

Oct. 22, 1946.

S. J. ELLIOTT ET AL.

2,409,617

SIGNAL DISTRIBUTOR

Filed July 18, 1942

2 Sheets-Sheet 1

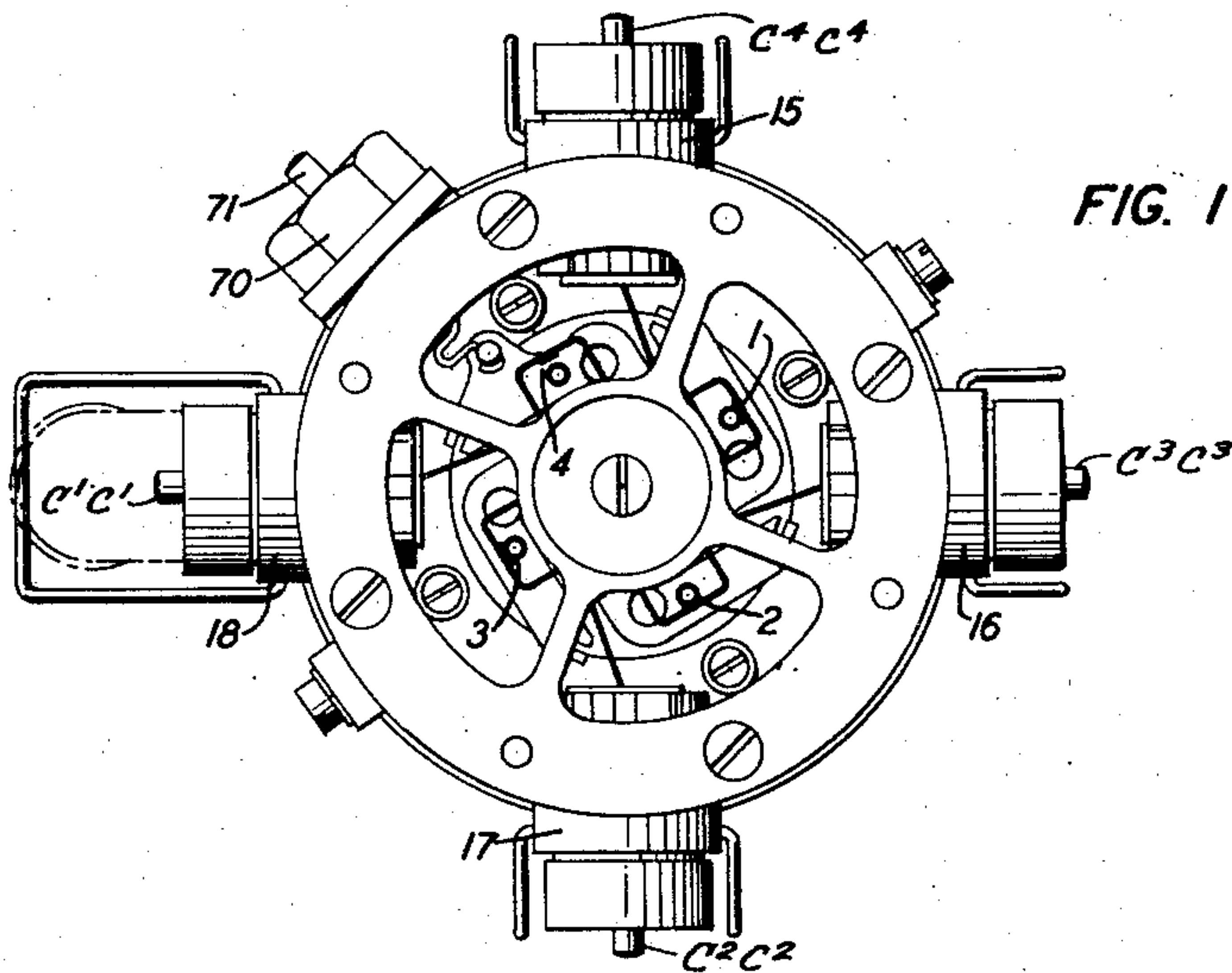


FIG. 1

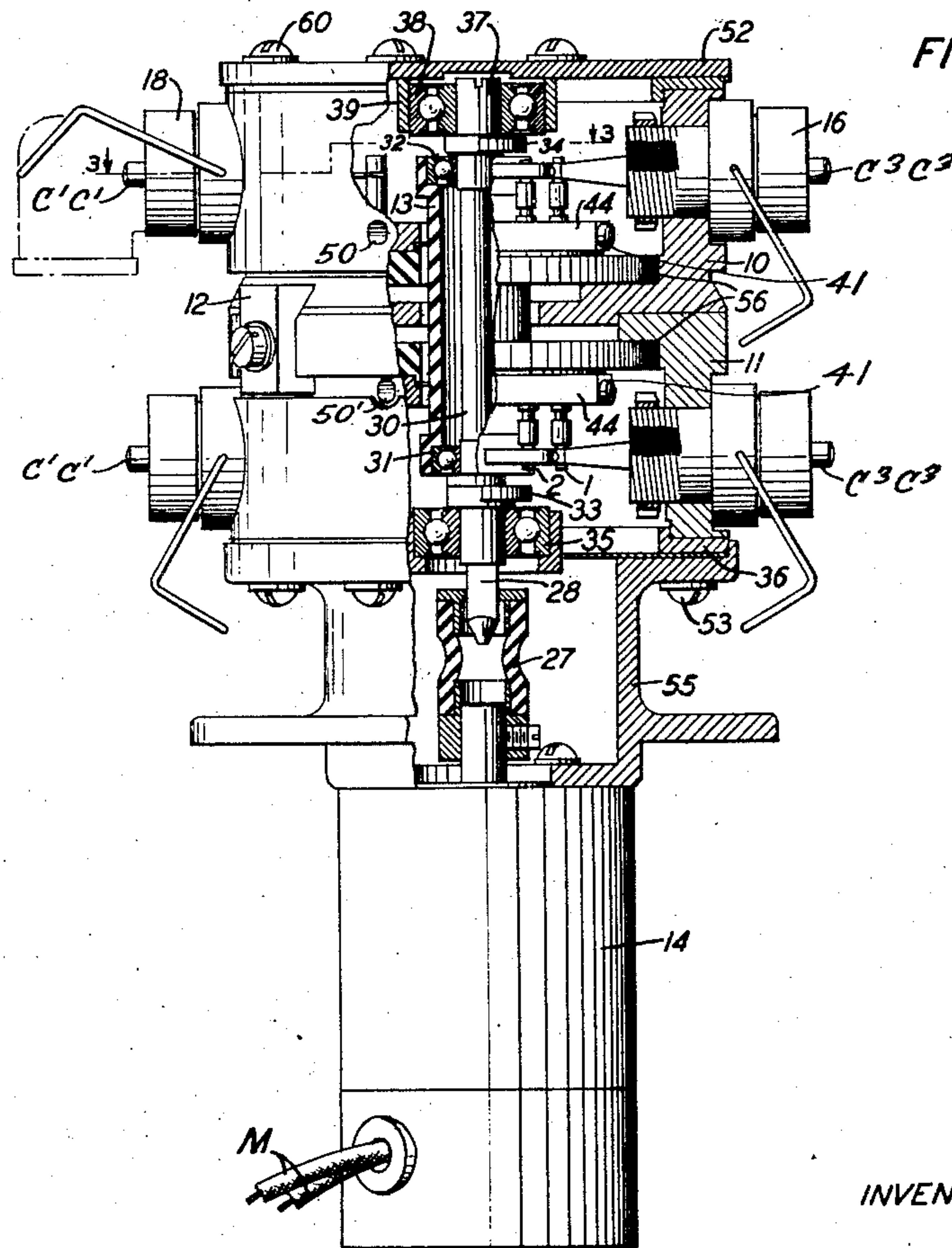


FIG. 2

