

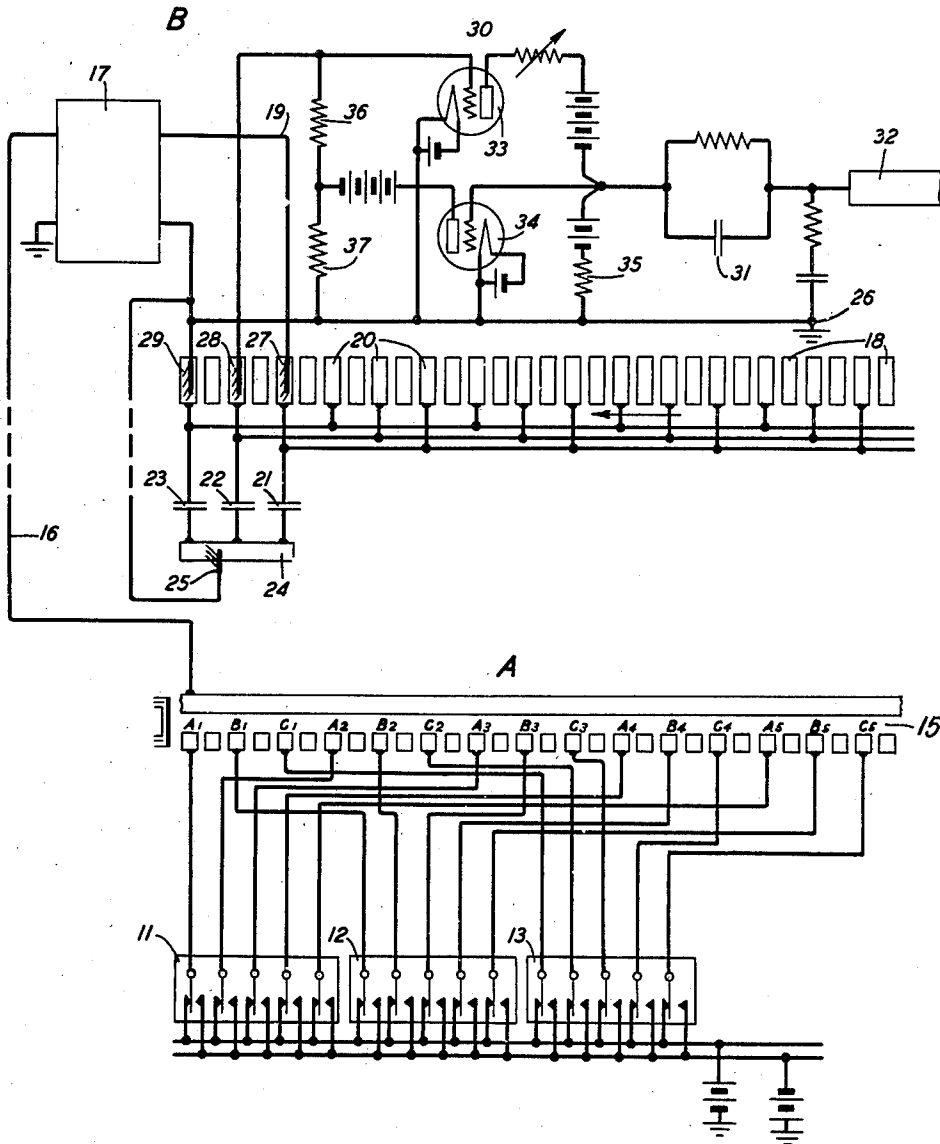
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TELEGRAPH REPEATING SYSTEM

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TELEGRAPH REPEATING SYSTEM

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6 Claims. (Cl. 178—70)

This is a substitute application for my former application, Serial No. 487,220, filed October 8, 1930.

This invention relates to impulse transmission systems and more particularly to telegraph systems employing commutators for repeating signals.

An object of the invention is to permit adjustment of brushes on a rotating distributing device during operation.

Another object is to provide a rotary distributing device wherein storing condensers may be built within the structure of the device.

Another object is to provide a simplified and economical distributing device for repeating signals.

