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INDIRECTLY OPERATING REGULATING
OR CONTROLLING APPARATUS
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Fig. 1

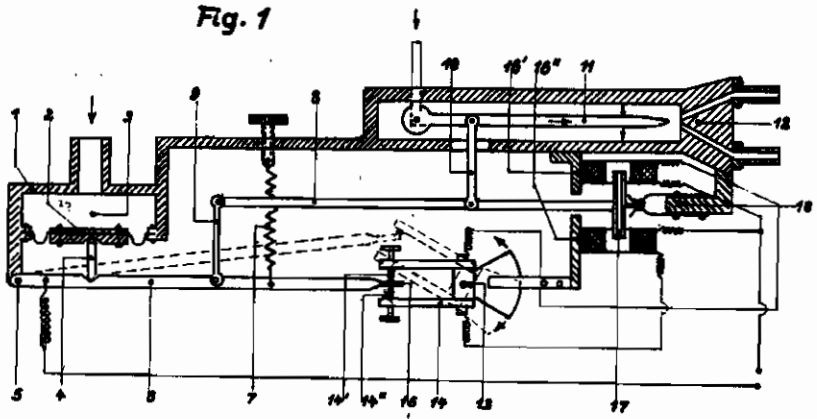


Fig. 2

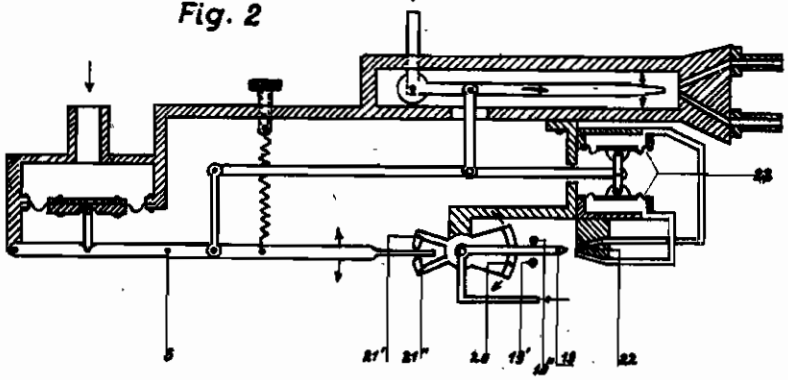
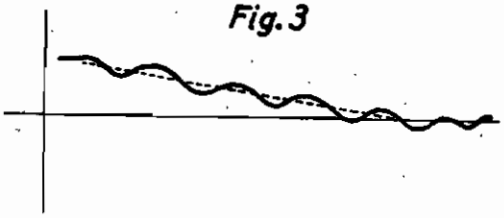


Fig. 3



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ALIEN PROPERTY CUSTODIAN

INDIRECTLY OPERATING REGULATING OR CONTROLLING APPARATUS

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The invention relates to a controlling or regulating device, more particularly to devices in which a controlling impulse derived from a physical condition influences a relay controlling an auxiliary force. In such so-called indirectly operating controlling, respectively regulating devices it is customary to provide a so-called restoring device which either influences the position of the relay (position restoration) or the force (force restoration) in such a manner that the effect due to the relay (f. i. the stroke of the piston of a servo-motor) always remains equal in proportion to the impulse. Characteristic of each device is that the influence on the relay is first created by same. The restoring device is provided to avoid oscillations about the predetermined condition. Doubtlessly, this is achieved to a certain degree in that due to the restoration the controlling effect is always equal in proportion to the impulse value. If the impulse has become zero, the predetermined position is achieved, then as a result of the restoration the controlling effect has become zero. As, however, each controlling or regulating process is effected with more or less great inertia, the predetermined condition is not maintained at the moment in whch the controlling effect ceases. In spite of the restoring device the condition will swing past the predetermined condition. This well-known appearance may be successfully removed by using as controlling impulse not only the change in condition, i. e. the error, but also derivations of the change in condition in accordance with the time (velocity, respectively acceleration impulses). However, it is necessary to first create in these devices derivations of the change in condition and to provide for this purpose special impulse givers, which render such an arrangement complicated and expensive.

The device according to the invention differs fundamentally from the controlling devices operating with restoring devices and derivations, in that aside from the controlling impulse additional impulses controlled by the impulse giver influence the relay, which in case of an increase of the main impulse support said impulse and in case of a decrease of the main impulse oppose said main impulse.

It is practical to create the additional impulses by means of an auxiliary relay, actuated by the impulse giver, whose neutral position is displaced by the impulse giver in accordance with the value of the main impulse.

