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MECHANISM FOR RECIPROCATING BRUSH CARRIAGES
OF SELECTOR SWITCHES OR THE LIKE

2,490,035

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2 Sheets-Sheet 1

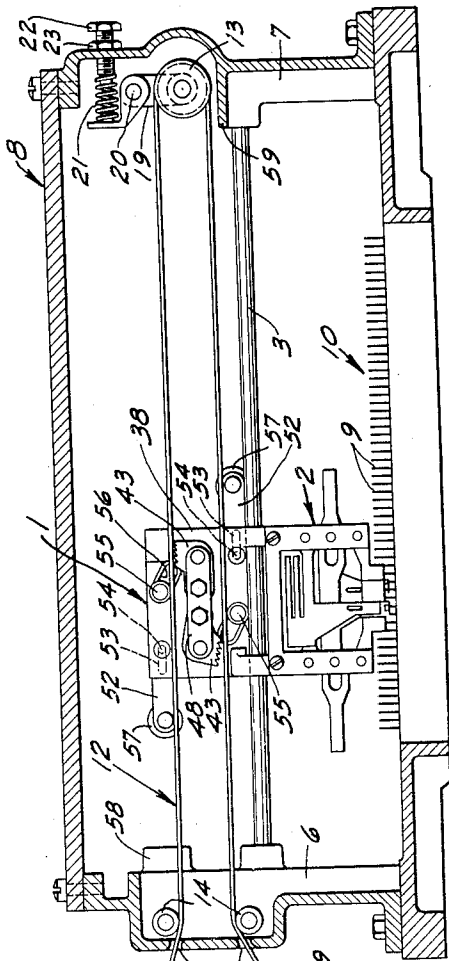


FIG. 1.

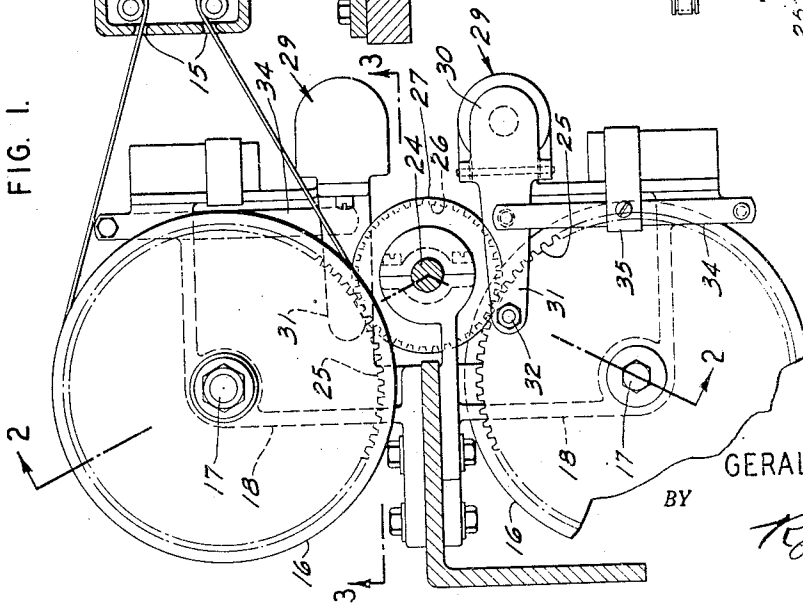


FIG. 2.

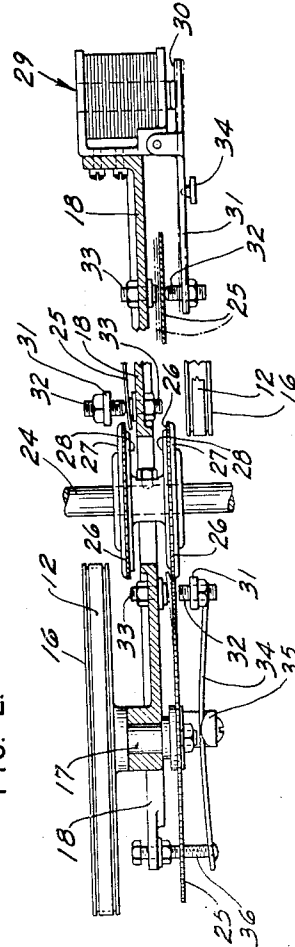


FIG. 3.