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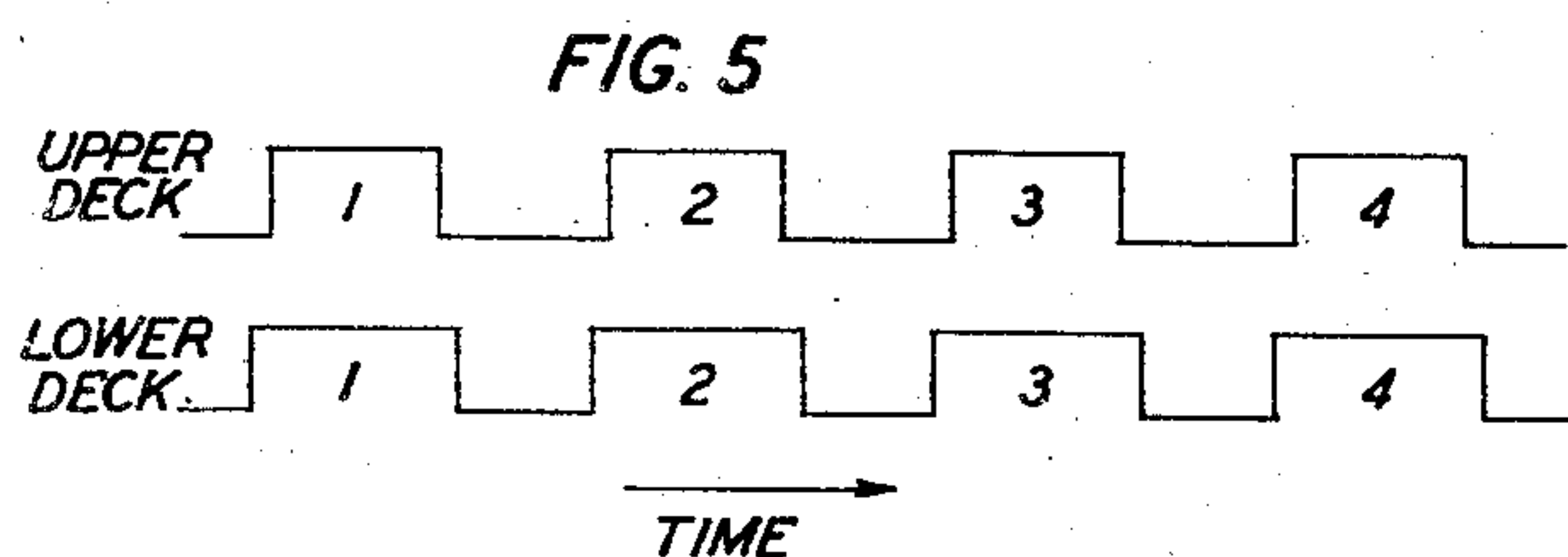
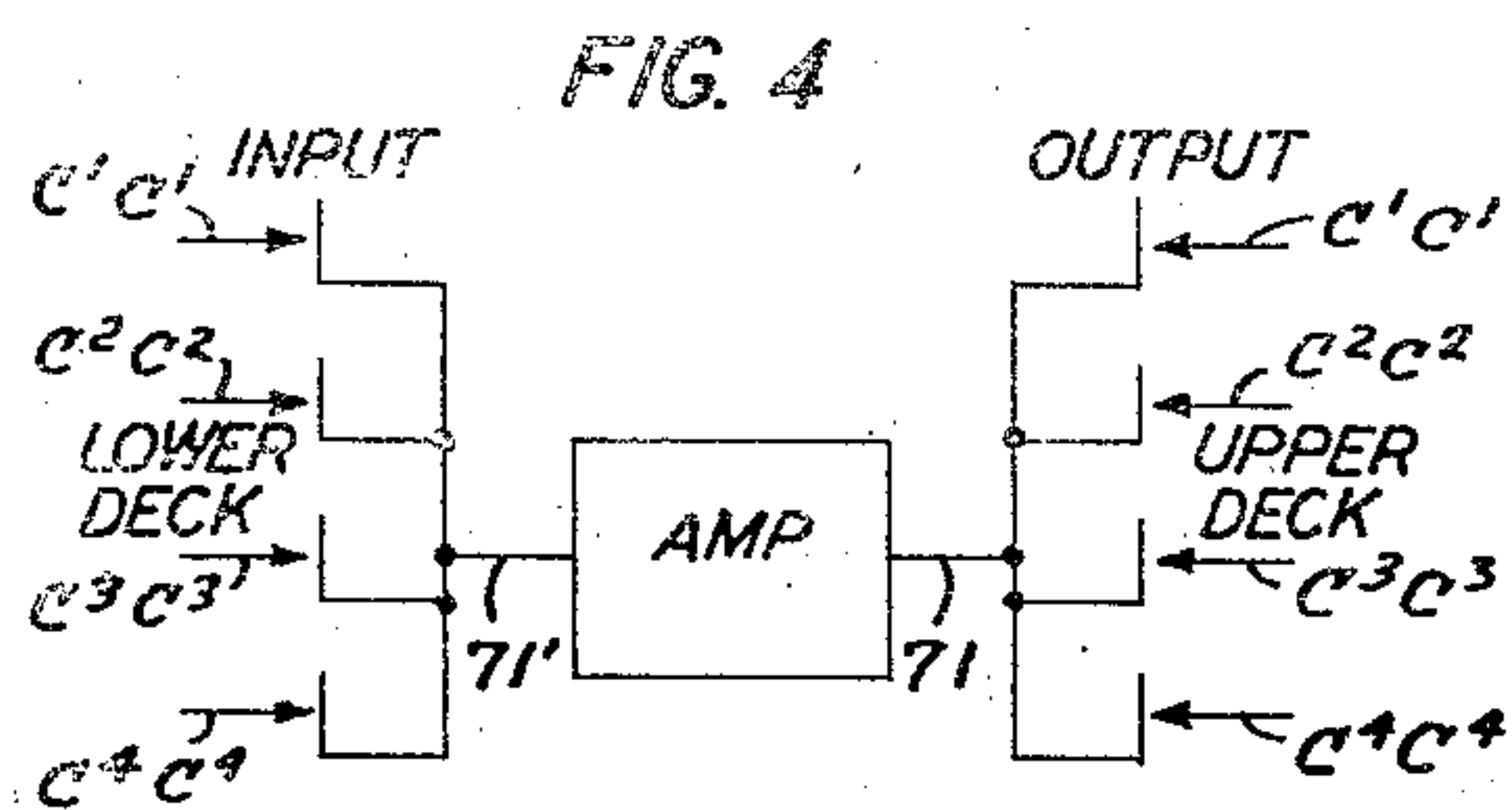
