Sept. 13, 1938. Y. WATANABE 2,130,166

AUTOMATIC TELEGRAPH RECEIVING MACHINE

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Fig. 1.

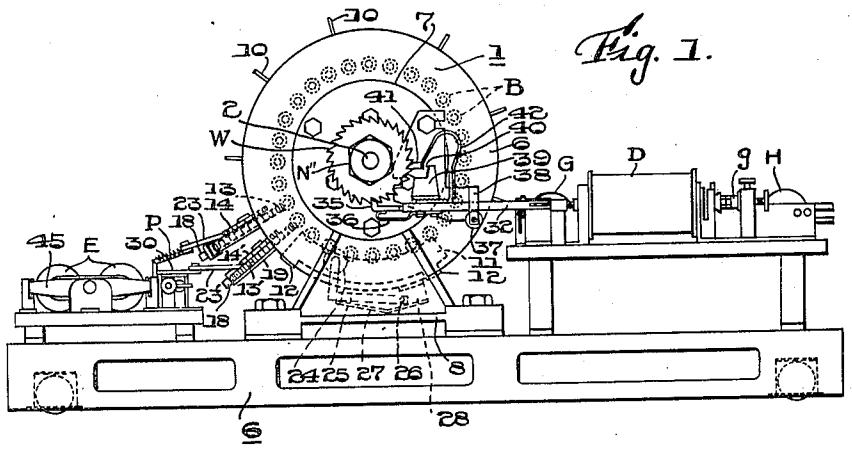


Fig. 2.

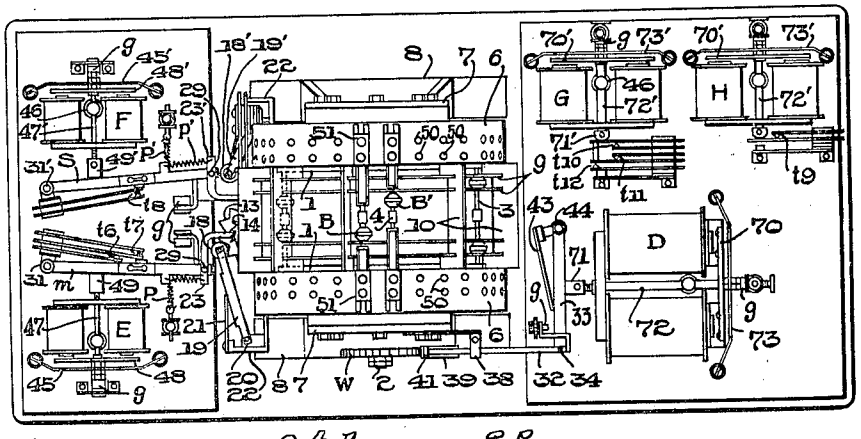


Fig. 10

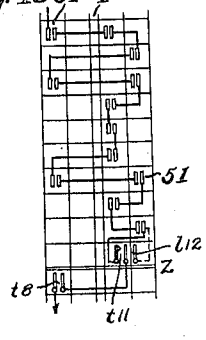


Fig. 9.

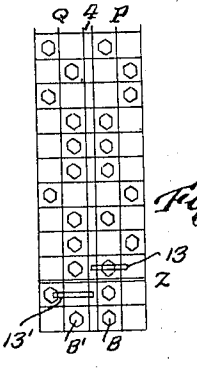
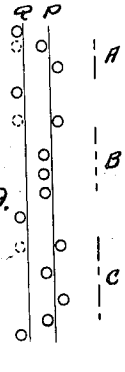


Fig. 8.



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Fig. 4.

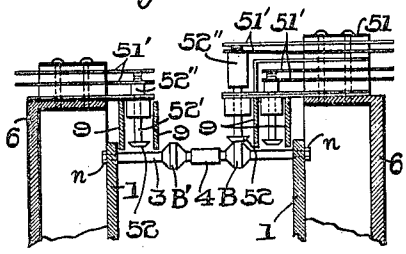


Fig. 3.

