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(54) A LIFTING DEVICE FOR MAINTENANCE AND REPAIR OF MOTORIZED TWO-WHEELED VEHICLES

(57) A lifting device (1) for two-wheeled vehicles, with a base frame (2), a horizontal platform (3) placed on top of the frame (2), a scissor mechanism (4) interposed between the frame (2) and the platform (3) having two pair of mechanical arms (5) pivoted together proximate to a central portion, one hydraulic cylinder (6) acting on the scissor mechanism (4), an electric pump (10) and a reservoir (11) for collecting the hydraulic fluid (F), which are connected to the cylinder (6) via a hydraulic circuit (12). The hydraulic circuit (12) comprises pilot solenoid valves (13, 15) along branches (14, 16). The solenoid valves are opened on command to allow the fluid (F) to be discharged from the cylinder (6) to the reservoir (11) as the platform (3) is being lowered, the solenoid valves (13, 15) being closed to hold the platform (3) and prevent discharge of the fluid (F).

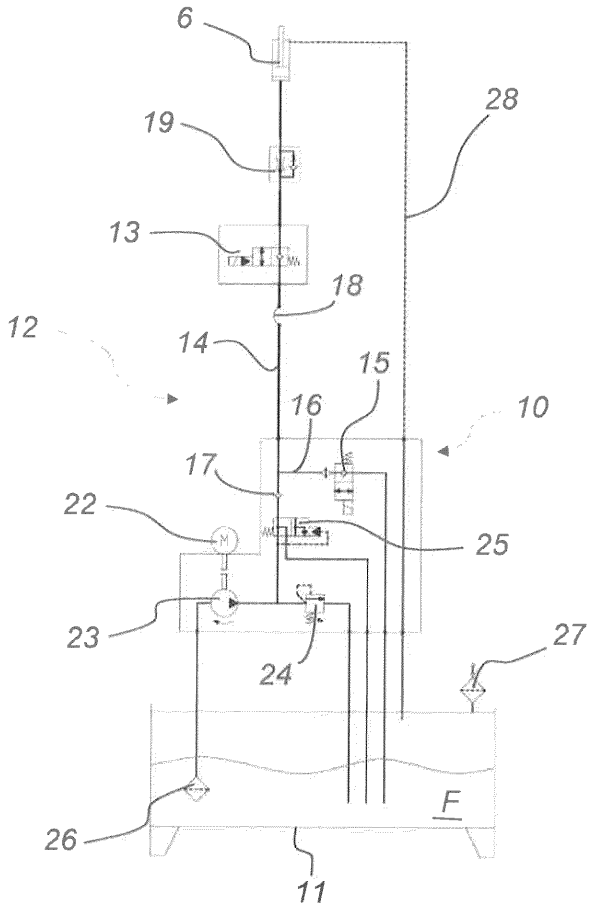

FIG. 5

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Description

Technical field

[0001] The present invention generally finds application in field of lifting devices, and particularly relates to a lifting device for maintenance and repair of motorcycles and similar vehicles.

Background art

[0002] Motorcycles, like the other motor vehicles with more than two wheels, have been long known to require servicing and/or repair several times over their lifetime.

[0003] If the motorcycle is stationary on the ground, the maintenance or repair work is rather difficult and inconvenient for an operator as not all the parts of the vehicle are easily visible and accessible.

[0004] Moreover, under these conditions the operator must assume uncomfortable working positions, possibly leading to injuries and occupational diseases over time.

[0005] In general, mechanical lifts are used to facilitate maintenance and repair work on a two-wheeled motor vehicle, allowing the vehicle to be effortlessly lifted from the ground to human level.

[0006] Typically, such lifts comprise a platform for supporting the vehicle, the latter being locked by suitable anchor means to ensure that it can be safely serviced and prevented from falling down the platform with the risk of injury to the operator.

[0007] The platform is normally lifted by means of a pneumatic or hydraulic actuator, which applies an upwardly-directed force to lift the platform from the ground.

[0008] In order to load the vehicle on the platform, the platform is fully lowered, and a ramp is used in this position to assist loading of the vehicle.

[0009] Usually, this ramp is placed on the rear of the lift and may be either movable or directly coupled to the lift.

[0010] If the ramp is movable, every time an operator must move it close to the lift to allow the vehicle to get on board and later remove it to prevent the operator from being hindered in his/her movements while working on the vehicle.

[0011] On the other hand, if the ramp is coupled to the lift, it can be fixed to the base of the lift or to the platform.

[0012] Nevertheless, when the ramp is fixed it can obstruct the operator's movements around the platform, thus becoming a possible cause of accidents and injuries.

[0013] In an attempt to obviate this drawback, CA2266164 teaches a lift for two-wheeled motor vehicles, which has a retractable ramp inside the platform.

[0014] Nevertheless, the main disadvantage of this known lift is that the ramp must be manually pulled out or back into the platform, thereby increasing work times.

[0015] WO2017/207882 discloses a lift for two-wheeled motor vehicles that has a movable ramp coupled beneath the platform and to mechanical arms designed to lift the platform.

[0016] With this arrangement, as the platform is lowered, the ramp is automatically ejected from the bottom of the platform, in a position suitable for the vehicle to climb onto the lift.

[0017] On the other hand, as the ramp is lifted, it is automatically retracted underneath the worktop, thereby clearing the surrounding space.

[0018] However, this known lift suffers from the drawback of requiring mechanical locks to lock the platform in the working position.

