March 15, 1955 F. JOHNSON ET AL 2,704,310

HOMING SWITCH

Filed Feb. 18, 1952 2 Sheets-Sheet 1

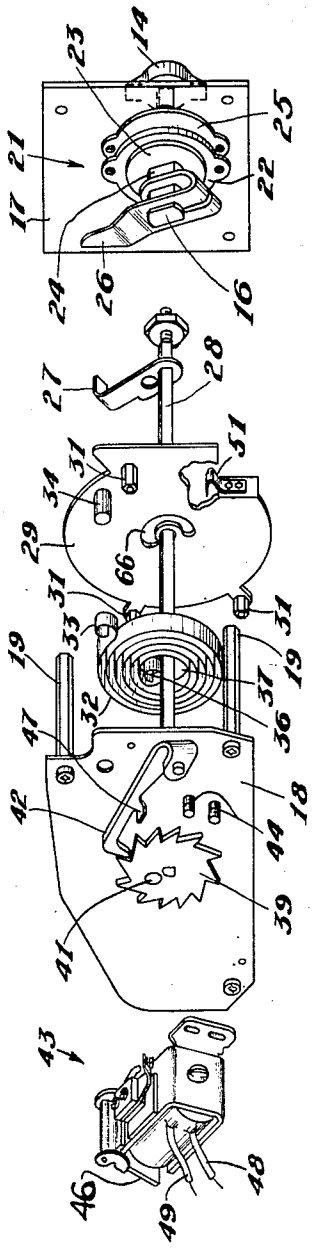


Fig 2

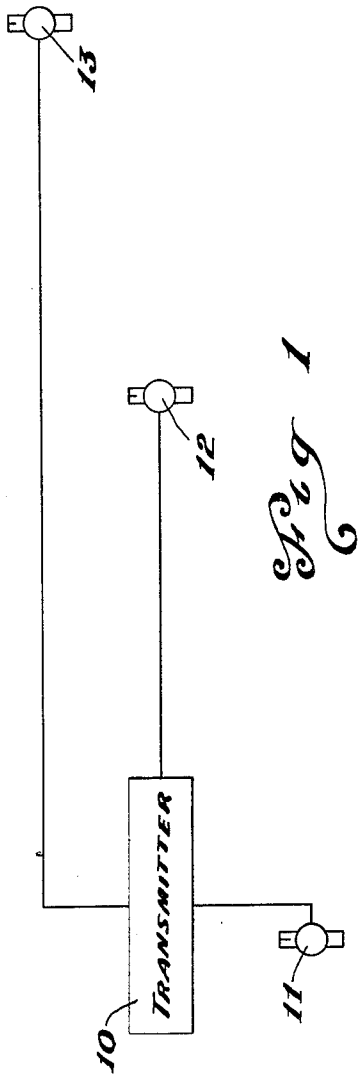


Fig 1

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HOMING SWITCH

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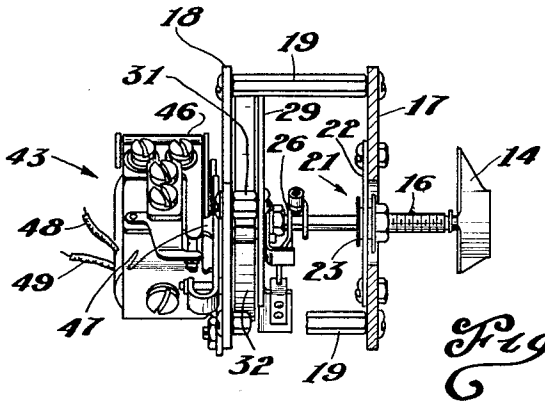


