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(54) Electromechanical control device particularly for boats

(57) Control device particularly for boats, at least a control mechanism (1) for setting the operation conditions of at least an engine and/or of other operating units, which control mechanism is movable along a predetermined path and for a predetermined travel between two end limit stop positions (201, 301); means (6) for setting the engine supply and/or the operation parameters of said other operating units which setting means have at least a mobile setting mechanism, such as for example a throttle of a carburator, and which setting mechanism is connected to said at least single control mechanism (1) by means of a mechanical transmission (2, 4, 6), such as a cable, lever or tie rod system or the like. A movement thereof causes a movement of the setting mechanism. According to the invention the system further provides a movement and/or position sensor (3) of the at least one control mechanism, which sensor produces electrical signals univocally correlated to the position and/or movement of said control mechanism; at least a motor actuator (5) for operating the setting mechanism, which motor actuator (5) is connected to a control gearcase and which gearcase produces control signals of the motor actuator univocally correlated and corresponding to signals transmitted by the position and/or movement sensor (401, 203); the motor actuator (5) and the mechanical transmission (4) being contemporaneously connected to the setting mechanism (6).

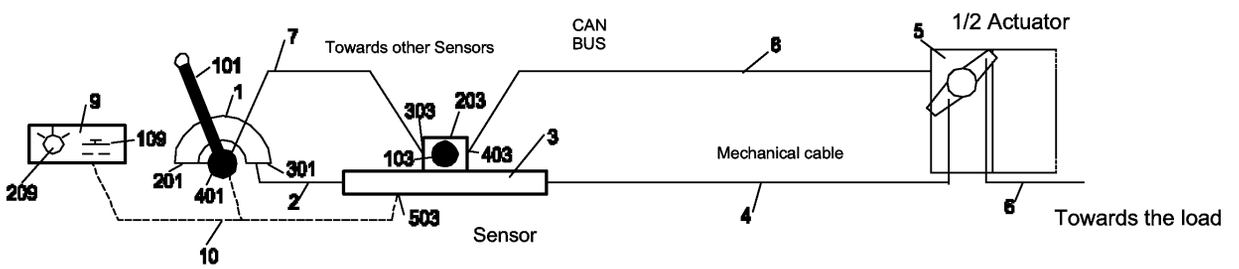


FIG. 1

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Description

[0001] The present invention relates to an electromechanical control device, particularly for boats, suitable also for other means such as earthwork means and generally any other equipment requiring remote control of drive and operation means.

[0002] At present this kind of devices are used in boats, in order to set, for example, the operation condition of engines by control mechanisms, tipically levers, movable along a predetermined path and for a predetermined travel between two end limit stop positions, mechanically connected to mobile setting mechanisms of the engine operation conditions, such as a throttle, for example by means of a lever or flexible cables or tie rod system. Although highly reliable, these known devices have the drawback that may be difficult and hard to operate, especially if there is a great distance between control and user and in presence of multiple series-connected controls. Particularly in the case of flexible cables there can occur deformation of the cables that negatively affect control trasmission and will increase the required control efforts by operator. In order to overcome such drawbacks and in order to have a more flexible system, electric or flow dynamic systems have been introduced. An example of electronic device is disclosed in US6587765 to be considered an integral part of the present disclosure. The electric/electronic transmission system comprises a gearcase that operates communications between different boat mechanisms the communication links thereof being connected with the gearcase by means of bus links with a predetermined coding and signal transmitting protocol such as CAN. The gearcase interprets and recognises signals of different control mechanisms such as levers, buttons, or the like that are associated to electromechanical transducers and it produces control signals of an actuator connected to the setting mechanism. This easily allows to add to the system several units integrating with the current ones increasing the automation degree of operations. For example, with a suitable software and suitable interfaces it is possible to connect sensors of the engine operating conditions, course sensors, and others whose signals can be considered and suitably processed by the gearcase in order to produce compatible controls on the basis even of signals of these further units obviously advising or leaving a choice among options to the person steering the boat. Particularly it is possible to process together control signals of two engines in synchronism in order to keep automatically the same operation condition.

[0003] Systems of this type are more accurate in carrying out the control and require limited efforts by the user, but, because of their complexity have the greater mulfunction risk and thus the heavy drawback that the control could not be fed making the boat unmanageable in case of failures or in the absence of current. In order to overcome the drawback of reliability and in order to guarantee a precise control with limited efforts, the Italian patent IT01263481 to the owner of the present invention, is to be considered an integral part of the present description, it discloses a mixed electromechanical type system comprising a motor actuator for operating the setting mechanism the mechanical transmission being connected with the setting mechanism as well. This solution accomplishes both to guarantee a characteristic reliable operation of mechanical transmission systems and a precise control with limited efforts typical of electronic systems.

[0004] The aim of the present invention is a similar system of the electromechanical type allowing also to improve to some extent the current mechanical control systems such to work likewise the electronic systems without providing high costs for structural change of the system, such as replacing control mechanisms or providing complex wiring.

[0005] The invention attains the above aims with a control device, particularly for boats, which device comprises at least a control mechanism for setting the operation conditions of at least an engine and/or of other operating units, which control mechanism is movable along a predetermined path and for a predetermined travel between two end limit stop positions, at least means for setting the engine supply and/or operation parameters of said other operating units which setting means have at least a mobile setting mechanism ,such as a throttle of a carburator, and which setting mechanism is connected by means of a mechanical transmission, such as a cable, a lever or tie rod system or the like, to the said at least one control mechanism so that a movement thereof causes a movement of the setting mechanism characterized in that in conjunction the system further has a movement and/or position sensor of the at least one control mechanism, which sensor produces electrical signals univocally correlated to the position and/or movement of said control mechanism, at least a motor actuator for working the setting mechanism, which motor actuator is connected to a control gearcase and which gearcase produces control signals of the motor actuator univocally correlated and corresponding to signals transmitted by the position and/or movement sensor, the motor actuator and the mechanical transmission being simultaneously connected to the setting mechanism. The sensor producing electrical signals univocally correlated to the position and/or movement of said control mechanism can be of any known type such as for example a potentiometer, a variable condenser or a Hall effect device.

