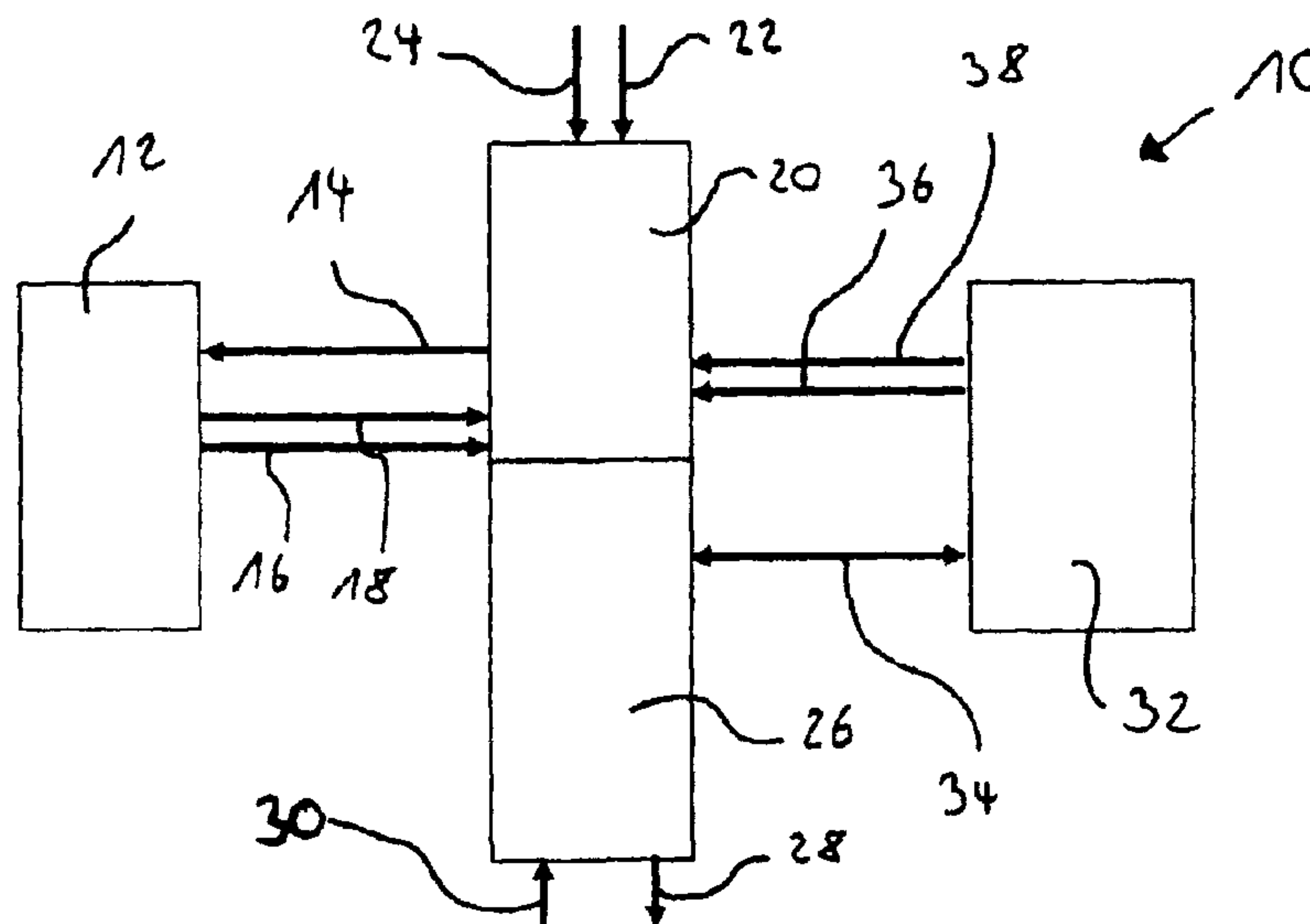




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(54) **Titre : ORGANE DE COMMANDE D'EMBRAYAGE POUR UNE BOITE DE VITESSES MANUELLE D'UN VEHICULE ET
PROCEDE DE COMMANDE CORRESPONDANT**
(54) **Title: CLUTCH ACTUATION DEVICE FOR A MANUAL TRANSMISSION OF A VEHICLE AND CORRESPONDING CONTROL
METHOD**



(57) **Abrégé/Abstract:**

The invention relates to a clutch actuation device (10; 100), particularly for a manual transmission of a vehicle, particularly a commercial vehicle, having a clutch actuation setting device (12; 112) that can be placed in various settings, based on which a corresponding actuation of the clutch takes place. According to the invention, the clutch actuation setting device (12; 112) is suitable for generating electrical signals as a function of the setting, based on which the clutch is correspondingly actuated. The invention further relates to a method for controlling/regulating such a clutch actuation device (10; 100), particularly for a manual transmission of a vehicle.

