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ERNEST A. FALLER AND EDWARD E. KLEINSCHMIDT, OF BROOKLYN, NEW YORK, ASSIGNORS, BY MESNE ASSIGNMENTS, TO MORKRUM-KLEINSCHMIDT CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

METHOD OF AND DEVICE FOR TRANSMITTING ELECTRIC IMPULSES.

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It is old in the art of electric transmission of intelligence to use a plurality of separate movable elements, such as small balls, for integrating combinations representing signals. In order to differentiate between the signal impulses, the make-and-break in electric circuits, the marking and spacing in telegraph circuits, balls of different kinds, preferably of two kinds, were employed, for instance, balls of conducting and non-conducting materials, or of magnetic and non-magnetic materials, or of different size, to accomplish the desired results.

Complicated arrangements were required to utilize the balls, special means for disintegrating the combinations of balls after use, for separating the same in the constituent kinds and finally returning the same in such separate conditions for re-use.

Devices of this general kind are adapted for use in calling systems, fire alarm systems, messenger call systems, printing telegraph systems, or various other means for transmitting intelligence, in which a series of electric impulses are sent from a transmitting to a receiving station.

The present invention is useful for all the foregoing purposes and various other key-controlled, automatic-controlled and similar apparatus and is characterized by a plurality of independent movable like elements, or of a single kind, such as metal or other balls, marshaled in single file in a single channel, and by proper selecting mechanism integrated in a plurality of channels, though still maintaining the single file arrangement. They are then conveyed to a contact device, at which the balls in any or all of the separate channels, may be utilized for operating one or more electric contact or other devices. A device according to the foregoing statement is of extreme simplicity, and can be of remarkable reliability of operation and is capable of manifold use.

According to the number of plural lines along which the single file of elements is conveyed at the transmitting station, electric contact devices may be actuated by the elements for controlling one or more electric circuits over which electrical impulses are sent, some of one polarity and some of the other, or of different characteristics,

each signal being distinguished from other signals by a particular permutation of the impulses. At a distant station these impulses are caused to act upon appropriate receiving mechanism for controlling the final operation of various devices as, for instance, a printer in printing telegraphy.

The drawing illustrates the invention in a most simple form, but shows separation of elements along two lines only. Fig. 1 is a sectional view of one embodiment, showing part of the device diagrammatically, Fig. 2 is a longitudinal section of the storage channel holding the elements in plural lines, Fig. 3 is a horizontal cross section on line 3—3 of Fig. 1, Fig. 4 is a perspective detail of one of the integrating slides and Fig. 5 is a plan view of a pocket in the take-off device, showing one of the elements before being conveyed to the contact operating lever.

Description.

A tube or other container 10 holds a stock of balls or elements 11, of a single size and preferably of the same material, conducting or non-conducting, magnetizable or non-magnetizable, and arranged or marshaled preferably in single file, though they may be kept in a hopper promiscuously, but conveyed to the selecting bar or slide 12 consecutively and singly. This bar is capable of reciprocating movement within a distance substantially equal to twice the diameter of a single ball. Permutation or selecting bars and slides of this type are well known, as for instance, in United States Letters Patent Nos. 946,372 and 1,392,609. A flange 13 is provided with an opening 14 adapted to register with the open end of the tube 10 and of a size to loosely hold one of the balls 11. A plurality of slides may be superimposed one upon the other, to permit the integration of balls in groups corresponding to the number of slides.

A receiving or storage tube 15 is arranged with its upper end substantially in register with the lower end of the tube 10. The tube 15 is provided with ribs or fins 16 on two opposite sides, thereby forming a double channel 17 and 18, of a joint diameter of less than the diameter of two balls, so that each of them is large enough to receive a ball 11, but not large enough to em-

brace the entire ball, and the balls located in one channel slightly extend into the adjacent channel, whereby successive balls are always in contact with each other and their arrangement in single file is maintained, though the balls may be located in either or both of the channels so that the balls in one channel act as spacing means for the balls in the other channel.

A receiving wheel or drum 19 is located at the lower end of the storage tube 15 and rotatable in the direction indicated by the arrow. It is provided with pockets 20 having an incline 21 and comprising adjacent pocket portions 22 and 23, adapted to hold a single ball 11 at one or the other side of the pocket 20.

A bell crank lever comprises an operating arm 24 biased by resilient means, as the helical spring 25, and capable to be moved by means of the balls when being passed by the rotating wheel 19 under the free end of the arm. The arm 24 is so arranged that it is affected only by the balls located in one pocket portion, for instance 22, of the wheel 19, and not affected by the balls located in the other pocket portion 23.

The second arm of the bell crank consists of a contact tongue 26, adapted to move between, and make electrical contact with either of the contact points 27 or 28. The contact tongue 26 may be provided with means for producing yielding contact with the contact points, or these means may be arranged on the contact points. A battery 29 is preferably connected to ground and to the contact tongue 26, though any other connection may be made between the battery, the ground and the transmission line.

Operation.