[0006] According to a further aspect the system can be mounted on boats having control mechanism of the mixed type that is with movement and/or position sensors of control mechanisms of the axial type that is directly associated to the control mechanism of the type described in US6587765 and/or of the serial type that is made of movement and/or position sensors inside a transmission insert namely a mobile connecting mem-

ber to be inserted in series to the mechanical transmission. The control gearcase processes only signals of movement and/or position sensors of the control mechanism directly associated to the control mechanism or only signals of movement and/or position sensors of the mobile connecting member or in parallel both signals of movement and/or position sensors of the control mechanism directly associated to the control mechanism and of movement and/or position sensors of the mobile connecting member. That allows the greatest flexibility of the installation and for selecting the control mechanisms, tipically levers, as well as of the control and command methods that can be used.

[0007] According to a further aspect the control gearcase has hardware or software comparators of movement and/or position sensor signals of the control mechanism directly associated to the control mechanism and of movement and/or position sensor signals of the mobile connecting member and means indicating error or alarm in case of non-correspondence between said signals of the movement and/or position sensors of the control mechanism directly associated to the control mechanism and of the movement and/or position sensors of the mobile connecting member.

[0008] The reliability of the electromechanical connection is guaranteed by an automatic joint for engaging and disengaging the mechanical transmission and/or the motor actuator to the setting mechanism, which joint engages and disengages in an alternative way the mechanical transmission and/or the motor actuator one with respect to the other to the setting mechanisms.

[0009] According to a further aspect the system can have two control mechanisms, tipically levers, for controlling two engines or for controlling the supply and for controlling the reversing gear of a single engine. Hence, in sea engines, the forward, reverse and idle gear conditions are guaranteed by mechanical devices called reversing gears. These can be directly controlled by a particular control lever or by the same control lever of the engine supply constituting a so called single-lever system. In this case the control station is composed of a single lever with a neutral central position and forward and reverse gear engagement with a first movement in one direction or in the opposite one of said lever and forward and reverse acceleration with a further movement of the lever. Thus by using two or more levers of this type two or more engines can be correspondingly controlled.

[0010] According to a further aspect the invention provides at least two control stations connected in such a way to control setting mechanisms of at least one engine, each of which stations is composed of at least a control mechanism mechanically connected to at least a motor electromechanical actuator.

[0011] It is possbile to provide for each control mechanism of each station a separate electromechanical actuator.

[0012] When more than one engine is provided, for example two engines, in each station it is possibile to provide a control mechanism for setting means of each engine, to each setting mechanism being associated a corresponding actuator.

[0013] In a system with at least two or more control stations the control mechanisms of each station or only those of a station sub-group or only of one of the control stations may be provided in conjunction with a movement and/or position sensor of the at least one control mechanism, which sensor produces electrical signals univocally correlated to the position and/or movement of said control mechanism that can be of the type that is directly connected to the control mechanism and/or alternatively or in conjunction with said direct sensor it can be composed of an interposing unit between two portions of the mechanical transmission in the same way as disclosed above.

[0014] In a particular embodiment, the control mechanisms of the two or more different stations are connected in series one with respect to the other by a mechanical transmission, such as a cable or the like, to the setting mechanisms of the corresponding engine, whereas movement and/or position sensors of control mechanisms can be connected in series or in parallel to the control gearcase of the electromechanical actuator of actuating mechanisms and/or directly to the electromechanical actuators.

[0015] In this way it is possible to make complex systems composed of several control stations with any combination of sensor type.

[0016] Particularly it is possible to provide a more simple system where position sensors are esclusively arranged at the only station nearest the load or a more complex system provided with a sensor, on axis or in series, for each control mechanism of each station.

[0017] Some examples of preferred arrangements comprising several stations are object of the following description however are not intended to be limitative of the general claimed principle.

[0018] The invention relates also to a method for making an electromechanical control system, particularly for boats provided with mechanical control systems, constiting of the following steps:

- divide the current mechanical transmission system in two portions, one coming from the control mechanism and the other directed to the setting mechanism;
- insert a unit composed of a transmission insert connected to the ends of said two portions of mechanical transmission means and provided with a position transducer made according one or more of the preceiding claims;
- divide the mechanical transmission system between the transmission insert and the setting mechanism in two portions;
- insert an electromechanical actuator made according one or more of the preceding claims between

said portions the position transducer and the actuator being connected to at least a control gearcase by an electric connecting bus.

[0019] It is to be noted that the characteristics individually disclosed can be provided in any arrangement one with respect to the other even apart from the individual specific embodiments.

[0020] The invention has further improvements that are object of the subclaims.

[0021] Characteristics of the invention will appear more clearly from the following description of some non limitative embodiments shown in the annexed figures in which:

Fig. 1 is the illustrative diagram of the device according to a first embodiment for controlling a single setting mechanism by means of a single actuator and a single control lever.

Fig. 2 is a two control lever system for controlling two engines.

Fig. 3 is a system for controlling two engines by means of two control stations in series, each with two control levers and a single pair of sensors of the serial type.

Fig. 4 shown the same system of fig.3, but provided with 4 sensors of the serial type and 2 of the axial type.

Fig.5 is the side view of an example of electromechanical actuator.