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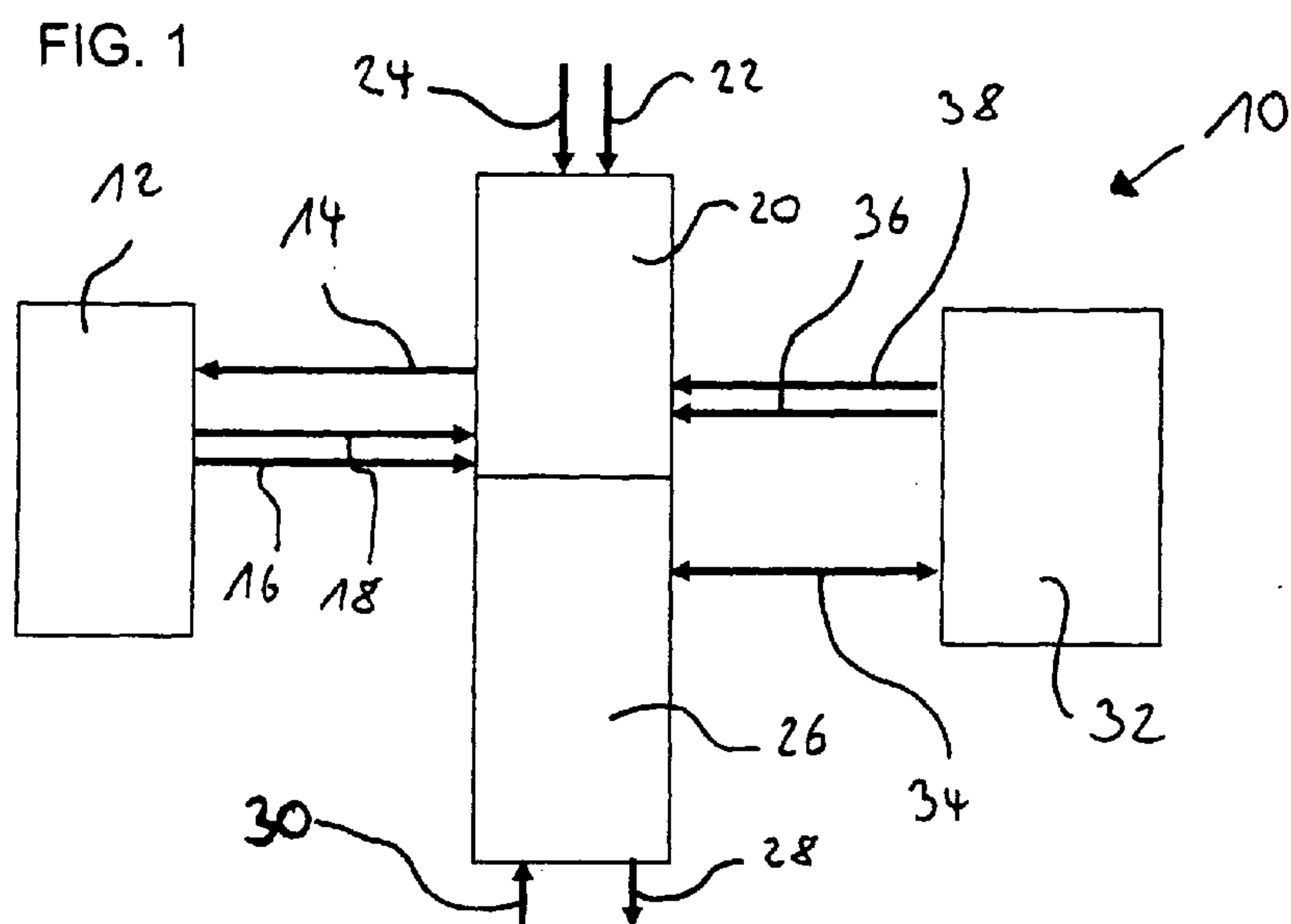
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(54) Title: CLUTCH ACTUATION DEVICE FOR A MANUAL TRANSMISSION OF A VEHICLE AND CORRESPONDING CONTROL METHOD

(54) Bezeichnung: KUPPLUNGSSTELLVORRICHTUNG FÜR EIN MANUELLES SCHALTGETRIEBE EINES FAHRZEUGS UND ENTSPRECHENDES STEUERUNGSVERFAHREN



(57) Abstract: The invention relates to a clutch actuation device (10; 100), particularly for a manual transmission of a vehicle, particularly a commercial vehicle, having a clutch actuation setting device (12; 112) that can be placed in various settings, based on which a corresponding actuation of the clutch takes place. According to the invention, the clutch actuation setting device (12; 112) is suitable for generating electrical signals as a function of the setting, based on which the clutch is correspondingly actuated. The invention further relates to a method for controlling/regulating such a clutch actuation device (10; 100), particularly for a manual transmission of a vehicle.

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(57) Zusammenfassung: Die Erfindung betrifft eine Kupplungsstellvorrichtung (10; 100), insbesondere für ein manuelles Schaltgetriebe eines Fahrzeugs, insbesondere eines Nutzfahrzeugs, mit einer Kupplungsstellvorgabeeinrichtung (12; 112), die in unterschiedliche Stellungen gebracht werden kann, auf deren Grundlage eine entsprechende Betätigung einer Kupplung erfolgt. Erfindungsgemäß ist vorgesehen, dass die Kupplungsstellvorgabeeinrichtung (12; 112) geeignet ist, in Abhängigkeit von ihrer Stellung elektrische Signale zu erzeugen, auf deren Grundlage die Kupplung entsprechend betätigt wird. Weiterhin bezieht sich die Erfindung auf ein Verfahren zur Steuerung/Regelung einer solchen Kupplungsstellvorrichtung (10; 100), insbesondere für ein manuelles Schaltgetriebe eines Fahrzeugs.

