April 24, 1951 R. H. WINCKLER 2,550,314

INTERCONNECTING MEANS FOR CONTROL DEVICES

Filed Dec. 28, 1945 2 Sheets-Sheet 1

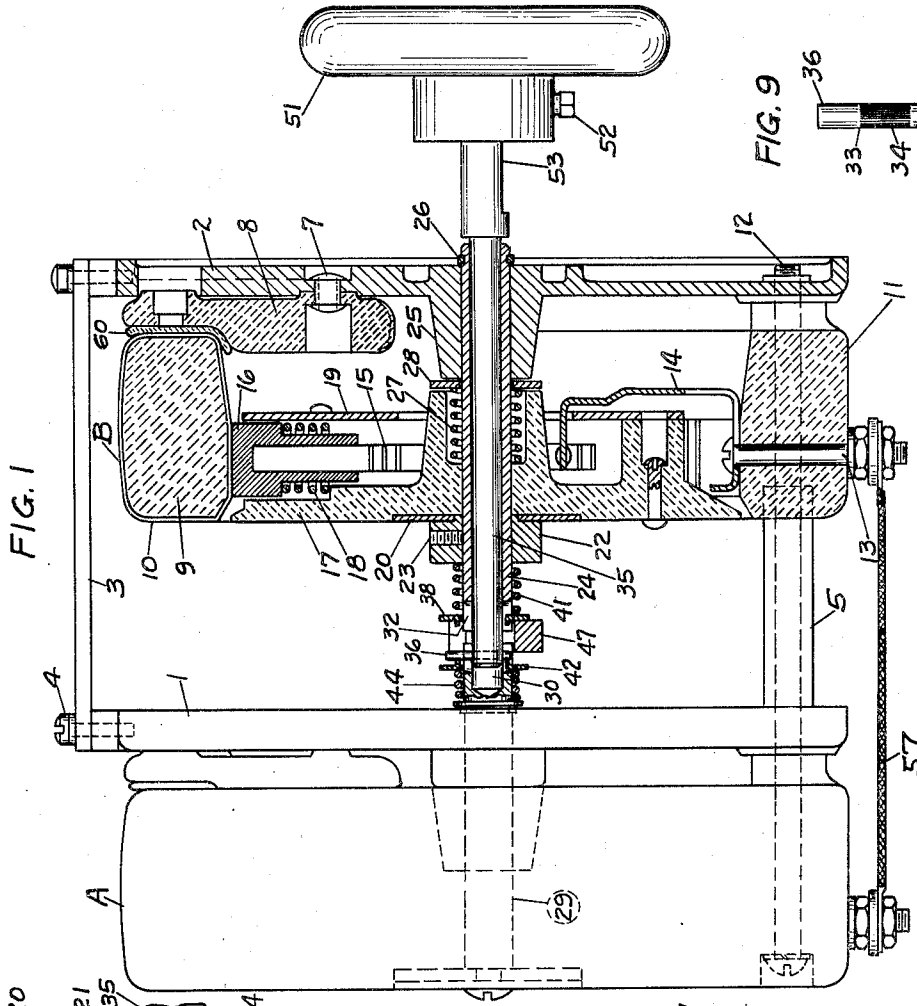


FIG. 1

FIG. 9

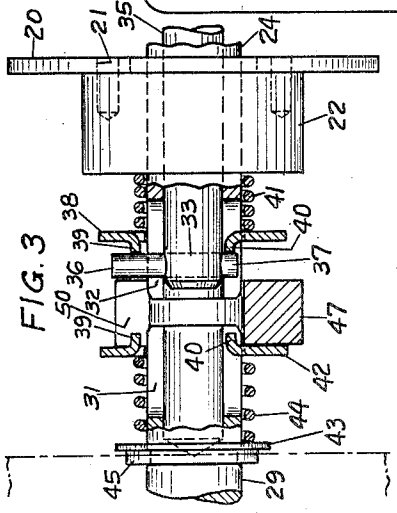


FIG. 3

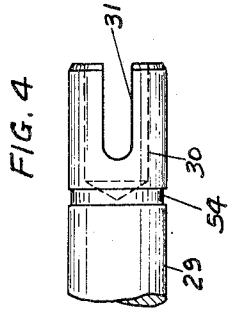


