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(54) **WHEEL END SURFACE DETECTION AND CORRECTION DEVICE**

(57) The present disclosure a wheel end surface detection and correction device. The present disclosure may detect the end surface runout of the wheel on line and correct the wheel end surface on line when used, and has the characteristics of high automation degree, advanced process, high generality, safe and stable performance and the like.

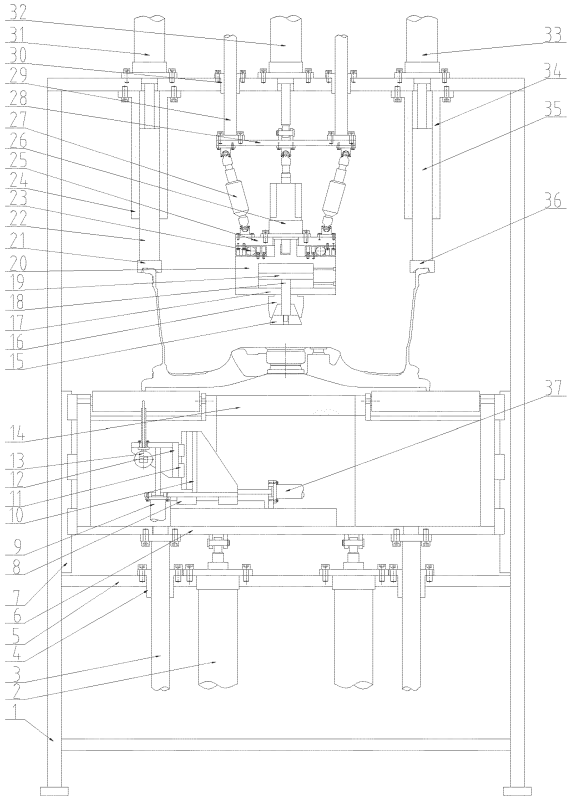

Fig. 1

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Description

Field

[0001] The present disclosure relates to a detection and correction device, and more particularly relates to a wheel end surface detection and correction device.

Background

[0002] In a machining process of aluminum alloy wheels, a machined wheel end surface is often unqualified in runout due to an end surface deformation and a clamping deformation of a blank, which will cause a wheel to vibrate during driving and affect the driving safety and comfort. Therefore, there is a need for automated equipment that performs online detection on the end surface runout of the wheel and corrects unqualified workpieces.

Summary

[0003] The present disclosure aims to provide a wheel end surface detection and correction device. The device may detect the end surface runout of a wheel on line and correct the wheel end surface on line when used.

[0004] In order to achieve the aforementioned objective, the technical solution of the present disclosure is as follows: Awheel end surface detection and correction device, consisting of a stand, cylinders I, guide columns I, guide sleeves I, a fixed plate, a lifting frame I, guide rails I, guide rails II, a servo electric cylinder I, a translational frame, guide rails III, a lifting frame II, a dial indicator, a supporting plate, an expansion core, an expansion sleeve, a reference plate, a cylinder rod, a piston, a cylinder body, a left copying pressing block, a left pressing rod, a rotating ring, a left guide sleeve, a movable plate, a servo motor, servo electric push rods, a lifting plate, guide columns II, guide sleeves II, a left servo electric cylinder, a cylinder II, a right servo electric cylinder, a right guide sleeve, a right pressing rod, a right copying pressing block and a servo electric cylinder II, the fixed plate is fixed on the stand; the four guide sleeves I are fixed on the fixed plate; the four guide columns I matched with the guide sleeves I are fixed below the lifting frame I; the two cylinders I are also fixed on the fixed plate, and the output ends of the two cylinders I are hinged with the bottom of the lifting frame I; two sides of the lifting frame I are connected with the stand through the guide rails I; the front and rear ends of the supporting plate are fixed on the stand.

[0005] A detection system is that: the bottom end of the translational frame is mounted above the bottom of the lifting frame I through the guide rails II; the lifting frame II is mounted on the side surface of the translational frame through the guide rails III; the servo electric cylinder I is fixed on a bottom plate of the translational frame, and the output end of the servo electric cylinder I is connected with the lifting frame II; the dial indicator is mounted on the lifting frame II; the servo electric cylinder II is fixed above the bottom of the lifting frame I, and the output end of the servo electric cylinder II is connected with the translational frame.