[0022] Referring to figure 1, there is shown a first embodiment of the invention with respect to a system for controlling a single control mechanism, called load and not shown in figure, by means of a control station 1 composed of a single lever 101. The lever 101, movable along a predetermined path and for a predetermined travel between two end limit stop positions 201 and 301, is connected via a short mechanical cable 2 to a mobile interposing unit 3, for simplicity sake hereinafter referred to as position sensor in series, connected via a mechanical cable 4 to an actuator 5 such as for example the one shown in figure 5. The actuator 5 is connected via a mechanical cable 6 to the load, for example constituted of the throttle of an engine. The lever 101 has a position sensor constituted of a potentiometer 401 directly constrained to the lever axis. The sensor 3 in series is composed of a rack member connected at the ends to the two mechanical cables 2 and 4 and with which a pinion 103 cooperates mounted on the shaft of a potentiometer 203. The sensor further comprises an electronic gearcase, an input connector 303 for connecting other sensors by means of a bus 7 of the CAN type, and to which the potentiometer 401 of the lever 101 in particular is connected, an output connector 403 to which the actuator 5 is connected by means of a bus 8 of CAN type, a connector 503 for directly connecting the potentiometer on axis 401 of the lever and with a control panel 9 provided with a button 109 for selecting the station and a led 209 for indicating the occurred selection of the station. The connection 10 with the connector 503 is shown as a broken line in figure since it is optional and it has to be considered as a possible development above all in more complex multi-station systems that, due to the introduction of the electronic gearcase, can have the greatest possible flexibility level and can be provided with commands and controls typical of electronic systems as the ones disclosed in US658776. However in the particular case of figure 1, the direct connection with the potentiometer on axis 401 via connection 10 is redundant since it already exists via connection 7.

[0023] Still referring to figure 1, the system is functioning as follows: the movement of the lever 101 by the user, sensed by the potentiometer 401 integral with the lever axis, is transmitted via the mechanical cable 2 to the rack placed inside the sensor 3 which correspondingly moves. The movement of the rack and thus of the lever 101, is sensed by the potentiometer 203 by the rotation of the pinion 103 mounted on the shaft of the potentiometer. The control electronic gearcase arranged inside the sensor 3 processes the signals coming from the potentiometers 401 and 203 and it produces control signals of the motor actuator 5 through the CAN-bus 8. The motor actuator 5 is also mechanically connected via cable 4 to sensor 3 and thus it is able to move the load even only by means of the mechanical action due to its advantageous structure that is shown in more details in figure 5.

[0024] Referring to figure 5, the motor actuator 5 provides two idle levers 105 and 205 with coaxial semicylindrical sector shaped bodies 305, 405 having an arc of slighly less than 180°. The control lever 105 is connected to the flexible control cable 4, whereas the other driven lever 205 is connected to the driven flexible cable 6. Said two levers are assembled, can freely rotate with the aid of known means.

[0025] The bodies of levers 305, 405 surround a spiral spring 505 provided with opposed ends faced outwards 605, 705. By 805 there is shown the driving shaft of a geared motor, not indicated in the drawings and of known construction, which is tightly widened by said spring 505 so that there is a strong friction and a good adhesion between the shaft and the unstressed spring thus making an automatic joint for engaging and disengaging the mechanical transmission and/or the motor actuator. Hence, when the engine is driven, the shaft 805 rotates the spring 505 tightly coiled thereon, whose tip 605, in the case of clockwise rotation, 705 in the opposite case, pushes on the body of the driven lever 405, causing its rotation. If the engine can't work because of a failure of the electrical/electronic system, as a consequence of a mechanical control the control lever 105 pushes with its body 305 against the tip of the spring 605, or 505, in opposite direction of its winding. That causes a widening of the spring 505 that is no longer winded on the shaft 805 and can freely rotate. This free

rotation of the spring 505 causes a push against the body of the driven lever 405, causing a rotation. With the action stopped on the control cable 4, the control lever 105 stops rotating so that the spring 505 no longer stressed restores its original adhesion condition on the shaft 805 thus disengaging the mechanical transmission and engaging the motor actuator.

[0026] Figure 2 shows a further embodiment of the invention. The control station 1 is formed of two levers 101 and 101' for controlling two not shown control mechanisms such as for example for controlling two engines or for controlling supply and for controlling the reversing gear of a single engine. The two control levers 101 and 101' are mechanically connected to actuators 5 and 5' via mechanical cables **2,** 2', 4, 4' and two mobile sensors 3 and 3' as in figure 1. From the electric prospective, only the sensor 3 is connected to actuators 5 and 5' via the output connector 403 and bus 8 whereas sensor 3' is connected to sensor 3 via connectors 304', 303 and bus 7.

[0027] In this example the gearcase arranged inside sensor 3' is responsible only of feeding, according to the predetermined protocol, for example of the CAN type, the position data of the lever 101' to the gearcase arranged in sensor 3 working for controlling both actuators on the basis of such position signal of the lever 101' and of the one relative to lever 101 detected by the potentiometer 203 inside sensor 3.

[0028] According to a further aspect, the system with a single control station 1 of figure 2 can be combined with a second control station 11 mechanically connected in series with the first one, as shown in figure 3, via mechanical cables 12 and 13. When the user uses the levers of the station 11, the levers of station 1 are moved by dragging with the same effect occuring with a direct movement of the user. The control of actuators can thus occur as the preceding case as figure 2.

[0029] According to a further aspect, as shown in figure 4, the second control station 11 is mechanically connected to the first one via two sensors 14 and 14' in series, whereas the first station 1 is mechanically connected to actuators 5 and 5' via sensors 3 and 3' such as in figures 2 and 3. From the electric perspective, only sensor 3' is connected to actuators 5 and 5' via the output connector 403 and bus 8. Sensor 3' is connected to sensor 3 via connectors 403', 303 and bus 7. Sensor 14' is connected to sensor 14 via connectors 414', 314 and bus 15, whereas sensor 14 is connected to sensor 3' via the output connector 414, the input connector 303' and bus 16. Radial sensors of levers of the second control station 411 and 411' are in turn connected respectively to sensor 14' via connector 514' and to sensor 14 via connector 514. Control panels 9 and 15 of each control station are connected respectively to sensor 3 via connector 503 and to sensor 14 via connector 514. The electronic gearcase arranged inside sensor 14' reads position signals of lever 111' by means of potentiometers 411' and 214' and transmits them to the gearcase arranged inside sensor 14 via connector 414'. This one, in addition to position signals relevant to the lever 111' coming from sensor 14', reads position signals relevant to the lever 111 by means of potentiometers 411 and 214 and communicates them to the gearcase arranged on sensor 3' via bus 16. The gearcase arranged in sensor 3' is responsible for inputting position data of levers 111' and 111 coming from the gearcase 14 and for the position data of lever 101', obtained by reading potentiometer 203, to the gearcase arranged in sensor 3 that controls both actuators 5 and 5' on the basis of said position signals of levers 111', 111, 101' received as input and on the basis of the one relevant to lever 101 sensed by potentiometer 203 inside sensor 3. The system further provides two control panels 9 and 15 placed in station 1 and 11 respectively each comprising a button and a led connected to the gearcase placed in sensor 3 and to the one placed inside sensor 14 respectively. The presence of sensors at both the stations 1 and 11 makes necessary to communicate to the operating electronics which of the two stations is used by the operator. Such comunication is made by the button + led couple. The operator pushing the button of the station where he is working communicates to the system which position sensors are to be used in order to give control to actuators.