FIG. 4

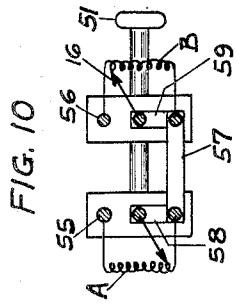


FIG. 10

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INTERCONNECTING MEANS FOR CONTROL DEVICES

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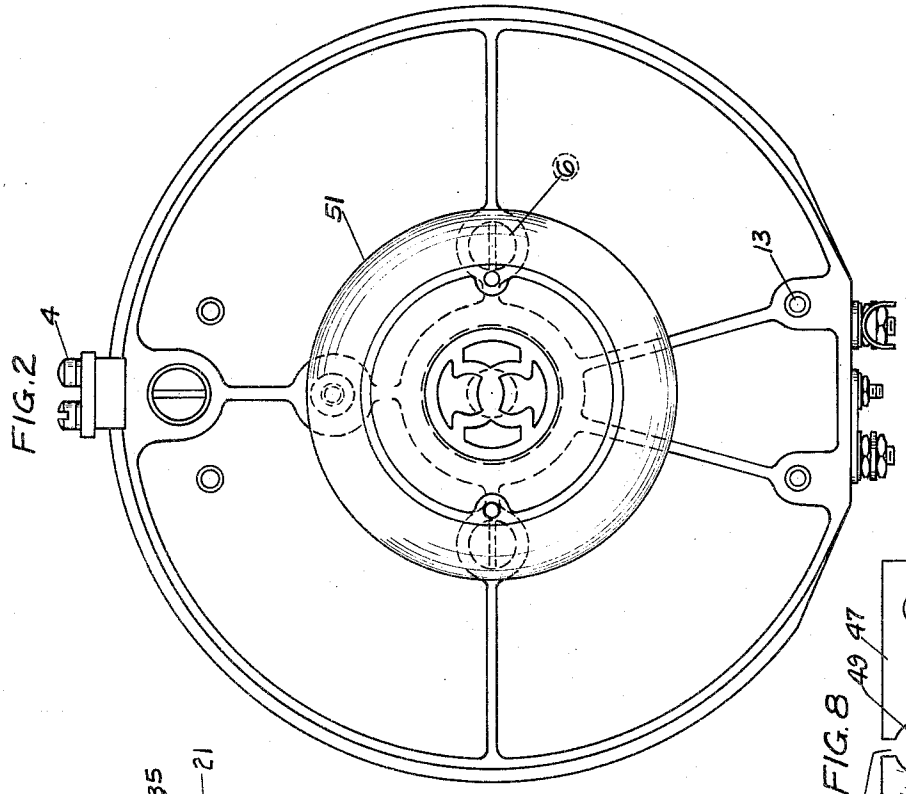