[0006] A customized cylinder is that: the reference plate is fixed below the cylinder body; the piston is matched with an inner hole of the cylinder body; the cylinder rod is connected with the piston.

[0007] The expansion sleeve is fixed below the reference plate; the expansion core is fixed at the top end of the cylinder rod; the outer side of the expansion core is matched with the inner side of the expansion sleeve; the top end of the cylinder body is mounted below the movable plate through the rotating ring; the servo motor is fixed above the movable plate, and the output end of the servo motor is connected with the top end of the cylinder body; the upper ends of the three servo electric push rods are hinged with the lower end of the lifting plate, and the lower ends are hinged with the top end of the movable plate; the three servo electric push rods are uniformly distributed between the movable plate and the lifting plate; the four guide columns II are fixed above the lifting plate; the four guide sleeves II matched with the four guide columns II are fixed at the top end of the stand; the cylinder II is also fixed at the top end of the stand, and the output end of the cylinder II is hinged with the top end of the lifting plate.

[0008] A correction system is that: the left servo electric cylinder is fixed on the left side of the top end of the stand; the left guide sleeve is fixed below the left servo electric cylinder and is matched with the left pressing rod; the top end of the left pressing rod is connected with the output end of the left servo electric cylinder, and the left copying pressing block is fixed at the left end of the left pressing rod; the right servo electric cylinder is fixed on the right side of the top end of the stand; the right guide sleeve is fixed below the right servo electric cylinder and is matched with the right pressing rod; the top end of the right pressing rod is connected with the output end of the right servo electric cylinder; and the right copying pressing block is fixed at the lower end of the right pressing rod.

[0009] In a working process, firstly, a stopper initially locates a wheel in the center; a cylinder II 32 enables an expansion sleeve 16 to move down through guide columns II 29 and be matched with a wheel center hole; three servo electric push rods 27 adjust a posture of a reference plate 17 to cause the reference plate 17 to be flatly fitted to a wheel flange surface; a cylinder rod 18 pulls an expansion core 15 to tighten the wheel; the cylinder II 32 lifts the wheel, and a servo motor 26 enables the wheel to rotate; a servo electric cylinder II 37 enables a dial indicator 13 to be located below the end surface of a wheel rim of the wheel through guide rails II 8; a servo electric cylinder I 9 enables the dial indicator 13 to be in contact with the wheel end surface through guide rails III 11; at the moment, the end surface runout of the wheel may be detected; after the detection is completed, cylinders I 2 enable a lifting frame I 6 to move down via

guide columns I 3; meanwhile, the cylinder II 32 enables the wheel end surface to be flatly fitted to a supporting plate 14; a right servo motor 33 enables a right copying pressing block 36 to be flatly fitted to the upper end surface of one side of the wheel through a right pressing rod 35, but no force is applied; and a left servo motor 31 enables a left copying pressing block 21 to over press the other side of the wheel through a left pressing rod 22 to cause the lower end surface to move down, so as to achieve the aim of correcting the end surface.

[0010] The present disclosure may detect the end surface runout of the wheel on line and correct the wheel end surface on line when used, and has the characteristics of high automation degree, advanced process, high generality, safe and stable performance and the like.

Brief Description of the Drawings

[0011]

Fig. 1 is a front view of a wheel end surface detection and correction device of the present disclosure;
Fig. 2 is a left view of a wheel end surface detection and correction device of the present disclosure; and
Fig. 3 is a front view of a wheel end surface detection and correction device of the present disclosure during working.

[0012] In the drawings, 1: stand; 2: cylinder I; 3: guide column I; 4: guide sleeve I; 5: fixed plate; 6: lifting frame I; 7: guide rail I; 8: guide rail II; 9: servo electric cylinder I; 10: translational frame; 11: guide rail III; 12: lifting frame II; 13: dial indicator; 14: supporting plate; 15: expansion core; 16: expansion sleeve; 17: reference plate; 18: cylinder rod; 19: piston; 20: cylinder body; 21: left copying pressing block; 22: left pressing rod; 23: rotating ring; 24: left guide sleeve; 25: movable plate; 26: servo motor; 27: servo electric push rod; 28: lifting plate; 29: guide column II; 30: guide sleeve II; 31: left servo electric cylinder; 32: cylinder II; 33: right servo electric cylinder; 34: right guide sleeve; 35: right pressing rod; 36: right copying pressing block; and 27: servo electric cylinder II.