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2 Sheets-Sheet 2

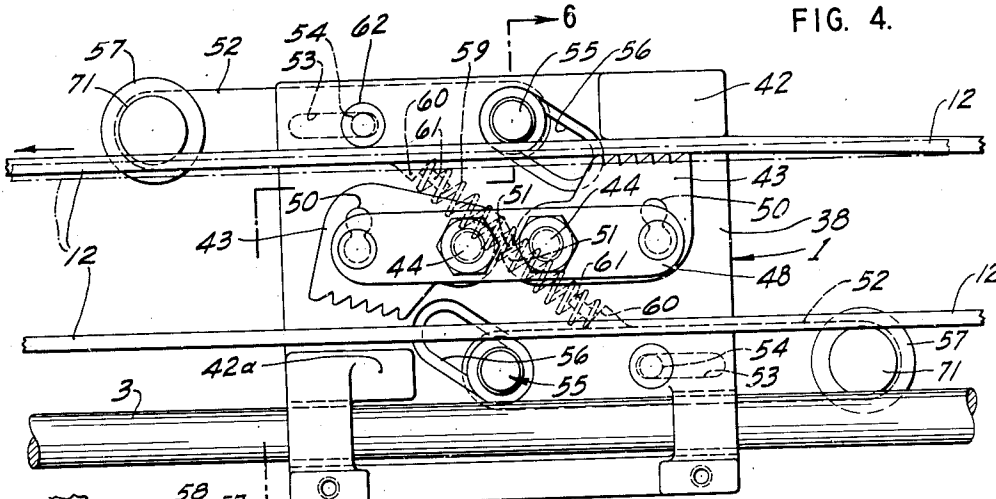


FIG. 4.

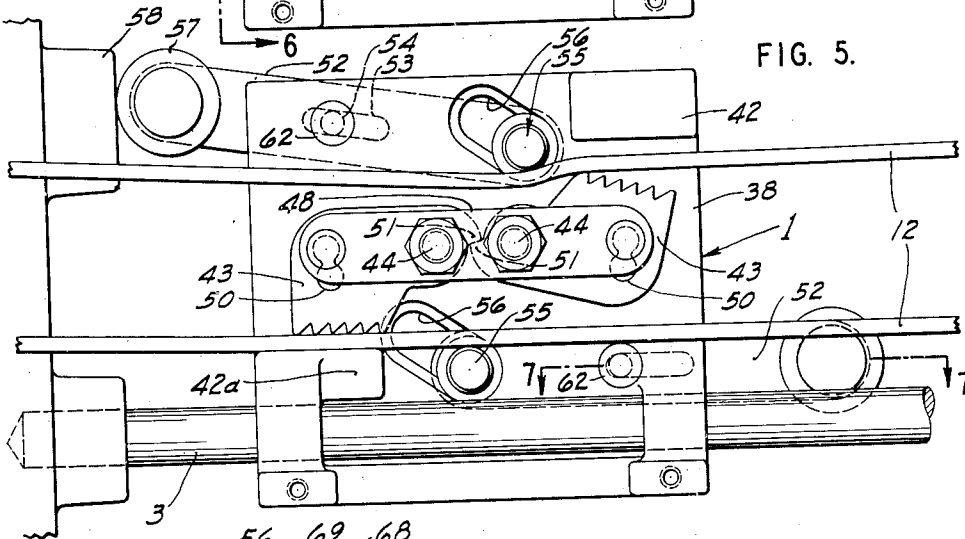


FIG. 5.

