United States Patent [19]

Schwerdtfeger

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[54] **SINGLE LEVER CONTROL**

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[52] **U.S. Cl.** ..... **74/471 XY**

[51] **Int. Cl.** **G05g 9/04**

[58] **Field of Search** ..... 74/471 XY, 471, 491

[56] **References Cited**

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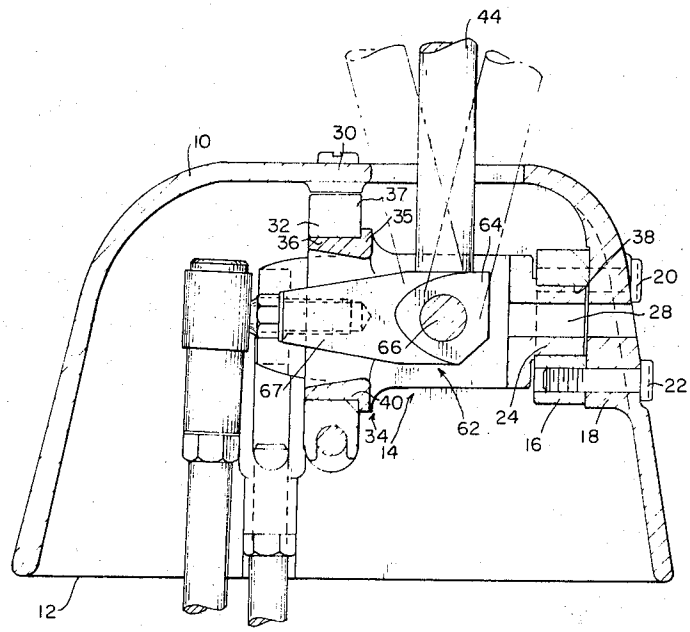
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[57] **ABSTRACT**

A two-cycle control lever with a first bell-crank lever pivotally carried on a second bellcrank lever which is, in turn, pivotally mounted in a frame. A single control handle serves as a common input means for both levers, and since the axes of the levers are perpendicular, upon actuation the bellcrank levers simultaneously function as both a bearing and a lever.

