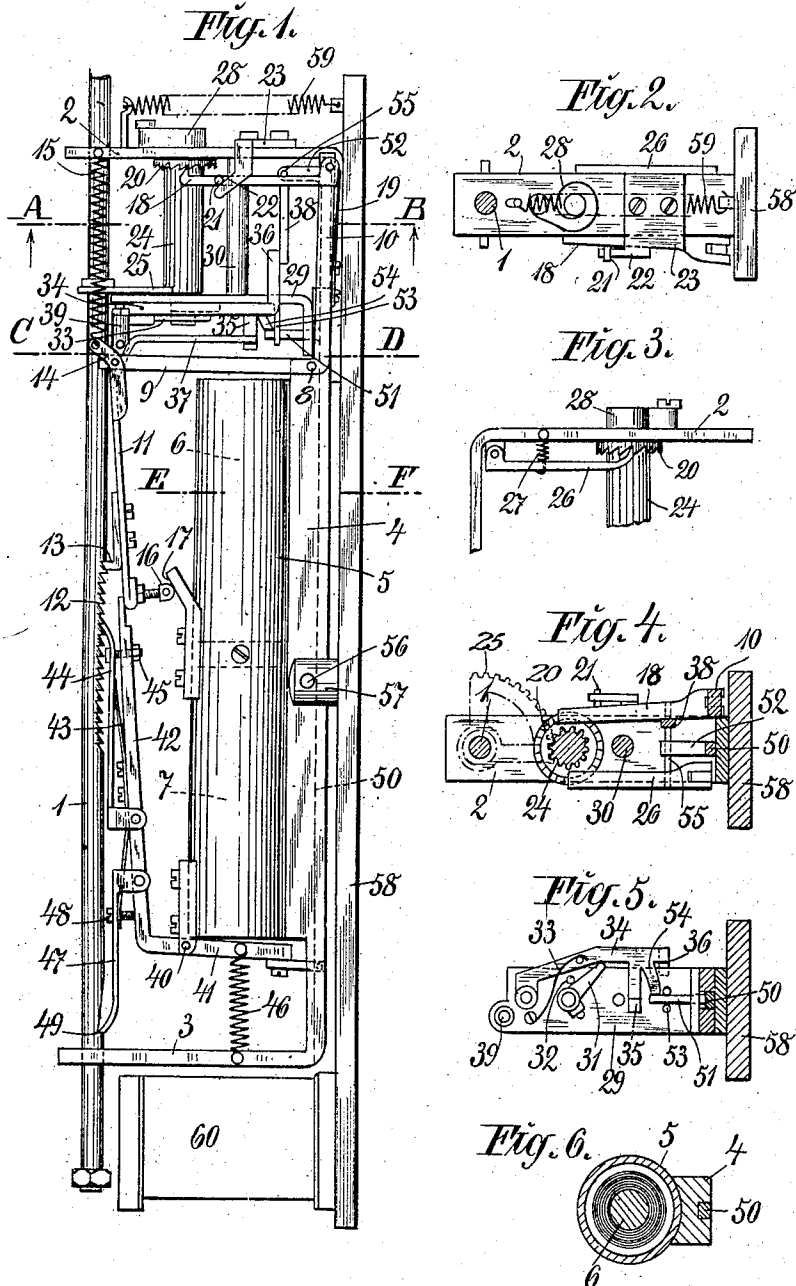


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ELECTRICAL CONNECTING APPARATUS.
APPLICATION FILED JAN. 4, 1912.

1,064,957.

Patented June 17, 1913.



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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

Patented June 17, 1913.

Application filed January 4, 1912. Serial No. 669,403.

To all whom it may concern:

Be it known that I, GOTTHILF ANSGARIUS BETULANDER, a subject of the King of Sweden, and resident of Södertörns Villastad, in the Kingdom of Sweden, have invented certain new and useful Improvements in Electrical Connecting Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

In electrical connecting apparatuses operated from a distance especially so called selectors of automatic telephone exchanges the shifting of the movable line contacts is preferably effected by means of electromagnets. If the line contacts are to be shifted in two different directions, it lies nearest to use a separate electromagnet for each direction of movement. However, for the purpose of reducing the number of electromagnets in such a connecting apparatus attempts have been made to use only one electromagnet for both directions of movement.