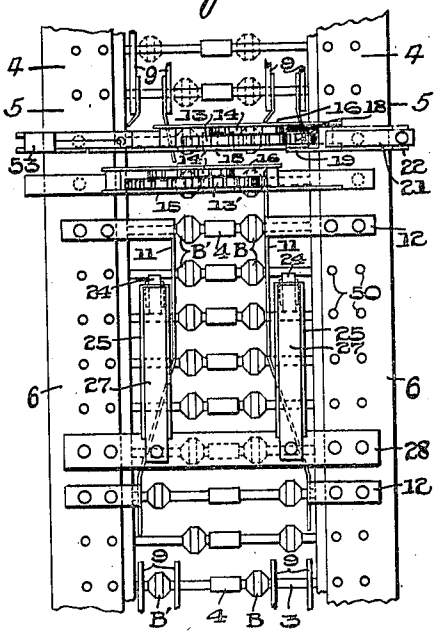


Fig. 6.

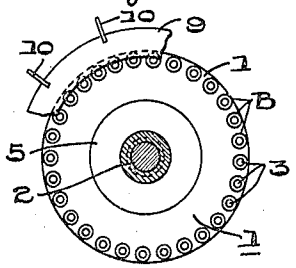


Fig. 7.

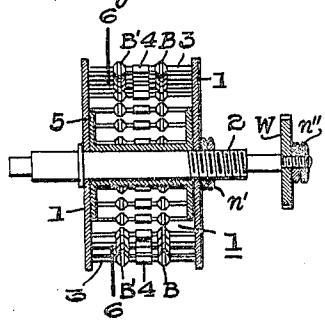
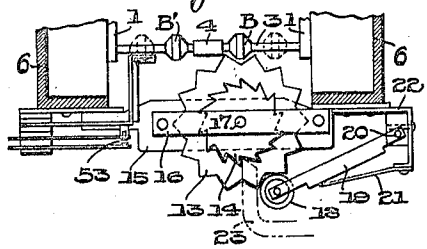


Fig. 5.



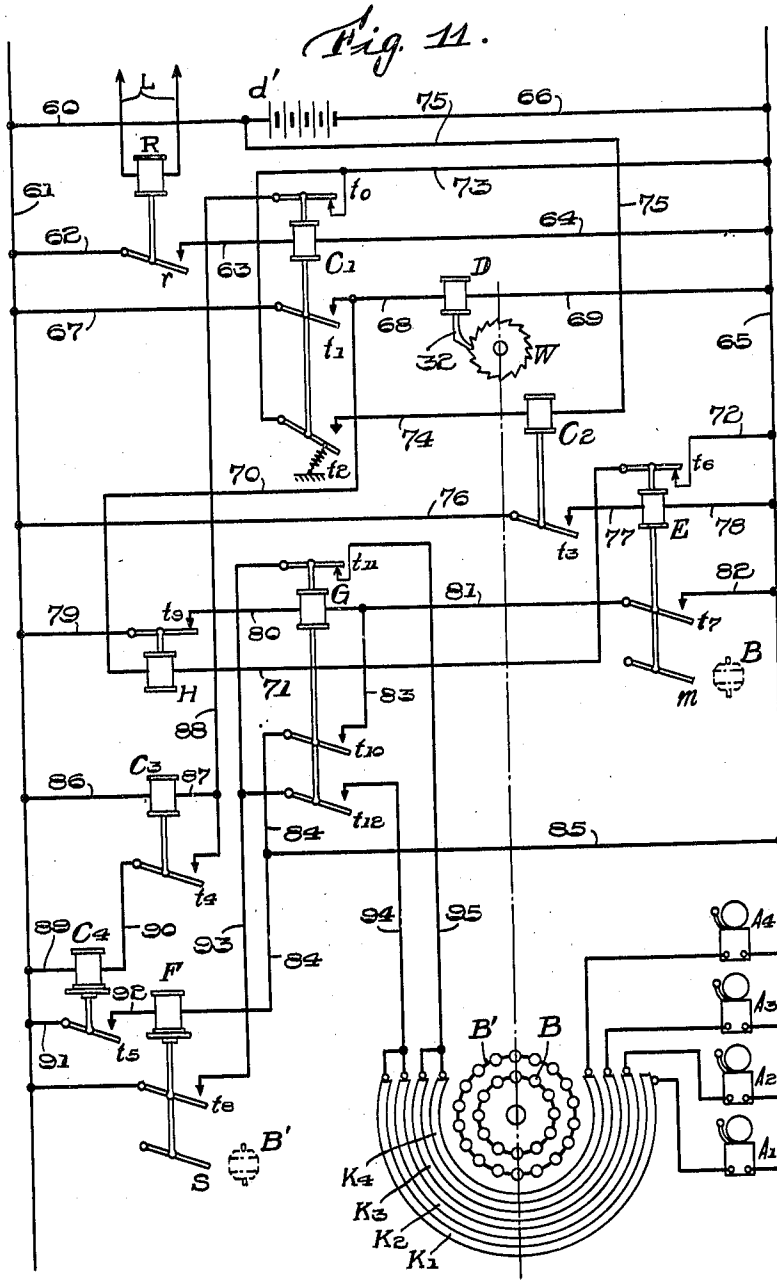
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Fig. 11.