FIG. 2

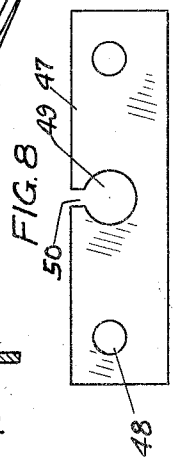


FIG. 8

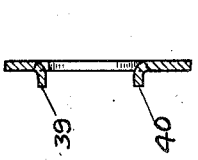


FIG. 7

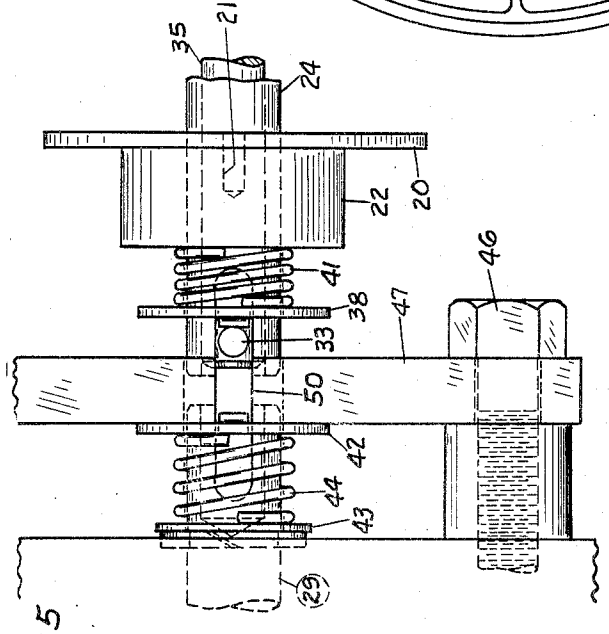


FIG. 5

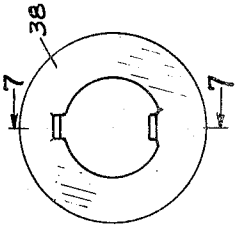


FIG. 6

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Patented Apr. 24, 1951 2,550,314

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2,550,314

INTERCONNECTING MEANS FOR CONTROL DEVICES

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Application December 28, 1945, Serial No. 637,727

17 Claims. (Cl. 201—48)

1

This invention relates to means for mounting and operating a plurality of devices or structures, in operative relationship. It is one of the objects of my invention to provide an arrangement for mounting a plurality of devices or structures in such a manner that any one device or structure may be operated entirely independent of the other by a common control or operative means. By way of illustration but not of limitation, I have chosen to illustrate the application of my invention to the mounting of rheostats.

A further object of my invention is to provide a mounting of a plurality of rheostats which may be independently operated by common means but so engaged that a definite sequence of operation must be followed for the purposes which will be hereinafter pointed out.

It is another object of my invention to provide a construction in which the rheostats may be mounted in tandem but adapted to be connected in an electrical series arrangement thereby providing a greater resistance in a smaller arcuate space on a switch board or mounting than would be required by a single rheostat to give the same electrical characteristics thereby conserving switch board or panel space. These and other objects will be clear to one familiar with these devices from a reading of the following specification taken in connection with the annexed drawings, wherein,

Figure 1 shows a pair of rheostats mounted in tandem relationship one rheostat being shown in elevation while the other is shown only partly in elevation with certain of the operating parts moved from their correct positions so as to illustrate a certain location of the operating shaft.

Figure 2 is a view of Figure 1 looking from right to left.

Figure 3 is a view of the central part of Figure 1 between the two rheostats but on an enlarged scale from that shown in Figure 1 certain of the parts being shown in section and part in elevation.

Figure 4 is a plan view of one of the shaft ends shown in Figure 3.

Figure 5 is a top plan view of Figure 3 but with the parts shown in full.

Figure 6 is a plan view of one of the members shown in Figure 5.

Figure 7 is a view on the line 7—7 of Figure 6.

Figure 8 is a plan view of the key-plate shown in Figure 5.

Figure 9 is a plan view of the driving pin shown in Figures 1, 3 and 5.

Figure 10 is a diagrammatic arrangement showing one step in the electrical connections between the two rheostats.

2

Referring now to the drawings wherein like numbers refer to corresponding parts A and B are two rheostats which are mounted in tandem relationship. The rheostat A has a mounting plate 1 connected to the mounting plate 2 of the rheostat B in a satisfactory manner as by one or more bars 3 held to the mounting plates 1 and 2 by screws and lock washers 4 and one or more spacing studs 5. The mounting plate 2 is adapted to be fastened to a support in a satisfactory manner as by mounting screws 6. Fastened to the mounting plate 2 as by means of a plurality of rivets or eyelets 7 is an arcuately formed insulator 8 preferably of ceramic material. Supported by the insulator 8 is an insulator 9 preferably of ceramic material on which is wound the resistance wire 10. A high heat resisting cement 60 is used to hold the resistance unit composed of the insulator 9 and wire 10 to the insulator 8. The insulator 9 terminates in what may be referred to as an integral connecting yoke 11 which is adapted to have a plurality of through bolts 12 which pass through both yokes 11 and the holes 13 in the mounting plate 2. The yoke part 11 has an electrical stud 13 positioned therein. The stud 13 is used to fasten a U-shaped connector 14 to the yoke part 11. Fastened to the connector 14 is a circularly wound flexible band 15 which is fastened to a suitable brush 16 preferably of the carbon metal type. The brush 16 is carried by an insulator 17 preferably of the ceramic type. A spring 18 of suitable material such as chrome-vanadium is used to hold the brush 16 in contact with the brush track on the winding 10. A retaining washer 19 preferably of mica is utilized to assist in holding the brush 16 and spring 18 in operative position. The insulator 17 has on its face a recess to receive a polygonally shaped metal plate 20. This plate is preferably square and carries a plurality of studs 21, two being illustrated in Figure 3. The studs 21 project into a block or ring 22 which in turn is fastened in any satisfactory manner as by one or more set screws 23 to a sleeve-like shaft member 24 that is supported by a bearing 25 preferably integral with and projecting from the mounting plate 2. The hollow shaft 24 is held in place in plate 2 by a split snap ring 26. A thrust spring 27 and washer 28 are utilized to hold the snap ring 26 against the end plate 2 to thereby take up any end play of the brush holder 17.