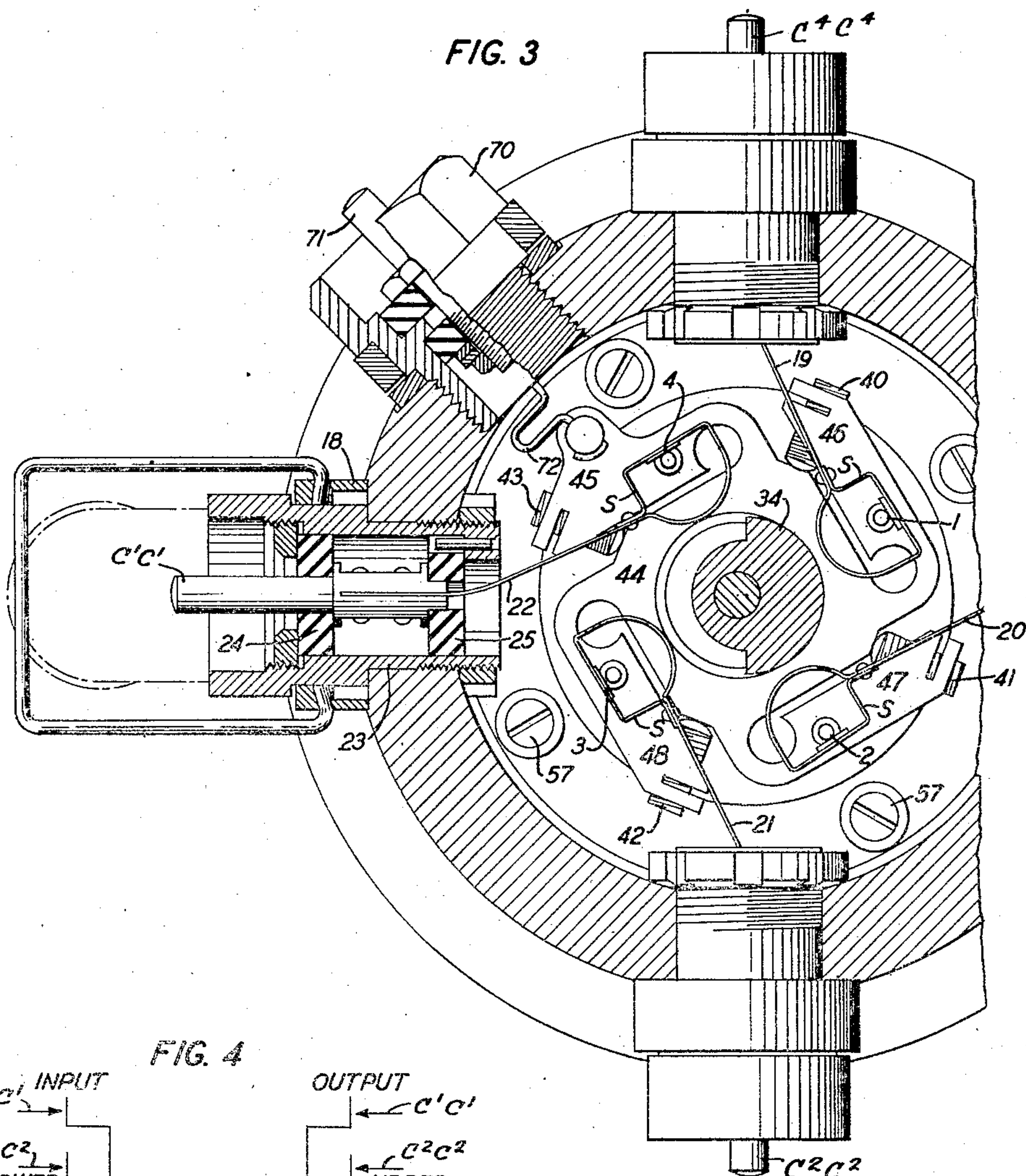
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2,409,617