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Fig. 16. Fig. 15. Fig. 14. Fig. 13. Fig. 12.

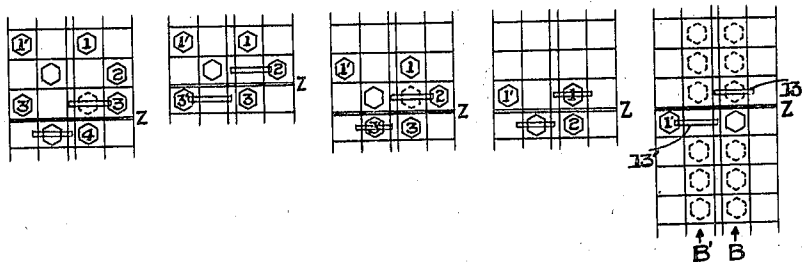


Fig. 22. Fig. 20. Fig. 19. Fig. 18. Fig. 17.

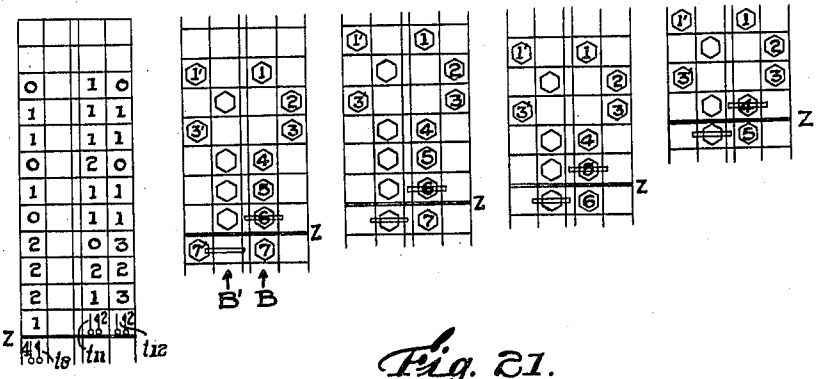
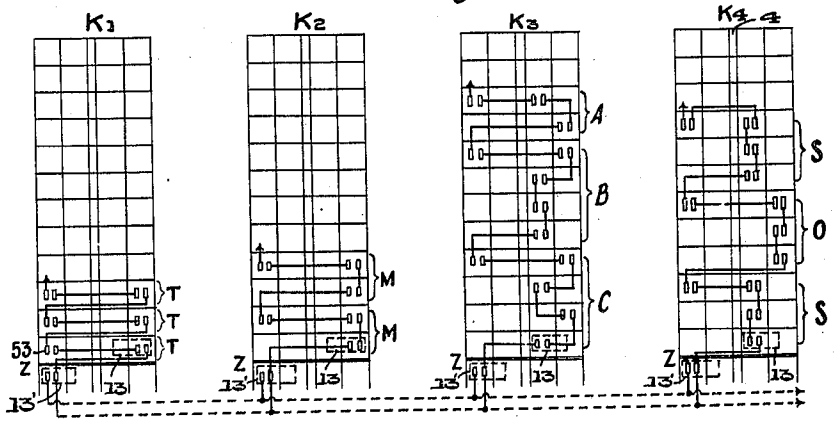


Fig. 21.



