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DEVICE FOR THE REMOTE TRANSMISSION OF CONTROL IMPULSES

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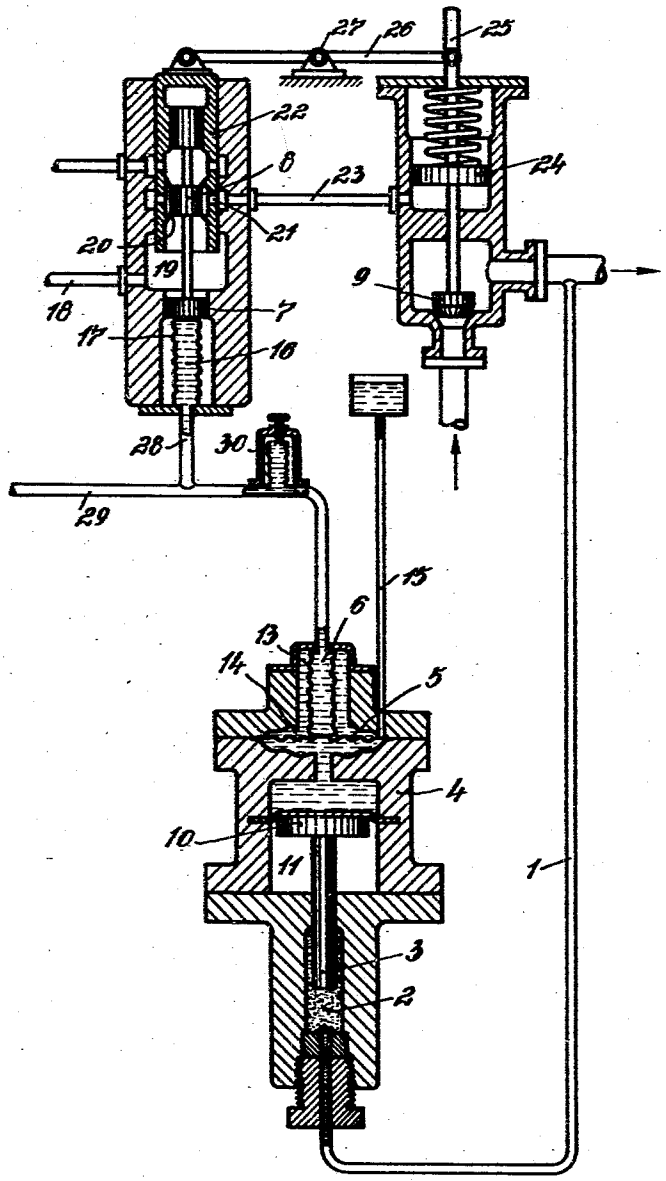

Inventor
Martin Eule
by Knight Bros
Attorneys

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MARTIN EULE, OF SPANDAU, GERMANY, ASSIGNOR TO SIEMENS-SCHUCKERTWERKE GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, OF BERLIN-SIEMENSSTADT, GERMANY, A CORPORATION OF GERMANY

DEVICE FOR THE REMOTE TRANSMISSION OF CONTROL IMPULSES

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My invention relates to a device for the remote transmission of control impulses.

For compensating variations in the condition of any gaseous or liquid medium a special kind of regulation is employed, the so-called impulse regulation. The deviations in the condition of the medium to be regulated from its normal value influence adjusting devices which by the control of regulating devices restore the original state of the medium to be regulated.

The hitherto known impulse regulations may be divided in two groups. The first group is that in which the part subjected to the impulse directly transmits its motion to an adjusting device positively coupled with it. The second group is characterized by the indirect transmission of the impulse movement upon the adjusting and regulating devices. In principle the regulations of the last named group are distinguished by the feature that artificial fluctuations are caused in a control liquid by the impulse motion which in their turn act upon control devices for a second control liquid which in its turn only operates the regulating devices.

My invention provides a third group of such control devices. It also relates to a device for the remote transmission or tele-transmission of control impulses which are released by changes in the condition of gases or liquids, but differs from the present day known arrangements by the part responding to the impulse transmitting its motion directly upon the adjusting device, the adjusting device being positively connected with the part responding to the impulse.

In the remote transmission of control impulses as required in the first place in modern steam power plants, comparatively long distances are sometimes to be bridged over by the transmission device. For this purpose the first mentioned group of transmission devices is entirely useless. Owing to the positive coupling of the impulse carrier with the adjusting device a close constructive combination of the two parts is rendered necessary. This drawback is eliminated by the second kind of the impulse regulations which, however, has the disadvantage that the indirect control by the aid of various auxiliary control devices complicates the layout of the plant and thus augments the likely sources of faults which just in a sensitive regulation should be excluded to the greatest possible extent.

In the drawing attached hereto one of many possible embodiments of my invention is illustrated diagrammatically, the impulse regulation being brought about by the change of pressure in a gaseous or liquid medium.