SIGNAL DISTRIBUTOR

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Application July 18, 1942, Serial No. 451,506

6 Claims. (Cl. 200—30)

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This invention relates to signal distributors, and particularly to devices of that character which are associated with radio receiving equipment.

The object of the invention is to provide an efficient low capacity signal distributor particularly adapted for use in association with the receiving circuits on interceptor airplanes provided with equipment to transmit radio signals which are reflected back from other airplanes to the interceptor planes and thus furnish information as to the location of such airplanes. The device, however, is of general application.

A feature of the invention is the provision of means for preventing chatter of the contact springs of the signal distributor, which springs are rapidly actuated to make and break the radio signal receiving circuit.

Another feature is the provision of means for permitting adjustment of the contacts without the necessity of dismantling the device.

Other features will appear from the detailed description and the appended claims.

In the drawings:

Fig. 1 is a plan view of the device;

Fig. 2 is a side view partially in section;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 illustrates a circuit arrangement with which the switch may be used; and

Fig. 5 is a view to show the relative closures and openings of two sets of contacts in the circuit arrangement.

Referring now to the drawings, Fig. 2, 10 and 11 indicate a pair of housings, 10 indicating the upper housing and 11 indicating the lower housing. This pair of housings or casings is secured together by clamps 12. These casings house two sets of similar equipment; that is, each housing contains four pairs of contacts, the four pairs in the upper housing 10 being indicated by the numerals 1, 2, 3 and 4, Figs. 1 and 3. The housings also contain other equipment for performing the necessary operations to open and close these contacts as required to receive the radio impulses. Of the four pairs of similar contacts 1, 2, 3, and 4 in the lower housing 11, only two can be seen in the figures, Fig. 2. These two are indicated by the numbers 1 and 2. These two sets or decks of four pairs of contacts as they will hereinafter be called, are rapidly actuated by a sleeve member 13, Fig. 2, preferably of hard rubber, which is eccentrically mounted with respect to the shaft assembly 28, 37. This sleeve is driven by an electric motor mounted in casing 14, as will be later described in detail. The leads

