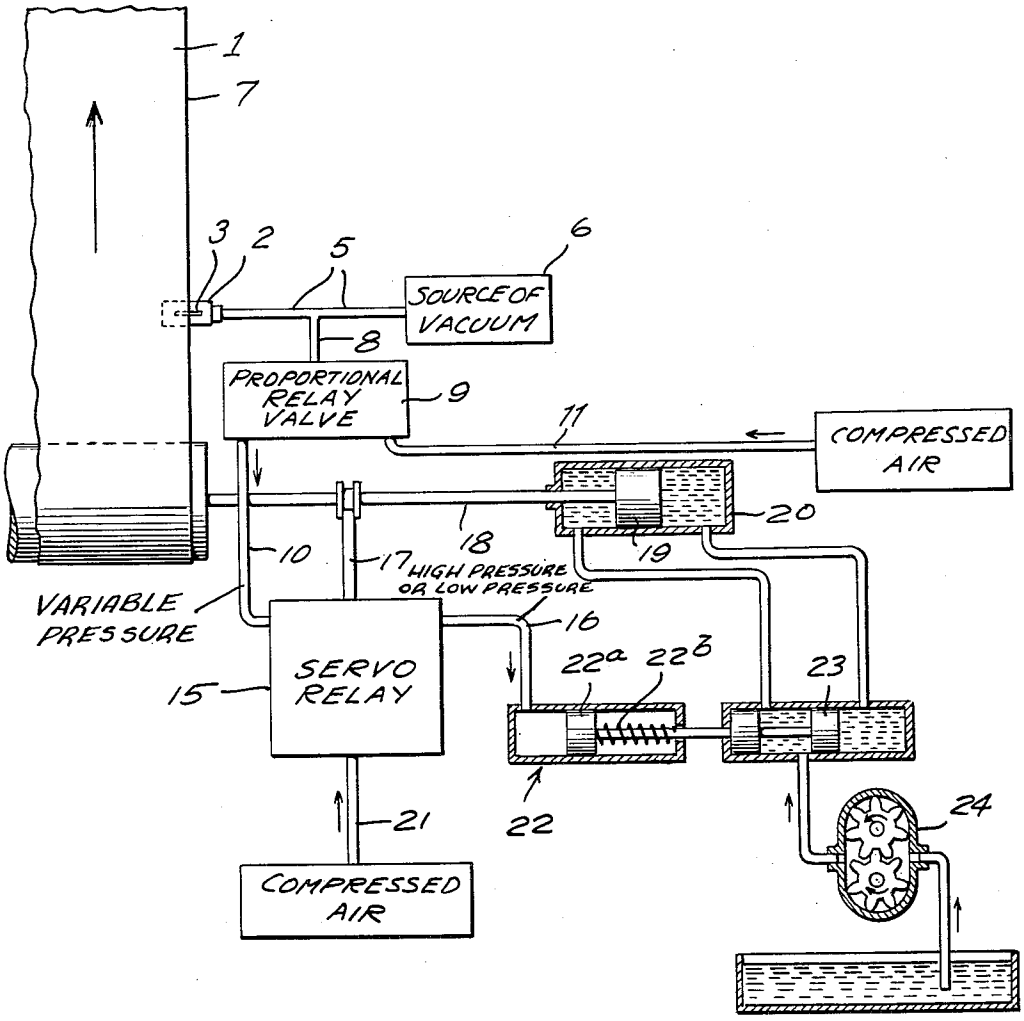
Dec. 13, 1955 P. CHÉRIGIÉ 2,726,858

WEB POSITION CONTROL MECHANISM

Filed March 14, 1952



Inventor

PIERRE CHERIGIE

By

Attorney

United States Patent Office 2,726,858
Patented Dec. 13, 1955

2,726,858

WEB POSITION CONTROL MECHANISM

Pierre Chérigié, Paris, France, assignor to La Cellophane, Paris, France, a French company

Application March 14, 1952, Serial No. 276,723

Claims priority, application France March 19, 1951

1 Claim. (Cl. 271—2.6)

This invention relates to a servomotor system for moving heavy loads in response to small input variations and has for an object to provide a system for shifting the position of a reel so as to maintain in alignment the edge of the web being unreeled therefrom.

Another object is to provide a hydraulic servomotor for the above purpose operated under the control of air pressure which is varied in response to shifting of the web from its correct position.

Other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

It is sometimes desirable to regulate the movement of a mechanical member in order to ensure the constancy of a parameter. In many cases, use is made for this purpose of regulators which vary in the required manner the pressure of compressed air acting on a piston-type or diaphragm type servomotor. However, such arrangements are not satisfactory when it is necessary to move mechanical members of considerable weight with a high speed of response, since the force which must then be developed by the servomotor necessitates the use of a piston or diaphragm of excessive dimensions by reason of the relatively low air pressures set up in such arrangements. Moreover, the compressibility of the air prevents the pressure from being immediately set up at the required value, and thus involves a reduction in the speed of response.

In the apparatus hereinafter described, compressed air regulators of known type are associated with a servomotor operated by oil under pressure. Use is thus made both of the excellent operational characteristics of compressed-air regulators with regard to the sensitivity and the maintenance of the point of control, and of the high pressures and the incompressibility of the oil.

There will be more especially described the application of the said apparatus to the displacement of the unwinding cradle of a machine for severing continuous webs of cellulosic film-like material or similar materials, but it is obvious that this example is not limitative and that the invention also covers any other application in the same sense.