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OF A VEHICLE AND CORRESPONDING CONTROL METHOD

5 The invention relates to clutch actuation device,
particularly for a manual transmission of a vehicle, in
particular a commercial vehicle, having a clutch
actuation setting device that can be placed in various
positions, on the basis of which a corresponding
10 operation of a clutch ensues.

The invention further relates to a method for
controlling/regulating a clutch actuation device,
particularly for a manual transmission of a vehicle, in
15 particular a commercial vehicle, the clutch actuation
device comprising a clutch actuation setting device
that can be placed in various positions, on the basis
of which a corresponding operation of the clutch
ensues.

20

In connection with manual transmissions clutch
actuation devices of the generic type usually comprise
clutch actuation setting devices in the form of clutch
pedal devices with foot-operated clutch pedals, which
25 are generally hydraulically coupled to an operating
cylinder. The hydraulic operating cylinder is in turn
mechanically coupled to a clutch operating device, for
example a central clutch operator, which serves for the
direct operation of a clutch. In order to reduce at
30 least partially the force that has to be exerted by the
clutch pedal for operation of the clutch, various forms
of clutch servo assistance are generally used. For
example, the clutch pedal device may comprise a so-
called hydraulic master or main cylinder, which is
35 mechanically coupled to a foot-operated clutch pedal.
In this case a clutch servo embodied as an operating
cylinder may be equipped with a hydraulic slave
cylinder coupled to the master cylinder of the clutch
pedal device. The clutch servo is also at the same time

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coupled to a pneumatic system, in order to provide clutch servo assistance through interaction with the slave cylinder. Provision can also be made for clutch servo assistance virtually within the clutch pedal device. The clutch pedal
5 device is accordingly already coupled to the pneumatic system, in particular the master cylinder of the clutch pedal device, the master cylinder being coupled to the hydraulic operating cylinder. Through interaction of the master cylinder with the pneumatic system, the clutch servo assistance is already
10 incorporated in the clutch pedal device, which by way of the hydraulic coupling actuates the operating cylinder, in this case embodied as a hydraulic slave cylinder. In these clutch actuation devices of the prior art for manual transmission the use of the hydraulic actuation or coupling makes no provision
15 for a clutch or transmission control device or transmission control electronics. In manual transmissions in commercial vehicles the clutch is therefore operated at least partially through the use of such hydraulic systems. Their incorporation into an overall system, however, makes the overall system very
20 costly and also expensive to service. Special functions, such as clutch monitoring functions, clutch closure detection, clutch wear optimization and clutch overload protection, for example, can be achieved only at additional cost.

25 The object of the invention is therefore to develop the clutch actuation devices of generic type and methods for controlling/regulating such clutch actuation devices in such a way that the aforesaid disadvantages can be at least partially overcome and in particular so that a clutch
30 actuation device of increased functionality is created.

The clutch actuation device according to the invention proceeds from the generic state of the art in that the clutch actuation setting device is suited to generating electrical

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signals as a function of its position, on the basis of which the clutch is correspondingly operated. In this context the clutch actuation setting device is preferably a clutch pedal device, which comprises a foot-operated clutch pedal. It is also equally feasible, however, to use a lever for the clutch actuation setting, for example in vehicles such as motorcycles. The electrical signals may be generated by an inexpensive clutch pedal sensor, for example. The fact that the clutch actuation setting device only generates and delivers electrical signals as a function of its position means that a so-called clutch-by-wire system for manual transmission is created. The clutch actuation setting device embodied as a clutch pedal device with clutch pedal therefore delivers a purely electrical control variable. This affords the advantage, among other things, that the clutch actuation device can be mechanically simplified, since no hydraulic coupling is needed for connecting the clutch pedal device to a clutch servo or a hydraulic operating cylinder. The absence of the hydraulic coupling therefore saves both costs and the overall space required for this coupling. Where the clutch pedal device comprising a clutch pedal is used, it is possible by choosing a suitable spring, for example, to generate any desired counterforce characteristic for operation of the clutch pedal, since the clutch pedal device is completely isolated pneumatically and hydraulically and only has an electrical connection through the clutch pedal sensor. Inexpensive and simple

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electrical sensor switches can thereby be used to generate the electrical signal.