[0030] Still referring to figure 4, the system operation is as follows: if the operator chooses to work from the remote station 11, he pushes the button arranged on the control panel 15. The gearcase placed inside sensor 14 reads such button, feeds the on signal to the led placed on the same control panel and it inputs information to the gearcase placed in sensor 3 that feeds an off signal to the led placed on the control panel 9 and drives actuators 5 and 5' on the basis of position data of levers 111 and 111'. If the operator chooses to work from station 1, he pushes the button arranged on the control panel 9. The gearcase placed inside sensor 3 reads such button, feeds the on signal to the led placed on the same control panel and it inputs information to the gearcase placed in sensor 15 that in turn feeds an off signal to the led placed on the control panel 15 .Thus the gearcase placed inside sensor 3 drives actuators 5 and 5' on the basis of position data of levers 101 and 101'.

[0031] The invention is not limited to the embodiments shown and disclosed above, but it can be changed without departing from the above principle and claimed hereinafter.

Claims

1. Control device particularly for boats, which device comprises:

   - at least a control mechanism (1) for setting the operation conditions of at least an engine and/or of other operating units, which control mech-

anism is movable along a predetermined path and for a predetermined travel between two end limit stop positions (201, 301)

- at least means (6) for setting the engine supply and/or the operation parameters of said other operating units which setting means have at least a mobile setting mechanism, such as for example a throttle of a carburator, and which setting mechanism is connected to said at least single control mechanism (1) by means of a mechanical transmission (2, 4, 6), such as a cable, lever or tie rod system or the like, so that a movement thereof causes a movement of the setting mechanism.

characterized in that
in conjunction the system further provides:

- a movement and/or position sensor (3) of the at least one control mechanism, which sensor produces electrical signals univocally correlated to the position and/or movement of said control mechanism,
- at least a motor actuator (5) for operating the setting mechanism, which motor actuator (5) is connected to a control gearcase and which gearcase produces control signals of the motor actuator univocally correlated and corresponding to signals transmitted by the position and/or movement sensor (401, 203),

the motor actuator (5) and the mechanical transmission (4) being contemporaneously connected to the setting mechanism (6).

2. System according to claim 1, **characterized in that** it comprises mechanical transmission means divided in two portions one of which is connected to the control mechanism (2) and one is connected to the setting mechanism (4) and means for mechanically connecting said two portions one with respect to the other composed of a interposable unit (3) in series between said two portions and with a connection member of the two portions of the mechanical transmission means that is movable together with said two portions and **in that** it further comprises position and/or movement sensors (203) of the mobile connecting member (3) generating a univocal signal corrisponding to the position and/or movement of said mobile connecting member.

3. System according to claim 2, **characterized in that** movement and/or position sensors of the control mechanism (1) are composed of movement and/or position sensors (203) of the mobile connecting member (3).

4. System according to claim 2, **characterized in that** it has position and/or movement sensors of the control mechanism (1) directly associated to che control mechanism (401) and in conjunction, that is in parallel or in series, movement and/or position sensors of the mobile connecting member (203).

5. System according to claim 4, **characterized in that** the control gearcase processes only signals of movement and/or position sensors of the control mechanism directly associated to the control mechanism (401) or only signals of movement and/or position sensors of the mobile connecting member (203) or in parallel both signals of movement and/or position sensors of the control mechanism directly associated to the control mechanism (401) and movement and/or position sensors of the mobile connecting member (203).

6. System according to claim 5, **characterized in that** the control gearcase has hardware or software comparators of movement and/or position sensor signals of the control mechanism directly associated to the control mechanism (401) and of movement and/or position sensor signals of the mobile connecting member (203) and means indicating error or warning in case of no corripondence between said signals of movement and/or position sensors of the control mechanism directly associated to the control mechanism (401) and of movement and/or position sensors of the mobile connecting member (203).

7. Control system according to one or more of the preceding claims, **characterized in that** it has an automatic joint (505) for engaging and disengaging the mechanical transmission (4) and/or the motor actuator (5) to the setting mechanism (6), which joint (505) alternatively engages and disengages the mechanical transmission (4) and/or the motor actuator (5) to setting mechanisms (6).

8. System according to claim 7, **characterized in that** the automatic joint (505) is provided between a mobile actuating member (205) and the mechanical transmission (105) and/or between said mobile actuating member (205) and a drive engine thereof (805).

9. System according to claims 7 or 8, **characterized in that** it comprises an electromechanical actuator (5) comprising a driving shaft (805) dinamically connected to the setting mechanism by means of mechanical means (205), an automatic mutual engaging and disengaging joint (505) being provided between said driving shaft (805) and said mechanical means (205), while said mechanical means (205) for the dinamic connection to the setting mechanism are further connected by means of an auto-

matic engaging and disengaging joint (505) to mechanical transmission means to control mechanism (105).