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Patented Sept. 13, 1938

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UNITED STATES PATENT OFFICE

2,130,166

AUTOMATIC TELEGRAPH RECEIVING MACHINE

Yoshito Watanabe, Suma-ku, Kobe, Japan

Application May 22, 1935, Serial No. 22,673
In Japan June 20, 1934

1 Claim. (Cl. 177—353)

The present invention relates to telegraph receiving systems and particularly to an apparatus by which an alarm or a signal will be automatically given in response to prearranged codes of dots, dash and interletter space impulses.

This application is a continuation in part of my copending application Serial No. 2,157 filed January 17, 1935, corresponding to British Patent 436,423. In the aforementioned application is described in substance a receiving apparatus and a selector device for closing a circuit in response to different prearranged codes of dots, dashes and interletter spaces comprising a stationary frame and a rotatable squirrel-cage type controller having studs spaced along its periphery. A contact roller is mounted on each stud and is slidable longitudinally thereof, and selecting means are so positioned that it will cause the roller which will normally enter the dot passageway, to enter either the dash or interletter space passageway. Upon receipt of a dot, dash or interletter space impulse, the controller is moved the space of one stud and is presented to the selecting means. Means responsive to a dash impulse causes the selecting means to move the then presented roller into the dash position and separate means responsive to an interletter space impulse causes the selecting means to move the roller into the interletter space position.

The object of the present invention is to provide an economical and efficient apparatus of the type described in which the squirrel-cage type controller is reduced in size.

Another object is to eliminate unnecessary rotation of the controller and reduce the number of studs required which will result in increased reception speed of the messages.

These objects may be accomplished by bringing separate sets of contact rollers arranged in two rows on the studs and actuated respectively by means responsive to the receipt of dot and dash impulses and by means responsive to the receipt of the interletter space impulses. Separate means responsive only to dot and dash impulses are provided to cause the controller to rotate one step forward. Thus, the controller will remain stationary upon the receipt of an interletter space impulse. The interletter responsive means however, will in this instance cause the selecting means to move the corresponding roller into interletter space position.

Referring to the accompanying drawings,

Figure 1 is a front view of an automatic telegraph receiving apparatus according to the present invention;

Figure 2, a plan of the same with some of the studs removed;

Figure 3, a development showing an example of the arrangement of the essential parts;

Figure 4, a partial section along the line 4—4 of Figure 3;

Figure 5, a partial section along the line 5—5 of Figure 3;

Figure 6 is a front section of a rotating member along the line 6—6 of Figure 7;

Figure 7, a sectional side view of the rotating member;

Figures 8, 9 and 10 show the manner of transforming electric dot and dash impulses, the manner of arranging the corresponding rollers of the rotating member, the manner of arranging the contact points of the fixed member, and also their electric connection;

Figure 11 is a diagram of an electric circuit showing the whole system,

Figures 12 to 20 are examples showing the order of the selection and forward movement of the rollers;

Figure 21 shows an arrangement of a group of contact points for several different signals and

Figure 22 shows the number of the contact points insulated from one another corresponding to several signals shown in Figure 21 and to be arranged in each section.

Referring to Figs. 6 and 7, a rotatable member 1 is made by providing studs 3 horizontally at certain intervals between side plates 1 to form a squirrel cage with its shaft 2 in the center, dividing the studs by means of flanges 4 attached to their middle portions and inserting contact point closing rollers B, B′ into each stud separately at the right and left. As shown in Fig. 4, studs 3 may be tightened by screwing nuts n upon their ends connected with the side plates 1. A rotatable shaft 2 is passed through a frame 5 between the side plates 1 and connected with the latter by means of a suitable nut n' as shown in Fig. 7. Then, said frame 5 is secured to said shaft 2 and the shaft 2 of the rotatable member 1 is rotatably mounted upon a portion 7 of a fixed member 6 of drum type, (see Figs. 1 and 2) and provided at its one end with a ratchet wheel W fixed thereto by means of nuts n''.

The fixed member 6 is pierced with several series of apertures 50 into which contact points 51 are screwed, said contact points consisting of the combination of elastic contact pieces 51′ at the periphery of a side frame 6 fixed to the surface of the base, the movable ones of said contact pieces having legs 52′ adapted for press-

ing and closing the contact points when a roller B or B' meets the shoes 52 of the legs 52' as shown in Fig. 4. For the purpose of partitioning the passages of the rollers into normal and selected tracks at the left and right portions of each stud 3, a pair of arc-shaped partitions 9 is secured to a holding frame 10 fixed to the fixed member 6. As shown in Fig. 3, the partitions 9 are not provided in several sections preceding the selecting position where they are substituted by roller-adjusting plates 11 which are somewhat inclined toward the central line so that they are able to guide a series of rollers to a certain position, which is the normal track, near the flange 4 on the stud, a part 12 of each roller-adjusting plate 11 being attached to the fixed member 6.