Owing to its displacements during winding and due to the fact that the edges are irregular and slightly curled in manufacture, the film does not unwind from the reel with its edge in constant alignment.

When the edges are trimmed by means of a severing machine, the cut must be deep enough to remove all irregularities with a consequent waste. This waste is reduced by the present invention as the web may be shifted to accommodate the variations in edge position.

A specific embodiment is shown in the drawing in which the figure is a diagrammatic showing of a servomotor system for controlling the position of a reel for maintaining the edge of the web or film in constant alignment as it is being unwound.

In this system there is used as reference point one of the edges of a web **1** which is passed over a nozzle **2** having a slot **3** which is partially closed by the web as the web is unwound from a reel **4**.

The interior of the nozzle **2** is connected by a short calibrated tube section **5** to an enclosed space **6** in which a constant vacuum is maintained by suitable means (not shown). The negative pressure within the nozzle **2** is therefore a function of the degree of opening of the slot **3**, that is, of the position of the edge **7** of the web **1**.

The tube **5** is connected by a pipe **8** to a proportionally acting compressed air relay **9** of known type which measures this negative pressure in the nozzle **2** and produces an air pressure in outlet pipe **10** which is a function of the pressure variations in nozzle **2**. The said relay **9** is connected to a compressed air feed pipe **11** supplied with air at constant pressure. The relay **9** constitutes a variable valve mechanism for varying the pressure in its outlet pipe **10** proportionally to variations in pressure in the pipe **8**. The relay **9** may, for example, be of the type known as "Air-o-Line" relay manufactured by Brown Instrument Co. of Philadelphia.

The said air pressure in the outlet pipe **10** acts on a servo-relay **15** which is also of known type and which in turn produces an air pressure in its outlet line **16** dependent both upon the air pressure in the line **10** and upon the position of a rod **17** which is connected to be shifted with piston rod **18** of a piston **19** of an oil servomotor **20**. The said relay **15** is fed with compressed air by a pipe **21**. The relay **15** may be of the type known as "Air-o-Motor" manufactured by said Brown Instrument Co.

The arrangement is such that if the air pressure provided by the nozzle **2** varies even to the slightest extent in one direction or the other, the servo-relay **15** varies to the extreme the air pressure in its outlet pipe **16**, that is, reduces it to zero or raises it to the feed pressure of the line **21** (about 1.2 kg./cm.^{2}).

An oil distributor **22** comprises a piston **22***a* subjected on one face to the air pressure provided by the servo-relay **15**. The said piston is balanced by a spring **22***b* and is coupled with an oil distribution slide valve **23**.

In its end positions, the said slide valve **23** places the delivery of an oil pump **24** in communication with one of the faces of the piston **19** of the servomotor **20** which is coupled by rod **18** with the unwinding cradle or reel which is to be shifted axially.

Throughout the region of its mean positions, the slide valve **23** closes the ports communicating with the servomotor **20**.

The system then operates as follows:

Any movement of the edge **7** of the film **1** produces, through the relay **9** and the servo-relay **15**, a movement of the slide valve **23** of the oil distributor in one direction or the other to the end of its stroke. The oil pressure is then transmitted without any reduction to one side (or the other) of the piston **19** of the servomotor **20**, which moves and thus shifts the unwinding cradle laterally. However, its movement is not continued to the end of the stroke, which would correspond to an on-and-off regulation and not to a proportional regulation as is desired. In fact, the servo-relay **15** controlled by its connecting rod **17** connected to the piston rod **18**, becomes operative and tends to return the air pressure acting on the oil distributor to an intermediate value as soon as the servomotor **20** begins to operate.

Finally, the whole system returns into a position of equilibrium in which the closed portion of the slot **3** is restored to its initial value, that is, the film **1** has returned into correct position, while at the same time the pistons of the oil distributor **23** close the orifices admitting the oil to the servomotor **20** and the latter is stopped.

What is claimed is:

A servo system for maintaining edge alignment of a moving web, comprising a suction nozzle having an elongated slot of uniform width positioned to be partly covered by said web when the web is in a predetermined position, the part covered varying as the web is shifted transversely, whereby the suction in said nozzle varies as a function of the transverse position of said web, a compressed air line having a proportional control valve connected to respond to variations in said suction in said nozzle and adapted to produce variations in the air pressure in said line proportional to variations in said suction, a servo-relay connected to be actuated in response to minor variations in pressure in said compressed air line, said servo-relay having an output line and having means to supply to said output line a fixed high pressure or a fixed low pressure according to the direction of said variation in said compressed air line, a hydraulic motor connected to control the position of said web with respect to said suction nozzle, a liquid control valve connected to control the supply of actuating liquid to said motor, means connecting the output line of said servo-relay to supply either said fixed high pressure or said fixed low pressure to actuate said liquid control valve in a sense to cause said hydraulic motor to return said web to a predetermined position with respect to said suction nozzle, and follow-up mechanism connected to be actuated by said motor and adapted to restore said servo-relay to its initial condition whereby the movement of said motor is proportional to the change in air pressure which produced such movement.

References Cited in the file of this patent

UNITED STATES PATENTS

1,982,685	Muller	Dec. 4, 1934
2,047,922	Seligmann	July 14, 1936
2,239,472	Stanford	Apr. 22, 1941
2,303,533	Ferm	Dec. 1, 1942
2,336,096	Heintz	Dec. 7, 1943
2,380,357	Ziebolz	July 10, 1945
2,488,294	Hornbostel	Nov. 15, 1949
2,491,636	Amos	Dec. 20, 1949
2,539,131	Gundersen et al.	Jan. 23, 1951