10. System according to one or more of the preceding claims, **characterized in that** on the driving shaft (805) a first radial control lever (205) is mounted connected by mechanical means to setting means and which lever (205) can be dynamically connected respectively by means of a disengaging and engaging automatic joint (505) to the driving shaft (805) or to a second radial lever (105) having a different angular position that is connected to transmission means to the control mechanism (4), said disengaging and engaging automatic joint (505) being such that engages alternatively in turn with the first radial lever (205) the driving shaft (805) or the second radial lever (105), in this last condition the two levers being rotating together about the driving shaft (805).

11. System according to one or more of the preceding claims, **characterized in that** it comprises at least a unit composed of a transmission insert (3) that can be mounted in series at any suitable point of the mechanical transmission dividing said mechanical transmission in two portions, one coming from the control mechanism (2) and the other directed to the setting mechanism (4), and which insert is composed of a rack member connected to the ends of said two portions of mechanical transmission means (2, 4) and with which a pinion (103) cooperates mounted on the shaft of a position transducer (203).

12. System according to one of the preceding claims, **characterized in that** it comprises at least a unit composed of a transmission insert (3) that can be mounted in series at any suitable point of the mechanical transmission dividing said mechanical transmission in two portions, one coming from the control mechanism (2) and the other directed to the setting mechanism (4), and which insert is composed of a slide connected to the ends of said two portions of mechanical transmission means and of a slider integral with said slide to which a position transducer (203) is secured.

13. System according to claims 11 or 12 wherein the position transducer (203) is a potentiometer or a variable condenser or an Hall effect device.

14. System according to one or more of the preceding claims, **characterized in that** it is provided in combination with a pair of engines and which system is composed of two control mechanisms (101, 101'), two movement and/or position sensors (203, 203', 401, 401') of said control mechanisms, at least a control gearcase for processing signals of movement and/or position sensors (203, 203', 401, 401') of control mechanisms (101, 101') and two motor electromechanical actuators (5, 5') one for each control mechanism (101, 101') each control mechanism being associated to one of the two engines.

15. System according to claim 14, **characterized in that** movement and/or position sensors of control mechanisms are of the serial type (203, 203') that is composed of movement and/or position sensors of mobile connecting members of an interposing unit (3).

16. System according to claim 14, **characterized in that** movement and/or position sensors of control mechanisms are of the axial type (401, 401') that is directly associated to the control mechanism (101).

17. System according to claim 14, **characterized in that** movement and/or position sensors of control mechanisms are both of the axial type (401, 401') that is directly associated to the control mechanism (101), and of the serial type (203, 203') that is composed of movement and/or position sensors of mobile connecting members of an interposing unit (3).

18. System according to one or more claims 14 to 17, composed of several control gearcases for processing movement and/or position sensor signals of control mechanisms (101, 101') such gearcases being associated to the respective sensor (203, 203', 401, 401').

19. System according to one or more claims 14 to 18, further comprising an electric connecting bus between sensors, gearcase or gearcases and actuators (7, 8).

20. System according to claim 19 wherein the electric connecting bus (7, 8) is of the CAN type.

21. System according to one or more of the preceding claims, composed of at least two control stations (1, 11) connected in such a way to control setting mechanisms of at least an engine, each of which station is composed of at least a control mechanism (101, 111) mechanically connected to at least an electromechanical motor actuator (5).

22. System according to claim 21, **characterized in that** each control mechanism (101, 101', 111, 111') of each station is associated to a separate electromechanical actuator (5, 5').

23. System according to the preceding claims 21 or 22, **characterized in that** it is provided in conjunction with more than one engine, especially two engines,

and in each station (1, 11) it has a control mechanism (101, 111) for setting means of each engine, to each setting mechanism being associated a corresponding actuator (5, 5').

24. System according to one or more of the preceding claims 21 to 23, charaterized in that it has at least two or more control stations (1, 11) and control mechanisms of each control station or only those of a subgroup of stations or of a single station are provided in conjunction with a movement and/or position sensor of the at least one control mechanism, which sensor produces electrical signals univocally correlated to the position and/or movement of said control mechanism and which sensors are of the type directly connected to the control mechanism (401) and/or alternately or in conjunction with said direct sensor of the type composed of an interposing unit between two portions of the mechanical transmission (203).

25. System according to one or more of the preceding claims 21 to 24, **characterized in that** control mechanisms of the two or more stations (1, 11) are connected in series one with the other by a mechanical transmission (12, 13), such as a cable or the like, to setting mechanisms of the corresponding engine, whereas movement and/or position sensors of control mechanisms can be connected in series or in parallel to the control gearcase of the electromechanical actuator of actuating mechanisms and/or directly to the electromechanical actuators.

26. System according to one or more claims 21 to 25, charaterized by a number of movement and/or position sensors lower than the number of control mechanisms (101, 101', 111, 111').

27. System according to claim 26, wherein movement and/or position sensors are placed at the control station that is nearest the load and whose number is equal to the number of homologous control mechanisms (203, 203').

28. System according to one or more of the preceding claims, wherein the control mechanisms are levers (101, 101', 111, 111').

29. System according to one or more of the preceding claims wherein the control station or each of the control stations or a part thereof (1, 11) is composed of a pair of levers (101, 101', 111, 111') one of which for setting the engine supply and the other for controlling the reversing gear the control for the reversing gear being made as the setting control of the engine supply.

30. System according to one or more of the preceding claims, **characterized in that** the control station or each of the control stations or a part thereof (1, 11) is composed of a single lever (101, 111) with a central neutral position and forward and reverse gear engagement with a first movement in one direction or in the opposite one of said lever and forward and reverse acceleration with a further movement of the lever in conjunction with characteristics claimed above.

31. System according to one or more of the preceding claims, wherein position signals of control mechanisms (101, 101') relating to the setting of supply of at least two engines are processed together and in particular the control signals of the first engine are used to produce control signals of the second engine.

32. System according to claim 31 **characterized in that** the at least two engines are controlled in synchronism in order to maintain the same operation condition.