[0019] By doing so, however, the worktop can only be placed at predetermined heights, based on the position of the locks, which may not be suitable for the operations to be carried out by operators having different heights.

[0020] In addition, the platform must be lifted before being lowered, to disengage the mechanical locks from the platform, which also extends the work times.

[0021] CN205114946 discloses a motorcycle lift in which the work surface is held at a predetermined height, selected by the operator, by means of a hydraulic lock installed on the side of the hydraulic actuator.

[0022] The main drawback of this known lift is that if the hydraulic lock fails, the platform will be suddenly dropped, thereby causing immediate outflow of the hydraulic fluid.

[0023] This poses serious risks to any operator nearby, especially if a vehicle is placed on the platform.

[0024] Therefore, the aforementioned hydraulic or pneumatic lifts are impractical, relatively ineffective and cause accidents in the event of failure of the locking systems.

Technical Problem

[0025] In view of the prior art, the technical problem addressed by the present invention consists in increasing safety during work, while affording quicker and simpler loading/unloading of the vehicle onto/from the platform.

Disclosure of the invention

[0026] The object of the present invention is to solve the above mentioned problem, by providing a lifting device for maintenance and repair of motorized two-wheeled vehicles that can obviate the above discussed drawbacks and be highly efficient and relatively cost-effective.

[0027] A particular object of the present invention is to provide a lifting device as described hereinbefore that can prevent any accidents and injuries to lift operators.

[0028] A further object of the present invention is to provide a lifting device as described hereinbefore that can also operate with hydraulic fluid leakage, power failure or similar drawbacks.

[0029] Another object of the present invention is to provide a lifting device as described hereinbefore that can reduce the work time on the vehicle.

[0030] A further object of the present invention is to provide a lifting device as described hereinbefore that ensures high versatility.

[0031] Yet another object of the present invention is to provide a lifting device as described hereinbefore that requires no particular operator skills during use.

[0032] These and other objects, as more clearly shown hereinafter, are achieved by a lifting device for maintenance and repair of motorized two-wheeled vehicles as defined in claim 1, comprising a frame designed to rest on the ground, a substantially horizontal platform placed on top of the frame, a scissor mechanism interposed between the frame and the platform, having two pairs of mechanical arms pivoted together proximate to a central portion, at least one single-acting hydraulic cylinder acting on the scissor mechanism for lifting and lowering the platform and having a lower end pivoted to the frame, an electric pump and a reservoir for collecting the hydraulic fluid connected to the cylinder via a hydraulic circuit.

[0033] The hydraulic circuit comprises a first pilot solenoid valve along a first branch connecting the electric pump with the cylinder, and a second pilot solenoid valve along a second branch of the circuit connecting the cylinder to the reservoir, wherein the first and second solenoid valves can be opened on command to allow the fluid to be discharged from the cylinder to the reservoir as the platform is being lowered and wherein a single platform is provided, whose plan size is sufficient to support one motorized vehicle at a time.

[0034] According to a peculiar aspect of the invention, both solenoid valves are normally closed to hold the platform at a predetermined height, thereby preventing any inadvertent discharge or loss of the fluid in the event of failure even of only one of the solenoid valves.

[0035] Advantageously, the first branch of the hydraulic circuit comprises a non-return valve located inside the electric pump so that, in the event of technical failures, the platform will remain locked in position.

[0036] Also, the hydraulic circuit has a third branch adapted to directly connect the reservoir to the cylinder proximate to its lower end, to create a negative pressure therein as the platform is being lowered. In this arrangement, the fluid drawn from the reservoir is vaporized and the vapors are deposited on the inner walls of the cylinder, thereby lubricating it and increasing the safety of the device.

[0037] With this combination of features, the platform of the lifting device remains in position even in the event of power failure or fluid leakage, as the first solenoid valve remains closed, thereby holding the cylinder in position and increasing the safety of an operator in the vicinity of the device.

[0038] Conveniently, the first solenoid valve can be opened on command, with the second solenoid valve normally closed to allow the cylinder to be pressurized and the platform to be lifted.

[0039] Advantageous embodiments of the invention are obtained in accordance with the dependent claims.

Brief description of the drawings

[0040] Further characteristics and advantages of the invention will be more apparent upon reading of the detailed description of a preferred, non-exclusive embodiment of a lifting device for maintenance and repair of motorized two-wheeled vehicles like the aforementioned one, as shown by way of a nonlimiting example with the help of the following drawings, in which:

FIGS. 1 and 2 are a front perspective view and a rear perspective view of the lifting device of the invention respectively;
FIGS. 3A and 3B are front and rear views of the lifting device of Fig. 1 respectively;
FIGS. 4A, 4B and 4C are side views of the lifting device in different operating positions;
FIG. 5 is a schematic view of the hydraulic circuit of the lift of Fig. 1.

Detailed description of a preferred exemplary embodiment

[0041] Particularly referring to the figures, there is shown a lifting device, generally designated by numeral 1, for maintenance and repair of motorized two-wheeled vehicles, not shown.

[0042] By way of example and without limitation, the lift 1 may be used to operate with mopeds and motorcycles having two wheels in line or with three-wheeled motorized vehicles.

[0043] The lifting device 1 comprises a base frame 2 adapted to rest on the ground or on a substantially horizontal plane S, having a substantially horizontal platform 3 thereon. Conveniently, a single platform 3 is provided having a predetermined plan size, sufficient to support one motorized vehicle at a time.

