United States Patent

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[54] **CLUTCH MEANS FOR SELECTIVELY COUPLING A SINGLE INPUT TO ONE OR MORE PLURAL OUTPUTS**
5 Claims, 3 Drawing Figs.

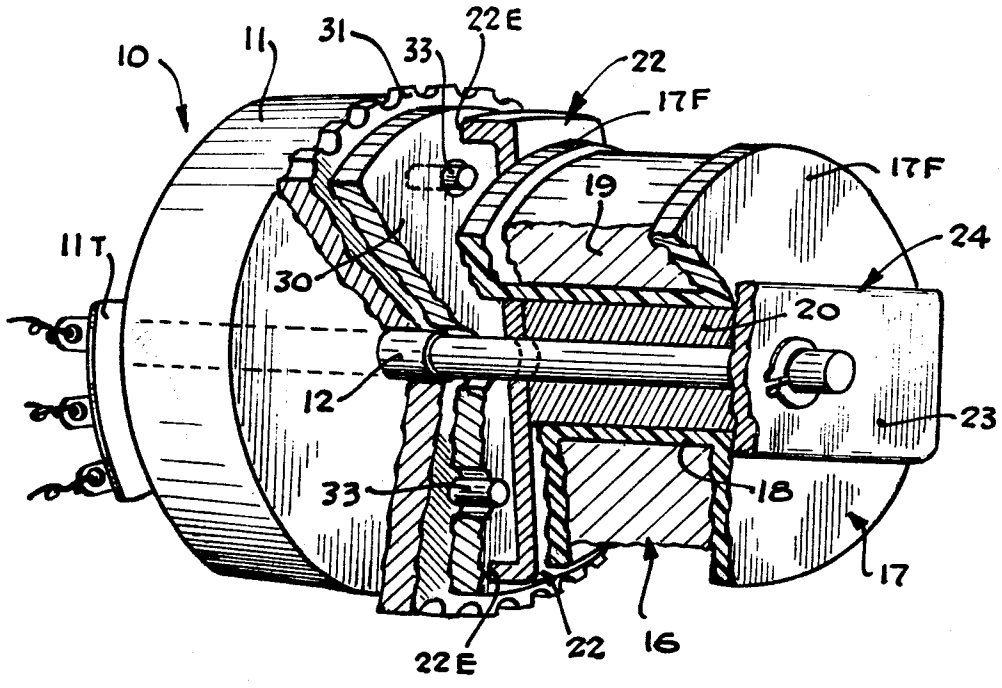
[52] **U.S. Cl.** **192/48.2,** 192/48.91, 192/84; 76/665; 338/116
[51] **Int. Cl.** **F16d 21/04,** F16h 37/06
[50] **Field of Search** ..... 192/48.2, 48.9, 48.91, 84, 84(A), 84(A1), (A2); 74/665(G1), (G5); 338/116

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ABSTRACT: A control system characterized by variantly positionable shafts is so arranged that the shafts may be positioned collectively or individually, and only a single drive motor is required to accomplish this, selective energization of electromagnets being effective to determine which shaft shall be active.