Referring to the drawing, 1 is the impulse conveying pipe through which the variations in pressure are transmitted to the part adapted to receive the impulse. The pipe 1 opens into a cylinder 2 in which a plunger 3 operates. The motion of the piston is transmitted to a pressure liquid 4 which deflects a diaphragm 5 and thus displaces the liquid in the chamber 6. The displaced quantity of liquid is conveyed below a control piston 7 which is coupled with a further piston 8. This piston 8 serves for the control of a pressure liquid by the motion of which a valve 9 is controlled. The device operates in the following manner: When the pressure in the pipe 1 rises the plunger 3 moves upwards. On the upper end of the plunger 3 is mounted a piston 10 of larger diameter than the plunger 3. By this arrangement the pressure in the chamber 4 is reduced in relation to the pressure in the chamber 2 in the ratio of the areas of the piston and the plunger so that the adjusting mechanism has to deal with smaller forces only. The chamber 4 is sealed towards the chamber 11 by a rubber diaphragm 12 which transmits the motion of the piston 10 to the liquid in the chamber 4. In the chamber 4 is located a diaphragm 5 against which abuts a cylindrical diaphragm 13 containing the pressure liquid which forms the positive coupling between the impulse responsive part and the adjusting device of the regulating mechanism. In order to obtain with small forces also a large deflection, the diaphragm must be made of a soft material. This would, however, impair its strength which is not desirable in view of the high stresses to which it is subjected. To

avoid the risk of rupture the impulse pressure is balanced up to a definite smallest value by providing within the chamber 14 a counter force which corresponds with this minimum value. This counterforce is produced by the static pressure of a column of liquid 15, for example a column of mercury. By compressing the cylindrical diaphragm 13 the liquid is forced from the chamber 6 into the chamber 16 which is enclosed by a cylindrical diaphragm 17. In order to obtain even with small displaced quantities, that means with small impulse quantities, long strokes of the control piston 8, the cylindrical diaphragm 17 is made smaller than the cylindrical diaphragm 13 so that an increase in the lift takes place between the diaphragm 13 and the diaphragm 17. By forcing the pressure liquid into the chamber 16 the piston 7 is moved upwards and thereby simultaneously the piston 8. The piston 8 uncovers during its upstroke the control edge 20 so that the pressure oil below the piston 24 can enter the chamber 19 through the pipe 23 and escape through the pipe 18. The valve 9 thus descends so that the passage of the working medium is throttled and its pressure reduced thereby. The piston slide bushing 22 is connected with the valve rod 25 by a lever 26 which is pivoted at 27. During the descent of the valve 9 the piston slide bushing or liner 22 is moved upwards and the distribution edge 20 covered by the piston 8. If the desired condition of the operating medium is not attained yet the impulse motion commences again until the normal state is produced again.

When the pressure in the pipe 1 drops the control process takes place in the reverse order. A second impulse pipe 29 is connected with the pressure pipe 28. By this manner of connection it is rendered possible to control the valve 9 from two different supervision stations of the working medium, so that a preliminary regulation may be effected by a preliminary impulse prior to the main impulse becoming operative.

Into the pipe 28 is further inserted a device 30 which serves for compensating changes in volume in this pipe. In this way temperature fluctuations remain without effect upon the accuracy of the regulating process. This device may consist for instance of a housing of similar character to 13 or 17 and may be compressed to a greater or smaller extent by an adjusting screw.

Various modifications and changes may be made without departing from the spirit and scope of the invention, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:—

1. A device for the transmission of control impulses caused by changes in the state of a fluid, comprising an element having a small pressure receiving area and a large pressure transmitting area for transforming the original pressure at which the impulses are exerted into lower pressure impulses, static pressure means for balancing the reduced pressure, and means for transmitting the low pressure impulses to the point of control, and means for transforming said impulses into controlling motions at said control point.

2. A device for the transmission of control impulses caused by changes in the state of a fluid, comprising means for transforming the original pressure at which the impulses are exerted, into lower pressure impulses, a fluid transmitter for conveying the low pressure impulses to the point of control and an auxiliary actuating, device operated by the low pressure fluid impulses for initiating the controlling motions at the control point.

3. A device for the transmission of control impulses caused by changes in the state of a fluid, comprising a housing containing a double piston having a small area exposed to the original pressure at which the impulses are exerted, and a large area, and a non-compressible fluid in contact with the large piston for receiving the original impulses at lower pressure and for transmitting them to the remote point of control, and means operated by said transmitting fluid for initiating the control motions at the control point.

4. A device for the transmission of control impulses caused by changes in the state of a fluid, comprising a housing containing two chambers and a double piston having a small area exposed in one chamber and exposed to the original pressure at which the impulses are exerted, said piston having a large area exposed in the other chamber, for transforming said original pressure impulses to lower pressure impulses, a diaphragm closing said latter chamber, and non-compressible liquid in said chamber, displaceable by said large piston to operate said diaphragm, and a non-compressible liquid connection from the other side of said diaphragm to the point of control for transmitting the low pressure impulses imparted by the large piston to the point of control, and means at said point, operated by said transmitted impulses, for initiating the desired control motion.

