United States Patent [19]

Nicholson

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[45] **Apr. 17, 1973**

[54] **VARIABLE RATIO CONTROL LEVER**

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[52] **U.S. Cl.**.....**74/491,** 74/96, 74/480 R, 74/516, 74/524, 251/233

[51] **Int. Cl.**.....**G05g 1/04**

[58] **Field of Search**.....251/233, 252, 251/251; 74/518, 516, 524, 491, 96, 480 R; 287/52.02

[56] **References Cited**

UNITED STATES PATENTS

1,255,220	2/1918	Petry	74/522 X
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FOREIGN PATENTS OR APPLICATIONS

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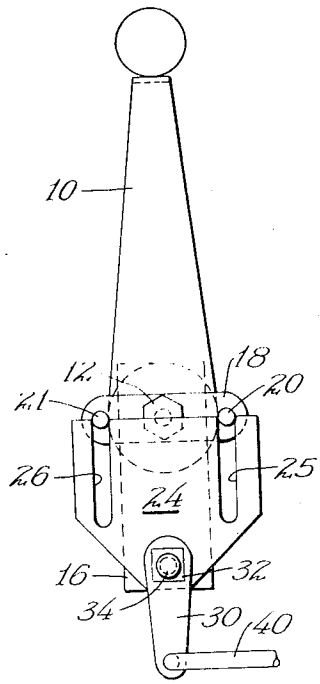
[57] **ABSTRACT**

Two camming pins are mounted on a pivoting control lever so as to slide into slots in a pivotable actuating member upon rotation of the lever, the sliding action operable to rotate the actuating member only slightly at first but more so as the throw of the control lever is increased.

4 Claims, 5 Drawing Figures



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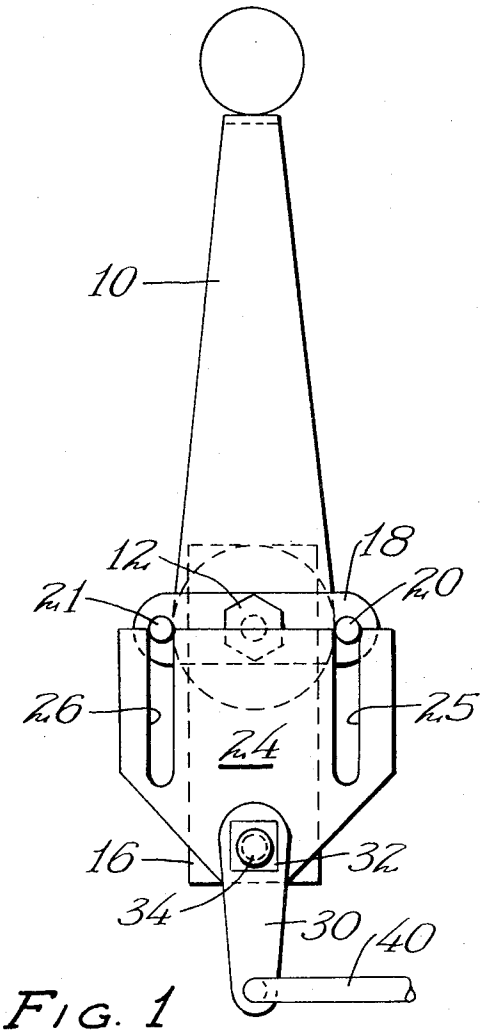