Fig 3

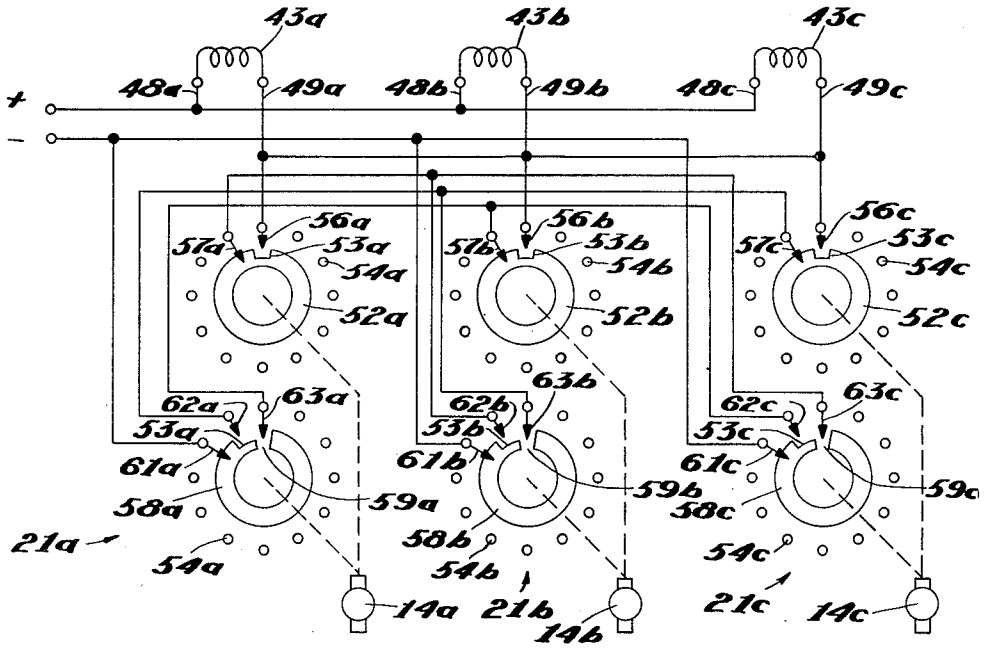


Fig 5

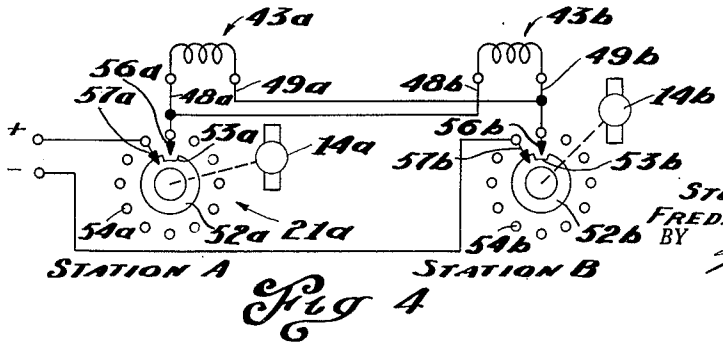


Fig 4

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2,704,310

HOMING SWITCH

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5 Claims. (Cl. 200—12)

This invention relates in general to a system which may be controlled from any one of a plurality of locations such that when one of the control knobs is turned it assumes control of the controlled element.

It is oftentimes desirable to control the position of a shaft from a number of remote locations. For example, a radio transmitter might be located at a first position and have remote control units at other positions. It is advisable in general to have only one controlling point in use at a time so that the transmitter will not be confused by a number of commands received simultaneously.

It is an object of this invention therefore, to provide a shaft control system with remote controlling units located at a plurality of positions that they may individually assume control of the controlled shaft.

Another object of this invention is found in the provision for control switches which automatically return to a home position when another switch is actuated.

Further features, objects and advantages of this invention will become apparent from the following description and claims when read in view of the drawing, in which:

Figure 1 illustrates a system according to this invention;

Figure 2 is an exploded view of the controlling switch of this invention;

Figure 3 is a side view of the controlling switch;

Figure 4 is a suitable electrical circuit for operating a pair of controlling switches; and,

Figure 5 is a suitable electrical circuit for operating three controlling switches.

Figure 1 illustrates by way of example, a transmitter **10** which may be controlled by a first switch **11** located at the transmitter site, or alternatively, by second and third switches **12** and **13** located at remote positions. Let it be assumed that each of the switches **11**, **12** and **13** have a first home position which corresponds to the "off" position of the transmitter **10** and a number of other positions which correspond to a particular frequency setting of the transmitter **10**.

The problem presented is to control the transmitter **10** from any of the three switch positions. In other words, if an operator at switch **12** turns it to a setting corresponding to 30 megacycles the transmitter is automatically tuned to this frequency. One position might turn the transmitter on, another one might put it on voice, or another might put it on CW. This is true even if the transmitter **10** may have been previously set to 20 megacycles by switch **11**.

To accomplish the desired results applicant has developed a system wherein operation of any one of the control switches immediately returns all the other switches to a home position corresponding to the transmitter off-position so that only the switch being turned sends a command to the transmitter. If, subsequently, another control switch is operated the previous control switch will return to the home position and allow the new switch to assume command.

One of the switches such as **11**, **12** and **13** is shown in Figure 3 and comprises a knob **14** which is mounted on a shaft **16** which passes through a plate **17** that is mounted to a second plate **18** by standoffs **19**. A switch **21** is of the wafer type and has a stationary disc **22** that is mounted to the plate **17** and a rotary portion **23** which is mounted on the shaft **16**. The switch **21** is the relay control switch. A second wafer switch **25** is mounted on shaft **16** and is the function control switch.