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Fig.1

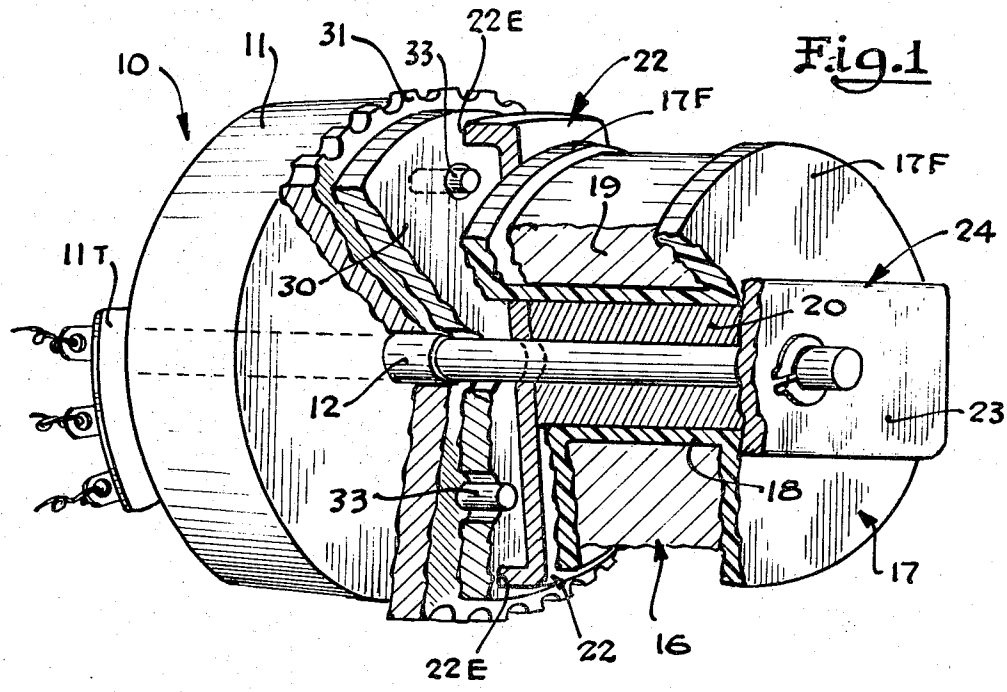
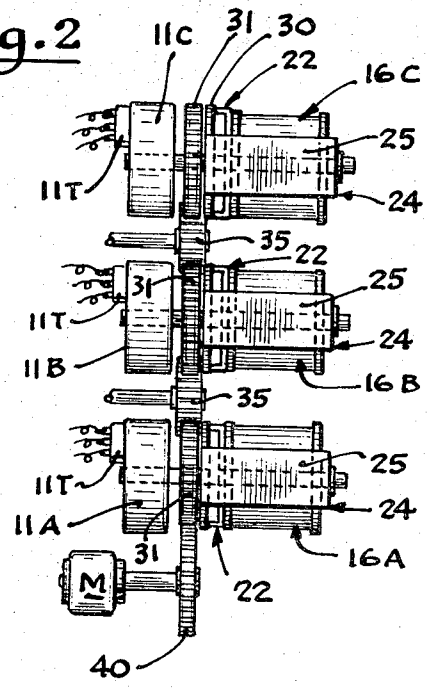


Fig.2



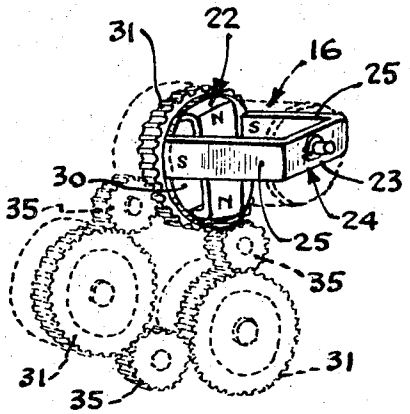


Fig.3

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CLUTCH MEANS FOR SELECTIVELY COUPLING A SINGLE INPUT TO ONE OR MORE PLURAL OUTPUTS

This invention relates to control systems which may be governed by potentiometers, and in particular to systems of this kind which may be embodied in a television receiver set, although the invention in its basic form has many areas of utility other than this.

There are many instances where a plurality of independent functions are achieved by variantly positionable shafts. An example of this is presented by a television receiver set where tuning and volume settings are attained by either remotely or immediately adjusting the shaft of a potentiometer upon energizing a motor. In the present day construction there is a potentiometer for each function and a motor for each potentiometer, and the primary object of the present invention is to enable any one or all functional settings to be realized through a single drive motor, thereby greatly reducing the unit costs.

While the primary utility of the present invention is thus established in terms of television receiver installations, it will be appreciated that this is but one example of utility. Thus, the primary object of the present invention, as inferred, is to enable a single drive motor to be used to position any one of a plurality of shafts the angular position of which represents a predetermined function. The set position of the shaft itself sets the potentiometer, or the shaft member may carry a sprocket, which is to say that the position to which the shaft is turned is an analog of the ultimate effect of whatever element or device is responsive to shaft positioning. Therefore, a related and more specific object of the present invention is to deliver to any selected one of a plurality of such shafts, independently of one another, torque derived from a single drive motor and to accomplish this by associating with each shaft an independent rotary power input element which is free to rotate with respect to the related shaft, and which carries a facing of magnetically attractable material rotatable with the input a element; an electromagnet is fixed to the shaft and the pole pieces of the electromagnet are opposite said facing, but ordinarily spaced therefrom, such that when the electromagnet is energized, the pole pieces and the facing are coupled whereby the torque of the input element is transmitted to the electromagnet and from the electromagnet to the shaft, thereby driving the shaft.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawing which, by way of illustration, shows preferred embodiments of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be made as desired by those skilled in the art without departing from the present invention. In the drawings:

FIG. 1 is a perspective view, partly in section, of a unit constructed in accordance with the present invention;

FIG. 2 is a plan view, partly schematic, illustrating a system constructed in a accordance with the present invention;

FIG. 3 is a perspective view, partly schematic, suggesting another embodiment of a system constructed in accordance with the present invention.

Referring to FIG. 1 the control unit **10** there illustrated is one of several identical units which may be incorporated in an entire control system as will be evident from FIG. 2, each such unit including a potentiometer **11**, the output function of which is determined by the angular position of a potentiometer control shaft **12**. It will be appreciated that the potentiometer is but a variable resistor, the resistance setting of which varies the output current delivered through a potentiometer output terminal board **11T**.

The electromagnet **16** is of coil form, as will be described in more detail, and is concentric with and fixed to the potentiometer shaft **12** so as to be coaxial therewith.

The electromagnet **16** comprises a bobbin **17** of insulating material affording a pair of end flanges **17F** and a spool or sleeve **18** between and on which the usual wire coil **19** is wound. When the electromagnet coil is energized, a magnetic field is created, and this magnetic field is concentrated by the usual iron core **20** having associated therewith a short front pole piece **22** and a longer rear pole piece **24**. It will be appreciated that the core **20** and the pole pieces may be press-fitted to the shaft **12** to fix the electromagnet to the shaft **12**.

Each of the pole pieces **22** and **24** is substantially of yoke form as perhaps best shown in FIG. 3, which is to say that each pole piece includes a bight portion **23** and a pair of parallel forwardly projecting arms **25** spaced one from another and extending at right angles to the bight **23**. As will be evident in FIG. 3, the pole pieces **22** and **24** are in effect crossed to be displaced 180° relative one to another, when assembled, and together are effective to present four end portions **22E** at the free ends of the arms **25** separated by 90°.

The four pole piece ends displaced 90° one from another as thus presented, are opposed to a low permeability washer **30** present as a facing on a rotary input element **31** in the form of a gear freely mounted on the shaft **12** and disposed between the potentiometer **11** and the electromagnet **16**.

While the rotary input element **31** is in the form of a gear, it may be a pulley, but in any event is free to rotate on the shaft **12**. Suitable thrust washers or spacers may be interposed between relatively movable parts assembled on shaft **12**.

The facing washer **30** is magnetically attractable, and is preferably of soft iron constituency so as to be readily responsive to the magnetic field created adjacent thereto by the pole piece ends when the electromagnet is energized. The washer **30** may be secured for rotation to the input element **31** in many different ways, but I prefer that such mounting be by way of a pair of pins **33**, FIG. 1, fixed to and projecting from the face of gear **31**, the pins **33** allowing the washer **30** to partake of a slight amount of axial motion in the direction of the electromagnet **16** when the latter is energized to create a magnetic field.

Ordinarily, with the electromagnet unenergized, any rotary motion imparted to the gear **31** is simply manifest in the latter idling on the shaft **12**, carrying the washer **30** along by means of the pins **33**; but when the electromagnet **16** is energized, the pole pieces **22** and **24** are magnetized and the washer **30** is attracted to the pole piece ends **22E** whereby the input gear **31** is in effect coupled to the potentiometer causing the latter to rotate with the gear **31**. In this connection, it is important to observe that the four pole piece ends will couple at four different areas to the outer periphery or margin of the washer **30**.

By virtue of this arrangement, a high degree of efficiency is realized in transmitting torque from the gear **31** to the electromagnet **16**, and resultantly the electromagnet turns the shaft **12** of the potentiometer to set or vary the function of the potentiometer. Also, in FIG. 3, note how the four pole piece ends in effect produce four interlocked magnetic fields (N-S-N-S) between the gear facing and electromagnet.