The balls 11 are marshaled in single file and single line in tube 10, the first or lowest ball being located in the flange opening 14 of the slide 12, and normally resting on the fins 16. The selecting bar 12 is then moved back or forth so as to register its opening 14 with either of the channels 17 or 18, and a ball 11 held by the flange 13 is permitted to drop in either of the channels. The movement of the bar 12 may be controlled by any well known mechanism such as shown in the above mentioned Letters Patent, suitable to arrange the balls in combinations representing predetermined signals or telegraphic symbols. One set of such predetermined signals may be based upon the well known Baudot telegraph code in which each letter of the alphabet, or other signal, is characterized by a certain group of marking and spacing impulses. In the present invention the marking impulses are represented by the balls located in one of the channels and the spacing impulses by those in the other channel. The balls of both channels are then

successively delivered to the receiving wheel 19 and deposited in one or the other of the branch pockets of the wheel. Instead of a wheel, an endless chain or a rotating disc may be provided with suitable pockets or other means for receiving the balls from the storage tube. The balls representing the marking impulses are caused to actuate the operating lever 24 and, in turn, make and break the circuit at the contact points 27 and 28. The electrical impulses so created are then sent over the line to the receiving station to be utilized thereat in any desired manner.

The balls deposited in the branch pocket and not acting upon the operating lever 24, have no effect except serving as spacing means between the impulses. Arrangements can, however, be made that additional operating levers are provided for being acted upon by these balls and, according to the number of channels, two or more, a variety of signals may be produced, based upon any of the characteristics of electric currents or any two of the possible electrical conditions present on a circuit terminal, namely positive potential, negative potential, or no potential.

The balls 11, after having caused the operation of arm 24, resulting in the breaking of the electric circuit leading from ground through battery 29, contact tongue 26 and either of the contact points 27 or 28 to line, are returned to the container 10 by being held in the wheel pockets by the shield 30 and moved within the container by pressure of the balls delivered in succession. There may be a sufficient number of balls to entirely fill the container 10 between the point of delivery from the pocket wheel 19 to the sliding bar 12 or any other arrangement may be made to provide an ample supply of used balls for the integrating slide.

The storage tube 15 may be of sufficient length to store any desirable number of groups of balls representing signals and the periods of integrating and of transmitting signals may be timely separated, as the signal traffic may require.

The characteristics of current impulses may not only include difference in polarity, but also difference in current, in pressure, in frequency, etc.

What is claimed as new, is:—

1. Apparatus for transmitting electrical impulses comprising contact carrying means, contact operating means, a plurality of paths of movement in each of which said contact operating means may be caused to move in a manner to cause variable operation of said contact carrying means, and means for selectively compelling movement of said contact operating means into one or the other of said paths in accordance with the nature of the impulses to be transmitted.

2. The combination as set forth in claim 1 in which said contact carrying means comprises a single contact.

3. The combination as set forth in claim 1 in which the contact operating means comprises a plurality of separate and distinct members.

4. The combination as set forth in claim 1 in which said contact operating means are balls of uniform size.

5. The combination as set forth in claim 1 in which said paths are so arranged that movement of said operating means in one of said paths will cause actuation of said contact carrying means, and movement of said operating means in another of said paths will not actuate said contact carrying means.

6. The combination as set forth in claim 1 in which said contact operating means comprises a plurality of separate like members, and in which said paths are in overlapping relation so that said members must move past said contact carrying means in successive and fixed order.

7. The combination as set forth in claim 1 in which said plurality of paths are of sufficient length between said selectively compelling means and said contact carrying means to effect the storing of a plurality of code combinations of said contact operating means.

8. The combination as set forth in claim 1 in which said selectively compelling means comprises permutation means for compelling movement of said contact operating means into said actuating and said non-actuating paths in permutations of equal numbers whereby successive code combinations of electrical impulses are transmitted.

9. The combination as set forth in claim 1 together with means for moving said contact operating means past said contact carrying means at a uniform rate, and independently of the speed of operation of said contact compelling means.

10. The combination as set forth in claim

1 together with means for moving said contact operating means past said contact carrying means at a uniform rate, and a single path into which said contact operating means are discharged and returned to said compelling means after being carried past said contact carrying means.

11. In a transmitter, a single path through which a plurality of separate like members are fed in contact with each other successively to a control means; a second path in which said members are adapted to be positioned by said control means to transmit an electrical condition, and a third path in which said members are adapted to be positioned by said control means to transmit a differing electrical condition.

12. The combination as set forth in claim 11 in which the last mentioned paths overlap so that the members in both paths are in contact and maintained in successive order.

13. A subcombination comprising a selectively actuated ball setting member, a tube for feeding a plurality of balls to said member in successive order and a pair of paths into either of which said balls are adapted to be shifted by said member.

14. The combination as set forth in claim 13 in which said paths overlap so that the balls are compelled to pass through the same in successive order.

15. A transmitting device comprising contact carrying means and rotary member for carrying a plurality of selectively positioned actuating balls past said contact carrying means in successive order, a single tube through which said balls are discharged from said rotary member and fed to the selectively positioning means, and a plurality of paths in which said balls are selectively positioned by said last mentioned means and fed to said rotary member.

Signed at Brooklyn, in the county of Kings and State of New York, this 8th day of December 1921.

ERNEST A. FALLER.

EDWARD E. KLEINSCHMIDT.