The present invention has for its object to get a construction of this kind and consists in that the two actuating members acting upon the movable connecting member carrying the line contacts to shift the latter in one or the other direction, are connected mechanically in parallel to the common driving device, each of them being adapted to be made inactive or to be disconnected by means of a suitable controlling device, so that in shifting the line contacts in one direction the actuating member corresponding to the other direction of movement is inactive.

One form of the invention is illustrated by way of example in the accompanying drawing, in which—

Figure 1 is a side view of a selector for automatic telephone exchanges, the line contacts of which being movable in two different directions, Fig. 2 is a plan view of the uppermost parts, Fig. 3 is a side view of the upper step-by-step acting mechanism seen from the rear side of Fig. 1, Fig. 4 is a section along the line A—B in Fig. 1 seen from below, Fig. 5 is a like section along the line C—D in Fig. 1, Fig. 6 is a section along the line E—F in Fig. 1.

The line contacts of the selector, not shown in the drawing, are fixed to the upper end of a connecting member or shaft 1, which is rotatable and slidable in the members 2, 3 of a fork-shaped frame 4 and is

guided by the same. Two electromagnets 6, 7 are fixed to the frame 4 and provided with a casing 5 of iron. The upper electromagnet 6 has an armature 9 pivoted at 8 and provided with an upward extending arm 10. The outer end of the armature 9 is pivoted to an arm 11, which at one end carries a pawl 13 engaging teeth 12 on the shaft 1 and at its other end is provided with two lugs 14 projecting on each side of the shaft 1. A spring 15 is fastened between each of the lugs 14 and the member 2. These springs tend to raise the pawl 13 and the armature 19 and simultaneously to move the pawl 13 toward the teeth 12 on the shaft 1. The arm 11 has at its lower end an adjustable screw 16, which slides on an oblique surface 17 during the upward movement of the arm 11, whereby the pawl 13 is locked in a reliable manner in the space between two teeth 12 at the end of its upward movement. By this arrangement the shaft 1 is locked in every advanced position and thus any disturbing effect upon the connecting movement owing to the inertia of the shaft 1 is obviated. A pawl 18 is pivoted to the top end of the arm 10 extending from the armature 9 and is acted upon by a spring 19 attached to the arm 10 and tending to move the pawl 18 into engagement with a ratchet wheel 20. The pawl 18 is provided with a laterally projecting pin 21 sliding on an oblique surface 22 in the same manner and for the same purpose as before mentioned with regard to the screw 16 and the surface 17. The oblique surface 22 is formed by an arm extending from a plate 23 fixed to the frame piece 2. The ratchet wheel 20 is fixed to the top end of a vertical toothed cylinder 24 coupled with the shaft 1 by means of a toothed segment 25. A pawl 26 (Figs. 3 and 4) is pivoted to the frame piece 2 opposite to the pawl 18 and on the other side of the toothed cylinder 24 and is acted upon by a spring 27 tending to move the same into engagement with the teeth 20.

The toothed cylinder 24 is journaled at its top end in the frame piece 2 and is acted upon by a spiral spring 28 fastened to the frame piece 2 tending to turn the cylinder 24 back to its position of rest. The toothed cylinder 24 is journaled at its lower end in a plate 29 attached to the frame 4 and stayed against the frame piece 2 by means of a bolt 30. An arm 31 is fixed to the