A pair of roller-selecting devices, as shown in Figs. 1 and 2, has toothed wheels 13, 13', ratchets 14, 14' and roller rubber brakes 18, 18', one set of which is clearly shown in Fig. 5. Each set of the toothed wheels and ratchets is fitted to supporting plates 15 and 16 attached to the fixed frame 6, the toothed wheels 13 and 13' being engaged by the rollers B and B' in the normal row respectively, while the ratchet 14 or 14' is interlocked with the end of a pawl 23 or 23' pivoted at its end to the inner end of a swinging lever *m* or *s* respectively (Fig. 2). The swinging lever *m* or *s* is pivoted at its outer end to a pivot 31 or 31' and also connected at 49 or 49' with the ends of push rod 47 or 47' which is attached to the armature 48 or 48' of an electro-magnet E or F E or F, so that when said electro-magnet E or F operates, it attracts the armature 48 or 48' against the force of an elastic plate 45 and spring P or 45' and P' and moves the swinging levers *m* or *s* about the pivot 31 or 31' and causes the pawl 23 or 23' to push the ratchet 14 or 14' so as to move the roller B or B' to the right or left along the stud 3.

For convenience's sake a "letter space" selecting device is disposed under a "dash" mark selecting device. The rollers B and B' are used for marks corresponding to "dot" and "dash", and "letter space" according to Morse code respectively. In Figs. 1 and 3, 24 is a rubber roller serving as a brake and mounted upon one end of a lever 25 which is pivoted at its other end 26 (Fig. 1). A spring 27 presses against the lever 25, thus causing the roller 24 to be inserted between two studs 3 of the rotatable member 1, so that when the member 1 is rotated, the roller 24 is inserted successively between adjacent pairs of studs 3, thus preventing the member 1 from turning too far and assuring a step by step rotation of the member 1. The roller 18 shown in Figures 2 and 5 serves as a brake for the toothed wheel 13 and is mounted upon one end of a lever 19. The opposite end of the lever 19 is pivotally mounted in a block carried by the frame 22 which is attached to the fixed member 6. A spring 21, one end of which is fixed to the frame 22 presses against the lever 19 so that the roller 18 carried by the lever 19 is inserted between two adjacent teeth of the toothed wheel 13. Consequently, when the wheel 13 is driven along with the ratchet 14 by means of the pawl 23, the roller 18 prevents the wheel 13 from moving too far and causes it to carry out a step by step motion. A similar device is provided for the toothed wheel 13', which engages the roller B'. The roller 18' and the lever 19' of this device are indicated in Figures 1 and 2. In Figs. 1 and 2, 33 is a swinging lever adapted to be pushed and moved by the armature 70 of an electric magnet D and has one end fixed by a pivot 44 and is controlled by an elastic member 43, said lever 33 being connected at 71 with a rod 72 attached to the armature 70 drawn by an elastic plate 73. 32 is a push lever connected with the lever 33 at one end 34 and guided by a member 38 and wheel 37. A pawl 35 which is adjacent to one end of the lever 32 is pressed by an elastic member 36 to mesh with the ratchet W.

In order to prevent the rotation of the rotatable body 1 to the extent of more than one section at a time by inertia, the push lever 32 has secured thereto a member 39 which faces the ratchet W and has a shoulder 40, and an elastic piece 42 having a wedge 41 at its end, so that when said lever 32 operates and pushes the ratchet W with the pawl 35, the wedge 41 is held between one of the teeth of the ratchet W and the shoulder 40 of the member 39 and thus the ratchet is braked.