[0044] According to a preferred configuration of the invention, as shown in FIGS. 1 to 4, the frame 2 and the platform 3 have a substantially rectangular shape with a pair of long sides 2A, 2B; 3A, 3B and a pair of short sides 2C, 2D; 3C, 3D.

[0045] Furthermore, clamp-like locking means or the like, not shown, are provided on the top surface of the platform 3, for holding the vehicle in position.

[0046] Generally, the locking means act on the front wheel of the vehicle to prevent the latter from falling down the platform 3.

[0047] Thus, an operator who is close to the lifting device 1 can always work safely throughout the working steps.

[0048] As best shown in FIGS. 4A, 4B and 4C, a scissor mechanism 4 with two pairs of mechanical arms 5 mutually pivoted proximate to a central portion is interposed between the frame 2 and the platform 3 of the device 1.

[0049] Furthermore, the device 1 comprises at least one single-acting hydraulic cylinder 6 which acts on the scissor mechanism 4 for lifting and lowering the platform

3.

[0050] Conveniently, the scissor mechanism 4 comprises at least one intermediate cross-member 7 for mutual connection of the pairs of mechanical arms 5, placed above the pivot point. The cylinder 6 has an upper end that acts on the intermediate cross-member 7 and a lower end 6' pivoted to the frame 2.

[0051] The mechanical arms 5 of each pair of the scissor mechanism 4 have a lower end 8 operably associated with the frame 2 and an upper end 9 operably associated with the bottom surface of the platform 3.

[0052] In particular, the lower ends 8 of the mechanical arms 5 of each pair are operably associated with the frame 2 by means of a pin 8' and a movable carriage 8", respectively.

[0053] Likewise, the upper ends 9 of the mechanical arms 5 of each pair are operably associated with the bottom surface of the platform 3 via a pin 9' and a movable carriage 9", respectively.

[0054] Thus, the lower ends 8" and the upper ends 9" of the mechanical arms 5 having the movable carriage may slide along suitable guides, not shown in the drawings, formed on the pair of long sides 2A, 2B; 3A, 3B of the frame 2 and of the platform 3 respectively.

[0055] With this arrangement, when the cylinder 6 acts on the intermediate cross-member 7, the scissor mechanism 4 may extend vertically as the platform 3 is being lifted and collapse as the platform 3 is being lowered.

[0056] Furthermore, the device 1 comprises an electric pump 10 and a reservoir 11 for collecting the hydraulic fluid F, which are connected to the cylinder 6 via a hydraulic circuit 12.

[0057] According to a peculiar aspect, the hydraulic circuit 12 comprises a first pilot solenoid valve 13 along a first branch 14 connecting the electric pump 10 with the cylinder 6, and a second pilot solenoid valve 15 along a second branch 16 of the circuit hydraulic 12 connecting the cylinder 6 to the reservoir 11.

[0058] Preferably, the second solenoid valve 15 is placed inside the electric pump 10.

[0059] The first 13 and the second 15 solenoid valves can be opened on command to allow the fluid F to be discharged from the cylinder 6 to the reservoir 11 when the platform 3 is being lowered.

[0060] Both solenoid valves 13, 15 are of the normally closed type, to hold the platform 3 at a predetermined height, and prevent any inadvertent discharge or leakage of fluid F in the event of failure even of only one of the solenoid valves 13, 15.

[0061] Conveniently, the first branch 14 of the hydraulic circuit 12 comprises a non-return valve 17 located inside the electric pump 10.

[0062] It will be apparent to the skilled person that, with the arrangement of the solenoid valves 13 and 15, as well as of the non-return valve 17, in the event of technical failures, such as lack of current, failure of the hydraulic circuit 12 between the electric pump 10 and the cylinder 6, inoperability of one of the solenoid valves 13, 15 and/or failure of the non-return valve 17, the platform 3 will remain locked in position, and will be prevented from being abruptly lowered and from possibly causing the vehicle to fall.

[0063] This is because, if the hydraulic circuit 12 has one of the two solenoid valves in operation, i.e. closed, and the other not operating, i.e. open, the operating solenoid valve prevents the hydraulic fluid F from flowing out of the cylinder 6, thereby holding it in position.

[0064] Therefore, an operator will always work safely in the vicinity of the lifting device 1 even if one of the above-described technical faults occurs.

[0065] Generally, the hydraulic fluid F flows out of the electric pump 10 to the cylinder 6 via a flexible rubber tube 18.

[0066] Preferably, the first 13 and the second 15 pilot solenoid valves comprise manual discharge means for discharging the fluid F from the hydraulic circuit 12 toward the reservoir 11.

[0067] These manual discharge means may be used to lower the platform 3 and remove the vehicle from the lifting device 1 if the platform 3 has been locked at a given height due to a technical fault.

[0068] In order to ensure that the platform 3 will be always lowered under safe conditions, a balancing valve 19 is mounted along the first branch 14 of the hydraulic circuit 12, to regulate the flow of the hydraulic fluid F as it is being discharged and the lowering speed of the platform 3.

[0069] Conveniently, the first solenoid valve 13 can be opened on command with the second solenoid valve 15 normally closed to allow the cylinder 6 to be pressurized and the platform 3 to be lifted.

[0070] In a well-known manner, the pressurized fluid F is sent to the cylinder 6 via the electric pump 10.