33. System according to one or more of the preceding claims, **characterized in that** it comprises at least two control stations (1, 11) with at least a control lever (101, 111) of setting mechanisms of at least an engine and wherein the control levers of an engine of the at least two stations (1, 11) are connected by a mechanical transmission in cascade one with respect to the other (12, 13) and in series to the actuator (5) of the setting mechanism, whereas the control lever of the last station (101) of the control station set has a movement or position direct sensor (401) of said lever and/or an interposing unit (3) provided with a mobile connecting mechanism and with a movement and/or position sensor (203) of said connecting means that is connected to a control gearcase of an electromechanical actuator (5) and/or directly to an electromechanical actuator (5).

34. System according to claim 33, **characterized in that** it is provided a movement or position direct sensor (401) and/or an interposing unit (3) with a mobile connecting means and an associated movement and/or position sensor (203) thereof which movement and/or position sensor is associated to the control lever (101) of at least one of the further control stations and/or of the further control station (1, 11), whereas the interposing unit (3) is provided downstream of said further control station (11) and upstream of the first one (1) or of a further different control station.

35. System according to one or more claims 33 or 34, **characterized in that** it has at least two, three or more control stations (1, 11) each with at least a

control lever (101, 111) and wherein one of said control stations has only mechanical means (12) for transmitting to the actuator or actuators of the setting mechanism or mechanisms.

36. System according to one or more of the preceding claims 33 to 35, **characterized in that** at least some or all the control stations (1, 11) have at least two control levers (101, 101', 111, 111') one of which for controlling the setting mechanisms of the engine supply (101, 111) and the other for controlling the reversing gear (101', 111').

37. System according to one or more of the preceding claims 33 to 36, **characterized in that** at least some or all the control stations (1, 11) have at least two control levers (101, 101', 111, 111') that are setting mechanism control levers of the supply of one of two the engines respectively.

38. System according to one or more of the preceding claims 33 to 37, **characterized in that** at least some control stations (1, 11) have for each engine a pair of control levers (101, 101', 111, 111') of the supply setting mechanisms of the corresponding engine and of the reversing gear of the corresponding engine respectively.

39. System according to one or more of the preceding claims, **characterized in that** at least some control stations (1, 11) have only a control lever (101, 111) for each engine, of the supply setting mechanisms of the corresponding engine and of the reversing gear of the corresponding engine respectively.

40. Interposing unit (3) in a mechanical transmission between two portions thereof (2, 4) **characterized in that** it comprises a connecting member of said two mechanical transmission portions, which member is mobile therewith, and a movement and/or position sensor (203) of said mobile connecting member driven by said connecting member.

41. Interposing unit (3) in a mechanical transmission between two portions thereof (2, 4) according to claim 40 **characterized in that** it is composed of a rack member connected to the ends of said two portions of mechanical transmission means (2, 4) and with which a pinion (103) cooperates mounted on the shaft of a position transducer (203).

42. Interposing unit (3) in a mechanical transmission between two portions thereof (2, 4) according to claim 40 **characterized in that** it is composed of a slide connected to the ends of said two portions of mechanical transmission means and of a slider integral with said slide to which a position transducer (203) is secured.

43. Interposing unit (3) according to claims 41 or 42, **characterized in that** the position transducer (203) is a potentiometer or a variable capacitor or a Hall effect device.

44. Interposing unit (3) according to claims 40 to 43 **characterized in that** it further comprises a control electronic gearcase of a remote mechanism, particularly an actuator (5).

45. Interposing unit (3) according to claim 44 **characterized in that** it further comprises connectors (303, 503) to which movement and/or position sensors external to the unit can be connected, and the control gearcase is able to read and process signals coming from such movement and/or position sensors external to the unit (3) and/or from the movement and/or position sensor arranged inside the unit (203).

46. Interposing unit (3) according to one or more claims 40 to 45, **characterized in that** the control gearcase has hardware or software comparators of signals coming from the movement and/or position sensor arranged inside the unit (203) and from movement and/or position sensors external to the unit (303, 503) and means indicating error or warning in case of non correspondence between said signals of movement and/or position sensors internal and external to the unit (3).

47. Interposing unit (3) in a mechanical transmission between two portions thereof according to one or more preceding claims 40 to 46 **characterized in that** it is provided in a system according to one or more of the preceding claims 1 to 39.

48. Method for making an electromechanical control system, particularly for boats provided with mechanical control systems, constituing of the following steps:

- divide the current mechanical transmission system in two portions, one coming from the control mechanism and the other directed to the setting mechanism (2, 4);
- insert a unit (3) composed of a transmission insert connected to the ends of said two portions of mechanical transmission means and provided with a position transducer (203) made according one or more of the preceding claims;
- divide the mechanical transmission system between the transmission insert and the setting mechanism in two portions (4. 6);
- insert an electromechanical actuator (5) made according to one or more of the preceding claims between said portions
- the position transducer (203) and the actuator

(5) being connected to at least a control gear-case by means of an electric connecting bus (8).