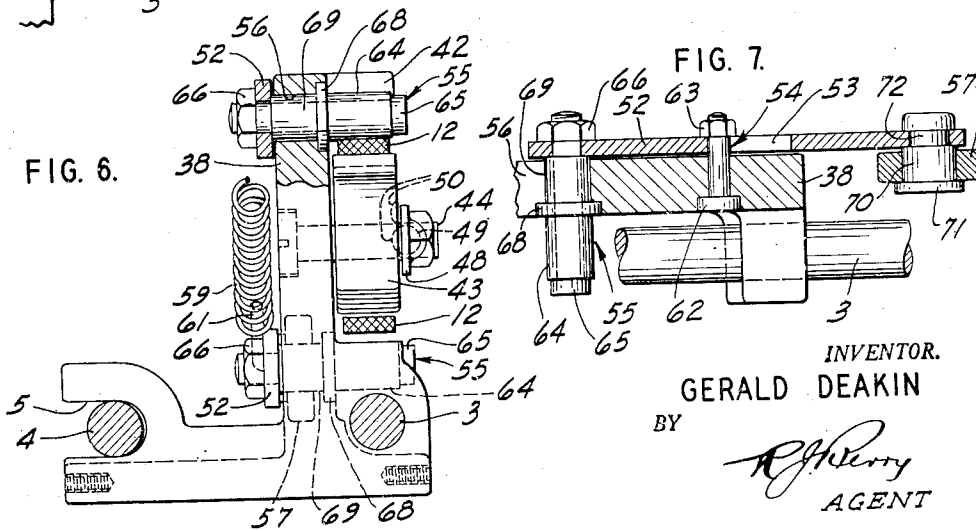


FIG. 6.

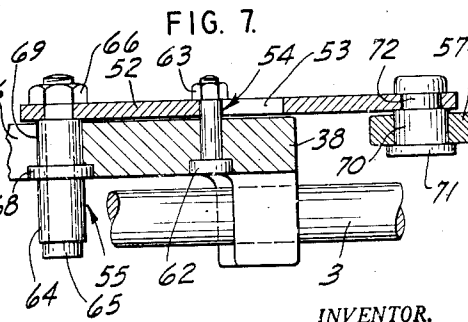


FIG. 7.

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2,490,035

MECHANISM FOR RECIPROCATING BRUSH CARRIAGES OF SELECTOR SWITCHES OR THE LIKE

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Application February 23, 1945, Serial No. 579,367

13 Claims. (Cl. 74—37)

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This invention relates to means for driving reciprocatory carriages such as brush carriages of selector switches, for example switches of this character used in automatic telephone systems as finder switches, group selectors, final connectors, marking switches or the like.

An object of the invention is to provide an endless or continuous belt drive for a reciprocatory brush carriage or the like which is novel and advantageous in construction and operation, which is easy to assemble and economical to manufacture, and which will operate satisfactorily over long periods of service with a minimum of attention.

Another object of the invention is to provide for a reciprocatory carriage a drive which will operate with a minimum of noise.

Still another object of the invention is to provide a carriage drive in which a reciprocatory brush carriage is reciprocated across a flat terminal bank by a flexible band which is driven in one direction only.

A further object of the invention is to provide means for gripping the reciprocatory carriage to either run of an endless belt in accordance with the desired direction of carriage movement.

A still further object of the invention is to provide means whereby a brush carriage or the like is reciprocated by means in which a continuous belt is driven in one direction only and a belt gripping or clutching device is sprung for operation in the opposite direction, at each end of a carriage stroke.

Another object of the invention is to provide a reciprocating-carriage drive whereby two reciprocatory brush carriages may be reciprocated on opposite sides of the same bay from a centrally located vertical shaft, thus reducing the vertical shaft equipment by one-half.

Other objects, features and advantages will appear upon consideration of the following detailed description and of the drawings in which

Fig. 1 is a fragmentary section as seen from above, illustrating one embodiment of the invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a view of the belt gripping means on the brush carriage showing it as gripping one run of the belt.