lower journal of the toothed cylinder and bears in its position of rest against a pin 32 (Fig. 5) through the action of the spring 28. In the starting position of the apparatus a controlling member 34 pivotally connected to the plate 29 (Figs. 1 and 5) bears against the said arm 31 through the action of a spring 33. The controlling member 34 is provided with two arms 35, 36, one of them 35 being bent downward and having a lateral extension passing below an extension of the arm 11, the other being bent upward and adapted to engage an arm 38 extending from the pawl 18. In the position of rest of the controlling member 34 (Fig. 5) the arm 35 is placed in the path of the extension 37, so that at the attracting of the armature 9 the pawl 13 is swung out from the shaft 1 and at the releasing of the armature the pawl 13 again enters into the same space between two teeth, which it just now left, thus being prevented from raising the shaft 1. However, in the shown position of rest the arm 36 is out of the path of the arm 38 and therefore during the first connection period the pawl 18 freely acts upon the ratchet wheel 20 thus producing the turning movement of the shaft 1. The arm 31 connected to the cylinder 24 is thereby turned out of its arresting position in the first step of the connecting movement, so that the controlling member 34 afterward may be turned through the action of the spring 33 until stopped against the plate 29. In this position the arm 35 is no longer in the path of the extension 37 of the pawl 11, but the arm 36 is now opposite the arm 38. Thus, the pawl 18 acted upon by the armature 9 now moves back and forth without any effect, while the pawl 13 freely acts upon the teeth 12, thereby effecting the raising of the shaft 1. The returning movement of the armature 9 is limited by an adjustable screw 39 secured to the plate 29.

The lower electromagnet 7 has an armature 41 pivoted at 40 and provided with an upwardly extending arm 42. A pawl 44 acted upon by a spring 43 and engaging the teeth 12 is pivoted to the arm 42. The movement of the said pawl out from the arm 42 is limited by a screw 45. The armature 41 is acted upon by a spring 46 connected to the frame piece 3 and tending to force the top end of the arm 42 against the lower end of the arm 11. A catch 47 acted upon by the lower end of the spring 43 is further pivoted to the arm 42. The movement of the said catch in one direction is limited by a screw 48. The purpose of this catch 47 is to lock the shaft 1 in its position of rest by engaging a shoulder 49. As the armature 41 is attracted, the catch 47 is moved out of engagement with the shoulder 49 owing to the screw 48.

The armature 41 is pivoted at its inner

end to a bar 50 guided in a groove in the frame 4 and provided at its upper end with two laterally extending arms 51, 52. The lower one 51 of these arms is guided between two pins 53 fixed to the plate 29 and is adapted to arrest the controlling member 34 in its end positions. To this end the said member 34 is provided with a downwardly extending arm 54, the end of which being located in the shown position of rest near above and on one side of the arm 51 (Figs. 1 and 5). As the armature 41 is attracted, the arm 51 is raised, thus preventing the controlling member 34 from being turned through the action of the spring 33, after the arm 31 connected to the cylinder 24 has been turned out of its arresting position. The armature 41 being then released the arm 51 moves out of the path of the arm 54, so that the member 34 acted upon by the spring 33 is turned to its other end position. As the armature 41 is attracted the next time, the arm 51 is raised now passing on the other side of the arm 54, thereby locking the controlling member in this position. The upper arm 52 is provided with a transverse bar 55, in the shown position of rest extending near above the two pawls 18, 26.

The frame 4 is journaled in two bearings 57 fixed to a back plate 58. The top end of the frame 4 is acted upon by a spring 59 connected to the plate 58, so that in the shown position of rest the frame bears with its top end against the plate 58. An electromagnet 60 fixed to the lower end of the plate 58 attracts, when current carrying, the frame 4 consisting of iron, thereby turning the same, until the lower end of the frame is stopped against the plate 58. By this arrangement the line contacts are maintained out of contact with the contact field of the selector during the connecting operation.

The apparatus operates in the following manner: Owing to the connecting impulses of current sent from the substation first the armature 41 is attracted, whereby the catch 47 is moved out of engagement with the shaft 1 and the arm 51 is raised into its arresting position. In the next moment the electromagnets 6 and 60 become current carrying. The electromagnet 60 attracts the frame 4, thereby moving the line contacts out of contact with the contact field. As the armature 9 is attracted, the pawl 18 is brought into engagement with the next tooth of the ratchet wheel 20, while the pawl 13 is moved out of engagement with the shaft 1 owing to the arm 37, the shaft being prevented from falling by the pawl 44. When the armature 9 is then released, the toothed cylinder 24 and thus the shaft 1 is rotated one step through the action of the springs 15, while the pawl 13 is returning to the first point of engagement. In this manner the

