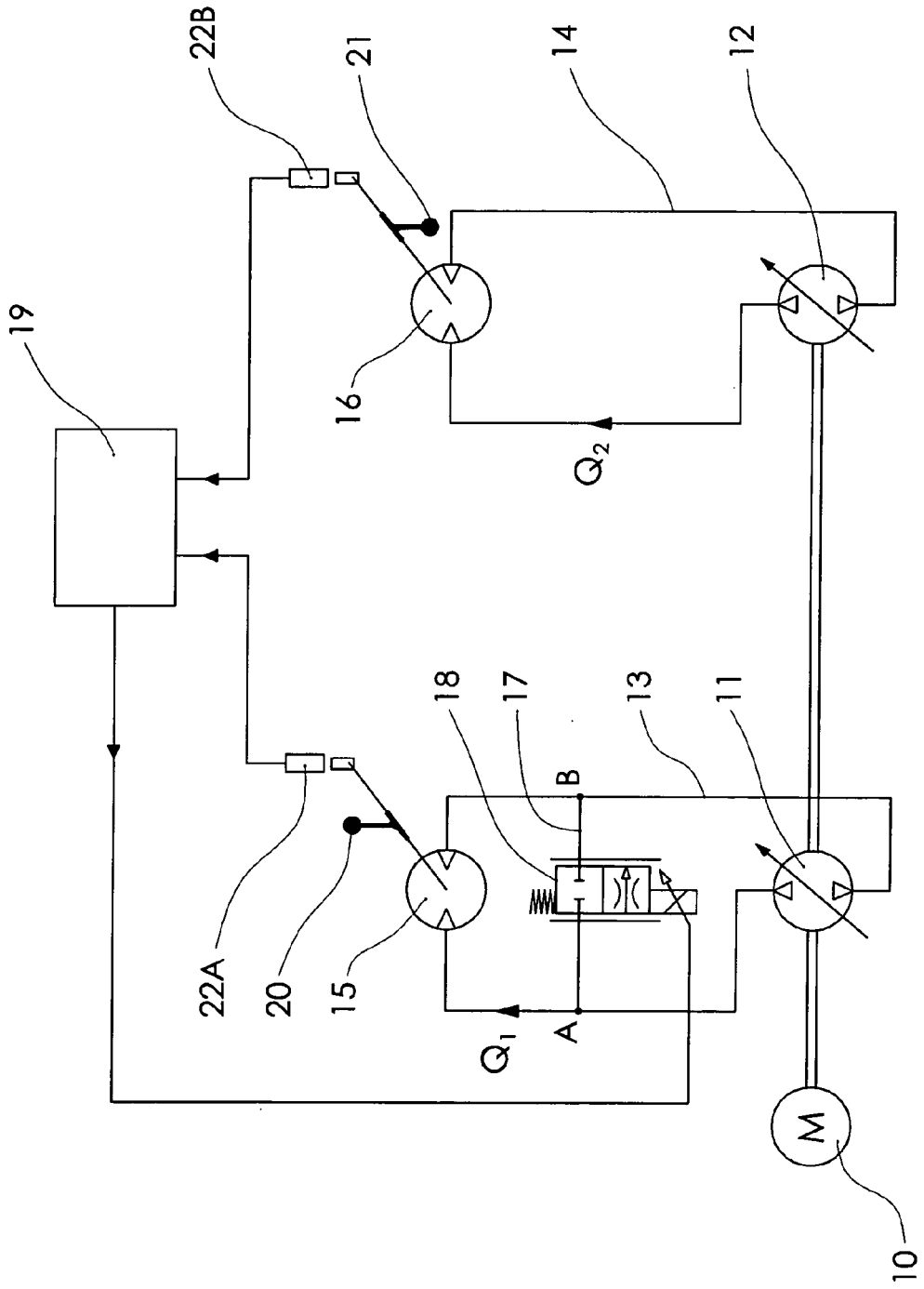

fig.1

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EUROPEAN SEARCH REPORT

Application Number
EP 08 46 6017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	WO 02/099199 A (INGERSOLL RAND CO [US]) 12 December 2002 (2002-12-12) * page 9, lines 21-34; figures 1-3,5 *	1	INV. E01C19/28 E02D3/074
A	US 4 187 036 A (BIELINSKI RALPH F [US] ET AL) 5 February 1980 (1980-02-05) * column 2, line 46 - column 3, line 2; figures 1-4 *	1	
A	DE 39 12 277 A1 (KRACHT PUMPEN MOTOREN [DE]) 18 October 1990 (1990-10-18) * column 3, lines 12-48; figures 5-8 *	1	
A	US 6 241 420 B1 (PERRIN JACQUES [FR] ET AL) 5 June 2001 (2001-06-05) * column 3, lines 4-32; figures 1-3 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) E01C E02D

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 December 2008	Flores Hokkanen, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 46 6017

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-12-2008

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WO 02099199 A	12-12-2002	US 2003026657 A1	06-02-2003
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 0209919911 A **[0003]**