Fig. 5 is a view similar to Fig. 4 but showing

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the belt gripping means just after release of one run of the belt and the gripping of the other run of the belt for movement of the brush carriage in the opposite direction;

Fig. 6 is a section taken along the line 6—6 of Fig. 4; and

Fig. 7 is a section taken along the line 7—7 of Fig. 5.

Referring more particularly to Figs. 1 and 6, a supporting frame 1 of a brush carriage 2 is mounted to slide along a horizontal guide or rod 3 and is held against swinging about said rod 3 by a guide or rod 4 (Fig. 6) which extends slidably through a slot or groove 5 in a depending part of the brush-carriage frame. Such guides or guide rods 3 and 4 are secured at their ends to frame members 6 and 7 which may form part of a casing 8 in which the brush carriage is reciprocated.

The brush carriage frame 1 may be considered as made up of two parts, an inner part and an outer part. Said inner part (Fig. 1) carries brush means to cooperate with terminals 9 of a flat terminal bank 10 and the brush carriage proper will not be described further inasmuch as it is described and claimed in my copending patent application Ser. No. 576,797, filed Feb. 8, 1945, and is no part of the present invention. Said outer part of the brush carriage frame carries the belt-gripping means. These two parts of the carriage frame may be permanently connected together or may be detachably connected which would enable either part to be reversed with respect to the other.

Said outer part of the supporting frame of the brush carriage 2 carries gripping means to cooperate alternately with parallel runs of a continuous or endless belt 12 which is driven in one direction only. Preferably said belt 12 is made of suitable textile or plastic material. The endless belt drive and the gripping means on the brush carriage constitutes important parts of the present invention. As illustrated in Fig. 1, the endless belt 12 passes around a pulley 13 at one end of the casing 8 and from this pulley 13 extend parallel runs which at the opposite end of the casing 8 pass between two guide rollers 14 and then diverge through openings 15 in frame or casing member 6 to the outside of the casing where the belt 12 passes around a large driving pulley or wheel 16 fixed on a short or stub shaft 17 journaled in a bracket 18 constituting part of the frame of the assembled machine. The belt may be kept taut and shock

absorbed to some extent by pivotally mounting the pulley 13 on a frame 19 pivoted at 20 and urged in the proper direction by means of a compression spring 21 and an adjusting screw 22 held in adjustment by a lock nut 23.

The driving pulley 16 for the belt 12 is driven by suitable clutch mechanism from a vertical shaft 24 which is motor driven in a manner that is well known in so-called rotary telephone exchange systems. Preferably the clutching mechanism is similar to clutching mechanism already in use and comprises a thin flexible gear 25 secured to the lower end of stub shaft 17. A gear 26 is secured on shaft 24 to rotate therewith and to mesh with gear 25, but gear 25 may be flexed so as to disconnect it from said gear 26. In order to provide teeth of suitable thinness for gear 26, this gear may be in the form of a thin disc and it may be mounted between stiffener discs 27 and 28 of which the larger disc 27 may assist in maintaining the gears 25 and 26 in proper alignment while in mesh with each other.

The clutch is controlled by a clutch magnet 29 mounted on a flange of bracket 18 with its pivoted armature 30 at the bottom thereof. An arm 31 extends from the armature to a point beneath the flexible gear 25 near the point of engagement between the gears 25 and 26 so that when the armature arm 31 is lifted it will flex gear 25 out of engagement with gear 26. The movement of arm 31 and flexing of the gear 25 may be regulated as by means of a set screw 32 in the arm 31 and a set screw 33 in the bracket 18 to limit the upward movement of the displaced portion of the flexible gear 25.

Upward movement of the arm 31 may be effected by means such as a leaf spring 34, fulcrumed on a bracket 35. A set screw 36 threaded in bracket 18 acts on one end of the spring 35 and may be adjusted to produce at the other end of the spring the desired upward pressure against arm 31 to deflect the adjacent part of gear 25 upwardly to disengage it from gear 26. Obviously energization of the magnet 29 will swing arm 31 downwardly against the action of spring 34 and permit gear 25 to mesh with gear 26 and be driven thereby. Subsequent deenergization of the magnet will result in disengagement of flexible gear 25 from driving gear 26.