The clutch actuation device according to the invention
5 can advantageously be developed in that the clutch
actuation setting device is suited to delivering the
electrical signals to a control unit, which on the
basis of the electrical signals causes a pressure to be
applied to a clutch operating device for operation of
10 the clutch. This makes it possible, for example, to
adjust the degree of pressure applied to the clutch
operating device by way of a valve device. A clutch
regulating device or clutch regulating module is
preferably formed through the integration of the
15 control unit or control electronics with the valve
device comprising the necessary solenoid valves for
actuation of the clutch operating device. This clutch
regulating module can then preferably be mounted
externally on the manual transmission, in particular on
20 a clutch bell-housing. This affords greater
interchangeability when servicing. The provision of the
clutch regulating module in connection with the manual
transmission furthermore also makes it possible to
utilize the advantages of an automated clutch control.
25 For example, it is possible to monitor the clutch plate
wear, since a clutch position can be relayed to the
control unit, for example by way of a CAN bus. It is
furthermore also possible to minimize the clutch plate
wear. This is done by, among other things, calculating
30 the clutch load as a function of a rotational speed, a
torque, a slip etc. and by a 'harder engagement' of the
clutch on the basis of a correspondingly defined clutch
pedal position; for example when the driver of the
vehicle keeps the clutch in a slipping position for an
35 unnecessary length of time, so that a full engagement
of the clutch then ensues despite the clutch pedal
being only partially depressed. The clutch regulating
module can also be used to provide an overload

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protection. Owing to the complete hydraulic, pneumatic and mechanical isolation of the clutch pedal device from an operating cylinder, it is possible to achieve an adjustment of the clutch pedal characteristic, for example through electronic optimization of the clutch characteristic curve. In addition all diagnostic functions can be performed by the clutch regulating module. Communication with other vehicle control modules is also possible, for example communication with a control module of an electronic braking system; in this case this communication may consist, for example, in opening the clutch in the event of an antilock braking mode instituted by an ABS system, thereby interrupting a power flow in a drivetrain in the event of ABS control. Similarly communication may also be provided between ESP electronics or an ESP control unit for the execution of an electronic stability program, which serves to interrupt the drivetrain in the event of ESP control. Communication can likewise be established with ASC electronics or an ASC control unit for the acceleration skid control, in which, for example, an 'automated' starting is permitted with slipping clutch even when the clutch pedal is not being operated, in order to prevent wheel spin on the driving wheels of the vehicle. In addition it is also possible to achieve an interaction with a halt brake system or to combine the control/regulation through the clutch regulating module with a so-called hill-holder function. Thus when bringing the vehicle to rest on an incline a braking force is maintained without the need to operate a parking brake or a handbrake of the vehicle. At the same time an automated disengagement of the clutch can be undertaken, if the driver fails to do this, in order to prevent the internal combustion engine of the vehicle stalling. The vehicle is then driven off again by operating an accelerator pedal, the clutch being automatically engaged. An interaction is also possible with a

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transmission control connected to a gearbox servo, which permits release of the gearbox servo (power-assisted gearshift) only when the clutch is operated, for example.

5

Further advantages also accrue in connection with the clutch operating device embodied as an operating cylinder. Thus the operating cylinder may be fitted externally to a clutch bell housing and preferably
10 integrated into the clutch regulating module. Alternatively the operating cylinder may also be designed separately, for example as a central clutch operator. A travel or position sensor is preferably provided directly in the operating cylinder. A separate
15 evaluation unit for this sensor may be arranged either in the operating cylinder or also on the clutch regulating module, for example. In order to enhance the reliability of such a clutch-by-wire system, redundant components can be incorporated into the clutch
20 actuation device. In particular, for example, the clutch pedal device may deliver two mutually independent electrical signals for the clutch pedal position or clutch pedal setting, for example via two different electrical lines from two corresponding
25 sensors. Four electrical lines may equally well be provided, in order to provide the clutch regulating module with two supply voltages and two ground connections. This serves at least greatly to reduce any probability of failure on the part of the clutch
30 regulating module. With regard to the adjustment of the pressure applied to the clutch operating device, the valve device may comprise redundant solenoid valves both for ventilation and venting of the clutch operating device. The operating cylinder may likewise
35 supply the clutch regulating module with two mutually independent electrical signals for the release travel of the clutch via two electrical lines.

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In addition the clutch actuation device according to the invention can also be embodied so that a valve device is provided, which is suited to applying a pressure to the clutch operating device. For example, the valve device may comprise two ventilation valves, connected in parallel, for ventilation of the clutch operating device, one of the two solenoid valves having a large flow cross section and the other having a small or smaller flow cross section. The clutch operating device can therefore be ventilated with different volumetric flows. Similarly two solenoid valves with different flow cross sections and connected in parallel are preferably also used for venting the clutch operating device. These solenoid valves for ventilation and venting are, in particular, embodied as 2/2-way valves.

The clutch actuation device according to the invention may further be embodied in such a way that the clutch actuation setting device is suited to generating further electrical signals as a function of its position and delivering these further electrical signals to a further control unit, the further control unit being suited to delivering the further electrical signals to the control unit. Provision of the further control unit serves further to enhance the reliability of the clutch-by-wire system. In this context the clutch pedal device preferably delivers two mutually independent electrical signals, the first signal being supplied to the control unit, which is assigned to the clutch regulating module, for example, whilst the second signal is supplied to the further control unit, for example via a CAN bus. This further control unit may in particular be any vehicle control module, which in turn delivers the further signals to the control unit assigned to the clutch regulating module, for example likewise via a CAN bus. Both the control unit of the clutch regulating module and the further control

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unit may obviously be in communication with any vehicle control modules via the CAN bus. In this case, for example, it is possible to separate the drivetrain of the vehicle through the clutch when the antilock brake
5 control is activated by the ABS system.