The general construction of the rheostat A is

the same as that described with respect to rheostat B except its brush shaft **29** may not be hollow like the brush shaft **24** except at its inner end as defined by the broken line **30** (see Figure 4). This inner end of the brush shaft **29** has a transverse slot **31** therein and the brush shaft **24** has a similar slot **32** therein. These slots are adapted to receive a stud or pin **33** which is knurled at **34** in order to hold it securely close to the end of operating shaft **35** which is carried by the hollow shaft **24**. The pin **33** as shown in Figure 3 has a long end **36** and a short end **37** projecting transversely from the operating shaft **35**. The long end **36** of the pin **33** extends beyond the outer periphery of the brush shaft **24** while the short end **37** is positioned wholly within the opposite side of the slot **32**. Carried on the brush shaft **24** is a disc **38** having a pair of lugs or fingers **39** and **40** projecting therefrom. From Figures 6 and 7 it will be seen that the lug **39** is further from the axial center of the disc than the lug **40**. This is so the lug **39** will contact with the long end **36** of the pin **33** while the lug **40** is positioned within the slot **32** so as to contact with the short end **37** of the pin **33**. Positioned between the disc **38** and the block **22** is a spring **41** the function of which will be directly pointed out. Carried on the end of the brush shaft **29** of rheostat A is a disc **42** which is identical with the disc **38** having the same lugs **39** and **40**. Positioned between the disc **42** and a washer **43** is a spring **44** similar to the spring **41**. The washer **43** is held in operative position to the shaft **29** by a spring snap ring **45** that sits in a groove **54** in the shaft **29**. Fastened to the end plate **1** of the rheostat A as by suitable screw studs **46** only one of which is shown in Figure 5, is a key plate **47** (see Figure 8). The plate **47** has holes **48** to receive the studs **46**. The plate **47** also has a hole **49** therein to receive the closely adjacent ends of the brush shafts **24** and **29** as is shown in Figure 5. The plate **47** has a slot **50** therein opening into the hole **49** for the purpose of allowing the long end **36** of the pin **33** to pass therethrough as well as to allow entrance of the lugs **39** of the discs **38** and **42** to enter therein for the purposes which will be described in the operation of the rheostats by the control knob **51** fastened to the operating shaft **35** in any satisfactory manner as by a set screw **52** which is adapted to engage a flat surface **53** on the shaft **35**.

Coming now to the operation of the rheostats and assuming the inter-engaging parts are in the position shown in Figure 1 it will be seen that the shaft **35** has been moved longitudinally so that the end **36** of the pin **33** is passed all the way through the slot **50** in the key plate **47** and has entered the slot **31** in the end of the shaft **29**. Also the ends of the pin **33** have engaged lugs **39** and **40** of the disc **42** thereby compressing the spring **44**. Since the pin **33** is now clear from the key plate **47** the operating shaft **35** may be turned thereby turning the brush shaft **29** and its associate brush of the rheostat A so that this rheostat may be set to control an electrical circuit to the limit of its capacity. After the pin end **36** has moved out of alignment with the slot **50** of the key plate **47** only the rheostat A can be caused to function and, if I prefer to make the winding **10** of rheostat A of lower resistance than the winding **10** of rheostat B, the rheostat A will carry a larger current which will diminish as its brush travels to the limit as shown in Figure 10 where the circuit terminals are indicated by the numerals **55** and **56**. It is in this maximum resistance position of rheostat A that is indicated in Figure 1 wherein the engagement of the operating shaft **35** is made with the brush shaft **29** as explained.