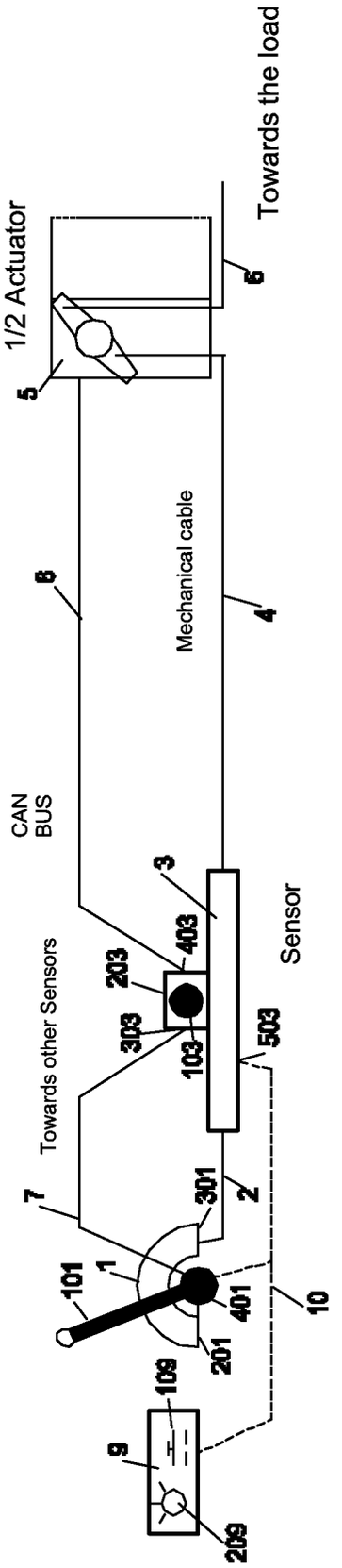
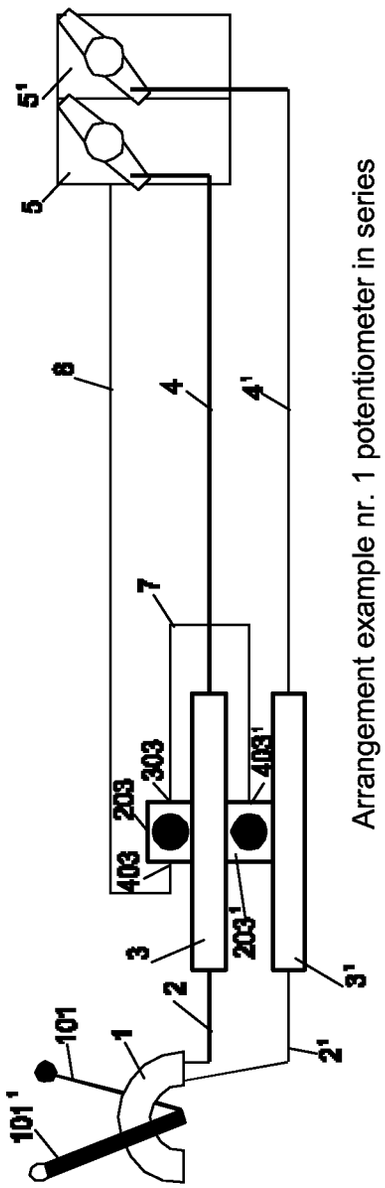

1/2 Actuator
Towards the load
5
6
Mechanical cable
4
8
CAN
BUS
3
Sensor
403
203
303
103
503
Towards other Sensors
7
301
2
101
1
401
10
201
109
9
209

FIG. 1



Arrangement example nr. 1 potentiometer in series

FIG. 2

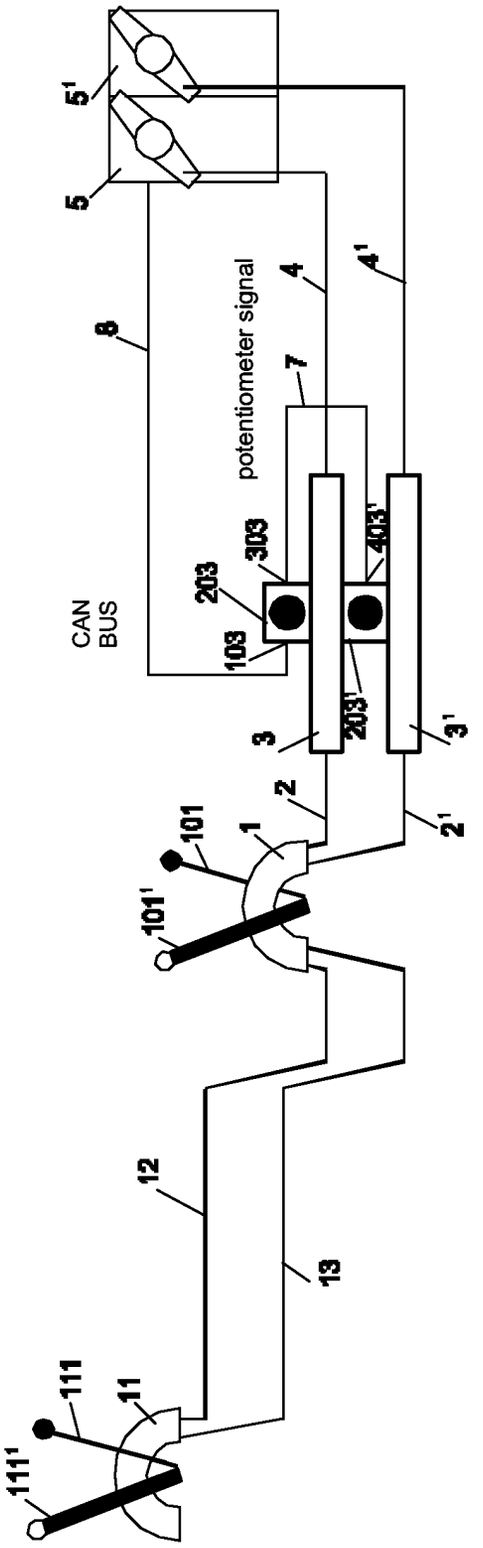

5'
5
potentiometer signal
4
4'
8
7
CAN
BUS
303
403'
203
103
203'
3
3'
2
2'
101
1
101'
12
13
111
11
111'

