Oct. 27, 1936. H. BROADWELL 2,058,561

GAIN CONTROL REGULATOR

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FIG. 1

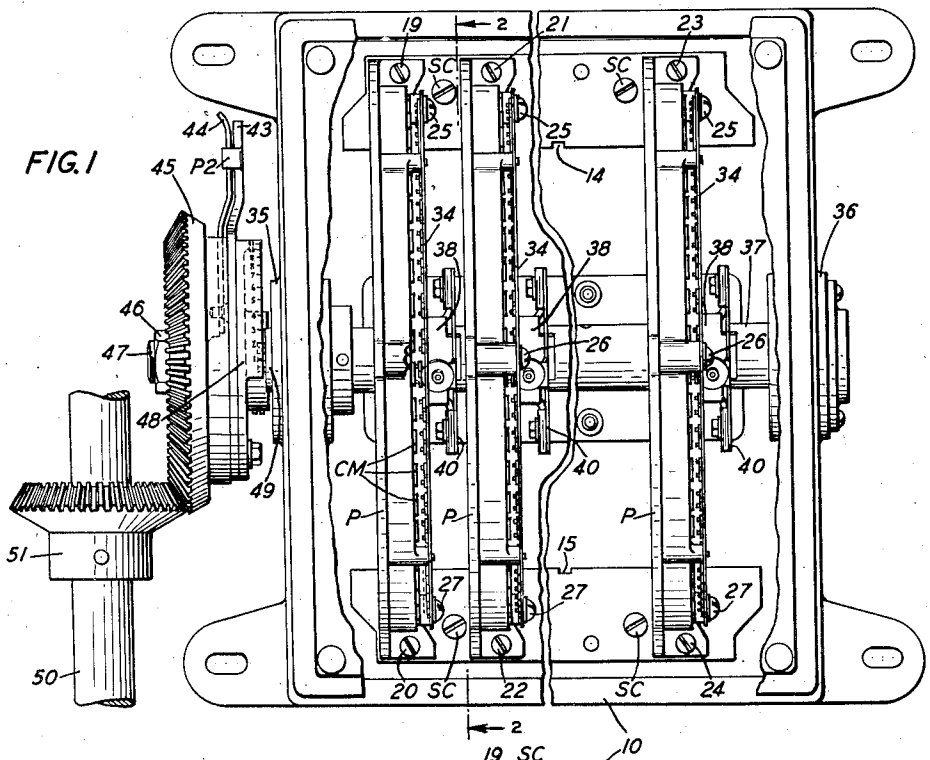

FIG. 2

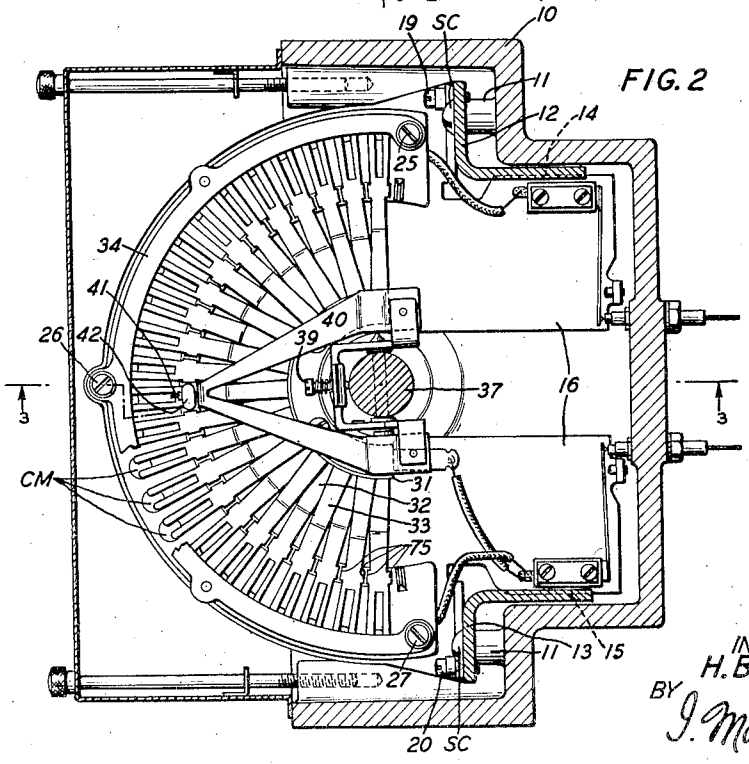

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FIG. 3

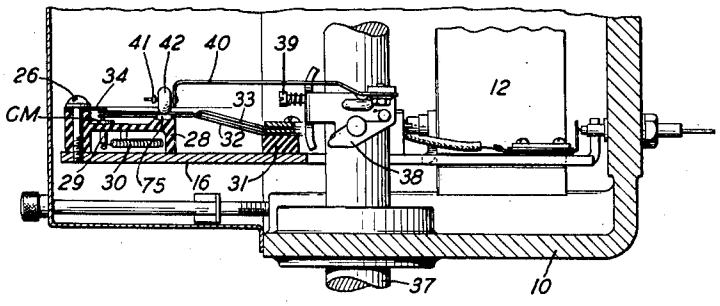


FIG. 5

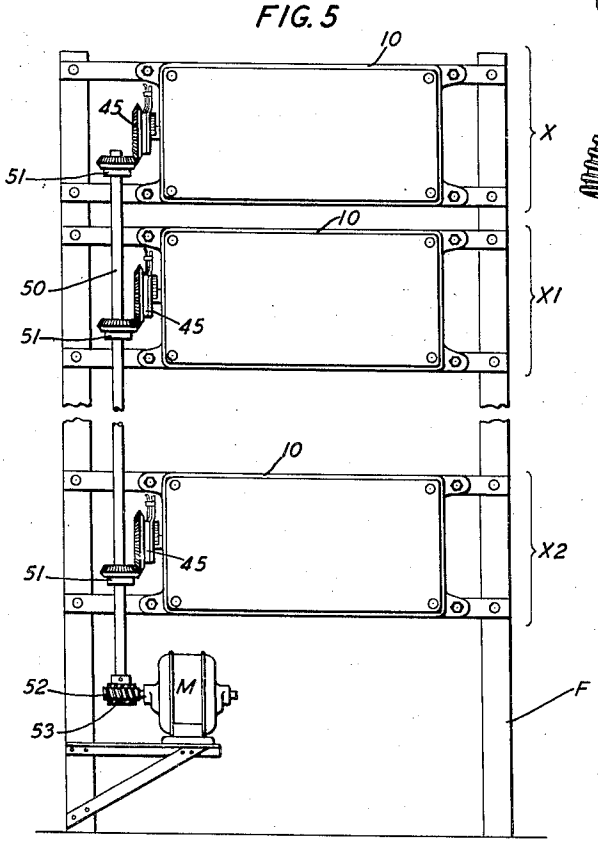
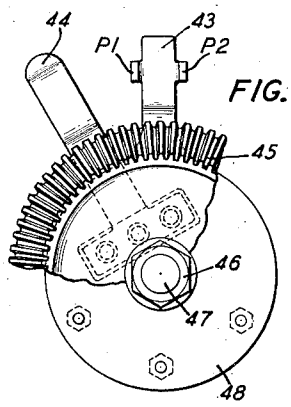


FIG. 4



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2,058,561

GAIN CONTROL REGULATOR

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Application September 11, 1935, Serial No. 40,088

2 Claims. (Cl. 201—48)

This invention relates to arrangements for maintaining constant the transmission level of a transmission circuit, and more particularly to a motor driven regulator for such systems, and its object is to provide a device of this character which will be simple, cheap to manufacture, easy to assemble, and efficient in operation.

The device of this invention is designed for use in a system such as disclosed in Patent No. 1,918,390 to E. I. Green.

