

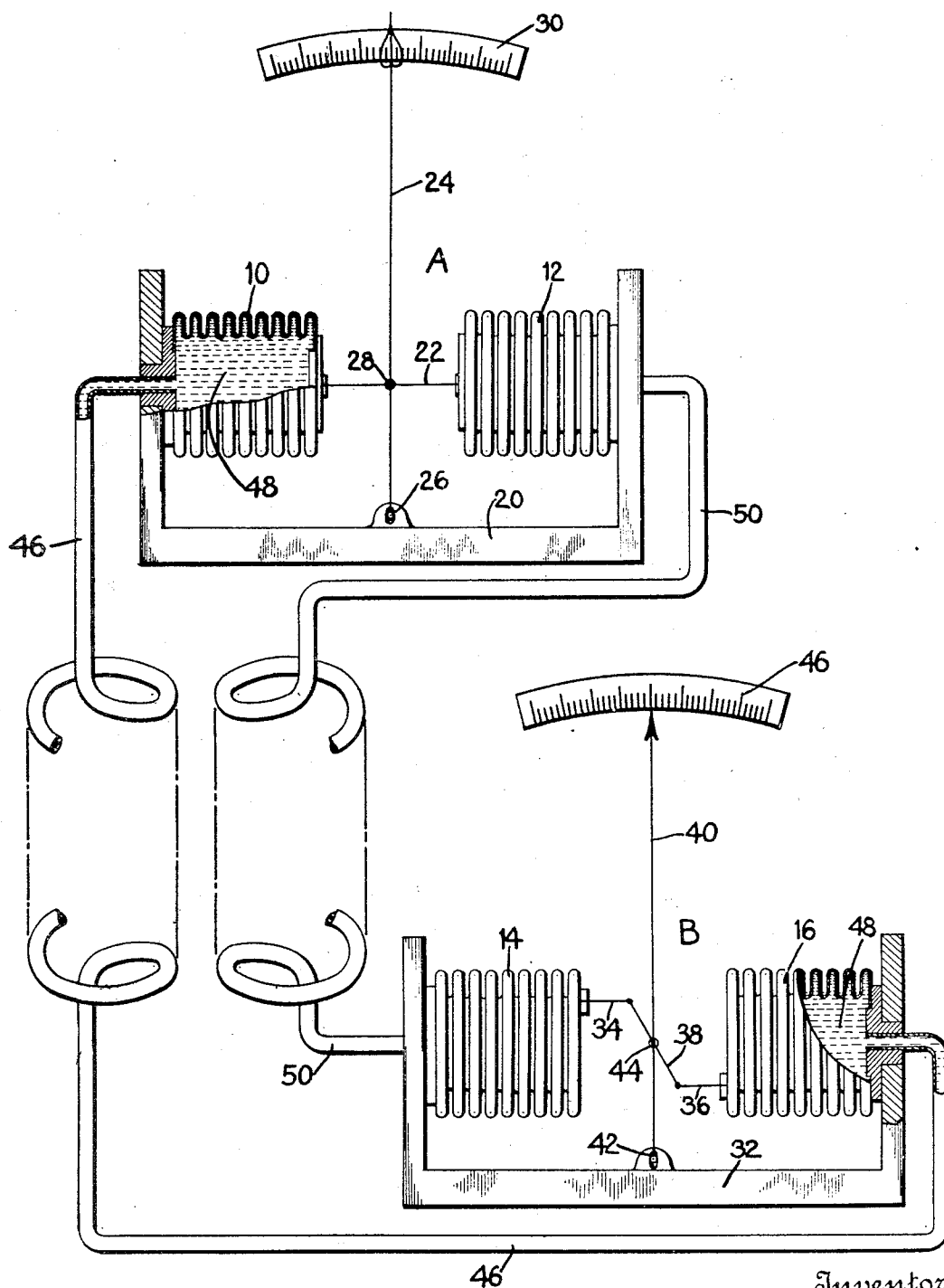
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MOVEMENT TRANSMITTING SYSTEM

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MOVEMENT TRANSMITTING SYSTEM

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This invention pertains to an apparatus or system for transmitting mechanical movements from one location to another.

It is often necessary for an operator to be able to positively control devices in inaccessible locations far beyond his reach. Such conditions arise frequently in the operation of airplanes, the pilot in the cockpit being required to adjust or control devices scattered about the plane at various inaccessible locations. Not only must the pilot be able to control the devices but he must have always before him positive and dependable indications of the state of adjustment of those devices. The pilot must be able to make a desired adjustment, the movement transmitting apparatus must simultaneously and synchronously transmit that adjustment to the distant device, and it must at the same time provide the pilot with an indication of the adjustment he has made.

In addition to the above the operation of the transmitting system must be independent of temperature changes.

The apparatus must be free from electricity in all its forms, in order to obviate interference with radio or other instruments, and in order to avoid the necessity for insulation of the apparatus, which, when necessary, greatly increases the difficulty of installation and also renders the apparatus liable to interruption in service.

The apparatus must be reversible in operation so that any change of adjustment of the distant device will be instantly apparent to the operator.

The apparatus must be readily installed, regardless of distance or location of the device and regardless of intervening obstacles.

The apparatus must be free of notches, steps, or other provisions for limiting closeness of regulation or setting, i. e. the possible settings must be infinite in number.

The apparatus must be independent of the position of the plane on the ground or in the air.

The principal object of the present invention is to disclose apparatus to meet the above requirements.