FIG. 3

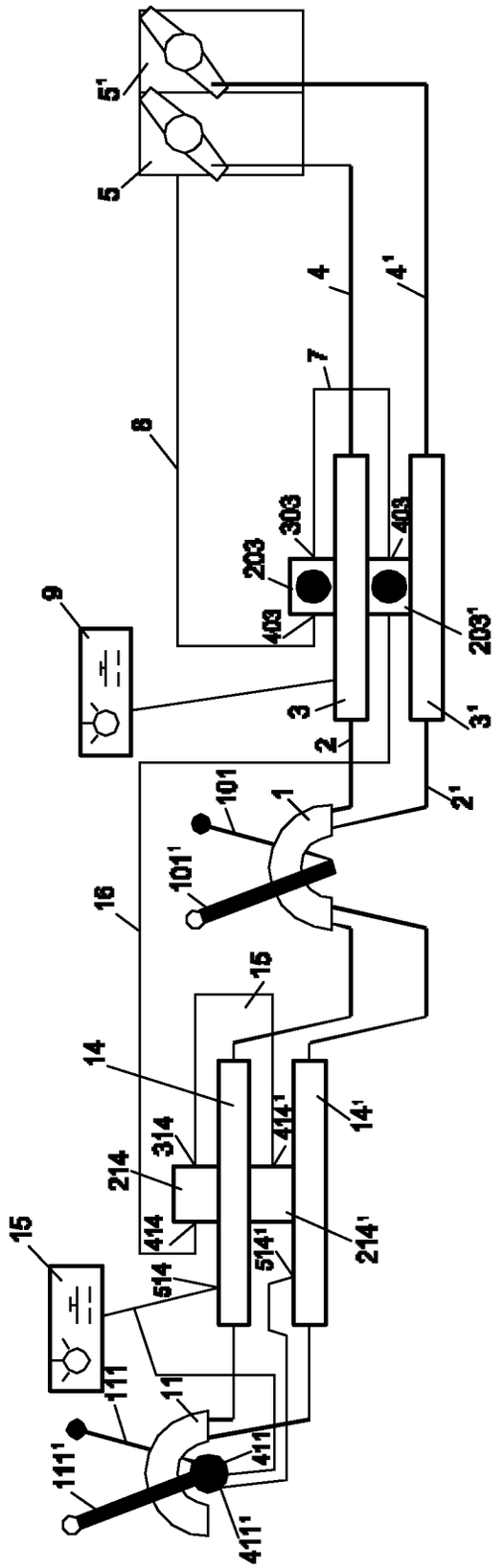

5'
5
4
4'
7
8
303
403
203
403
203'
9
3
3'
2
2'
101
1
101'
16
15
14
314
414'
14'
214
414
514'
214'
15
514
111
11
111'
411
411'

FIG. 4

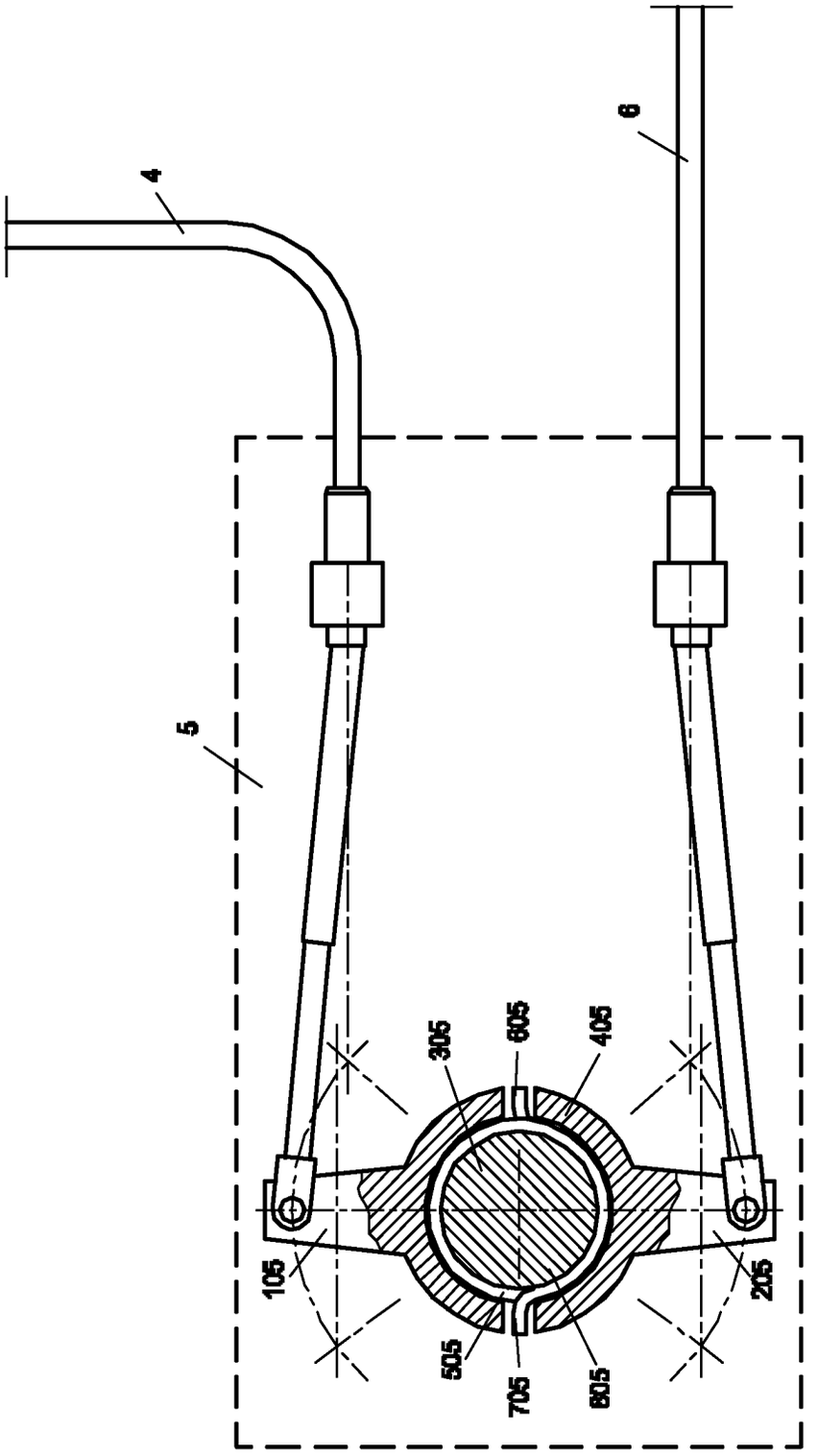


FIG.5