2 Claims, 3 Drawing Figures



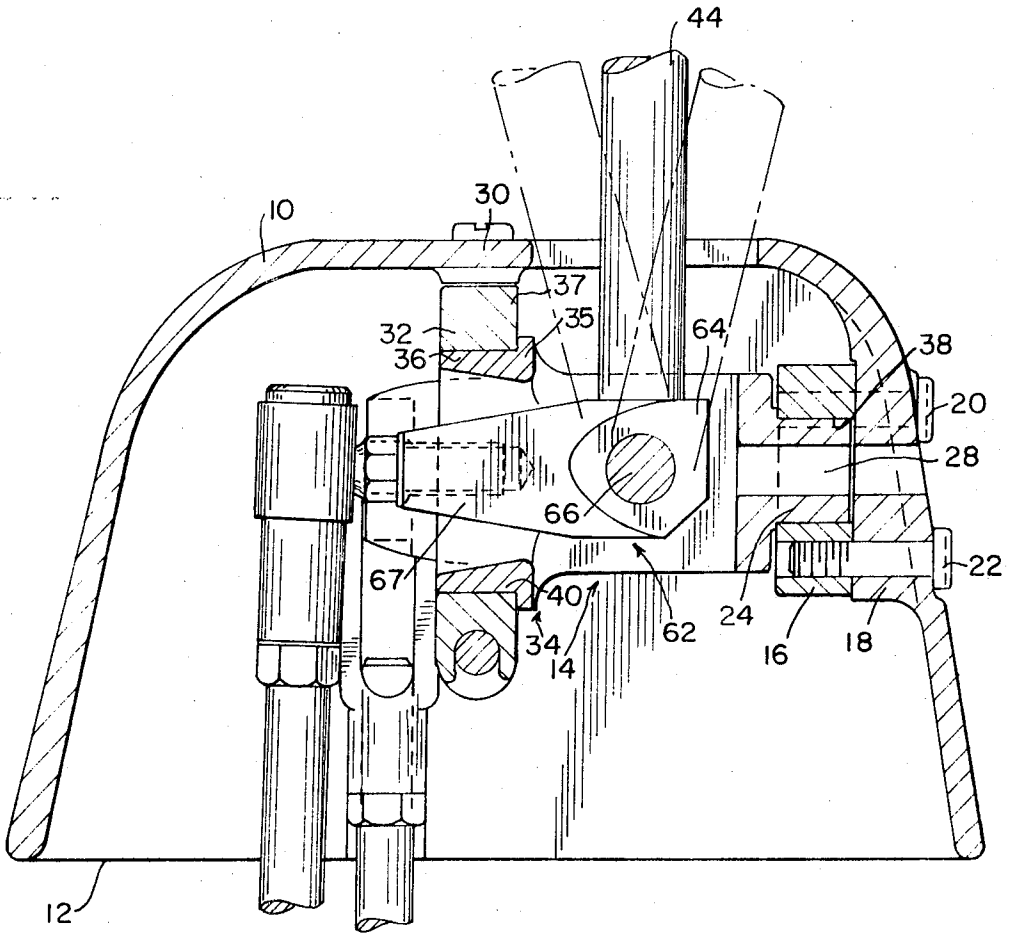


Fig. 1

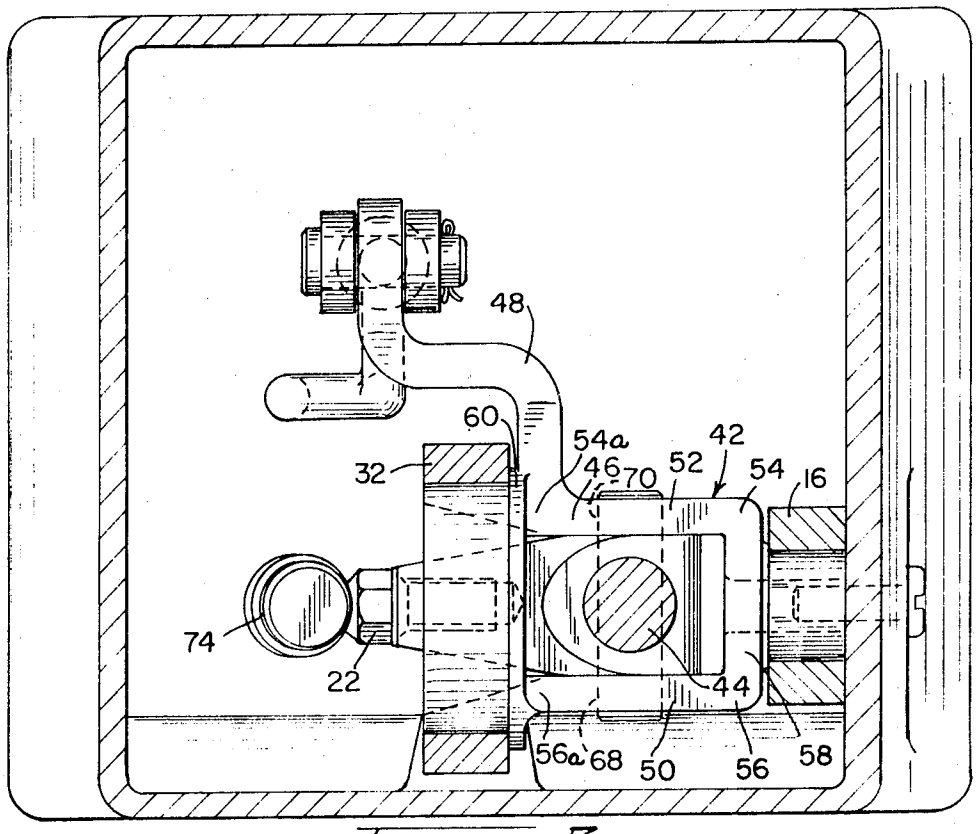

48
60
54a
46
70
52
42
54
16
32
74
22
44
56a
68
50
56
58

FIG. 3.