Further and other objects and advantages

will be apparent from the specification and claims, and from the drawings which illustrate what is now considered the preferred embodiment of the invention.

The drawing shows the invention in somewhat diagrammatic form but with sufficient detail to enable the invention to be applied to a wide variety of uses.

The unit at one end of the transmitting system is designated "A" and the one at the other end is "B". Movement may be transmitted from A to B or from B to A.

Each unit comprises a pair of similar liquid tight containers of variable capacity. These containers are preferably in the form of sylphons 10 and 12 in unit A and 14 and 16 in unit B. Sylphons 10 and 12 are supported in axial alignment in frame 20, one end of each sylphon being fast to the frame and the adjacent free ends being interconnected by a bar 22. A pointer 24 fulcrumed at 26 on frame 20 and pivoted on bar 22 at 28, serves to indicate on chart 30 any horizontal movement of bar 22.

In similar manner sylphons 14 and 16 in unit B are axially mounted in frame 32, but their adjacent ends, instead of being rigidly interconnected as in unit A, are connected by studs 34 and 36 to the free ends of a floating link 38. A pointer 40 fulcrumed on frame 32 at 42 is pivotally connected at 44 to the middle of link 38 and gives on chart 46 an indication of any horizontal movement of pivot 44. The anchored ends of sylphons 10 and 16 are interconnected by tube 46, the sylphons and tube being filled with a cold-proof liquid which usually is oil 48.

In like manner, sylphons 12 and 14 are interconnected by tube 50 and are filled with the same kind of liquid. Tubes 46 and 50 are of small bore, are usually of copper, and may be of any length. If the tubes happen to be longer than necessary the surplus length is usually wound in coils as indicated in the drawings.

It is a familiar property of sylphons that they expand or contract readily axially without appreciably changing their diameters.

With the above structure in mind, operation of the apparatus will be readily under-

stood. If, for instance, pointer 24 of unit A be moved to the right, sylphon 10 will be forcibly expanded and sylphon 12 forcibly contracted by bar 22, through the instrumentality of pivot 28. Expansion of sylphon 10 will draw oil 48 through tube 46 from sylphon 16 of unit B, causing sylphon 16 to contract axially in proportion to the axial lengthening of sylphon 10. Axial contraction of sylphon 12 will, on the other hand, force oil through pipe 50 into sylphon 14 and cause it to lengthen axially in proportion to the axial shortening of sylphon 12. Briefly, then, the free ends of all the sylphons of both units A and B move to the right. Link 38 is moved to the right equal amounts at both its ends, which means that pointer 40 is simultaneously moved to the right about its fulcrum through the instrumentality of pivot 44, and indicates the amount of its movement on chart 46.

In like manner movement of pointer 24 to the left will be indicated by pointer 40, and any movement of pointer 40 to the right or left will be indicated by pointer 24 at the other end of the system.

When changes of temperature occur, the volume of oil 48 changes, and incorrect indications would be given were it not for link 38, which serves as a temperature compensating device. As above described, normal use of the apparatus moves link 38 bodily to right or left, which means that pivot 44 is shifted horizontally and pointer 40 is moved. If, on the other hand, a temperature change occurs, sylphons 14 and 16 will both be lengthened, or both shortened, i. e. the free ends will both move toward each other or away from each other by equal amounts with the result that the upper and lower ends of link 38 will simply swing equal amounts in opposite directions about pivot 44, without moving the pivot or pointer 40.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described but may be used in other ways without departure from its spirit as defined by the claims which follow.

I claim—

1. A movement transmitting apparatus comprising in combination, a pair of movable members remote from each other, and an hydraulic device effective when one of said members is moved for moving the other of said members a corresponding amount in synchronism with said first member.

2. A movement transmitting apparatus comprising in combination, a pair of movable members remote from each other, an hydraulic device effective when one of said members is moved for moving the other of said members a corresponding amount in synchronism with said first member, and a device intermediate said members whereby the transmission of movement by said apparatus is rendered

independent of change of temperature of the apparatus.

3. A movement transmitting apparatus comprising in combination, a pair of movable members remote from each other, an hydraulic device operably connected with each member, and means effective when one of said members is moved for transmitting the movement of said first device to said other device whereby said second member is moved in synchronism with the movement of said first member.

4. The invention set forth in claim 3, in which said hydraulic device comprises a pair of sylphons.

5. The invention set forth in claim 3, in which said hydraulic device comprises a pair of liquid-filled sylphons and said transmitting means comprises liquid-filled tubes interconnecting said pairs of sylphons.

6. The invention set forth in claim 3, in which compensating means is provided whereby the movement of said indicators relatively to each other is unaffected by change of temperature of said apparatus.

7. The invention set forth in claim 3, in which compensating means is provided whereby the movement of said indicators relatively to each other is unaffected by change of volume of said liquid due to temperature change of the apparatus.

8. A movement transmitting apparatus comprising in combination, a pair of movable members remote from each other, a pair of liquid-filled sylphons operably connected with each member, a liquid-filled pipe connecting each sylphon to a sylphon of the remote pair, and a transmission system effective when one of said members is moved for moving said second member a corresponding amount in synchronism with movement of said first member, said system including said liquid-filled pipes, said liquid-filled sylphons, and a compensating device whereby the transmission of movement from said first member to said second member is unaffected by change of temperature of the apparatus.

In testimony whereof I hereto affix my signature.

CLARENCE A. DE GIERS.