It is a growing practice in telegraph transmission to employ rotary distributors for repeating signals wherein contacting brushes are each arranged to rotate at high speed over a segmented ring to successively complete a series of circuits. These brushes which ordinarily are of a fine wire or metal leaf type are subjected to considerable wear. The contacting brushes are recognized as most probable sources of trouble in a rotary distributor. Straggling or loose wires to which the brushes are liable will cause much trouble. The failure of a brush to make proper contact as it passes over the segments will obviously interfere with the correct reception or transmission of currents and signals. The ends of interconnected brushes must be kept in a straight line when viewed along the edges so that they may engage a particular segment at the same instant. Adjusting screws are usually provided on the brush supports or holders whereby the angle of the brush with respect to the face of the distributor and the pressure thereon sufficient to give a good contact may be readily determined. The brushes, therefore, require frequent attention and when such brushes are of the rotatable type it is necessary to stop the operation of the brush in order that any adjusting to it may be made.

According to the present invention these difficulties are overcome by replacing the distributor by a rotating commutator wherein the contacting brushes are always stationary except for any slight orientation that may be desired. With this arrangement slight adjustment of the brushes may be made at any time without stopping the rotating commutator. The commutator is shown adapted to a repeater station in a multiplex telegraph system wherein signals are repeated by means of storing condensers built in the structure of the commutator, three condensers being the minimum required to effect satisfactory operation. The commutator is provided with alternately "live" and "dead" bars of suitable relative lengths. These bars are ar-

ranged in three groups respectively connected to the three condensers. Three brushes are provided to successively engage the commutator bars and are arranged to perform separate functions, namely, to receive and store an incoming impulse on each condenser in rotation, to repeat the stored impulse over an outgoing line and to effect the discharge of the condenser before a second impulse is received by it. The charging, repeating, and discharging circuits are completed over a slip ring mounted on the shaft of the commutator. A circuit may be connected intermediate the condensers and the outgoing line for compensating for any distortion introduced in the signals by the commutator or condensers.

The accompanying drawing schematically illustrates an embodiment of the invention.

Referring to the single figure of the drawing, stations A and B represent the originating and repeating points respectively in a high speed submarine cable telegraph system. Transmitters 11, 12 and 13, which are shown as the tape operated type, are connected through a three-channel multiplex rotary distributor 15 to the line 16, the impulses of one transmitter being interleaved with those of each of the other transmitters for transmission over the line. The signal impulses are received at repeater station B in a regenerating or amplifying device represented diagrammatically by block 17, wherein they are reproduced and amplified and then impressed over conductor 19 onto a commutator 18.

The commutator 18 and the distributor 15 are shown developed for the purpose of illustration. The commutator is designed to rotate in the direction indicated by the arrow.

The distributor 15 is shown provided with fifteen pairs of segments to correspond to the five unit impulse code of the three transmitters 11 to 13 inclusive, it being understood that the system selected for illustration is arranged to send 50% marking signals. However, the commutator 18 is provided with thirty alternate "live" and "dead" contact bars, the "live" bars 20 being arranged to receive the middle portion of the incoming signal impulses. The commutator 18 and distributor 15 are arranged to operate in synchronism and, therefore, as the commutator rotates from right to left as indicated, each of the commutator bars 20 will in turn receive an incoming impulse over conductor 19.

The "live" commutator bars are interconnected to form three groups which are respectively connected in the manner shown to three condensers 21, 22 and 23, three being the minimum required to effect satisfactory operation. The condensers are also connected to a slip

ring 24 mounted on the shaft of the commutator. The brush 25 which is in continuous engagement with slip ring 24 is connected to ground at point 26. The "dead" commutator bars are connected to an electrical ground, not shown, and serve as buffer members.

Brush 25 and brushes 27, 28 and 29, the latter brushes being positioned in engageable relation with commutator bars 20, are stationary with respect to the commutator bars and are therefore always accessible for adjustment during the operation of the commutator.