In this invention, with regard to the elements of a telegraphic signal according to the Morse code, the "dot" and "dash" marks are, as shown in Fig. 8, denoted by the positions of the roller B at the left and right sides of a line P respectively; the "letter space" indicated by the position of roller B' at the left side of the line Q and thus when any telegraphic signal is received, the arrangement of the selected rollers B and B' of the rotatable member is brought into agreement with said received signalling marks. As between signal letters there is the time space, namely the "letter space", there is no possibility of confusion or mistake occurring if a "letter space" mark is shifted to the same row as the first mark of the following letter as shown by a dotted circle and therefore the forward movement of the rotatable member is omitted in case of "letter space" or in case of the end of the signal. Figure 9 shows the arrangement of rollers for a signal corresponding to that shown in Figure 8, in which however the rollers at the right side of the line Q have no significance. If a group of contact points 51 as shown in Fig. 4 is arranged as shown in Figure 10 at the fixed member 6 and connected together, each roller of the rotatable member presses and closes each contact point of the fixed member at the end of a signal, thus completing an electric circuit.

Figs. 12 to 20 show the order of the arrangement and formation of a group of rollers according to a signal corresponding to the letters "A" and "B", namely ". —" and "— . . .". As the period from the end of one signal until the beginning of the next one is essentially equivalent to a "letter space", No. 1' roller of B' group next to the selecting line Z is selected in the left row as shown in Fig. 13 upon the arrival of the first "dot" mark of the signal "A". (These operations will be understood by referring to the explanation to follow with regard to the electric circuit shown in Fig. 11.) Then, upon the arrival of the next "dash" mark they move one more section forward, after which No. 2 roller of B group is selected to the right through a dotted position as shown in Fig. 14, and at the next "letter space" time No. 3' roller of B' group underneath the selecting line Z is selected to the left (see Fig. 15) and moved one section forward as shown in Fig. 16 by a "dash" mark to select No. 3 roller of B group to the right. Then, by three "dot" marks it moves forward three times successively, while the rollers Nos. 4, 5 and 6 of B group remain in the normal posi-

tion (see Figs. 17, 18 and 19) and finally No. 7' roller of B' group is selected to the left by the next "letter space" as shown in Fig. 20.

As several contact points may be provided in a single system, it is possible to provide groups of contact points corresponding to several different signals. For example, when four signals "S O S", "A B C", "M M" and "T T T" are to be received, the connection of the contact points in each case is as shown in Fig. 21, and if these connections are brought into agreement with one another at the end, the number of the desired contact points in each section will be as shown in Fig. 22, and the four contact points corresponding to the last "letter space" may be substituted by a common contact point t_8, which for convenience's sake may be provided at the armature of an electric magnet F as shown in Fig. 2. Since the last mark may be combined into "dot" and "dash" marks, these may be substituted, for instance, by contact point t_{11} and t_{12} respectively. Also for convenience's sake these contact points t_{11} and t_{12} are transferred to other positions and changed into a switching mechanism of single pole double throw type, the central contact member of which is connected with the contact point t_8 as shown in Fig. 10.

As mentioned above, it is preferable that the several contact points corresponding to the last "letter space" and the last signalling marks such as "dot" and "dash" of any received signal are not arranged at the fixed member and substituted by the contacts t_8 and t_{11}, t_{12} of the relays F and G respectively, due to the provision of the toothed wheels **13** and **13'** at the front and rear positions of the selecting line Z so that the setting of said contact pieces on the fixed member to be closed by the rollers is difficult.

Consequently, unlike the other contact points, the common contact point t_9 cannot be set on the fixed member **6**, since the selective wheel **13'** stands in its way. Therefore, the common contact point t_9 is situated in a position, shown in Fig. 2, in which it may be closed by a lever S which is operated by the attraction of the armature **48'** of the electro-magnet F. For the same reason it is not possible to actuate the contacts t_{11} and t_{12} directly by the roller B; these contacts are, therefore, so located that they can be actuated along with the contact t_{10} by the electro-magnet G (Figs. 2 and 11).

In the across-the-line-wiring diagram of Figure 11, R is a relay connected with a receiving circuit L. C_1, C_2, C_3, and C_4 are relays for interpreting the signalling marks. The relay C_1 is provided with a normally closing and instantaneously opening contact t_0, an instantaneously closing contact t_1, and a slowly closing contact t_2, the relays C_2, C_3, and C_4 having instantaneously closing contacts t_3, t_4, and t_5.