A feature of this invention consists in the provision of a series of resistances mounted in molded arcuate mountings, the terminals of which are adapted to be engaged by radially extending contact springs pressed into engagement with the terminals by an operating arm, the engaged pressure of which is adjustable so as to ensure proper closure of the contacts without damage to the unit. Preferably the contacting fingers are of a short heavy type to prevent side sway and are provided with means engageable with the molded arcuate mounting, if necessary, to prevent overstraining when depressed by the operating roller arm. The roller arm is mounted on a V-shaped spring secured to a saddle or frame which straddles a shaft and is held loosely thereon by a shoulder pin retained in place by a spring clip. The saddle is made slightly narrower than the shaft and is sprung into place to eliminate play due to variations. An adjustable screw is mounted in the top of the saddle, and its end rests against the shaft when the roller arm is under tension. This arrangement of pivot pin and screw provides the equivalent of a three point support which, when the roller is under tension automatically produces a rigid arm free from shake even when a large amount of initial play is present in the parts, and by turning this screw with an ordinary screw drive inserted down between the units the saddle is rotated slightly on its pivot pin, thus increasing or decreasing the pressure of the roller against the finger springs beneath. This arrangement eliminates bending of the spring for tensioning purposes, which is difficult and especially impractical when the units are mounted on close centers as in this type of apparatus.

Another feature consists in the provision of means for permitting hand rotation of the shaft without disturbing the position of the roller arms of the other resistance units on the same frame for testing purposes.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto, reference being had to the accompanying drawings in which

Fig. 1 is a front assembly view of a group of resistance units showing a number of operating parts with portions cut away;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view of a resistance unit taken on line 3—3 of Fig. 2;

Fig. 4 is a front view of a clutch mechanism for operatively connecting and disconnecting the driven shafts from the driving shaft, the clutch being shown in disengaged position; and

Fig. 5 is a front elevation view showing the driving connections of a plurality of groups of resistance units in assembled relation on an upright support.

As shown in the drawings, 10 is a rectangularly shaped casing portion having integrally formed therewith a number of bosses 11 shown in Fig. 2 for mounting the angle bars 12 and 13 which are held securely thereon by a number of screws SC. The bars 12 and 13 are provided with a plurality of cooperating notches 14 and 15 for receiving registering parallel portions 16 of a number of semi-circular shaped plates P for readily locating them in equal spaced and in right-angled relation to the shaft as shown in Fig. 1, and also preventing snagging which would result in an improper registration of the two contact springs with their associated posts 62 when mounting the resistance unit in place. These plates are held securely on the angle bars 12 and 13 by respective sets of screws 19—20, 21—22 and 23—24, while the casing 10 and the angle bars 12 and 13 may be made of any desired length for receiving any number of plates P.

On each plate P is securely mounted as by similar screws 25, 26 and 27 an arcuate channel shaped mounting 28 of insulating material for mounting a semi-circular row of contact members, such as CM, each provided with a terminal portion 29 shown in Fig. 3 connecting with a plurality of resistance devices 30.

On plates P and in concentric relation with the arcuated mounting 28 there is secured a block 31 of insulating material shown in Figs. 2 and 3 provided for mounting two semi-circular rows of superposed contact springs 32 and 33 formed in a comb-like punching and extending radially in engageable relation with the contact points CM on the arcuated mounting 28 but normally tensioned for abutment with the underside of a plate 34 held on the insulating mounting 28 by the screws 25, 26 and 27, these contact springs being fork shaped at their free ends and each prong provided with a contact point for engaging a

common terminal CM. There are four comb-like punchings per unit. The fingers of each upper disposed punching **33** are offset a definite amount to shorten them slightly compared with those below to compensate for their higher position in the pileup, thus permitting the use of one finger stamping die in place of two for the entire unit.