Detailed Description of the Embodiments

[0013] Details and working conditions of a specific device provided according to the present disclosure are described below in combination with accompanying drawings.

[0014] The device consists of a stand 1, cylinders I 2, guide columns I 3, guide sleeves I 4, a fixed plate 5, a lifting frame I 6, guide rails I 7, guide rails II 8, a servo electric cylinder I 9, a translational frame 10, guide rails III 11, a lifting frame II 12, a dial indicator 13, a supporting plate 14, an expansion core 15, an expansion sleeve 16, a reference plate 17, a cylinder rod 18, a piston 19, a cylinder body 20, a left copying pressing block 21, a left pressing rod 22, a rotating ring 23, a left guide sleeve 24, a movable plate 25, a servo motor 26, servo electric push rods 27, a lifting plate 28, guide columns II 29, guide sleeves II 30, a left servo electric cylinder 31, a cylinder II 32, a right servo electric cylinder 33, a right guide sleeve 34, a right pressing rod 35, a right copying pressing block 36 and a servo electric cylinder II 37, the fixed plate 5 is fixed on the stand 1; the four guide sleeves I 4 are fixed on the fixed plate 5; the four guide columns I 3 matched with the guide sleeves I 4 are fixed below the lifting frame I 6; the two cylinders I 2 are also fixed on the fixed plate 5, and the output ends of the two cylinders I 2 are hinged with the bottom of the lifting frame I 6; two sides of the lifting frame I 6 are connected with the stand 1 through the guide rails I 7; the front and rear ends of the supporting plate 14 are fixed on the stand 1;

a detection system is that: the bottom end of the translational frame 10 is mounted above the bottom of the lifting frame I 6 through the guide rails II 8; the lifting frame II 12 is mounted on the side surface of the translational frame 10 through the guide rails III 11; the servo electric cylinder I 9 is fixed on a bottom plate of the translational frame 10, and the output end of the servo electric cylinder I 9 is connected with the lifting frame II 12; the dial indicator 13 is mounted on the lifting frame II 12; the servo electric cylinder II 37 is fixed above the bottom of the lifting frame I 6, and the output end of the servo electric cylinder II 37 is connected with the translational frame 10;

a customized cylinder is that: the reference plate 17 is fixed below the cylinder body 20; the piston 19 is matched with an inner hole of the cylinder body 20; the cylinder rod 18 is connected with the piston 19;

the expansion sleeve 16 is fixed below the reference plate 17; the expansion core 15 is fixed at the top end of the cylinder rod 18; the outer side of the expansion core 15 is matched with the inner side of the expansion sleeve 16; the top end of the cylinder body 20 is mounted below the movable plate 25 through the rotating ring 23; the servo motor 26 is fixed above the movable plate 25, and the output end of the servo motor 26 is connected with the top end of the cylinder body 20; the upper ends of the three servo electric push rods 27 are hinged with the lower end of the lifting plate 28, and the lower ends are hinged with the top end of the movable plate 25; the three servo electric push rods 27 are uniformly distributed between the movable plate 25 and the lifting plate 28; the four guide columns II 29 are fixed above the lifting plate 28; the four guide sleeves II 30 matched with the four guide columns II 29 are fixed at the top end of the stand 1; the cylinder II 32 is also fixed at the top end of the stand 1, and the output end of the cylinder II 32 is hinged with the top end of the lifting plate 28; and

a correction system is that: the left servo electric cylinder 31 is fixed on the left side of the top end of the stand 1; the left guide sleeve 24 is fixed below the left servo electric cylinder 31 and is matched with the left pressing rod 22; the top end of the left pressing rod 22 is connected with the output end of the left servo electric cylinder 31, and the left copying pressing block 21 is fixed at the left

end of the left pressing rod 22; the right servo electric cylinder 33 is fixed on the right side of the top end of the stand 1; the right guide sleeve 34 is fixed below the right servo electric cylinder 33 and is matched with the right pressing rod 35; the top end of the right pressing rod 35 is connected with the output end of the right servo electric cylinder 33; and the right copying pressing block 36 is fixed at the lower end of the right pressing rod 35.