Brushes 27, 28 and 29 are positioned to respectively engage three alternate commutator bars simultaneously, brush 27 causing an incoming impulse to be stored on one of the condensers 21, 22 and 23, brush 28 causing a previously stored charge on another of the condensers to be impressed on the distortion corrector device 30 of the output circuit, and brush 29 effecting the discharge of the third condenser in readiness to receive a new charge when brush 27 engages the next commutator bar. The charging and the discharging, in two steps, of each condenser is effected in consecutive order as the "live" commutator bar connected thereto is engaged by the three brushes in rotation.

The charges released by brush 28 are impressed on the output circuit through the distortion corrector circuit 30, sending condenser 31 and cable 32. When it is desired to operate a vacuum tube at high power efficiency, it is necessary that the load impedance be matched to the impedance of the tube and that any added resistance be very small or eliminated entirely. The characteristic of the circuit will become more and more curved up to a definite limit as this resistance is reduced, thereby introducing considerable distortion in the output signal wave. The distortion introduced in the signal wave by the considerable decrease in the vacuum tube output circuit impedance is reduced by superimposing a compensating voltage on the signal voltage in the grid circuit of the amplifier tube 33. The compensating voltage is produced by a second or compensator vacuum tube 34 which has its grid circuit and its plate circuit respectively connected in series with the plate circuit and the grid circuit of the amplifier tube 33. The compensating voltage is derived from the potential drop caused by the plate current flowing through the resistance 35 and this potential drop is effective to set up a corresponding voltage change on the grid of tube 34. In this way the output current of tube 34 is superimposed on the signal voltage in the input circuit of the amplifier tube 33 to make the plate current-input potential characteristic of the amplifier circuit symmetrical on both sides of the operating point of the input voltage.

The grid circuit resistance 36 and 37 of the distortion corrector circuit 30 are of comparatively high values in order to prevent the signaling charge on any of the condensers 21, 22 and 23 from discharging at the time the signal is being repeated to the cable 32.

This invention is not limited to the circuit disclosed herein but is understood to have application to other arrangements without deviating from the scope of the appended claims. Other distortion corrector circuits suitably

adapted for use in systems of the present type, wherein vacuum tubes are operated at high power efficiency directly into the cable are described in more detail in the applicant's copending application Serial No. 293,815, filed July 19, 1928.

What is claimed is:

1. An impulse transmission system comprising a circuit arranged in sections, a distributing device, contact elements for said device, impulse storing elements, means whereby said storing elements are successively connected in each of said sections, characterized in this, that one of said contact elements is arranged to store in each of said storing elements in rotation the impulses received from one of said circuit sections, another to repeat said stored impulses over the other of said circuit sections, and another to effect the discharge of said storing elements.

2. An impulse transmission system comprising a circuit divided into sections, a rotating device for repeating impulses from one circuit section an another, a plurality of storing elements, and a plurality of stationary contact elements in engageable relation with said device for successively storing on each storing element an impulse received from one of said circuit sections, repeating said stored impulses over another of said circuit sections and effecting the discharge of said storing element before another impulse is received by it.

3. An impulse transmission system comprising a circuit arranged in sections, a rotating distributing device having a segmented periphery, the segments of said periphery being interconnected to form separate groups, impulse storing elements respectively connected to said groups of segments, and stationary contact elements in engageable relation with said segments, one of said contact elements being arranged to store the impulses received from one of said circuit sections on said storing elements, another to repeat the stored impulses over the other of said circuit sections, and another to effect the discharge of each storing element before another impulse is received by it.

4. An impulse transmission system, in accordance with claim 2, wherein the rotating device includes a commutator having contact bars connected in multiple groups and arranged to rotate into contact with the plurality of stationary contact elements in a continuous operation, each of said multiple groups being connected to one of said storing elements whereby said storing elements are successively actuated into engageable relation with each of said stationary contact elements.

5. An impulse transmission system, in accordance with claim 2, wherein the plurality of storing elements comprise three condensers connected to different sections of the circuit through said rotating device.

6. An impulse transmission system, in accordance with claim 2, wherein the stationary contact elements are adjustably arranged brushes, one of which stores the impulses incoming from one circuit section, another repeats the impulses to another circuit section and another completes the discharge of the storing element upon which the incoming impulse is stored.

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