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to the motor are indicated at M. The lower four contact pairs 1, 2, 3, 4, which for convenience will hereinafter be called the lower deck contacts, Fig. 5, serve to selectively connect the four receiving antenna circuits on the airplane to an amplifier, Fig. 4. The upper four contact pairs 1, 2, 3, and 4, which for convenience will hereinafter be called the upper deck contacts, serve to connect the output of the amplifier to a suitable indicating device, this connection being made selectively and synchronously with the lower deck contacts. The lower deck contacts are closed shortly before the upper deck contacts, Fig. 5, and the lower deck contacts are opened shortly after the upper deck contacts have opened. When so operated, noise in the output circuit, which otherwise would be caused by switching the antenna circuits in and out, is prevented from reaching the indicating equipment, since due to this arrangement the indicating circuits are not connected to the amplifier when the antenna circuits are being connected and disconnected.

The specific construction and arrangement of the two decks of contacts 1, 2, 3, 4 by means of which we have succeeded in eliminating contact chatter will now be described.

The four socket assemblies 15, 16, 17, and 18, Fig. 1 on the upper housing which support the contact springs 19, 20, 21, and 22 are similar coaxial conductor sockets. The four socket assemblies on the lower housing are similar. Referring, for example, to socket 18 of the upper housing shown in detail in Fig. 3, this socket comprises a metal sleeve member 23 containing two insulating washers 24, 25, which support a stud 26 having a slot into which the contact spring 22 of contact 4 which may be of Phosphor bronze, is forced and anchored by rivets. Each spring has its free end looped back on itself and riveted to the body portion of the spring as shown. It is essential that these loops be formed substantially as shown, that is, that the side s be straight in order to give maximum stiffness to the structure. We discovered that this is the construction which eliminates chatter. If the side s is not straight the spring chatters when rapidly actuated by the sleeve 13. By having the side s straight, a condition is approached, due to not working the member in bending but in compression, that maximum stiffness or rigidity is attained. We prefer to so shape the spring as to have as nearly as possible three straight sides with sharp radii, that is, to approach a rectangular form. We discovered that no chatter occurs

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on the make or break of springs constructed and mounted in this manner even at high speeds of rotation of the sleeve 13 which actuates the four sets of contacts of each deck. Although the shaft of motor 14, through the coupling 27, drives the shaft 28 at a high rate of speed, for example 1,800 revolutions per minute, the sleeve 13 itself which actually engages the looped portions of the springs of the upper and lower contact sets actually rotates very slowly in the opposite direction on its ball bearing mounting, and effects the make and break of the contacts 1, 2, 3, 4 by a reciprocating motion due to the following construction: A shaft 30 of hard rubber carries the sleeve 13 also of hard rubber. Ball bearings 31, 32 are provided, their outer races secured to the sleeve 13 and their inner races to the shaft 30. The ends of shaft 30 fit into eccentrically located apertures in members 33, 34. The lower member 33 is integral with shaft 28. Intermediate shaft 28 and member 33 is a ball bearing 35 mounted in a bearing plate 36. The upper member 34 is integral with a member 37 which has a ball bearing 38 in bearing plate 39. Since the shaft 28 and upper bearing shaft 37 are central and the apertures for shaft 30 are eccentric, it will be evident that the sleeve or cam 13 has a reciprocating motion, as pointed out above, which results in four makes and breaks of the upper and lower deck contacts for each revolution of the shaft 28 which is driven by the motor.

We also provide an arrangement whereby the closed period of each contact can be adjusted independently from outside the casing even when the signal distributor is running, which facilitates adjustment operations. In the signal distributor the contacts are all normally closed. The contact force may be defined as the minimum force required to open the closed contacts when there is clearance between the contact springs and the sleeve or cam 13. The arrangement for adjusting the upper deck contacts can be best seen in Fig. 2. A similar arrangement is provided for the lower set. Each housing 10 and 11 contains a phenol fibre insulating disc 56, Fig. 2, and on each disc is secured a plate 44 of Phosphor bronze secured to said disc by screws. The screws 57 for the upper plate 44 may be seen in Fig. 3. The plate 44 carries the upper four contact studs, which may be of brass, with which the loops of contact springs 19, 20, 21, 22, Fig. 3, respectively, normally engage. Four hexagonal socket set screws 40, 41, 42, 43, Fig. 3, mounted in tapped holes in the ends of arms 45, 46, 47, and 48 are accessible through holes 50, Fig. 2, in the upper housing 10. These screws bear against the body of plate 44. By turning them in and out by a suitable tool inserted in the sockets through the openings in the housing 10 the radial positions of the stud contacts may be altered.