It is furthermore possible, particularly when a system failure of the clutch actuation device is registered, for the drivetrain of the vehicle to be correspondingly
10 shifted to an idling state either manually via the gearbox or preferably electronically on the basis of the corresponding control module, if the manual transmission is designed to allow this. In this context it may be particularly advantageous for the manual
15 transmission, where necessary, to initiate semi-automatic running if the manual transmission is designed to allow this. For example, on operation of the gearshift lever a clutch operation may be triggered via a sensor, so that the driver no longer needs to
20 operate the clutch pedal when shifting gear whilst underway. In this case the clutch pedal is only needed for driving off and maneuvering.

The clutch actuation device according to the invention
25 is preferably embodied so that a travel sensor is provided, which serves to detect a position of the clutch operating device, and on the basis of the signals from which it is possible to control/regulate the clutch operating device.

30

In this context the clutch actuation device according to the invention can be developed in such a way that a pressure sensor is furthermore provided, by means of which the position of the clutch operating device can
35 be determined, at least in the event of a failure of the travel sensor, and on the basis of the signals from which it is possible to control/regulate the position of the clutch operating device. Even in the event of a

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failure of the position or travel sensor in the clutch operating device, this will allow an emergency control by way of the pressure sensor incorporated in the clutch regulating module, for example. However the
5 pressure sensor may equally well be provided in order to improve the control quality through interaction with the travel sensor.

The clutch actuation device may furthermore be embodied
10 so that one or more of the following components are accommodated in a housing in a mechatronic unit: the control unit, the valve device, the travel sensor, the pressure sensor, and the clutch operating device.

15 The method according to the invention proceeds from the generic state of the art in that the clutch actuation setting device generates electrical signals as a function of its position, on the basis of which the clutch is correspondingly operated. In the same or a
20 similar way this affords the advantages explained in connection with the clutch actuation device according to the invention, so that in order to avoid repetition reference will be made to the corresponding stipulations in connection with the clutch actuation
25 device according to the invention.

The same applies analogously to the following preferred embodiments of the method according to the invention, so that again in order to avoid repetition reference
30 will be made to the corresponding stipulations on these in connection with the clutch actuation device according to the invention.

The method according to the invention can
35 advantageously be developed in that the clutch actuation setting device delivers the electrical signals to a control unit, which on the basis of the

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electrical signals causes a pressure to be applied to a clutch operating device for operation of the clutch.

5 The method according to the invention can furthermore be embodied so that a valve device applies pressure to the clutch operating device.

10 In addition the method according to the invention may be embodied in such a way that the clutch actuation setting device generates further electrical signals as a function of its position and delivers these further electrical signals to a further control unit, the further control unit being suited to delivering the further electrical signals to the control unit.

15 The method according to the invention can furthermore be embodied so that a position of the clutch operating device is detected by means of a travel sensor, and the position of the clutch operating device is controlled/regulated on the basis
20 of signals from the travel sensor.

In this context the method according to the invention can be developed in such a way that by means of a pressure sensor the position of the clutch operating device can be determined, at
25 least in the event of a failure of the travel sensor, and the position of the clutch operating device is controlled/regulated on the basis of the signals from the pressure sensor.

30 According to an aspect, there is provided a clutch actuation device, having a clutch actuation setting device, a first control unit and a second control unit, wherein the clutch actuation setting device can be placed in various positions, on the basis of which a corresponding operation of a clutch

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ensues, the clutch actuation setting device is suited, as a function of its position, to generating first electrical signals, on the basis of which the clutch is correspondingly operated, the clutch actuation setting device is suited to
5 delivering the first electrical signals to the first control unit, which on the basis of the electrical signals causes a pressure to be applied to a clutch operating device for operation of the clutch, wherein the clutch actuation setting device is suited to generating second electrical signals,
10 independent of the first electrical signals, as a function of its position and delivering these second electrical signals to the second control unit, the second control unit being suited to delivering the second electrical signals to the first control unit.

15
According to another aspect, there is provided a method for controlling/regulating a clutch actuation device, the clutch actuation device comprising a clutch actuation setting device, a first control unit and a second control unit, wherein the
20 clutch actuation setting device that can be placed in various positions, on the basis of which a corresponding operation of the clutch ensues, the clutch actuation setting generating as a function of its position first electrical signals, on the basis of which the clutch is correspondingly operated, the
25 clutch actuation setting device delivering the first electrical signals to the first control unit, which on the basis of the first electrical signals causes a pressure to be applied to a clutch operating device for operation of the clutch, wherein the clutch actuation setting device generates
30 second electrical signals, independent of the first electrical signals, as a function of its position and delivers these second electrical signals to the second control unit, the second control unit delivering the second electrical signals to the first control unit.