It might be connected as the control switch of a system according to Patent No. 2,476,673. As is best shown in Figure 2 the shaft **16** has a flat portion **24** that passes through a slot formed in a lever arm **26**. The lever arm **26** engages a second lever arm **27** that is mounted on a second shaft **28**.

A third plate **29** is mounted to plate **18** by standoffs **31** and the shaft **28** passes therethrough. An arcuate slot **66** is formed in the plate **29** adjacent the shaft **28**. A coil spring **32** has an end lug **33** which is received over a pin **34** mounted on the plate **29**. An internal end loop **36** is formed on the spring. The shaft **28** passes through a center opening **37** in the spring adjacent the end loop **36**.

The shaft **28** passes through plate **18** and has a toothed stop-wheel **39** mounted on its end. A pin **41** extends transversely of the stop-wheel **39** through an arcuate slot in the plate **18** and passes through the internal holding loop **36** of the spring.

A pawl **42** is pivotally supported on the plate **18** and engages the toothed stop-wheel **39** so that it can turn in only one direction when they are engaged.

An electrical relay, designated generally as **43**, is mounted to the plate **18** by holding means **44** and has an armature **46** that engages a projection **47** on the pawl **42** so as to lift it out of engagement with the toothed stop-wheel when the relay is energized. A pair of leads **48** and **49** are connected to the relay **43**. A spring **51** is mounted to the plate **29** so as to engage the lever arm **27** when it is released.

In operation, the knob **14** moves the lever arm **26** and the rotary disc **23** through the shaft **16**. The lever arm **26** engages the arm **27** so as to move it to any of a number of positions. The switch **21** contains a suitable detent so that the shaft **16** moves in distinct increments corresponding to particular settings. It is to be noted that the arm **26** moves the arm **27** in one direction only. Thus, if it is desired to move the arm **27** from a number six position to a number two position the knob **14** must be returned to the home or zero position which energizes the relay **43** so as to release the stop-wheel **39** which returns arm **27** to the home position due to the action of the spring **32**.

Figure 4 illustrates a circuit for controlling the relays **43** where two controlling switches are used.

It is to be remembered that whenever a switch is turned from the home position it is desired to return all other switches to the home position. The relay **43** returns the individual switches to their home position and when a switch is turned it will close the relay circuits if two switches are away from home.

With reference to Figure 4, a person located at station "A" may turn the knob **14**–*a* to control the transmitter. The wafer-type switch **21**–*a* comprises an annular member **52**–*a* which has a gap **53**–*a*. A number of contacts **54**–*a* are mounted about the disc **52**–*a*. The coils of relays **43**–*a* and **43**–*b* are connected in parallel and one side of the relays **43**–*a* and **43**–*b* are connected to a short contact **56**–*a* which is engageable with disc **52**–*a* in all positions except when the gap **53**–*a* is adjacent it. The other side of the relay coils **43**–*a* and **43**–*b* are connected to a short contact **56**–*b* which is engageable with the disc **52**–*b* in all positions except when the gap **53**–*b* is adjacent it.

A suitable voltage source, as for example, 28 volts D. C. has its positive side connected to a second contact **57**–*a* which engages the disc **52**–*a* at all times. The negative side of the voltage supply is connected to a contact **57**–*b* which engages the disc **52**–*b* at all times. This switching arrangement closes the armature circuits of the relays **43**–*a* and **43**–*b* at any time when both contacts **56**–*a* and **56**–*b* engage their respective discs **52**–*a* and **52**–*b*. When only one of the contacts **56**–*a* or **56**–*b* engages its respective disc the relay circuits are not closed.

A circuit for controlling three switches is illustrated in Figure 5. The switches are designated generally as **21**–*a*, **21**–*b* and **21**–*c*, and an additional disc **58**–*a*, **58**–*b* and **58**–*c* is mounted on the same shaft with the discs **52** so that they turn together. The discs **58** have a broken portion and a gap **59**. One side of each relay coil **48** is connected to the positive terminal of a suit-

able voltage source and the other side **49** of each relay coil is connected, respectively, to contacts **56** which engage the discs **52** at all times except when the gap is in line with them.

The negative side of the voltage source is connected to wiper contacts **61**–*a*, **61**–*b* and **61**–*c* respectively, which engage the discs **58** at all times except when the broken portion is opposite them. Second wiper contacts **62** and **63** respectively, are mounted adjacent each disc **58** with the contacts **62** of a length such that they engage the discs **58** except when the gap **53** or the open portion is opposite them. The contacts **63** engage the discs **58** at all times except when the open portion is opposite them.