A precisely similar arrangement is provided for adjusting the contacts 1, 2, 3, 4, in the lower housing 11. The holes in the lower housing 11 are designated 50'.

As shown schematically in Fig. 4, the four antennas hereinbefore mentioned are connected to the central coaxial conductors associated with the lower deck contacts two of which conductors are shown structurally in Fig. 2 and designated C¹C¹ and C³C³. The other two diametrically opposite central coaxial conductors C²C² and C⁴C⁴ associated with the lower deck contacts cannot be seen in Fig. 2. The four central coaxial conduc-

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tors associated with the lower deck contacts are a part of the four input circuits from the four antennas respectively.

As shown in Figs. 1, 2 and 4, a similar arrangement is provided for the output circuits from the amplifier, the four central coaxial conductors C¹C¹, C²C², C³C³, C⁴C⁴ shown structurally in Fig. 1, being associated with the upper deck contacts.

As shown in Fig. 4, the four input central coaxial conductors C¹C¹, C²C², C³C³ and C⁴C⁴ associated with the lower deck contacts 1, 2, 3, 4 are successively connected by said contacts 1, 2, 3, 4 to conductor 71' and thence to the amplifier. The output circuit of the amplifier, connected to conductor 71, is successively connected by contacts 1, 2, 3, 4 of the upper deck to the four central coaxial conductors C¹C¹, C²C², C³C³, C⁴C⁴ and thence to the indicating devices.

When it is desired to have access to the equipment in the upper housing 10, it is merely necessary to remove the screws 60 which secure the cover 52 to the upper housing. When it is desired to have access to the equipment in the lower housing, it is merely necessary to remove screws such as 53, which secure the upper and lower housings to the mounting assembly plate 55 and elevate the entire unit, the shaft 28 being thus removed from the hose coupling 27.

As described, the shaft assembly which carries the eccentrically mounted contact actuator consists of a shaft 30 of hard rubber, the sleeve or contact actuator 13 of hard rubber, the ball bearings 31, 32 for the sleeve, and a pair of members 33, 34 which have the off-center apertures for the shaft 30. The members 32, 34 are provided with counterbalancing weights to prevent vibration; that is, to balance the rotating structure. This shaft assembly is cheap to manufacture and efficient in operation.

The base coupling shown is of soft gum vulcanized rubber and eliminates critical adjustments and reduces vibration.

What is claimed is:

1. In a signal distributor, a series of stationary contacts, a series of movable contacts engaging said stationary contacts, each of said movable contacts being in the form of a resilient spring anchored at one end and having its free end looped back on itself and anchored to the body portion of the spring and a contact actuating member adapted to engage said loops in succession to force them out of contact with the respective stationary contacts.

2. In a signal distributor, a series of contact studs arranged in a circle, a series of movable contact members in the form of resilient springs, anchored at one end and having loops at the other end normally engaging said contact studs, and a member mounted eccentrically and adapted to open said contacts in succession by forcing said loops out of contact with said studs.

3. In a signal distributor, a series of contact studs, a series of movable spring contact members normally engaging said studs, said members being anchored at one end and having loops at their other ends, each loop having a number of substantially straight sides, and means for successively forcing said members out of contact with said studs.

4. In a signal distributor, a series of contact studs, a series of movable contact members in the form of flat springs anchored at one end and having their free ends bent back on themselves and secured to the body portion of the spring to form loops normally engaging said studs, the por-

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tions of the loops adjacent the secured ends being substantially straight.

5. In a signal distributor, a series of contact studs, a series of movable contact members in the form of flat springs having their free ends bent back and anchored to the body portions of the springs to provide a substantially rectangular loop, and means for actuating said members to force said loops out of contact with said studs.

6. In a signal distributor, a series of contact studs arranged in a circle, a series of movable

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contact members of resilient spring metal anchored at one end and at their other ends being formed in substantially rectangular loops which encircle and engage said studs, and an actuating member to successively force said loops out of contact with said studs.

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