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The invention will now be explained on the basis of preferred exemplary embodiments, referring to the drawings attached, in which:

- 5 Fig. 1. shows a schematic representation of a clutch actuation device according to the invention in a first exemplary embodiment of the invention

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which is suited to performing the method according to the invention; and

5 Fig. 2. shows a schematic representation of a clutch actuation device according to the invention in a second exemplary embodiment of the invention which is suited to performing the method according to the invention.

10 Fig. 1 shows a schematic representation of a clutch actuation device 10 according to the invention in a first exemplary embodiment of the invention which is suited to performing the method according to the invention. In this exemplary embodiment the clutch
15 actuation device 10 according to the invention is intended for a manual transmission of a commercial vehicle and comprises a clutch actuation setting device 12. The clutch actuation setting device 12 is embodied as a clutch pedal device with a foot-operated clutch
20 pedal, which can be operated by a driver of the commercial vehicle, for example. According to the invention the clutch actuation setting device 12 is designed so that it generates electrical signals as a function of its position, for example the position of
25 the clutch pedal, and delivers these to a control unit 20. These signals are generated, for example, by a sensor, in particular a clutch pedal sensor, assigned to the clutch actuation setting device 12. For this purpose the clutch actuation setting device 12 is
30 coupled to the control unit 20 via a power supply lead 14, so that the control unit 20 can supply electrical current to the clutch actuation setting device 12. The clutch actuation setting device 12 is furthermore coupled to the control unit 20 via a signal line 16 and
35 a further signal line 18, which in particular form two inverted signal outputs of the clutch actuation setting device 12, in order to supply the control unit 20 with signals correlating with a clutch pedal position. The

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further signal line 18 is here intended to create a redundancy. Electrical current is delivered to the control unit 20 via a power supply lead 22 and a further power supply lead 24, the further power supply lead 24 being intended to create a redundancy. In the case shown the control unit 20 is furthermore coupled to a valve device 26, to which compressed air can be fed via a valve device ventilation 30 and from which compressed air can be discharged via a valve device venting 28. The valve device 26 is here actuated by the control unit 20, so that the valve device 26 can feed a defined flow of compressed air to a clutch operating device 32 by way of the valve device ventilation 30, and the valve device 26 can discharge a defined flow of compressed air from the clutch operating device 32 via the valve device venting 28. For this purpose the valve device 26 is coupled to the clutch operating device 32 via a coupling 34, in particular a pneumatic line. The valve device 26 may in this case be a valve device, known to the person skilled in the art, which comprises a plurality of 2/2-way valves for proportioning the ventilation and venting volumetric flows. The clutch operating device 32 serves for the operation of a clutch (not shown), that is to say for the engagement and release of a clutch of a commercial vehicle, and is embodied, in particular, as a central clutch operator. In order to determine a position of the clutch operating device 32, the latter comprises a travel or position sensor, not shown in Fig. 1, which serves to detect the position of the clutch operating device. In this exemplary embodiment the signals from the travel sensor are delivered to the control unit 20 via a travel sensor signal line 36 and a further travel sensor signal line 38, which in particular form two inverted signal outputs of the travel sensor. The further travel sensor signal line 38 here again serves to create a redundancy. The control unit 20 and the valve device 26 in particular, and optionally also the

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travel sensor and the clutch operating device 32, are preferably formed in a housing in a mechatronic unit.

The method according to the invention for
5 controlling/regulating the clutch actuation device 10 according to the invention is configured as follows. It is assumed that the driver of the commercial vehicle intends to change gear using the manual transmission. For this purpose the driver operates the clutch
10 actuation setting device 12, in particular the clutch pedal of the clutch pedal device. The clutch actuation setting device 12 is thereby brought into a position which is intended to bring about a complete release of the clutch and hence an interruption of the power flow
15 in the drivetrain of the commercial vehicle. The clutch actuation setting device 12 consequently generates corresponding electrical signals as a function of this position and delivers these signals to the control unit 20. The control unit 20 evaluates these signals and in
20 this case determines that the clutch is to be fully released. The control unit 20 therefore actuates the valve device 26 accordingly. The valve device 26 consequently switches its valves over in such a way that pressure is applied to the clutch operating device
25 32 for operation of the clutch on the basis of the actuation by the control unit 20 and hence on the basis of the electrical signals from the clutch pedal device. The clutch operating device 32 accordingly operates the clutch, which undertakes the corresponding complete
30 release movement and thereby interrupts the power flow in the drivetrain of the vehicle. This process can be transferred analogously to all positions of the clutch ranging from a fully engaged clutch to a fully released clutch. In order to monitor the exact position of the
35 clutch, which correlates with the position of the clutch operating device 32, the clutch operating device 32 comprises the travel sensor (not shown). The travel sensor therefore determines the exact position of the

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clutch operating device 32 and delivers signals, correlating with the position of the clutch operating device 32, to the control unit 20. On the basis of these signals from the travel sensor and also as a function of the electrical signals from the clutch pedal device the control unit 20 is able to control/regulate the position of the clutch operating device 32.