[0015] In a working process, firstly, a stopper initially locates a wheel in the center; a cylinder II 32 enables an expansion sleeve 16 to move down through guide columns II 29 and be matched with a wheel center hole; three servo electric push rods 27 adjust a posture of a reference plate 17 to cause the reference plate 17 to be flatly fitted to a wheel flange surface; a cylinder rod 18 pulls an expansion core 15 to tighten the wheel; the cylinder II 32 lifts the wheel, and a servo motor 26 enables the wheel to rotate; a servo electric cylinder II 37 enables a dial indicator 13 to be located below the end surface of a wheel rim of the wheel through guide rails II 8; a servo electric cylinder I 9 enables the dial indicator 13 to be in contact with the wheel end surface through guide rails III 11; at the moment, the end surface runout of the wheel may be detected; after the detection is completed, cylinders I 2 enable a lifting frame I 6 to move down via guide columns I 3; meanwhile, the cylinder II 32 enables the wheel end surface to be flatly fitted to a supporting plate 14; a right servo motor 33 enables a right copying pressing block 36 to be flatly fitted to the upper end surface of one side of the wheel through a right pressing rod 35, but no force is applied; and a left servo motor 31 enables a left copying pressing block 21 to over press the other side of the wheel through a left pressing rod 22 to cause the lower end surface to move down, so as to achieve the aim of correcting the end surface.

Claims

1. A wheel end surface detection and correction device, consisting of a stand (1), cylinders I (2), guide columns I (3), guide sleeves I (4), a fixed plate (5), a lifting frame I (6), guide rails I (7), guide rails II (8), a servo electric cylinder I (9), a translational frame (10), guide rails III (11), a lifting frame II (12), a dial indicator (13), a supporting plate (14), an expansion core (15), an expansion sleeve (16), a reference plate (17), a cylinder rod (18), a piston (19), a cylinder body (20), a left copying pressing block (21), a left pressing rod (22), a rotating ring (23), a left guide sleeve (24), a movable plate (25), a servo motor (26), servo electric push rods (27), a lifting plate (28), guide columns II (29), guide sleeves II (30), a left servo electric cylinder (31), a cylinder II (32), a right servo electric cylinder (33), a right guide sleeve (34), a right pressing rod (35), a right copying pressing block (36) and a servo electric cylinder II (37), wherein the fixed plate (5) is fixed on the stand (1); the four guide sleeves I (4) are fixed on the fixed plate (5); the four guide columns I (3) matched with the guide sleeves I (4) are fixed below the lifting frame I (6); the two cylinders I (2) are also fixed on the fixed plate (5), and the output ends of the two cylinders I (2) are hinged with the bottom of the lifting frame I (6); two sides of the lifting frame I (6) are connected with the stand (1) through the guide rails I (7); the front and rear ends of the supporting plate (14) are fixed on the stand (1);

a detection system is that: the bottom end of the translational frame (10) is mounted above the bottom of the lifting frame I (6) through the guide rails II (8); the lifting frame II (12) is mounted on the side surface of the translational frame (10) through the guide rails III (11); the servo electric cylinder I (9) is fixed on a bottom plate of the translational frame (10), and the output end of the servo electric cylinder I (9) is connected with the lifting frame II (12); the dial indicator (13) is mounted on the lifting frame II (12); the servo electric cylinder II (37) is fixed above the bottom of the lifting frame I (6), and the output end of the servo electric cylinder II (37) is connected with the translational frame (10);

a customized cylinder is that: the reference plate (17) is fixed below the cylinder body (20); the piston (19) is matched with an inner hole of the cylinder body (20); the cylinder rod (18) is connected with the piston (19);