Casing **10** is provided at each end with bearing portions **35** and **36** provided for journaling shaft **37** in concentric relation with the insulating mounting **28** and on this shaft are pivotally mounted similar brackets **38** for movement at right angles with respect to the turning movement of shaft **37**, through the adjustment of screws **39**, shown in Figs. 2 and 3, and on each of these brackets is mounted a V-shaped spring arm **40** provided at its free end portion with a stud **41** for mounting a roller **42** for successively engaging the springs **32** and **33** with the contact points CM upon the rotation of shaft **37**, correct contact pressure being automatically determined by setting the screws **39** to exert a predetermined pressure value on the roller arms **40**. Two finger springs will be depressed simultaneously when the roller moves to a position between adjacent springs, thus providing a "passing" contact condition. The dimensions of the contact springs and roller arm spring are suitably worked out so that even under extreme conditions of commercial variation in thickness of the roller arm spring, suitable contact pressure, even with two contact springs depressed, will be provided without overstrain of the roller spring or excessive roller tension, when the roller pressure is adjusted to its predetermined value. The springs **32**, **33** are made short and relatively heavy with leaders **75** (Fig. 2) extending downward at an angle to ensure proper engagement of the spring by the roller. Projections are provided on the molded mounting under the roller engaging portions of the contact springs which limit, if necessary, the motion of the springs to prevent overstraining. A clutch arm **43** having at its free end portion two laterally extending prongs P1 and P2 is securely mounted on one end of each shaft **37** and extends radially therefrom for engaging with a spring arm **44** carried by a bevel gear **45** loosely mounted on the extreme end of shaft **37** and held against lateral movement thereon by a nut **46** engaging the threaded portion **47** of this shaft, a scale **48** shown in Figs. 1 and 5 being provided for indicating in conjunction with an index **49** the position of the arms **40** with respect to their associated contacts CM.

The gears **45** of resistance groups X, X1 and X2 shown in Fig. 5 are operatively connected to a common driving shaft **50** through gears **51** and this shaft is actuated by a motor M through a gear reduction mechanism which may take the form of a worm **52** on the armature shaft of the motor and a worm gear **53** secured at the end of driving shaft **50**.

In a typical example of operation, the movement of shaft **50** through the operation of the motor M under control of a regulating mechanism (not shown) is effective to rotate the shafts **37** of resistance groups X, X1 and X2 for moving the spring arms **40** of each group successively on their associated rows of contact springs 32 and 33 for engaging the contacts CM and thereby cutting in and out of the circuits the resistance **36** connected to the terminal portions **29** of contacts CM, the screw **39** being adjusted as to force the arms **40** against the contacts **32** and **33** so as to obtain the proper pressure of the contact springs on the contacts **29**. The arm **44** carried by the gear **45** may be disengaged from the arm **43** so as to disconnect the driven shaft **37** of any one of the groups X, X1 and X2 from driving shaft **50** as to permit the individual manual movement of the disconnected driven shaft for the adjustment of the operating parts and the testing of the contacts, resistances and associated circuits while permitting the operation of the arms in the other resistance groups under the control of the motor M. Removal of any one of the supporting plates P from the casing portion **10** is effected by removing its fastening screws **19—20** or **21—22** as the case may be without the breaking of any soldered connections since electrical connection from the resistance is effected by springs **60** and **61** mounted on the parallel portions of plate P and engaging the terminals **62** and **63** secured to casing portion **10**, this casing having portions such as **64** and **65** for receiving the screws **66** and **67** serving for securing the complementary casing portions **68** as shown in the drawings in order to effectively prevent dust reaching the contacts and other operating parts of the device.

What is claimed is:

1. In a resistance device, a mounting plate having a pair of parallelly disposed arms, a casing, a pair of bars mounted in parallel relation in said casing and having corresponding grooves for engaging the opposite edges of said arms for readily locating said plate in adjusted relation on said bars, movable and stationary contacts mounted on said plate, a rotatable shaft, and means carried by said shaft for successively operating said movable contacts.

2. In a resistance device, a group of resistances, terminals therefor, a series of radial contact springs adjacent thereto, a roller for engaging said springs with said terminals, a V-shaped spring mounting for said roller, a saddle to which said spring is secured, a shaft on which said saddle is mounted and held rotatably thereon by a pivot pin passing through an opening on the shaft, and an adjusting screw passing through the saddle and engaging the shaft.

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