The contacts **62**–*a*, **63**–*b* and **57**–*c* are connected together. The contacts **63**–*a*, **57**–*b* and **62**–*c* are connected together. The contact **62**–*b* is connected to contacts **57**–*a* and **63**–*c*.

This circuitry has the characteristic that when any pair of the knobs **14**–*a*, **14**–*b* or **14**–*c* are moved away from the home position corresponding to that shown in Figure 5 the relays **43**–*a*, **43**–*b* and **43**–*c* will be energized and allow the switches and the knobs to return to a home position. It is to be realized, of course, that the knob being manually adjusted will not return to a home position because it is held by the operator, and after all other switches have returned to the home position it will stay in the new set position when released.

It is seen that this apparatus provides means for taking control at any one of a plurality of positions. When any of the control knobs **14** are rotated the controlled element is actuated. The switches **25** may be connected to a suitable electrical control circuit which positions the shaft to control the transmitter, as for example, an auto-positioner such as described in Patent No. 2,476,673. The connections for switches **25** are not shown because they are shown in detail in the referenced patent. Reference may be made to this patent for a detailed description. A number of control circuits may be used and the one discussed in Patent No. 2,476,673 is used as an example only.

Although this invention has been described with respect to particular embodiments thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention as defined by the appended claims.

We claim:

1. A switch adapted for use with other switches and which will return to a home position at any time any of the other switches are moved away from the home position comprising, a first base plate rotatably supporting a first shaft, a control knob attached to one end of said first shaft, a lever arm attached to said first shaft, a second shaft, a second plate rotatably supporting the second shaft, a toothed stop-wheel connected to said second shaft, a pawl engageable with said toothed stop-wheel and pivotally supported by said second plate, an electromagnetic relay connected to said second plate and engageable with said pawl, a flexible means connected to said second shaft to spring bias it for one direction of rotation, and a second lever arm connected to said second shaft and engageable with said first lever arm.

2. A control switch which returns to a home position when any other control switch is moved away from the home position comprising, three end plates, a first shaft rotatably supported by the first plate, a control knob at one end of said first shaft, a first lever arm attached to said first shaft, a second shaft rotatably supported by the second and third end plates, a toothed stop-wheel mounted on said second shaft, a pawl pivotally supported by the second end plate and engageable with the toothed stop-wheel, a second lever arm attached to the second shaft and engageable with the first lever arm, a coil spring mounted about said second shaft between the second and third end plates and biasing said second shaft for one direction of rotation, an electromagnetic means mounted to said second end plate adjacent said pawl and engageable therewith, and an electromagnetic control circuit connected to said electromagnetic means and said control switches.

3. A shaft control mechanism comprising, three end plates, a first shaft rotatably supported by one of said end plates, a knob connected to one end of the first shaft, a first lever arm connected to said first shaft, a switching means connected to said first shaft, a second shaft rotatably supported by the second and third end plates, a stop-wheel attached to said second shaft, a pawl pivotally supported by said second end plate and engageable with the stop-wheel, electromagnetic means connected to the second end plate and the pawl to control its position relative to the stop-wheel, spring means connected to said second shaft and said third end plate for spring biasing the second shaft in one direction, and a transverse pin attached to said stop-wheel and extending through arcuate slots formed in the second and third end plates.

4. A controlled switch comprising, first, second and third end plates connected together by suitable stand-offs, a first shaft rotatably supported by the first end plate, a knob attached to one end of said shaft, a lever arm attached to the other end of said first shaft, a second shaft rotatably supported by the second and third end plates, spring biasing means attached to the third end plate and to the second shaft so as to bias it for a particular direction of rotation, a second lever arm mounted on the second shaft and engageable with the first lever arm on the first shaft, a pawl pivotally supported by the third end plate, a toothed stop wheel rotatably supported by the second shaft and engageable with the pawl, a relay attached to the second end plate, and a pair of wafer switches with their stators attached to the first end plate and their rotors connected to the first shaft.

5. A control switch comprising, first, second, and third end plates connected together with stand-offs, a first shaft rotatably supported by the first end plate, a lever arm attached to said first shaft, a knob connected to said first shaft, a second shaft rotatably supported by the second and third end plates, a second lever arm connected to the second shaft between the first and second end plates and engageable with the first lever arm, a toothed stop-wheel attached to said second shaft, a pawl pivotally supported by the third end plate and engageable with the toothed stop-wheel, electromagnetic means mounted on the third end plate and engageable with the pawl, a spring attached to the second shaft and the second end plate to bias the second shaft to a home position, and a stop means mounted on the second end plate and engageable with the second lever arm to limit its angular motion.

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