[0071] Advantageously, the electric pump 10 is operated and the first 13 and second 15 solenoid valves are opened via an electric circuit which comprises an electric controller 20 and a push-button panel 21 which can be operated by an operator to vary the height of the platform 3 with respect to the ground S between a maximum value and a minimum value.

[0072] As shown in FIG. 5, the electric pump 10 comprises, in addition to the second solenoid valve 15 and the non-return valve 17, an electric motor 22 connected to a pump 23 for pressurizing the fluid F, an adjustable maximum pressure valve 24 and a start-up valve 25 to facilitate start-up of the electric motor 22.

[0073] In addition, the reservoir 11 for the hydraulic fluid F comprises a suction filter 26 for moving the fluid F from the reservoir 11 to the pump 23, and a filler cap 27 for introducing additional fluid F or changing the fluid therein as required.

[0074] In one embodiment, the platform 3 reaches a maximum height value near 1300 mm, and a minimum value near 85 mm from the ground S.

[0075] No mechanical locks are required, as the solenoid valves 13 and 15 hold the cylinder 6 in position,

therefore an operator can move the platform 3 to any height between the maximum and the minimum heights, to work in ideal conditions.

[0076] According to the invention, the hydraulic circuit 12 comprises a third branch 28 for directly connecting the reservoir 11 to the cylinder 6. The connection of the third branch 28 to the cylinder 6 is placed close to its upper end, so that, as the platform 3 is being lowered, a negative pressure is created inside the cylinder 6.

[0077] As a result of this negative pressure, the fluid F drawn from the reservoir 11 into the cylinder 6 is vaporized and the vapors cover the inner walls of the cylinder 6.

[0078] With this configuration, the walls of the cylinder 6 are effectively lubricated, thereby increasing the safety of the device and avoiding any damage due to wear caused by friction during repeated lifting and lowering of the platform 3.

[0079] As shown in FIGS. 1 to 4, the lifting device 1 comprises a movable ramp 29 connected to the pairs of mechanical arms 5 via an articulated mechanism which is adapted to impart movements to fold the ramp 29 beneath the platform 3 as the latter is being lifted, and to extend it as the platform 3 is being lowered.

[0080] This articulated mechanism comprises first connection members 30 and second connection members 31 which are adapted to couple the ramp 29 to the pairs of mechanical arms 5 of the scissor mechanism 4.

[0081] The first connecting members 30 have one end hinged to the pair of mechanical arms 5 above the pivot point, and one end welded to the bottom surface of the ramp 29.

[0082] On the other hand, the second connecting members 31 have one end hinged to the pair of mechanical arms 5 below the pivot point, and one end hinged to the first connecting members 30 below the lower surface of the ramp 29.

[0083] In other words, the assembly composed of a first 30 and a second 31 connecting members with a pair of mechanical arms 5 forms a four-bar linkage adapted for moving the ramp 29 as described above.

[0084] In the preferred embodiment of the lifting device 1, the ramp 29 is entirely retracted beneath the platform 3 starting from an intermediate height thereof from the ground S of approximately 800 mm.

[0085] This particular configuration allows the operator to avoid further operations of removal of the ramp 29 from the perimeter of the lifting device 1, thereby reducing the work times.

[0086] Moreover, once the ramp 29 has been fully retracted beneath the platform 3, it is no longer of hindrance during work, which will ensure a safe condition for the operator.

[0087] In an alternative embodiment, the ramp 29 may be replaced with any other type of ramp known in the state of the art, to avoid hindering the work of the operator while ensuring his/her safety.

[0088] It will be appreciated from the foregoing that the lifting device of the invention fulfills the intended objects and namely can avoid accidents during work in the event of technical failures such as power failure, broken hydraulic circuit, failure of either the solenoid valves and/or the non-return valve.

[0089] The lifting device is also practical and ensures quick loading/unloading of the vehicle onto/from the ramp and lifting/lowering of the ramp.

[0090] While the lifting device has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

[0091] The same reference numerals in different figures will designate identical or similar elements and the attached figures are not necessarily to scale.

Industrial Applicability

[0092] The present invention may find application in industry because it can be produced on an industrial scale in the field of lifting devices.

Claims

1. A lifting device (1) for maintenance and repair of motorized two-wheeled vehicles, which device comprises:

- a base frame (2) designed to rest on the ground (S);
- a substantially horizontal platform (3) placed on top of said frame (2);
- a scissor mechanism (4) interposed between said frame (2) and said platform (3), having two pairs of mechanical arms (5) pivoted together proximate to a central portion thereof;
- at least one single-acting hydraulic cylinder (6) acting on said scissor mechanism (4) for lifting and lowering said platform (3) and having a lower end (6') pivoted to the frame (2);
- an electric pump (10) and a reservoir (11) for collecting the hydraulic fluid (F), which are connected to said cylinder (6) via a hydraulic circuit (12);

wherein said hydraulic circuit (12) comprises a first pilot solenoid valve (13) along a first branch (14) connecting said electric pump (10) with said cylinder (6) and a second pilot solenoid valve (15) along a second branch (16) of the circuit (12) connecting said cylinder (6) to said reservoir (11);

wherein said first (13) and second (15) solenoid valves can be opened on command to allow the fluid (F) to be discharged from said cylinder (6) to said reservoir (11) when said platform (3) is being lowered;

wherein said platform (3) is a single platform whose plan size is sufficient to support one motorized vehicle at a time,
characterized in that both said solenoid valves (13, 15) are normally closed to maintain said platform (3) at a predetermined height and to prevent inadvertent discharge or leakage of the fluid (F) in the event of failure even of only one of said solenoid valves (13, 15), said first branch (14) comprising a non-return valve (17) placed inside said electric pump (10) so that, in the event of technical failures, said platform (3) remains locked in position, said hydraulic circuit (12) having a third branch (28) adapted to directly connect said reservoir (11) to said cylinder (6) near said lower end (6') to create a negative pressure therein as said platform (3) is being lowered, the arrangement being such that the fluid (F) drawn from said reservoir (11) is vaporized and the vapors are deposited on the inner walls of said cylinder (6), thereby lubricating it and increasing the safety of the device (1).