When the relay R is operated to close its contact r upon arrival of a signalling mark according to either a "dot" or a "dash" mark of the Morse code, it completes the circuit of the relay C_1 including a battery d', the lines **60**, **61**, and **62**, the contact r, the line **63**, the coil of C_1, and the lines **64**, **65**, and **66**. Then the contact t_1 of the relay C_1 is closed instantaneously and energizes the coil of the relay D in the circuit including the battery d', the lines **60**, **61**, and **67**, the contact t_1, the line **68**, the coil of relay D, and the lines **69**, **65** and **66**. Thus, the ratchet W is rotated to the extent of one tooth by the push lever **32** and moves each series of roller groups B and B' on the rotatable member one section forward. As the contact t_8 of the relay E is normally kept closed, the circuit of a relay H is completed to separate its contact t_9 by the closed contact t_1, said complete circuit consisting of the battery d', the lines **60**, **61**, and **67**, the closed contact t_1, the lines **68** and **70**, the coil of H, the line **71**, the contact t_6, and the lines **72**, **65** and **66**.

Now, if the received signalling element is a "dot" mark, the relay C_1 closes its instantaneous contact t_1 only, but not the slowly acting contact t_2. However, if the received signalling element is a "dash" mark, the slowly acting contact t_2 will be closed after the closing of the instantaneously acting contact t_1 to operate the relay C_2, the circuit of which is constituted by the battery d', the lines **66**, **65**, and **73**, the closed contact t_2, the line **74**, the coil of C_2, and the line **75**. Then, the contact t_3 of the relay C_2 is closed to complete the circuit of the relay E including the battery d', the lines **60**, **61** and **76**, the closed contact t_3, the line **77**, the coil of E, and the lines **78**, **65**, and **66**. Thus, the relay E is operated to attract the lever m, and the roller of the B group at the selecting line is selected to the right position by the toothed wheel **13** of the selecting device.

At the same time, the contact t_6 of the relay E connected to the relay H is opened and the relay H is reset to reclose its contact t_9, while a current is transmitted to the relay G by the closed contact t_7 of the relay E, which completes the circuit including the battery d', the lines **60**, **61**, and **79**, the contact t_9, the line **80**, the coil of G, the line **81**, the closed contact t_7, and the lines **82**, **65**, and **66**, so that the relay G is operated to open a "dot" mark contact t_{11}, which is normally closed, and to close a "dash" mark contact t_{12}, the energization of said relay G after it has once been energized being maintained by its holding circuit, which includes the battery d', the lines **60**, **61**, and **79**, the contact t_9, the line **80**, the coil of G, the line **83**, the closed contact t_{10}, and the lines **84**, **85**, **65** and **66**.

At the end of a "dash" mark, the relays C_1 and C_2 are de-energized by the separated contact r of the relay R to open the contacts t_1, t_2, and t_3, and reset the relays D and E, while the relay G is held in operation through said holding circuit. Since the normally closed contact t_0 of the relay C_1 is closed again due to its resetting, the relay C_3 is energized by the battery d' through the lines **60**, **61**, and **86**, the coil of C_3, the lines **87** and **88**, the contact t_0, the lines **73**, **65**, and **66**, thereby closing its contact t_4. Then, the circuit of the relay C_4 is completed, said circuit including the battery d', the lines **60**, **61**, and **89**, the coil of C_4, the line **90**, the contact t_4, the line **88**, the contact t_0, and the lines **73**, **65**, and **66**. Then the slow operating relay C_4 is energized and closes its contact t_5, thereby completing the circuit of the slow operating relay F, which includes the battery d', the lines **60**, **61**, and **91**, the contact t_5, the line **92**, the coil of F, and the lines **84**, **85**, **65**, and **66**, and operating said relay. Then, in a section following the selecting line Z, a "letter space" roller B' is selected to one side and also a contact t_8 is closed. It will be seen that this closed contact t_8 connected with the line **93** is connected with either a pair of contact groups K_1K_2 and alarms A_1A_2 or K_3K_4 and A_3A_4 through the contact t_{12} and the line **94** or the contact t_{11} and the line **95**.

Upon the arrival of a signalling mark after a "letter space", the relay C_1 is operated, which

operates the relay H and opens its contact t_9. Therefore, even when the relay G has been kept in operation up to this time, its current is cut off once to reset the contact of a "dot" mark contact t_{11}.