5. A device for the transmission of control impulses caused by changes in the state of a fluid comprising a housing containing a double piston of small and large area to reduce at the ratio of the piston areas the pressure at which the original impulses are imparted, a pressure fluid actuated by the large piston, an operating element at the controlled point actuated by the pressure fluid displacement of the large piston to perform a stroke larger than the large piston stroke, and an operating medium controlled by said operating

element for producing the control motions at the controlled point.

6. A device for the transmission of control impulses by fluid displacement, comprising a housing containing a plunger piston and a chamber connected with the pressure impulse source and in which the plunger operates, a second chamber containing a piston fixed to the plunger and being larger than the latter to reduce the pressure at the ratio of the piston areas to reduce the pressure of the received impulses, a non-compressible fluid exposed to said larger piston, a main diaphragm closing said fluid compartment, a third chamber in said housing containing a cylindrical diaphragm and pressure fluid inside and outside thereof to communicate the reduced pressure impulses from the main diaphragm to said inside pressure fluid, a similar cylindrical diaphragm at the point of control and a pipe line connecting it with said first cylindrical diaphragm and an operating element connected with second cylindrical diaphragm for controlling an operating medium in accordance with the received impulses.

7. A device for the transmission of control impulses, by fluid displacement comprising a housing containing a plunger piston and a chamber connected with the pressure impulse source and in which the plunger operates, a second chamber containing a piston fixed to the plunger and being larger than the latter to reduce the pressure at the ratio of the piston areas to reduce the pressure of the received impulses, a non-compressible fluid exposed to said larger piston, a main diaphragm closing said fluid compartment, a third chamber in said housing containing a cylindrical diaphragm and pressure fluid inside and outside thereof to communicate the reduced pressure impulses from the main diaphragm to said inside pressure fluid, a similar cylindrical diaphragm at the point of control and a pipe line connecting it with said first cylindrical diaphragm and an operating element connected with second cylindrical diaphragm for controlling an operating medium in accordance with the received impulses, and a static column of liquid acting upon the outside fluid in said third housing chamber to substantially balance the static pressure at both sides of said main diaphragm.

8. A device for the transmission of control impulses, by fluid displacement comprising a housing containing a plunger piston and a chamber connected with the pressure impulse source and in which the plunger operates, a second chamber containing a piston fixed to the plunger and being larger than the latter to reduce the pressure at the ratio of the piston areas to reduce the pressure of the received impulses, a non-compressible fluid exposed to said larger piston, a main diaphragm closing said fluid compartment, a third chamber in said housing containing a cylindrical diaphragm and pressure fluid inside and outside thereof to communicate the reduced pressure impulses from the main diaphragm to said inside pressure fluid, a similar cylindrical diaphragm at the point of control and a pipe line connecting it with said first cylindrical diaphragm and an operating element connected with second cylindrical diaphragm for controlling an operating medium in accordance with the received impulses, and means in said pipe line for compensating the influence of temperature fluctuations upon the liquid transmission system.

9. In a fluid pressure regulator responding to the varying pressures of the controlled fluid, in combination with a main fluid control mechanism and an auxiliary control mechanism for governing the operation of the main mechanism, a pressure responsive element having a piston member provided with two heads of different effective areas for reducing the pressure effect of the controlled fluid, the smaller piston head being exposed to the pressure of the fluid to be controlled, the larger piston head being exposed to a transmitting liquid, and means for actuating said auxiliary mechanism by the displacement of said transmitting liquid.

10. In a fluid pressure regulator responding to the varying pressures of the controlled fluid, in combination with a main fluid control mechanism and an auxiliary control mechanism for governing the operation of the main mechanism, a pressure responsive element comprising a housing containing a piston for reducing the pressure effect of the controlled fluid, said piston having a small area head exposed to the pressure of the controlled fluid and a large area head, a chamber in said housing for said large piston head, a compartment filled with a liquid and having at one end a movable tight wall in contact with and separating the large piston head from the liquid, and means responsive to the liquid displacement produced by the large piston head for actuating said auxiliary mechanism.

11. In a fluid pressure regulator responding to the varying pressures of the controlled fluid, in combination with a main fluid control mechanism and an auxiliary control mechanism for governing the operation of the main mechanism, a pressure responsive element comprising a housing containing a piston for reducing the pressure effect of the controlled fluid, said piston having a small area head exposed to the pressure of the controlled fluid and a large area head, a chamber in said housing for said large piston head, a compartment filled with a liquid and having a flexible tight diaphragm in contact with and separating the large piston head from the liquid, and means responsive to the liquid

displacement produced by the large piston head for actuating said auxiliary mechanism.

12. In a fluid pressure regulator responding to the varying pressures of the controlled fluid, in combination with a main fluid control mechanism and an auxiliary control mechanism for governing the operation of the main mechanism, a pressure responsive element having a piston member provided with two different effective head areas for reducing the pressure effect of the controlled fluid, the smaller piston area being exposed to the pressure of the fluid to be controlled, the larger area being exposed to a transmitting liquid, and means for actuating said auxiliary mechanism by the displacement of said transmitting liquid, and means for balancing the desired minimum pressure exerted by the large piston area.

In testimony whereof I affix my signature.

MARTIN EULE.