2. Device as claimed in claim 1, **characterized in that** said first solenoid valve (13) can be opened on command with said second solenoid valve (15) normally closed to allow said cylinder (6) to be pressurized and said platform (3) to be lifted.

3. Device as claimed in claim 1, **characterized in that** a balancing valve (19) is mounted along said first branch (14) of the hydraulic circuit (12), to regulate the flow of the fluid (F) as it is being discharged and the lowering speed of said platform (3).

4. Device as claimed in claim 1, **characterized in that** it comprises an electric circuit for actuating said electric pump (11) and opening said first (13) and second (15) pilot solenoid valves, said electric circuit comprising an electric controller (20) and a push-button panel (21) operable by an operator so as to vary the height of said platform (3) from the ground (S) between a maximum value and a minimum value.

5. Device as claimed in claim 4, **characterized in that** said maximum value is about 1300 mm and said minimum value is about 85 mm from the ground (S).

6. Device as claimed in claim 1, **characterized in that** each of said first (13) and second (15) pilot solenoid valves comprises manual discharge means for discharging the fluid (F) from said hydraulic circuit (12) toward said reservoir (11).

7. Device as claimed in claim 1, **characterized in that** said scissor mechanism (4) comprises at least one intermediate cross-member (7) for mutual connection of said pairs of mechanical arms (5) placed above their pivot point, said cylinder (6) having an upper end acting on said at least one intermediate cross-member (7) and a lower end attached to said frame (2).

8. Device according to claim 1, **characterized in that** it comprises clamp-like locking means or the like that can be anchored to the top surface of said platform (3) to hold the vehicle in position.

9. Device as claimed in claim 1, **characterized in that** it comprises a movable ramp (29) connected to said pairs of mechanical arms (5) via an articulated mechanism which is adapted to impart movements to fold said ramp (29) beneath said platform (3) as the latter is being lifted and to extend it as said platform (3) is being lowered.

10. Device as claimed in claim 9, **characterized in that** said ramp (29) is entirely retracted beneath said platform (3) starting from an intermediate height thereof from the ground (S) of approximately 800 mm.