In accordance with the present invention, the restoring device is replaced by additional controlling impulses, which influence the relay and which are controlled by the impulse adjusting member in dependence on its position and movement determined by the impulse value. The entire impulse influencing the relay comprises a main impulse and an additional impulse, whose direction depends on the tendency of the impulse change. In case of an increasing impulse force the additional force has a supporting effect, in case of decreasing tendency of the impulse force the auxiliary force operates in opposition to the first. In case of decreasing impulse force an opposing effect is created by the said additional force, which prevents oscillation past the predetermined condition so that the condition aperiodically passes into the predetermined condition. In such a way the dissymmetry arising also in case of a rigid restoring device is avoided.

By means of two schematically illustrated embodiments the invention is explained in detail in the following:

A pressure chamber 3 closed by means of a diaphragm 2 is provided in a casing 1; said chamber being connected to a pressure conduit not illustrated. The pressure in the chamber 3 should be adjusted to a constant value. In case of a pressure change the stroke of the diaphragm 2 is transmitted by means of a pressure pin 4 to an impulse transmitting lever 6 rotatably mounted at 5. An adjusting spring 7 engaging the lever 6 operates in opposition to the pressure on the diaphragm 2 and maintains the lever 6 in equilibrium. The movements of the lever 6 are transmitted to an adding lever 8 by means of an intermediate member 9. The adding lever 8 is connected by means of a further intermediate member 10 to a jet pipe 11, which admits by way of the nozzle piece 12 of the distributer a servo-motor (not illustrated) connected to same, by means of whose movement (throttle valve adjustment or the like) the pressure in the chamber 3 is influenced.

A bipolar relay switch 14 is turnably mounted at 13, between whose contacts 14', 14'' a contact spring 15 arranged at the end of the lever 8 has a slight play. If the contact spring 15 touches one of the two contacts 14', 14'', the circuit of either the magnet coil 16' or 16'' is closed. The magnet coils influence an armature 17 fastened to the other end of the adding lever 8. In case of non-excited magnet coils 16', 16'' the adding lever 8 is held in the middle position by means of a spring 18.

The mode of operation of the device is the following:

If the pressure in the chamber 3 increases, the lever 6 is deflected in accordance with the pressure increase and moves by means of the rod connection 9, 9, 10, the jet pipe 11 in the usual manner so that a controlling process aiming to decrease the pressure is commenced. Simultaneously the relay 14 is turned a little by the lever 8 in anti-clockwise direction. In this case the circuit of the coil 16'' is closed between 15 and 14'' and the armature 17 is drawn up. In this

way an addtional impulse is effective on the jet pipe in the same sense as directly by means of the lever 6. Due to the immediately commencing controlling process the pressure in the chamber 3 drops. Long before the pressure has again reached the predetermined value, the lever 6 has already gone back to a slight degree. The contact 15, 14'' is opened and in case of a slight advancing movement of the lever 6 the contact 15, 14' is closed. Thus the coil 16' receives current and draws the armature 17 to the other side. This process results in an opposite impulse on the jet pipe, thus commencing the controlling process again in the sense of a pressure increase. But before the chamber 3 has again achieved the increased exit pressure, the lever 6, respectively the spring 15, has again left the relay contact 14' and made contact with 14'', i. e. the jet pipe is again reversed. This process is repeated until the lever 6 has again taken up its normal position corresponding to the predetermined pressure value. Thus the lever 8 displaces the relay contacts 14', 14'' in accordance with its impulse deflection and oscillates during the controlling process between these contacts 14', 14'', by means of which alternately supporting and opposing additional impulses are transmitted to the jet pipe 11. As long as the predetermined value has not been achieved in the chamber 3, the lever 6 and its engaging point at the lever 8 consequently have not yet reached their normal position, the jet pipe 11 still oscillates dissymmetrically to the distributing nozzles 12 and adjusts, therefore, the controlling member by means of amplitudes which become smaller and smaller until the predetermined value has been achieved.

Fig. 3 illustrates the controlling diagram created by this controlling process.

Naturally, the auxiliary impulses created by the relay switch 14, 14', 14'' may also, as illustrated in Fig. 2, be created by a pressure means relay. The auxiliary jet pipe 19, which oscillates between the stops 19', 19'', is moved by friction by means of an actuating device 20, between whose two fork-like stops 21', 21'', having slight play, the lever is arranged. The distributing piece 22 of the auxiliary jet pipe is connected to a differential pressure system 23 having the adding lever 8 between its parts. The mode of operation of this pressure means relay may easily be understood.

For the invention it is unimportant whether the additional impulses, influencing the relay 11, are created by means of relays or by mechanical transmission of the movement of the lever 6 or in any other way.

Of course, one may also provide photo-electric or glow discharge relays or temperature sensitive relays for this purpose. Whether a pressure or another force, tension, light- or temperature intensity influences the lever 6 as impulse, is unessential for the idea of the invetnion. The device is also suitable for the automatic control of vehicles and the like.

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