FIG. 1

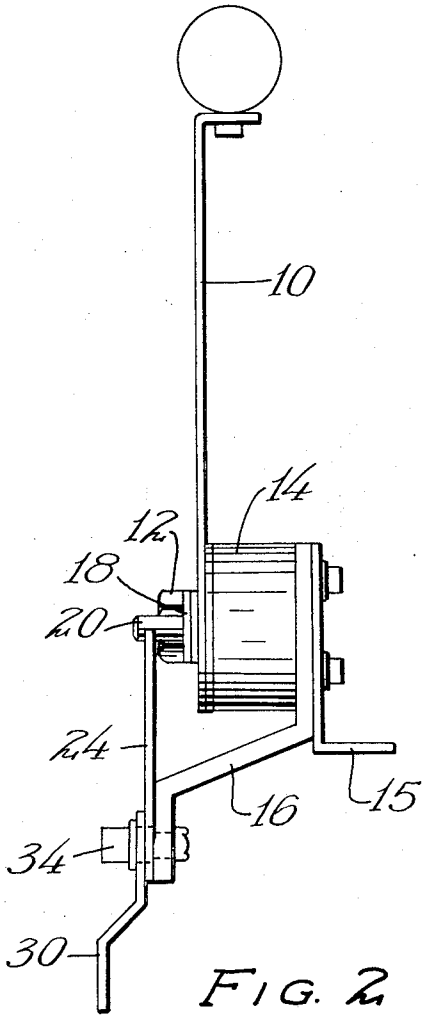

FIG. 2

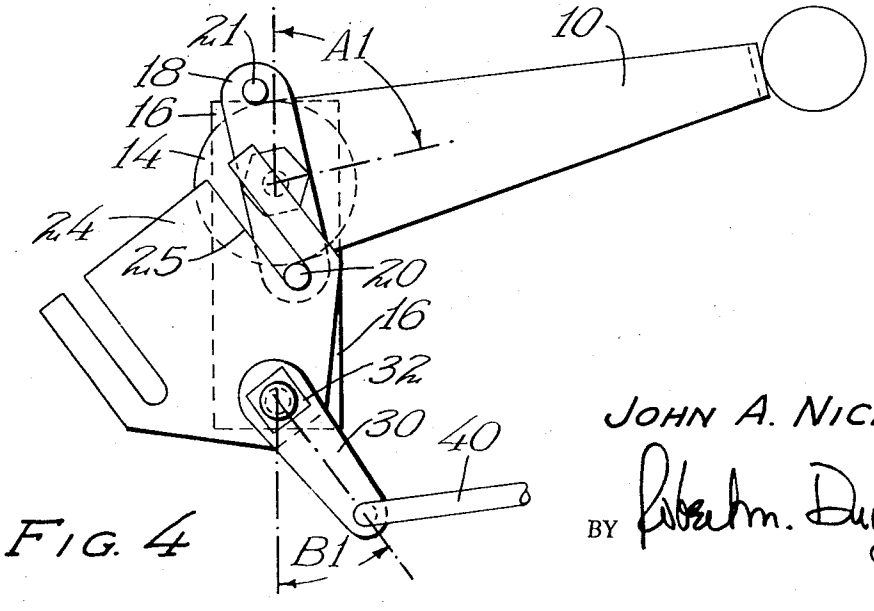

FIG. 4

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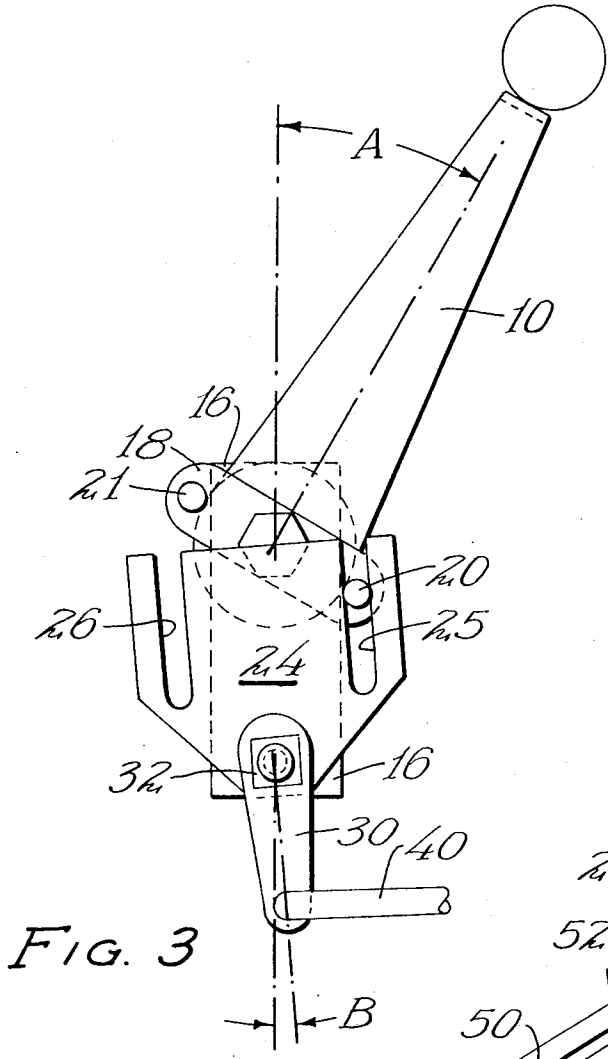