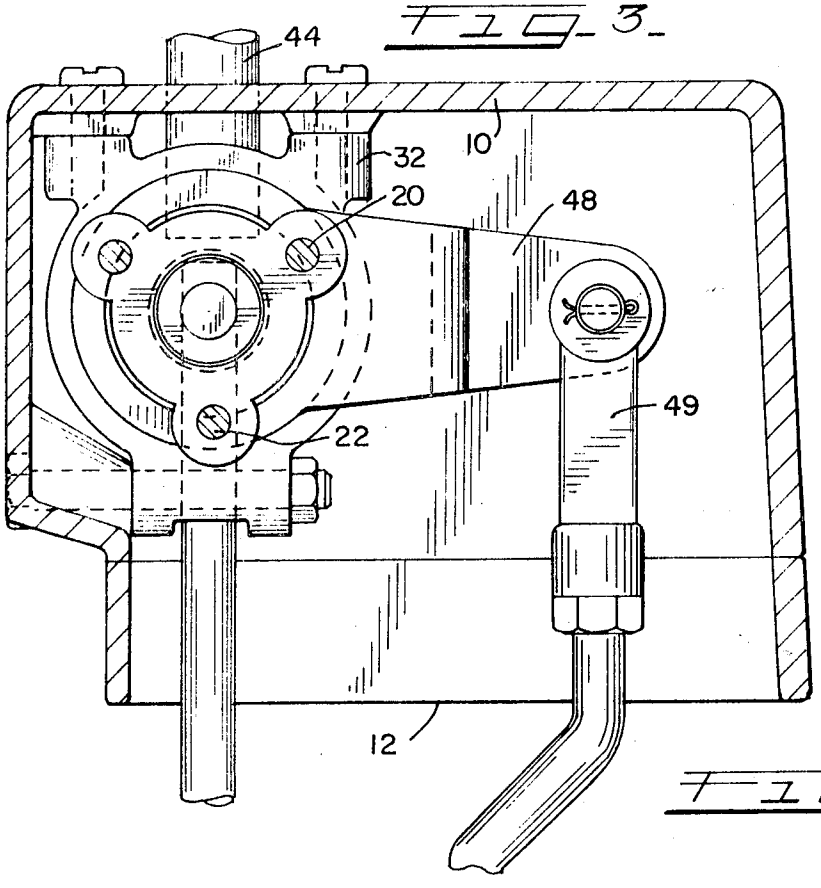

44
10
32
20
48
49
22
12

FIG. 2.

SINGLE LEVER CONTROL

Yet another object of the present invention is to provide a single lever two-cycle control having a design requiring a minimum amount of space;

Another object of the present invention is to provide a single lever two-cycle control which can be augmented with additional levers and means to provide forces in a series of directions;

BACKGROUND OF THE INVENTION

The present invention relates to a single lever two-cycle control mechanism and more particularly to a single lever control wherein a series of bellcranks work together as bearings and levers to give moment to lever arms in opposed, coordinated or individual control.

Single lever control devices of many kinds are used for a considerable variety of coordinated actions in the prior art such as, flight control sequential hydraulic valves, hot and cold mixing valves, etc. These control levers present different problems in varying degrees, such as complexed gear relationships, jamming of the driving gears, involved servomechanical systems, and substantial dead time during activation or deactivation. Thus, there is a need for a simple rugged control assembly having few parts and a minimum number of bearing points to cut down on dead time.

It is an object of the present invention to provide a single lever two-cycle control aving parts working together as levers and bearings;

Still another object of the present invention is to provide a single lever two-cycle control having few bearing points and little dead motion;

Yet another object of the present invention is to provide a single lever two-cycle control which can be augmented with additional levers and means to provide forces in a series of directions;

Still another object of this invention is to provide a single lever two-cycle control lever having bearing mounts located to give balanced loading through all movements.

Further objects and advantages will be apparent in the combination and arrangements of the constituent parts and in the details of construction thereof by reference to the following specification taken in connection with the accompanying drawings, wherein:

FIG. 1 is a generally front view in partial section of one form of the present invention;

FIG. 2 is a side sectional view of FIG. 1; and

FIG. 3 is a top sectional view taken of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a single lever two-cycle control of the type of apparatus to which the present invention applies. Shown is a mount or cover top **10** secured on a suitable support member **12**, both of which may be termed as the base. The single lever two-cycle control is designated generally by the number **14**.

A first bracket **16** is secured to the wall **18** of cover top **10** by any suitable means, such as by threaded engagement with bolts **20** and **22**. The bracket member **16** comprises an apertured seating means or bushing means **24**. In the preferred embodiment, the bushing means **24** comprises part of an aperture **28** in wall **18**.