the expansion sleeve (16) is fixed below the reference plate (17); the expansion core (15) is fixed at the top end of the cylinder rod (18); the outer side of the expansion core (15) is matched with the inner side of the expansion sleeve (16); the top end of the cylinder body (20) is mounted below the movable plate (25) through the rotating ring (23); the servo motor (26) is fixed above the movable plate (25), and the output end of the servo motor (26) is connected with the top end of the cylinder body (20); the upper ends of the three servo electric push rods (27) are hinged with the lower end of the lifting plate (28), and the lower ends are hinged with the top end of the movable plate (25); the three servo electric push rods (27) are uniformly distributed between the movable plate (25) and the lifting plate (28); the four guide columns II (29) are fixed above the lifting plate (28); the four guide sleeves II (30) matched with the four guide columns II (29) are fixed at the top end of the stand (1); the cylinder II (32) is also fixed at the top end of the stand (1), and the output end of the cylinder II (32) is hinged with the top end of the lifting plate (28); and

a correction system is that: the left servo electric cylinder (31) is fixed on the left side of the top end of the stand (1); the left guide sleeve (24) is fixed below the left servo electric cylinder (31) and is matched with the left pressing rod (22); the top end of the left pressing rod (22) is connected with the output end

of the left servo electric cylinder (31), and the left copying pressing block (21) is fixed at the left end of the left pressing rod (22); the right servo electric cylinder (33) is fixed on the right side of the top end of the stand (1); the right guide sleeve (34) is fixed below the right servo electric cylinder (33) and is matched with the right pressing rod (35); the top end of the right pressing rod (35) is connected with the output end of the right servo electric cylinder (33); and the right copying pressing block (36) is fixed at the lower end of the right pressing rod (35).

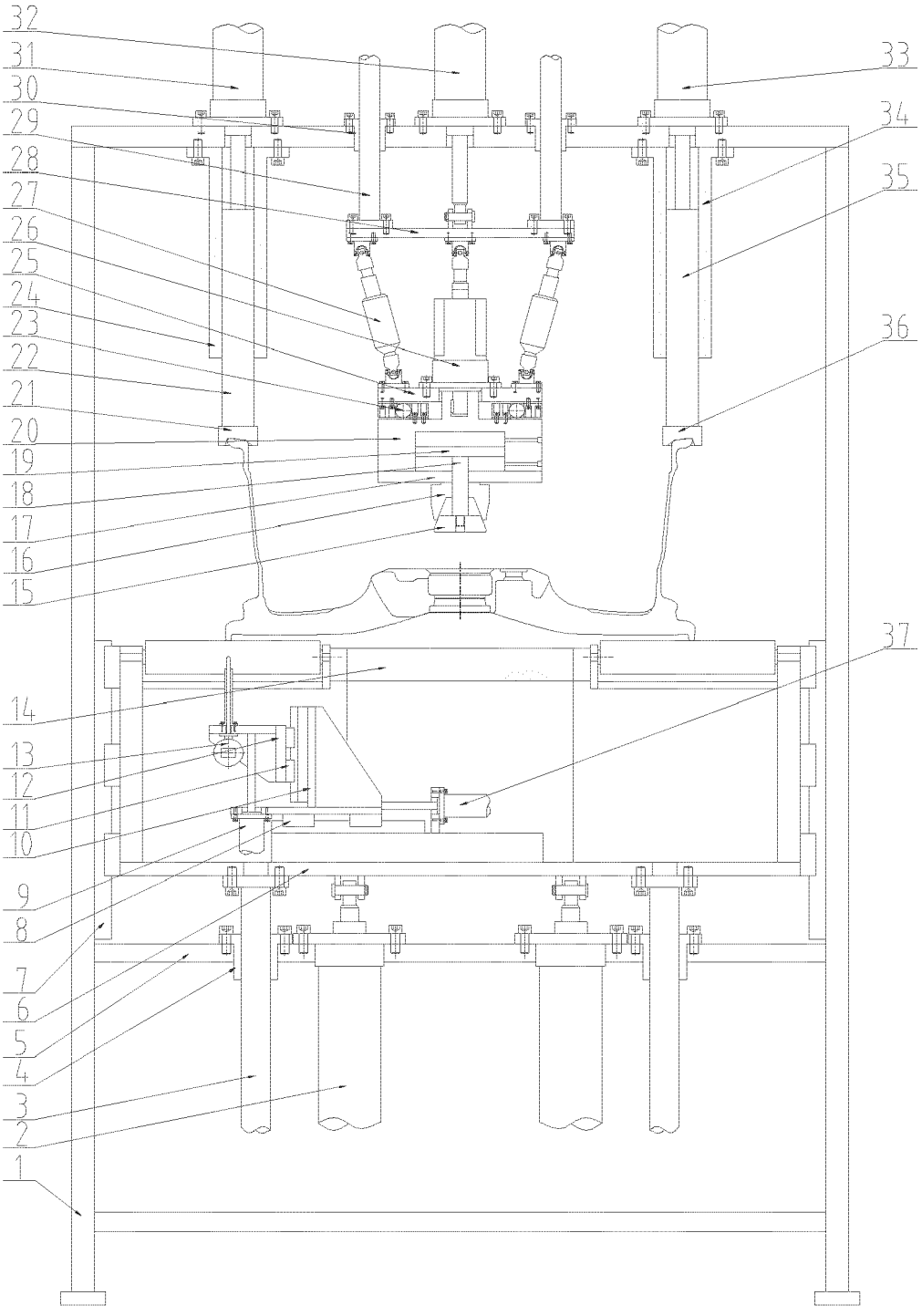
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Fig. 1