K_1 and K_2 in Fig. 21 show the arrangements of the contact points of signals having "dash" for the last marks like "T T T" or "— — —" and "M M" or "—— ——"; K_3 and K_4 show the arrangements of the contact points of signals ending with "dot" marks like "A B C" or ". — —... —.—." and "S O S" or "... ——— . . .". In this case, K_1 and K_2, and K_3 and K_4 are connected to a common "dash" mark contact point t_{12} and a common "dot" mark contact point t_{11} respectively. Then, at the end of a signal the contact point t_{12} or t_{11} will be closed to complete an electric circuit and operate one of alarming members A_1, A_2, A_3 and A_4. In Fig. 11, r is a resistance, P_2 a controlling spring and d' a storage battery. In Fig. 2, g is a rubber clasp and **72'** are push levers secured to the armatures **70'** of electric magnets H, G and having caps **71'** screwed to their ends so as to be able to regulate their length and also inserted in bearings **46**. **73'** are elastic members with armatures **70'** attached thereto.

According to the present invention, the rows of the contact point selecting rollers are divided into two kinds B and B' for use as "mark" and "letter space" respectively. The "mark" rollers, namely a series of B group rollers are selected in case of "dash" marks only, and "letter space" rollers, namely B' group rollers are selected in case of the "letter space" and at the end of a signal respectively. In case of a "dot" mark, all of them are moved one section forward. That is to say, in case of "letter space" the rotatable member is not moved forward. Accordingly, the number of the rows of the rollers for a receiving signal is minimized to reduce the size of the rotatable member and also the operating time at "letter space" is reduced. Thus, it is possible to receive a high speed signal securely.

In accordance with the present invention, the contact pieces **51'** are arranged one over the other at the periphery of the fixed member **6**, this arrangement being adapted for receiving signals such as "T T T", "M M", "A B C" and "S O S", and the contact points of each of the groups K_1, K_2, K_3 and K_4 are connected in series, one end of each of the groups K_1 and K_2 being connected to the contact t_{12} of the magnet G, as shown in Fig. 11, and the other end to the alarms A_1 and A_2 respectively, while one end of each of the groups K_3 and K_4 is connected to the contact t_{11} of the magnet G and the other end to the alarms A_3 and A_4 respectively. When this machine receives the signal "A B C", it operates the different electro-magnets selectively by means of signalling marks representing said signal as explained before to bring the arrangement of the rollers B, B' into the position indicated in Figure 9, so that only K_3 of the groups K_1, K_2, K_3 and K_4 is connected in series. On this occasion, the contacts t_{11} and t_8 of the magnets G and F are closed and a circuit consisting of the battery d', contacts t_8 and t_{11}, contact group K_3, and alarm A_3 is completed to operate the alarm A_3. Similarly, upon arrival of the signal "T T T", the alarm A is operated, or if the signal is "M M", the alarm A_2 is operated. In this way, each alarm is operated selectively.

I claim:

A selector device for closing a circuit in response to prearranged codes of dot, dash and interletter space impulses comprising a frame, a rotatable squirrel-cage type controller mounted for rotation in said frame and having studs fixed thereto, said studs being equally spaced at the periphery of said controller, each having a flange and a contact roller mounted thereon and slidable longitudinally thereof on each side of said flange, partitions fixed to said frame adjacent to the path of movement of said studs and forming passageways having entrances for said rollers on each side of said flange and corresponding to an interletter space, to spacing between impulses of the same letter, to a dot and to a dash, respectively, means for normally causing the rollers on one side of the flange to be positioned to enter the dot passageway and the rollers on the other side to enter the passageway corresponding to spaces between impulses of the same letter, selecting means positioned at the entrance of the passageways for moving the positioned rollers to cause the dot and dash rollers to enter the dash passageway and the interletter space rollers to enter the interletter space passageway, means responsive to the receipt of a dot or a dash impulse to move the controller the space from one stud to the next to successively present the rollers to the selecting means, means responsive to a dash impulse to cause the selecting means to move the selected roller into the dash passageway, means responsive to the receipt of an interletter space impulse for causing the selecting means to move the then presented space roller to interletter space position, contact members mounted on said frame to be engaged by said rollers, said contact members being arranged in accordance with the code to which the selector is to respond, and a circuit including in series all of said contact members.

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