Fig. 2 shows a schematic representation of a clutch actuation device 100 according to the invention in a second exemplary embodiment of the invention which is suited to performing the method according to the invention. In order to avoid repetition, it is proposed in the description of this exemplary embodiment to examine only the differences compared to the first exemplary embodiment, identical or similar components of the clutch actuation device 100 being denoted by similar reference numerals. In this exemplary embodiment the clutch actuation setting device 112 is coupled on the one hand to the control unit 120 via a power supply lead 146 and a signal line 116. On the other hand the clutch actuation setting device 112 is coupled to a further control unit 140, for example a drivetrain control unit, via a power supply lead 114 and a signal line 118. In particular, the clutch actuation setting device 112 may comprise two mutually independent sensors, in particular clutch pedal sensors, which each generate the electrical signals. The further control unit 140 is furthermore coupled to the control unit 120 via a CAN bus 148. The clutch actuation setting device 112 can therefore deliver its electrical signals to the control unit 120 on the one hand and to the further control unit 140 on the other. The further control unit 140 can in turn deliver the signals supplied to it to the control unit 120 via the CAN bus 148. Should one of the signal lines 116, 118 and/or one of the power supply leads 146, 114 fail,

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therefore, the generation of the electrical signals and the transmission of the electrical signals to the control unit 120 is assured. The control unit 120 further comprises a pressure sensor 144 for monitoring
5 a pressure in the clutch operating device 132, for example by determining the pressure in the valve device 126 or in the coupling 134. In addition the control unit 120 has a communications interface or multiple control interfaces 142 for communication with further
10 control modules of the vehicle, for example with a control module assigned to an electronic braking system (EBS). In this exemplary embodiment the control unit 20 and the valve device 126 in particular, and optionally also the pressure sensor 144 and the clutch operating
15 device 132, are preferably formed in a housing in a mechatronic unit.

The method according to the invention for controlling/regulating the clutch actuation device 100
20 in this exemplary embodiment differs from that in the first exemplary embodiment in that the clutch actuation setting device 112 additionally generates further electrical signals as a function of its position and delivers these further electrical signals to the
25 further control unit 140, the further control unit 140 delivering the further electronic signals to the control unit 120. In this exemplary embodiment the control/regulation of the position of the clutch operating device 132 can also be undertaken on the
30 basis of signals from the pressure sensor 144. The pressure sensor 144 serves in particular for determining the position of the clutch operating device 132 in the event of the travel sensor failing or in order to improve the control quality, the position of
35 the clutch operating device 132 being controlled/regulated on the basis of signals from the pressure sensor 144 and, in the case of the improvement in control quality, from the travel sensor.

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The features of the invention disclosed in the preceding description, in the drawings and in the claims may be essential for realization of the
5 invention both individually and in any combination.

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List of reference numerals

	10	clutch actuation device
5	12	clutch actuation setting device
	14	power supply lead
	16	signal line
	18	further signal line
	20	control unit
10	22	power supply lead
	24	further power supply lead
	26	valve device
	28	valve device venting
	30	valve device ventilation
15	32	clutch operating device
	34	coupling
	36	signal line
	38	further signal line
	100	clutch actuation device
20	112	clutch actuation setting device
	114	power supply lead
	116	signal line
	118	further signal line
	120	control unit
25	122	power supply lead
	124	further power supply lead
	126	valve device
	128	valve device venting
	130	valve device ventilation
30	132	clutch operating device
	134	coupling
	136	signal line
	140	further control unit
	142	communications interface
35	144	pressure sensor
	146	power supply lead
	148	CAN bus

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Patent claims

1. A clutch actuation device, having a clutch actuation setting device, a first control unit and a second control unit, wherein the clutch actuation setting device can be placed in various positions, on the basis of which a corresponding operation of a clutch ensues, the clutch actuation setting device is suited, as a function of its position, to generating first electrical signals, on the basis of which the clutch is correspondingly operated, the clutch actuation setting device is suited to delivering the first electrical signals to the first control unit, which on the basis of the electrical signals causes a pressure to be applied to a clutch operating device for operation of the clutch, wherein the clutch actuation setting device is suited to generating second electrical signals, independent of the first electrical signals, as a function of its position and delivering these second electrical signals to the second control unit, the second control unit being suited to delivering the second electrical signals to the first control unit.

2. The clutch actuation device as claimed in claim 1, wherein a valve device is provided, which is suited to applying a pressure to the clutch operating device.

3. The clutch actuation device as claimed in one of claims 1 or 2, wherein a travel sensor is provided, which serves to detect a position of the clutch operating device, and on the basis of the signals from which it is possible to control/regulate the clutch operating device.

4. The clutch actuation device as claimed in claim 3, wherein a pressure sensor is furthermore provided, by means of which

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the position of the clutch operating device can be determined, at least in the event of a failure of the travel sensor, and on the basis of the signals from which it is possible to control/regulate the position of the clutch operating device.

5

5. The clutch actuation device as claimed in claim 4, wherein one or more of the following components are accommodated in a housing in a mechatronic unit:

- 10 - the first control unit
 - the valve device,
 - the travel sensor,
 - the pressure sensor, and
 - the clutch operating device.