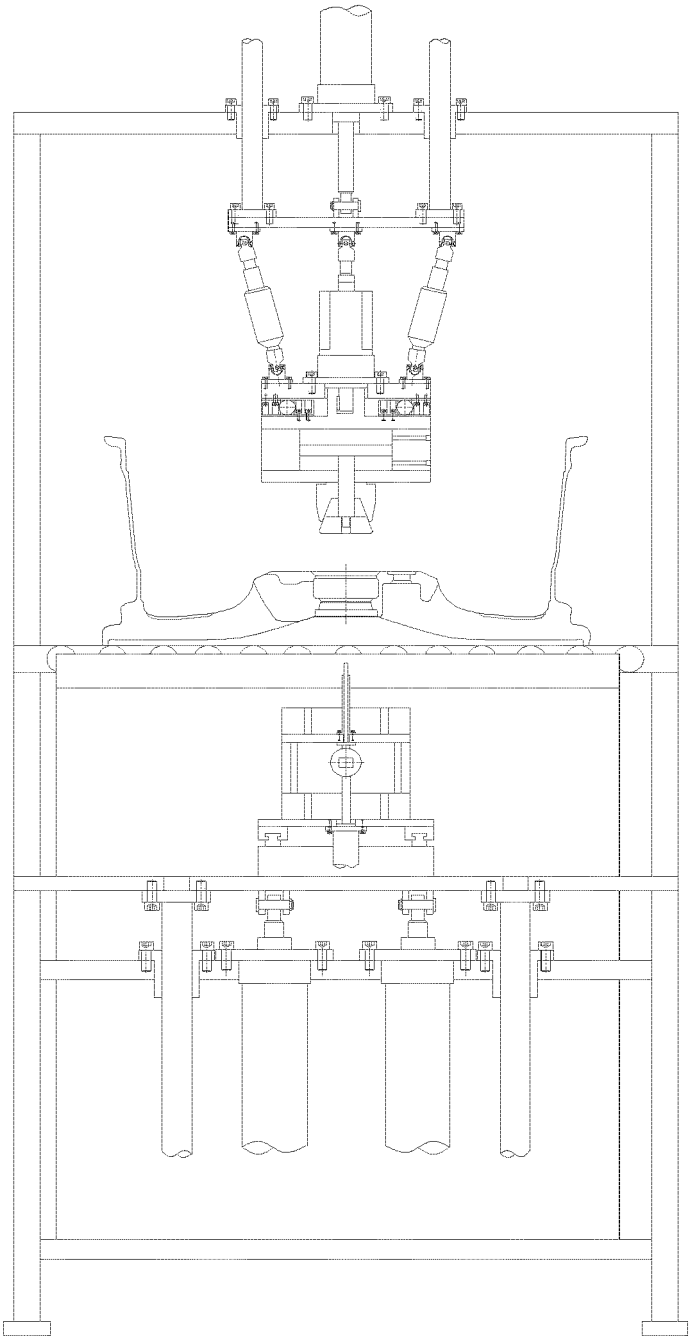

Fig. 2

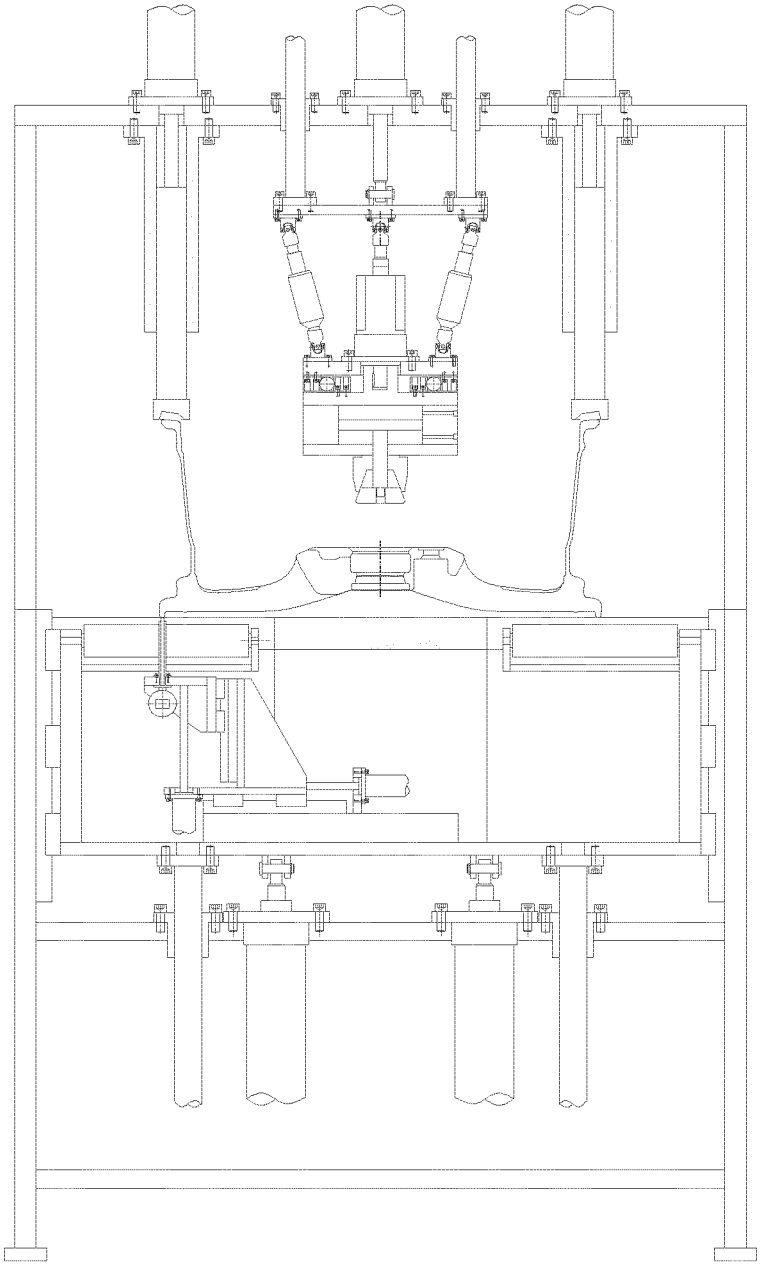

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 19 20 1488

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 108 273 875 A (CITIC DICASTAL CO LTD) 13 July 2018 (2018-07-13) * claim 1 * * figure 1 * -----	1	INV. B21D3/14 B21D53/30
A	CN 108 555 069 A (CITIC DICASTAL CO LTD) 21 September 2018 (2018-09-21) * claim 1 * * figures 1-6 * -----	1	
A	US 2017/182543 A1 (XUE BOWEN [CN] ET AL) 29 June 2017 (2017-06-29) * claim 1 * * figures 1, 2, 4, 7 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B21D
B60B
G01M
B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 March 2020	Stanic, Franjo

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09-03-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 108273875 A	13-07-2018	CN 108273875 A	13-07-2018
		US 2019193244 A1	27-06-2019
CN 108555069 A	21-09-2018	CN 108555069 A	21-09-2018
		US 2019351474 A1	21-11-2019
US 2017182543 A1	29-06-2017	CN 105363839 A	02-03-2016
		US 2017182543 A1	29-06-2017

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