FIG. 3

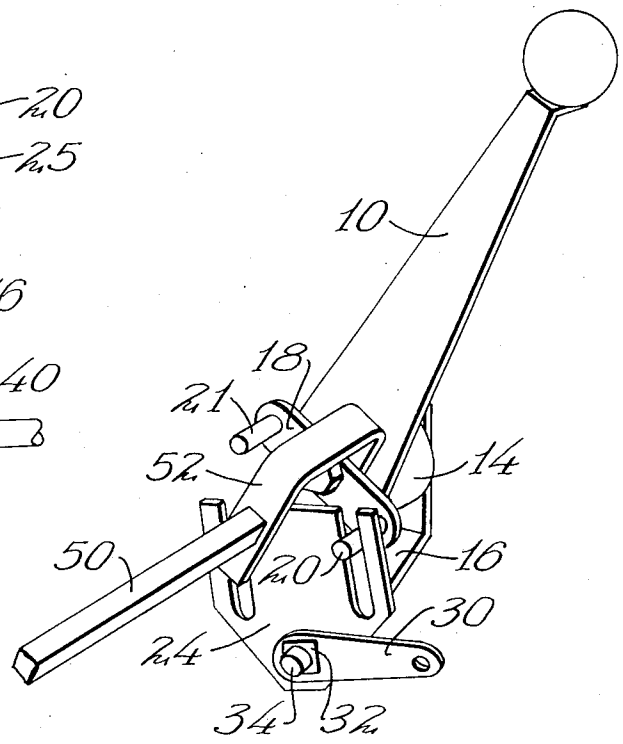

FIG. 5

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VARIABLE RATIO CONTROL LEVER

BACKGROUND OF THE INVENTION

In controlling a number of systems it is desirable to have a control lever which does not have much effect at first but has an increasing effect as the throw of the lever is increased. Such a control lever is particularly desirable in controlling hydraulic valves. Hydraulic valves generally operate under a large amount of pressure and when first opened will provide a sudden undesirable surge of pressure through the small opening. It is therefore desirable to provide a lever which may be connected to the valve in such a way as to operate it only very slightly at first and then increase its effect once the valve is past the initial abrupt opening phase. The present invention accomplishes just such an end.

BRIEF DESCRIPTION OF THE INVENTION

My invention contemplates mounting a control lever to pivot on a base member. Actuating or camming pins are mounted on each side of the pivot point of the control lever and affixed to rotate with the control lever. Mounted just below the pivot point of the control lever is a second pivoting actuating member which has a pair of slots aligned so as to accept the camming pins. As the control lever is rotated one of the camming pins enters one of the slots in the actuating member causing it to rotate. At first a very slight rotation is effected but as the throw of the lever is increased the actuating member is caused to rotate through a greater angle. An extension arm is connected to the actuating member so that various types of control linkages may be attached thereto.

The present invention also contemplates having a bracket arm extending out from the control lever so that additional remote levers may be attached to and operable to utilize this basic variable ratio mechanism. Other variations include the addition of an automatic locking device which operates to prevent the controlled hydraulic valve from forcing back the control lever. It may therefore be seen that it is an object of my invention to provide a variable ratio control lever mechanism for operating a number of different devices requiring such an operation. It is a further object of my invention to provide a control lever particularly suitable for operating hydraulic valves and the like. Further objects and advantages will become apparent upon consideration of the following detailed description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of the control lever of the present invention.

FIG. **2** is a side elevational view of the apparatus of FIG. **1**.

FIG. **3** is a second front elevational view of the apparatus of FIG. **1** showing the control lever in a partially rotated position.

FIG. **4** is a third front elevational view of the lever showing the control lever moved further than in FIG. **3**.