15

6. A method for controlling/regulating a clutch actuation device, the clutch actuation device comprising a clutch actuation setting device, a first control unit and a second control unit, wherein the clutch actuation setting device that
20 can be placed in various positions, on the basis of which a corresponding operation of the clutch ensues, the clutch actuation setting generating as a function of its position first electrical signals, on the basis of which the clutch is correspondingly operated, the clutch actuation setting device
25 delivering the first electrical signals to the first control unit, which on the basis of the first electrical signals causes a pressure to be applied to a clutch operating device for operation of the clutch, wherein the clutch actuation setting device generates second electrical signals,
30 independent of the first electrical signals, as a function of its position and delivers these second electrical signals to the second control unit, the second control unit delivering the second electrical signals to the first control unit.

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7. The method as claimed in claim 6, wherein a valve device applies a pressure to the clutch operating device.

5 8. The method as claimed in one of claims 6 or 7, wherein a position of the clutch operating device is detected by means of a travel sensor, and the position of the clutch operating device is controlled/regulated on the basis of signals from the travel sensor.

10 9. The method as claimed in claim 8, wherein the position of the clutch operating device is determined by means of a pressure sensor at least in the event of a failure of the travel sensor, clutch operating device and the position of the clutch operating device is controlled/regulated on the basis
15 of signals from the pressure sensor.

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FIG. 1

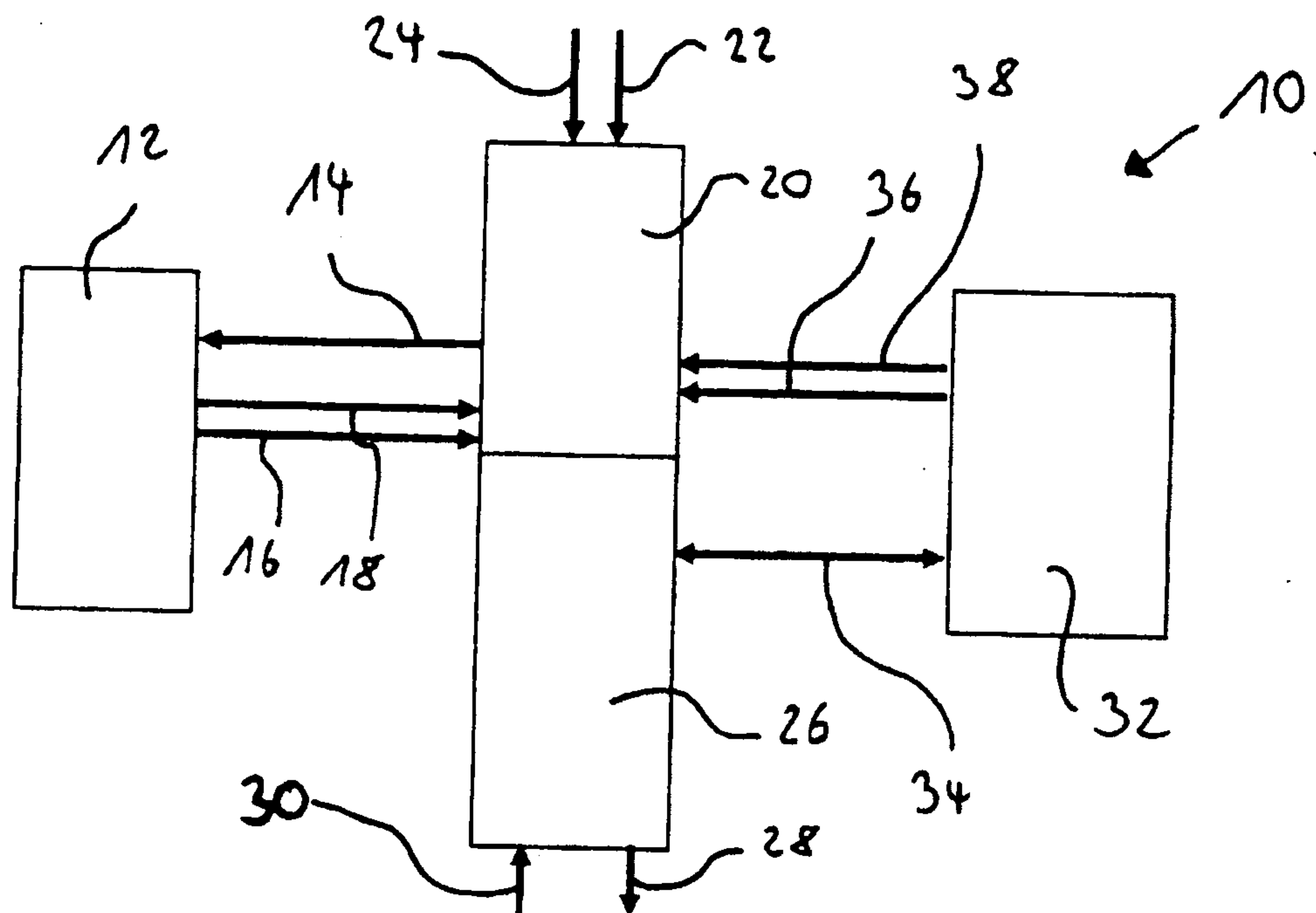


FIG. 2