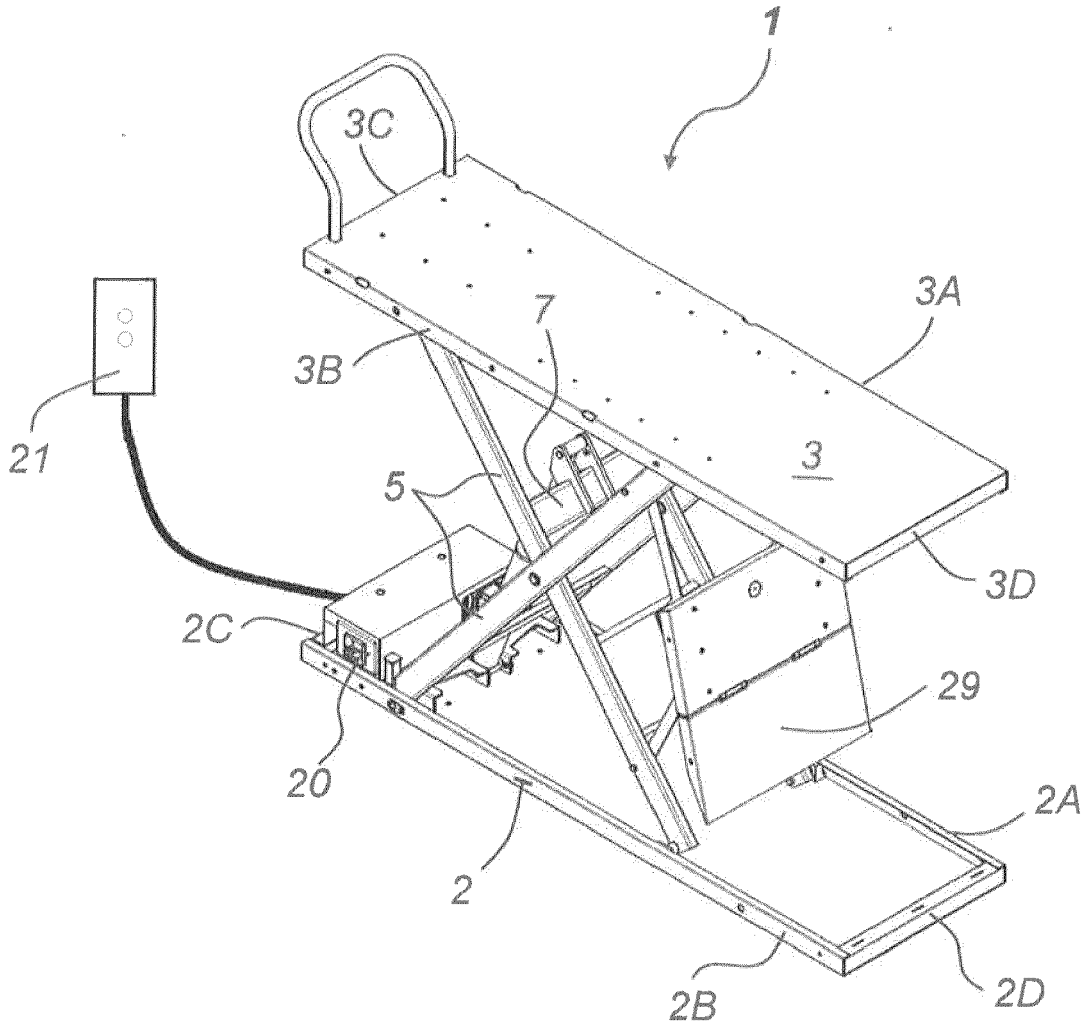

FIG. 1

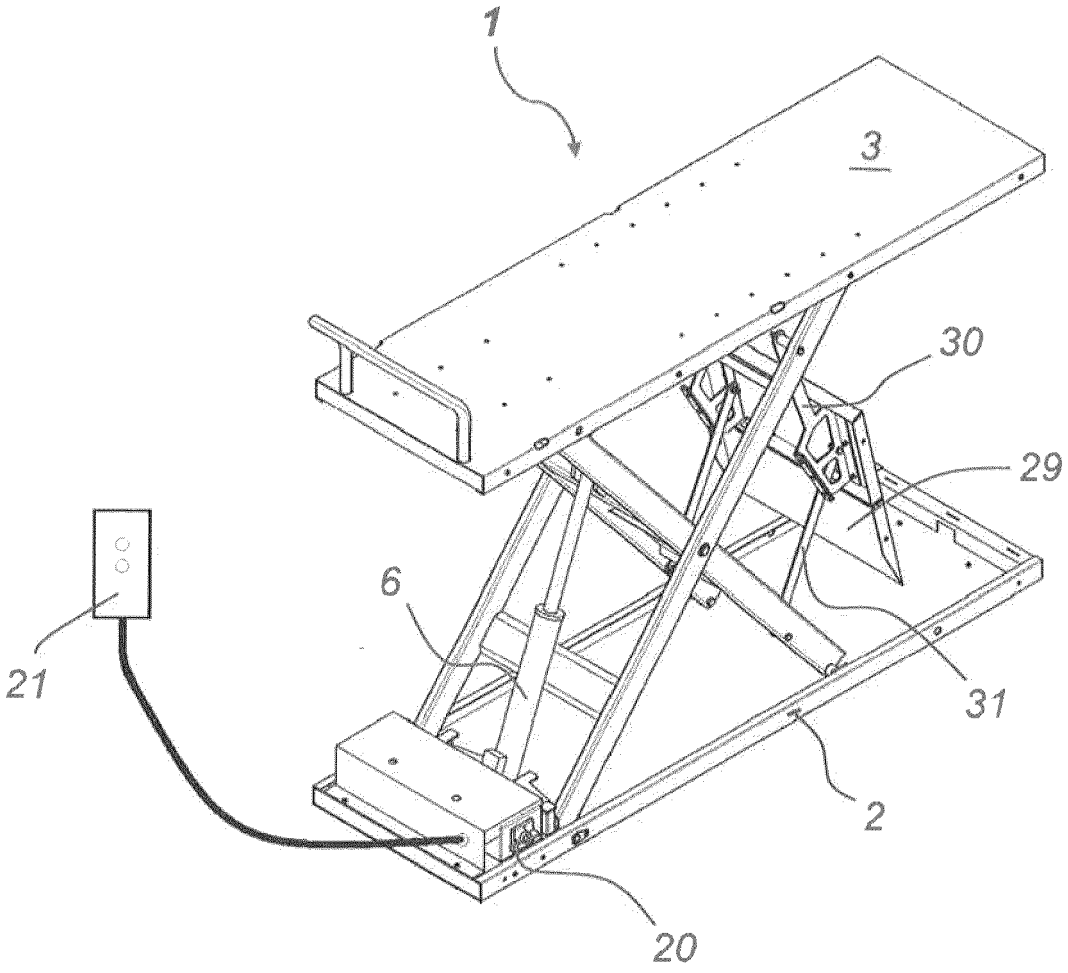

FIG. 2

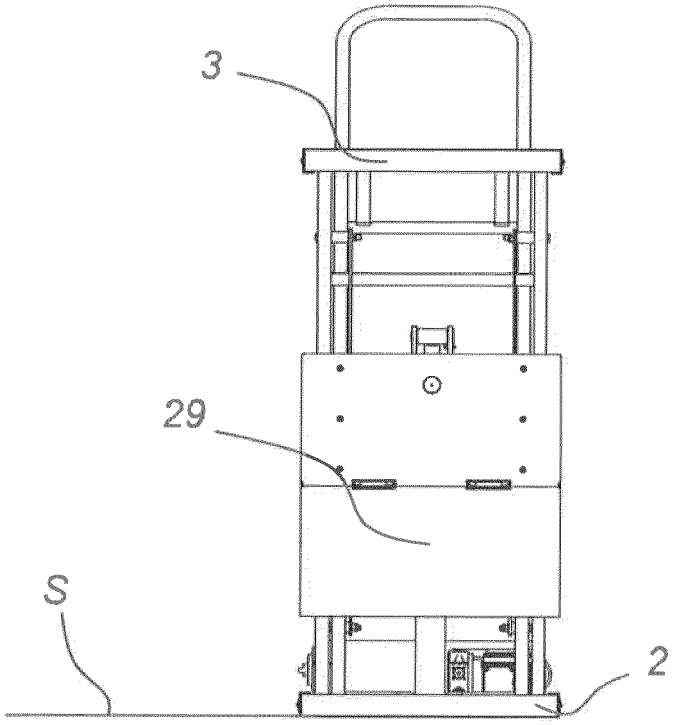

FIG. 3A

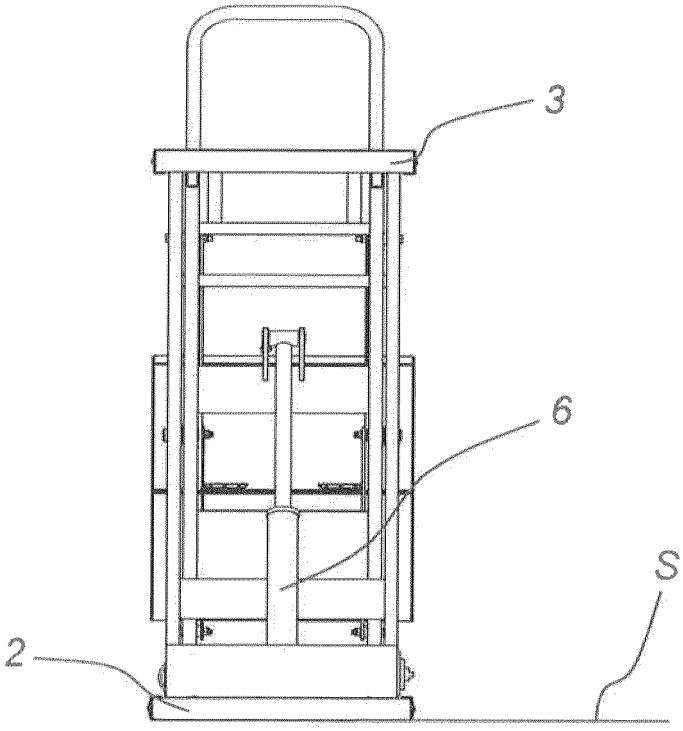

FIG. 3B

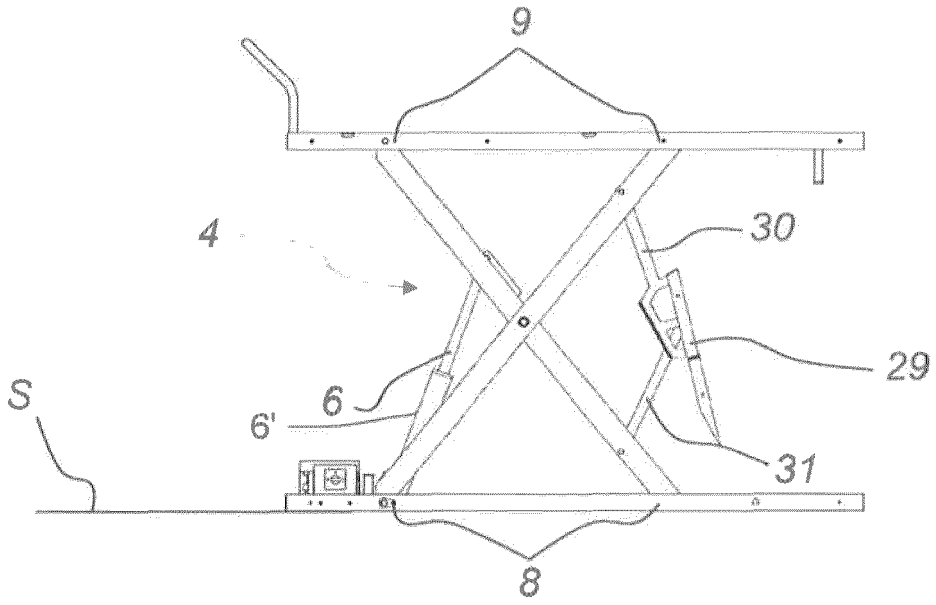

FIG. 4A

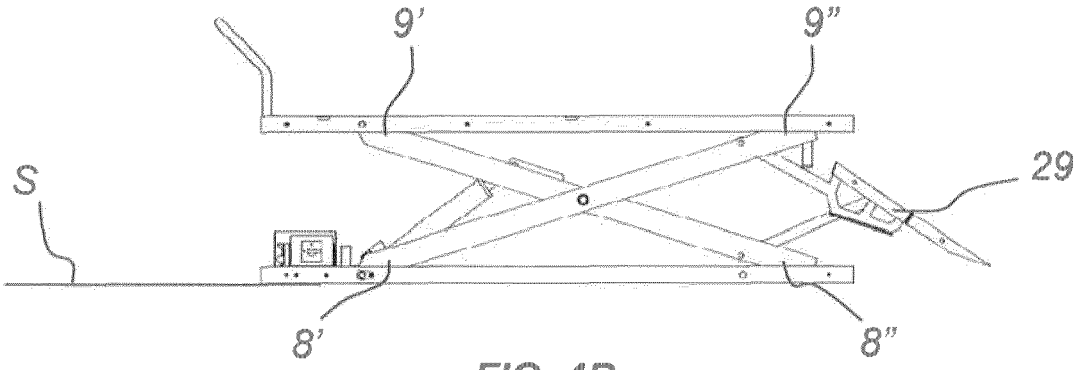

FIG. 4B

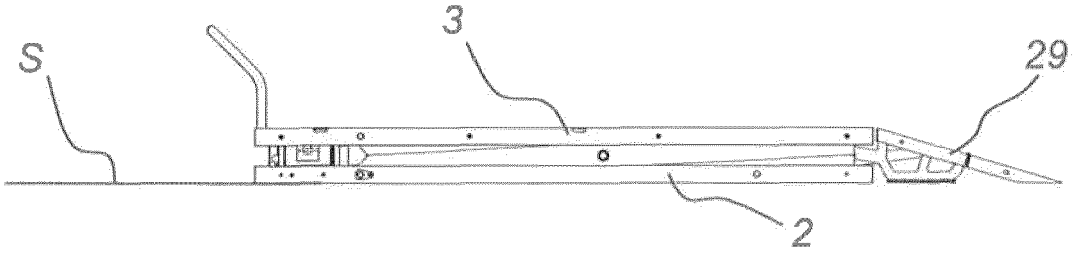

FIG. 4C

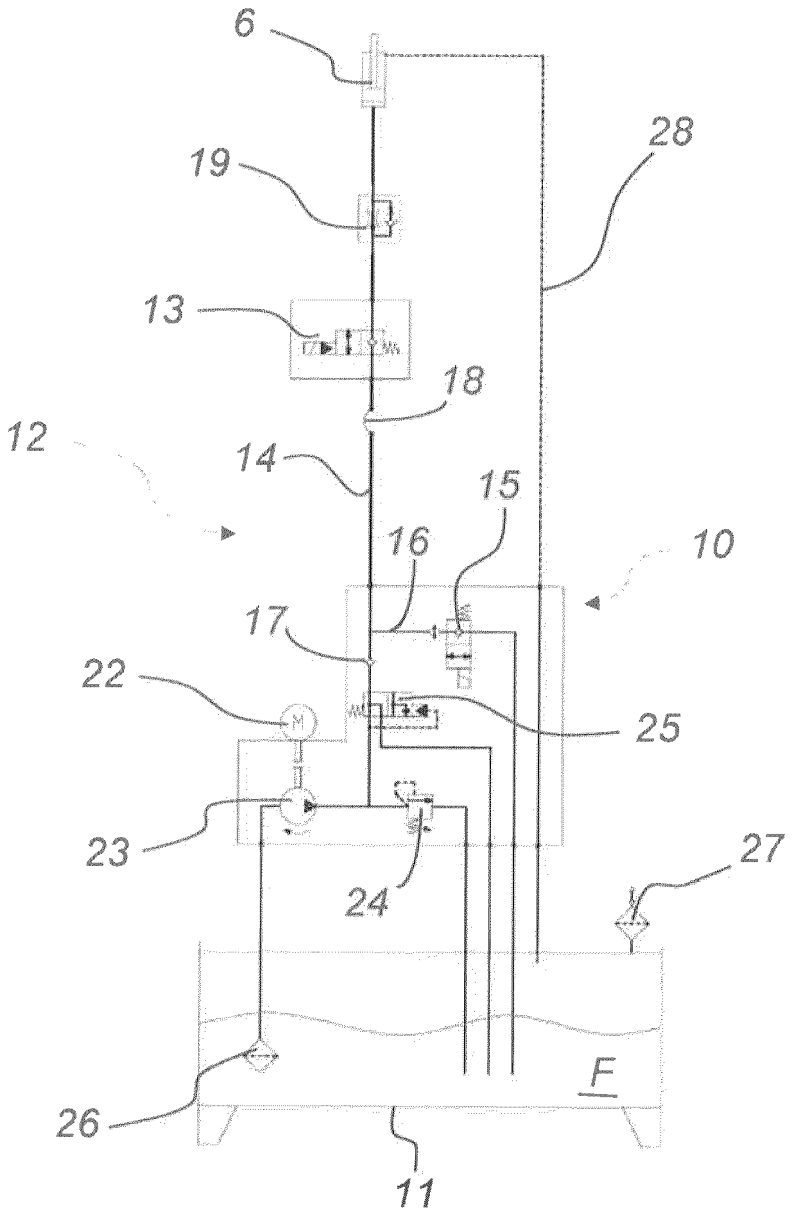

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 8277

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	JP H01 176800 A (TOSHIBA CORP) 13 July 1989 (1989-07-13) * paragraph [0001] * * abstract * * figures *	1-10	INV. B66F7/06 B66F7/08
A	KR 2015 0019344 A (UNKNOWN) 25 February 2015 (2015-02-25) * paragraphs [0025], [0026], [0031], [0034] * * abstract * * figures *	1-10	
A	JP 2001 089086 A (SUGIYASU KOGYO KK) 3 April 2001 (2001-04-03) * abstract * * figures *	1-10	
A,D	WO 2017/207882 A1 (MAROLOTEST [FR]) 7 December 2017 (2017-12-07) * figures *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC) B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 July 2021	Colletti, Roberta

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 15 8277

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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15-07-2021

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REFERENCES CITED IN THE DESCRIPTION

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