A second spaced apart bracket **32** is secured to the top means **10** at **30** and carries a second apertured seating means or bushing means **34**. The bushing means **34** comprises a sleeve **35** which journals in aperture **36** in the bracket wall **37**, the outer surface **40** of sleeve **35** comprising the bearing surface.

It should be understood that bracket memkers **16** and **32** are bushing carrying means and as such, could be secured to the top cover **10** or to the support base **12**, without deviating from the invention. Further, it is not necessary that the circumferential inner surfaces **38** and **40** comprise the inner race of the bushing surface, rather the bushing means can comprise independent grooves in the respective brackets, having center sections thereof removed to provide apertures.

A first bellcrank lever means **42** having an input means or means **44**, an elbow means **46** and an output means or means **48** is pivotally secured to and extends between brackets **16** and **36**. It should be noted that input means **44** is the single lever two-cycle control shaft means as well as the input means of a second bellcrank means **62** to be later discussed. The elbow means **46** comprises generally two parallel spaced apart elongated members **50** and **52** fixed to each other and **54*a***, and **56*a*** by a combination bridging/pivoting means **58** and **60**. As shown in FIGS. **1**, **2** and **3** the bridging/pivoting means **58** and **60** of the rectangular open ended hollow frame elbow **46** comprise the outer race of a bushing and journal the corresponding inner race bushing part. It is apparent that output means **48** can be fixed to a hydraulic control line **49** or it could be supplied with a ball and socket type means to redirect the force.

The output means **48** extends from end **54*a***, however, it is apparent that means **48** could be extended at any attitude such to control a particular hydraulic valve.

The input means **44** also functions as the single lever two-cycle control shaft means actuating first bellcrank lever means **42** and a second bellcrank lever means **62**. Second bellcrank lever means **62** is comprised of an input lever means **44**, an elbow means **64** and an output lever means **67**. The elbow pivots on a shaft **66**. Shaft **66** also pivotally journals the parallel spaced apart elongated members **50** and **52** such that if the control handle **44**, shown in FIG. **1**, is moved within the plane of the paper, the second bellcrank lever means **62** is actuated pivoting on shaft **66**. If the control handle, shown in FIG. **1**, is pivoted in a plane perpendicular to the plane of the paper, the second bellcrank lever is actuated pivoting in bushings **24** and **34**. Thus, it is apparent that the two bellcrank levers **42** and **62** work together as bearings and levers to give movement to the lever arms in opposed coordinated or individual control. It should further be apparent that the apparatus will have very little dead time because of the avoidance of pivot points.

The output lever means **67** is cone-shaped, being fixed to the base of the control shaft **44**, and extending through the apertured bushing **36**. The end **72** of output lever means **67** can be provided with a ball and socket means **74** or bellcrank levers, tension means, etc. to redirect the force generated in control handle **44** prior to connection to a hydraulic valve. The same variations can be made provided on output means **48**.

Thus a single lever two-cycle control is provided which consists of two bellcrank lever means having their pivot swings lying in perpendicular planes. The pivot point of the first bellcrank being bushings mounted in a frame means, while the pivot point of the

second bellcrank is carried by the frame of the first thereby avoiding dead time associated with pivot points.

It is to be understood that the above-described arrangements are but illustrative of the application of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A single lever control device comprising:
a control shaft;
first and second bushings having apertured cylindrical seating surfaces for circular edges;
a bellcrank lever with an elbow having cylindrical ends seating in said surfaces of said bushings and extending therebetween, and having an output arm means extending from said elbow radially and longitudinally beyond one said bushings, said control shaft comprising an input means thereof; and
a second bellcrank lever carried by the elbow of said first bellcrank, said control shaft being the input means thereof, and having an output means extending through said one of said apertured bushings.

2. A single lever control device comprising:
a base;
a control lever;
first and second frame members spaced apart and fixed to said base, each having an aperture comprising the inner race of a cylindrical bushing;
a first bellcrank lever having an input means, an elbow and output means, said output means extending from said elbow radially and longitudinally beyond one of said frame members, said elbow being pivotally mounted in said cylindrical bushings and
a second bellcrank lever having an input means, an elbow and an output means, said elbow being pivotally mounted on said elbow of said first bellcrank, the major axes of said elbows being perpendicular, said output means of said second bellcrank lever extending through the aperture of one of said spaced apart frame members.

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