Now assuming that it is desired to cut in more resistance into the circuit the operating knob **51** is pulled in a direction away from the mounting plate **2** causing the pin **33** to move out of the slot **31** of the brush shaft **29** through the notch **50** of the key plate **47** and into the slot **32** of the brush shaft **24**. At the same time the spring **44** forces the disc **42** toward the key plate so that the lug **39** will enter the slot **50** while the lug **40** still stays in the opposite side of the slot **31** thereby locking the brush shaft **29** of rheostat A in its full resistance position as indicated in Figure 10. As the pin **33** is moved to the right, looking at Figure 1, it engages the corresponding lugs **39** and **40** on the disc **38** and compresses the spring **41** to function for the same purpose as the spring **44**. When the above described engagement has been made by the hollow brush shaft **24**, the brush **16** should be in the position of minimum resistance so that turning of the knob **51** will introduce more resistance into the circuit.

To get back to rheostat A the brush shaft **24** must be turned back to the position indicated in Figure 10 so as to bring its slot **32** in alignment with the slot **31** of the brush shaft **29** whereby the operating shaft **35** may be moved into the position shown in Figure 1.

From the above description it will be seen that I have provided an interlocking or interconnecting arrangement such that the largest current utilized in rheostat A cannot be passed through rheostat B which cannot be introduced into the circuit until full resistance of rheostat A is included therein. Furthermore, rheostat B must be substantially cut out before the full-in position of the rheostat A can be changed.

While certain of the details of the construction may be varied, these variations should come within the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A plural rheostat mounting including a plurality of rheostats arranged in tandem relationship, each rheostat having a base plate carrying a resistance unit, means for holding said base plates in operative position, at least one of said base plates having means by which it may be mounted to a support, each rheostat having a rotatable shaft carrying a brush for contacting with said resistance unit, said shafts being in axial alignment with the inner end of one terminating adjacent the outer end of the other, at least one of said shafts being hollow, an operating shaft positioned within said hollow shaft with one end extending outwardly beyond the base plate of its associated rheostat and having operative means on said extending end and means on the inner end of said operating shaft for completing an independent connection with either of said first mentioned shafts.

2. A rheostat mounting as set forth in claim 1 characterized in that said connection comprises, a pin transversely carried near the inner end of said operating shaft, and slots in the ends of said first mentioned shafts to receive said pin as said operating shaft is shifted longitudinally of its length.

3. A rheostat mounting as set forth in claim 1 characterized in that said connection comprises, a pin transversely carried near the inner end of said operating shaft, and slots in the ends of

said first mentioned shafts to receive said pin as said operating shaft is shifted longitudinally of its length and further characterized in that said adjacent ends of the first mentioned shafts have springs operating in conjunction therewith with means for controlling the action of the springs in conjunction with the movement of said operating shaft and its said pin.

4. A rheostat mounting as set forth in claim 1 characterized in that said connection comprises, a pin transversely carried near the inner end of said operating shaft, and slots in the ends of said first mentioned shafts to receive said pin as said operating shaft is shifted longitudinally of its length, and further characterized in that a fixed cross member has a clearance hole therein to receive said adjacent ends of the first mentioned shafts, each shaft end slidably carrying a disc, the discs having oppositely positioned projections, the projections of one disc extending toward those on the other disc, said cross member being slotted to allow said pin to pass therethrough to contact with said projections, the slot also acting to pass the projections on one side of the axis of the shafts, the projection on the opposite side of said axis being located in one of the slots of its cooperative shaft and springs on each of said shafts adapted to be compressed by said discs as they are moved by said pin.

5. Means for mounting a pair of rheostats so each may be independently operated by a common operating shaft having operative means attached thereto, said means including a mounting plate for each rheostat with means for fastening the mounting plate of one to the mounting plate of the other in tandem relation the latter plate having means for mounting it to a support, each mounting plate carrying a resistance unit as well as means for supporting a shaft carrying a brush to engage its resistance units, said brush shafts terminating closely adjacent each other in axial alignment, an operating shaft extending through the brush shaft of the rheostat adapted to be mounted to a support, said operating shaft having means for drivingly engaging at will the ends of either brush shaft whereby either brush shaft may be turned independently of the other.

6. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that the adjacent ends of the brush shafts are slotted while the inner end of the operating shaft has a transverse pin for entering said slots to drivingly engage either brush shaft.

7. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that the adjacent ends of the brush shafts are slotted while the inner end of the operating shaft has a transverse pin for entering said slots to drivingly engage either brush shaft and means for preventing the pin from being transferred from one brush shaft to the other until a complete rotary movement is made of the brush shaft to which the pin is engaged.

8. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that means are provided for controlling the operating shaft so that one brush shaft must be turned a full rotary movement before it can be operatively connected to the other brush shaft.

9. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that means are provided for controlling the operating shaft so that a complete sequence of operation of either brush shaft must be made before the other brush shaft can be operated as and for the purposes set forth.

10. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that one rheostat has a relatively high current carrying capacity while the other has a relatively low current carrying capacity and further characterized in that means are provided for preventing the low current capacity rheostat from being introduced into the circuit until the high current capacity rheostat is fully introduced into the circuit.

11. A pair of rheostats placed one behind the other and each having a shaft for moving a brush on its cooperative resistance unit, the shafts terminating in end to end relation, an operating shaft extending through one of said brush shafts and being slidable therein and having means located at its inner end for engaging either brush shaft end and means for limiting the engagement to only one of said brush shafts at a time and then only after a predetermined movement of the brush shaft to which the operating shaft may be connected.

12. The combination of two tandemly mounted rheostats having contact brushes movable about a common axis in contact with their respective resistance units, the brush of one rheostat being carried by an insulator fastened to a shaft hollow throughout its length, while the brush of the other rheostat is carried by an insulator fastened to a shaft having at least its inner end hollow, both shaft ends being slotted and terminating closely adjacent each other, and an operating shaft positioned within said hollow shaft with means located at the terminus of all of said shafts to allow the operating shaft to be shifted into operative engagement through the medium of said shaft slots with either brush shaft while locking the other brush shaft in the position it was in when the shift from one to the other of said brush shafts was made.

13. An arrangement of rheostats as set forth in claim 12 further characterized in that said means includes, a cross pin in the end of said operating shaft, a rigidly fixed key plate having a hole therein to receive the ends of said brush shaft, the key plate having a slot from the shaft hole to its edge to allow an end of the pin to pass therethrough, a disc carried on each brush shaft and each having a lug positioned in alignment with said key plate slot and another lug positioned in a part of the brush shaft slot and a spring to cooperate with each disc to move it into locking position with the key plate on a given longitudinal movement of the operating shaft as and for the purpose described.

14. A tandem arrangement of devices each having an independent shaft for operating a revoluble member of each device, said shafts terminating beyond their respective revoluble members in end to end spaced relationship on the same axial center line, at least one of said shafts being hollow throughout its length, a driving shaft positioned within said hollow shaft and extending beyond its length for longitudinal and rotary movement therein and having a single operating means at its outer end for executing both of said movements and means located at the opposite end of said driving shaft between said devices for completing an independent driving connection with either of said first mentioned shafts.

15. Means for mounting a pair of rheostats as set forth in claim 5 further characterized in that the adjacent ends of the brush shafts and the inner end of the operating shaft have co-

operative slot and pin arrangements to drivingly engage each other and means for preventing such engagement being transferred from one brush shaft to the other until a complete rotary movement is made of the brush shaft to which a prior engagement has been made.

16. A pair of devices positioned one behind the other and each having an independent shaft for moving a revoluble member of said devices, the shafts terminating in end to end spaced relation, a driving shaft extending through one of said first mentioned shafts and being slidable therein and having means located at its inner end for engaging either of said first mentioned shafts and means for limiting the engagement to only one of said first mentioned shafts at a time and then only after a predetermined movement of the first mentioned shaft to which the driving shaft may be connected.

17. A pair of devices positioned one behind the other and each having an independent shaft for moving a revoluble member of said devices, the shafts terminating beyond their respective revoluble members in end to end spaced relation, a single driving shaft extending all the way through only one of said first mentioned shafts and being slidable therein and having means located directly on and at its inner end for directly drivingly engaging at will the ends of either of said first mentioned shafts whereby either of these shafts may be turned independently of the other.

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