FIG. **5** is a perspective view of the control lever of the present invention showing additionally the connecting bracket that may be used to add additional remote levers to the variable ratio control mechanism contemplated.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1** and FIG. **2** simultaneously the apparatus of the present invention may be seen. A control lever **10** is a pivoted about a bolt **12** which in turn is mounted in a bearing **14**. Bearing **14** may be a simple frictional bearing or a more complicated anti-slip mechanism which will be described in greater detail later. Bearing **14** is mounted to a base member bracket **16** which may, if desired, be mounted to a suitable support surface by means of a bracket **15**. Also pivoted on base member bracket **16** is an actuating member **24** which has a pair of slots **25** and **26** therein. Actuating member **24** pivots about a bolt **34** on bracket **16**. As it pivots an extension member **30** pivots with it secured in place by a square nut **32** inserted through extension **30** and actuating member **24**. Extension **30** may be adapted to be connected to any suitable connecting linkage **40**.

Mounted on control lever arm **10** is a cross piece **18** which has a pair of camming pins **20** and **21** extending therefrom and spaced at a distance equal to the distance between slots **25** and **26**. It is apparent uponn examination of FIG. **1** that as control lever **10** is rotated either to the left or to the right one or the other of the camming pins **20** or **21** will enter its respective slot in actuating member **24**. After the first 40° to 45° of rotation of control lever **10**, actuating member **24** is rotated through a slight angle as shown in FIG. **3**.

In FIG. **3** it may be seen that although control lever **10** has moved through a relatively large angle A the actuating member **24** has been caused to move through only a relatively small angle B. This is caused byy the fact that camming pin **20** has entered slot **25** but has for the most part travelled in a vertical direction thus causing little rotation of actuating member **24**. However, in FIG. **4** it may be seen that as control lever **10** is moved through a greater angle A1 the cammingg pin **20** has a greater effect, moving actuating member through an angle B1. Extension **30** transmits this motion to the connecting linkage **40**. Therefore the initial movement of control lever **10** provides a very slight rotation of actuating member **24** and consequently a very small movement of control linkage **40**. If the control lever is used to control a hydraulic valve this permits a very slight opening of the hydraulic valve so that the pressure change can come gradually rather than abruptly as in the case of the prior art. Of course, it is evident that if control lever **10** is moved in the opposite direction camming pin **21** will enter slot **26** and perform in the same fashion as already described except with the opposite rotation.

In FIG. **5** the variable ratio control lever of the present invention is shown in a perspective view. Several variations are shown in FIG. **5** including mounting extension arm 30 at a 90° angle to that previously shown. It may be noted that with the use of a square nut **32** such as shown extension arm **30** can be mounted in any of four positions. The present invention should not be limited to only four positions however, since many other possible connections exist. Extension arm **30** may be mounted in many different positions allowing the control lever to be connected to linkage from a variety of positions.

Also shown in FIG. **5** is an extension bracket **52** which carries a connecting rod **50**. Bracket **52** is fastened to lever **10** so that rod **50** rotates about the same axis around which control lever **10** rotates. Connecting rod **50** may be extended to a remote lever so that the variable ratio apparatus employed in the present invention need not be duplicated at the remote location. With such a connection several control levers may be used to rotate control lever **10** which in turn rotates actuating member **24**. Another variation contemplates moving the camming pins either individually or in unison by foot pedals rather than a hand lever.

Bearing **14** was described earlier as comprising either a friction bearing or an anti-slip mechanism. Bearing **14** may comprise an anti-slip locking mechanism designed to prevent rotation of control lever **10** by the forces on actuating member **24**. Such a device is disclosed in detail in United States Letters Patent No. 3,576,240 in the name of the present inventor and titled "Control Lever Locking Device". This locking mechanism prevents the forces on control linkage **40** from causing a rotation of lever **10**. Since this anti-slip bearing is described in detail in the above referenced patent it is not further described here.

I claim:

1. A variable ratio control lever comprising in combination:

a base member;

a lever arm pivoted on said base member, said lever arm having at least one camming pin connected thereto extending generally out of the plane in which said lever arm pivots;

an actuating member pivoted on said base member and having at least one slot therein positioned to accept said camming pin upon the pivoting of said lever arm, said actuating member being moved by said camming pin; and

connecting means for linking the actuating member to the device to be controlled.

2. The control lever of claim **1** in which said lever arm has a camming pin on each side of the pivot point of said lever arm and said actuating member has two slots the entrances to said slots being spaced the same distance apart as said camming pins so as to accept one pin in one slot and the other pin in the other slot.

3. The control lever of claim **2** in which said connecting means comprises an extension member adjustably mounted to said actuating member so as to allow connection to the controlled device from any angle.

4. The apparatus of claim **3** including means to connect said lever arm to other remote levers.

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