shaft 1 is now rotated a certain number of steps by a corresponding number of impulses of current being sent through the electromagnet 6. After that the electromagnet 7 becomes currentless. As the armature 41 is released, the controlling member 34 is also released, whereby the latter acted upon by the spring 33 is moved to its other end position. It may be observed that the arm 31 has been moved out of its arresting position even during the first connecting step. Now the armature 41 is attracted again, whereby the arm 51 is raised into its arresting position this time passing on the other side of the arm 54. In the next moment the electromagnet 6 is traversed by the first connecting impulse of current thereby attracting its armature 9. Owing to the changed position of the controlling member 34 the pawl 13 now engages the next tooth 12, while the pawl 18 is moved out of engagement with the ratchet wheel 20. As the armature 9 is released, the shaft 1 is raised one step by the action of the springs 15, while the pawl 18 is returning to the same point of engagement. In this manner the shaft 1 is now raised step by step by the impulses of current passing through the electromagnet 6, until the line contacts are shifted to a certain point of the contact field, when also the electromagnets 7 and 60 become currentless, whereby the connecting operation is completed. The returning of the selector to its initial position is effected by currents being sent through the electromagnets 6 and 60. As the armature 9 is attracted, the pawls 44 and 13 are moved out of engagement with the teeth 12 by the action of the spring 46 and the arm 42 and further the pawls 26 and 18 are disengaged by the action of the pin 55 fixed to the arm 52. Owing to this fact the toothed cylinder 24 acted upon by the spring 28 is returned to its initial position thereby bringing back the controlling member 34 by means of the arm 31. At the same time the shaft 1 drops into its position of rest, where it immediately comes to a standstill without rebounding owing to the catch 47.

Without losing the essential feature of this invention the construction of the apparatus may naturally be modified in many ways. Thus the nature of the common driving device and the motive power is immaterial.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an electrical connecting apparatus operated from a distance the combination with a movable connecting member (1) carrying one or more line contacts and two actuating members (13, 18) acting to move the line contacts in two corresponding directions, of a common driving device (6, 9) alternately

operating the said actuating members and a controlling device (7, 41, 51, 34) adapted to put the actuating members alternately out of action, so that in moving the line contacts in one direction the actuating member corresponding to the other direction of movement is inactive.

2. In an electrical connecting apparatus operated from a distance the combination with a movable connecting member (1) carrying one or more line contacts and two actuating members (13, 18) acting to move the line contacts in two corresponding directions, of a common driving device (6, 9) alternately operating the said actuating members and a controlling device comprising a member (34) to be put in engagement alternately with the said actuating members (13, 18), thereby putting the same out of action, so that in moving the line contacts in one direction the actuating member corresponding to the other direction of movement is inactive.

3. In an electrical connecting apparatus operated from a distance the combination with a movable connecting member (1) carrying one or more line contacts and two actuating members (13, 18) acting to move the line contacts in two corresponding directions, of a common driving device (6, 9) alternately operating the said actuating members and a controlling device comprising a member (34) to be put in engagement alternately with members of transmission coupled with the said actuating members (13, 18) thereby putting the latter out of action so that in moving the line contacts in one direction the actuating member corresponding to the other direction of movement is inactive.

4. In an electrical connecting apparatus operated from a distance the combination with a movable connecting member (1) carrying one or more line contacts and two actuating members (13, 18) acting to move the line contacts in two corresponding directions, of a common driving device (6, 9) alternately operating the said actuating members (13, 18) and a movable controlling member (34) acting to put the actuating members alternately out of action and co-operating with the said connecting member (1) in such a manner, that it is put into its initial position by the connecting member (1) being removed to its position of rest.

5. In an electrical connecting apparatus operated from a distance the combination with a movable connecting member (1) carrying one or more line contacts and two actuating members (13, 18) acting to move the line contacts in two corresponding directions, of a common driving device (6, 9) alternately operating the said actuating members, a controlling device acting to put the actuating members (13, 18) alternately

out of action, a member of transmission (24) interposed between the connecting member (1) and one of the actuating members (13, or 18) and a spring (28) connected
5 to the said member of transmission (24) and tending to remove the line contacts to their initial position.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

GOTTHILF ANSGARIUS BETULANDER.

Witnesses:

GRETA PERINE,
GUSTAF TSFALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."