The primary advantage of the unit thus disclosed in FIG. 1 will be evident from FIG. 2 where there is disclosed a typical system comprising three potentiometers **11A**, **11B** and **11C**. Each potentiometer, FIG. 2, represents a different television receiver function.

In the system presented in FIG. 2 all drive motors in the conventional television receiver set formerly associated with the three potentiometers may be eliminated, while utilizing a single motor M as a source of torque for positioning any one of the three potentiometer shafts.

In any event, the input gear **31** associated with electromagnet **16A** is driven by a gear **40** in turn driven by motor M. The coupled gears **31**, FIG. 2, may have idler gears **35** associated therewith to establish a common direction of rotation for all shafts **12** if necessary. It will be realized that the manner in which the parts are supported to establish the arrangement as shown in FIG. 2 constitutes no part of the present invention, and hence is not illustrated.

In the event that pulleys replace the gears, FIG. 2, then of course belts become the transmitting means.

When the drive pinion **40** is driven, all gears are constantly rotated, and when it is desired to impart a functional setting to

a potentiometer on a shaft **12**, then its electromagnet **16A**, **16B**, or **16C**, as the case may be, is energized by closure of an appropriate switch to complete a circuit to the conductors **15**, FIG. **1**, resulting in coupling of the input element to the thus energized electromagnet. The electromagnets, FIG. **2**, may be energized independently or all at once, and as will be appreciated upon comparing FIG. **3** to FIG. **2**, the gears (or pulleys) may be in a tandem arrangement or in a cluster, noting that only the pole pieces of a single electromagnet are shown in FIG. **3**.

The manner in which a shaft **12** is stopped in its set position plays no part in the present invention, and hence is not illustrated. Thus, the potentiometers may have internal stops, and the pulleys when used may have physical stops, the torque of the motor M being weak enough at partial voltage to prevent any physical abuse. On the other hand, the electromagnets may themselves be controlled by automatic switches or timers so that the angle through which the shaft **12** is turned is itself a function of the time period of holding energized the related electromagnet.

Potentiometers such as these will not be rotated through an angle of more than 360°. The electrical leads (not shown) may therefore be flexible and conventional, and in an extreme case slip rings may be used for supplying current to the coils.

It will be seen from the foregoing under the present invention, shafts that are variantly setable to or through a predetermined angle may be collectively or individually moved to set position by torque derived from a single drive motor. This is made possibly possible by a train of gears, pulleys or other rotary input elements, each one on a related shaft for independent movement relative to the shaft, and when it is desired to turn the shaft, an electromagnet fixed thereto is energized to couple its pole piece to the rotary input element. Of significance to television receiver sets is the fact that hand setting (external knobs) is by no means rendered any more difficult in the present instance.

Hence, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that we are capable of variation and modification within the purview of the following claims:

I claim:

1. In a control system comprising a plurality of variantly positionable shafts the angular setting of which represents a predetermined function, a rotary power input element freely mounted on each shaft for independent rotation with respect to the related shaft, the input elements being coupled so that rotation of one is imparted to another, each of said elements presenting a facing of a magnetically attractable material rotatable therewith, an electromagnet mounted concentrically about and fixed to each shaft, means for energizing the electromagnets independently of one another, and a pole piece fixed to each electromagnet in a position opposed to the related one of the facings and effective upon energization of the related electromagnet to couple to the related facing thereby enabling controllable torque to be transmitted to the related shaft.

2. A control system according to claim **1** in which each electromagnet is in the form of a coil with its axis coaxial with the related shaft, each of said electromagnets having pole pieces at opposite ends of the coil and each pole piece being of yoke form displaced approximately 180° so that there are four pole piece ends about 90° apart opposite each of said facings.

3. A control system according to claim **2** in which each shaft controls a potentiometer in a television receiver set.

4. A control system according to claim **3** in which the system includes only a single drive motor which imparts torque to one of the input elements.

5. In a control system comprising a positionable shaft the angular setting of which represents a predetermined function, a rotary power input element freely mounted on the shaft for independent rotation with respect to the related shaft, said input element presenting a facing of a magnetically attractable material rotatable therewith, an electromagnet mounted concentrically about and fixed to the shaft, means for energizing the electromagnet, and a pole piece fixed to the electromagnet in a position opposed to said facing and effective upon energization of the related electromagnet to couple to the facing thereby enabling torque to be transmitted to the shaft.