The clutch magnet 29 to be energized may be determined by dialing and may be de-energized by finding a proper terminal. Such clutch magnet operation is well known as evidenced by my prior Patent No. 2,336,471, December 14, 1943.

Referring to Figs. 4, 5 and 6 the belt-gripping device is shown as mounted on a sub-frame 38 constituting the outer part of the brush carriage frame 1 and to which the inner part carrying the brushes is attached for support thereby. The parallel runs of the belt 12 pass immediately above the flat body of the frame portion 38 which is slidably supported at its front or side toward the brushes by the main guide or guide rod 3 substantially at the same level as the belt runs, and by the second and lower rod 4 in the downwardly facing slot 5 in the depending portion of the gripper-carrying frame or sub-frame 38.

As seen in Figs. 4 and 5, one run of belt 12 passes just to the front of an abutment or fixed gripper 42 at the right and rear of the frame portion 38 and which cooperates with a suitable gripper jaw 43, preferably toothed, on a pivot 44 at the upper face of the frame portion 38. The other run of belt 12 passes just to the rear of an abutment 42a at the left and front of frame por-

tion 38, and may be gripped against the abutment 42a by an adjacent gripper member or jaw 43 on a second pivot 44 at the upper face of frame portion 38. The pivots 44 are arranged in line with the direction of their movement with the carriage and are the shanks of bolts (Fig. 6) inserted upwardly through the member 38 and having nuts on their upper ends. The gripper members may be made of any suitable material such as metal or plastic material.

Above the jaws the shanks of said bolts pass through corresponding perforations in the central portion of a leaf spring 48 which is secured in position by said nuts. At the ends of said leaf spring are detents such as ball detents comprising in each case a ball 49 (Fig. 6) held in a socket formed in the spring and adapted to snap into either one of two recesses 50 in the adjacent jaw and hold the jaw in either gripping or idle position. To throw one jaw 43 into gripping position as the other is moved out of position the jaws 43 are provided with overlapping lugs or tails 51 so that when one jaw 43, for example the right one (Fig. 4) is thrown from its effective position (Fig. 4) to its ineffective position (Fig. 5) the tail 51 thereon will act on tail 51 of the left hand jaw and swing it to effective position with reference to the other run of the belt, the corresponding detents acting together to assist in completing such movements.

To shift either jaw 43 from its effective position at the end of a carriage stroke, there may be provided at the opposite face of frame member 38 from the jaw, slides 52 each having at an intermediate point a longitudinal slot 53 through which passes a pivot or pin 54 fixed with reference to part 38, and at its inner end a pivot or pin 55 which is fixed with reference to slide 52 and passes through an inwardly inclined slot 56 in member 38 and over the adjacent run of the belt. Thus when the carriage with the parts positioned as indicated in Fig. 4 moves to the left until roller 57 pivoted on the upper or outer slide 52 strikes an abutment or buffer 58, the slide is held against further movement in that direction. However, the carriage continues its movement to the left and the right hand end of the slide due to inclined slot 53 is moved inwardly and the pin 55 acts through the belt 12 to swing the corresponding dog or jaw 43 in a clockwise direction to release the corresponding run of the belt 12. This movement of the right hand or outer jaw 43 is transmitted through tails 51 to turn the left hand jaw in a counter-clockwise direction for movement to effective gripping position. A reverse change in the gripping devices will occur when the carriage reaches the other end of its path and the corresponding roller 57 strikes an abutment 58.

After a slide 52 has acted to cause movement of one jaw 43 from an effective position to an ineffective position and vice versa for the other jaw, the slide must be returned to its outermost or normal position. Preferably such return may be effected by a helical compression spring 59 interposed between said slides and at such an inclination that the spring will urge the slides 52 away from each other both longitudinally and transversely. As indicated in Fig. 4, the spring 59 is interposed between abutments 60 on said slides and is retained in engagement therewith by pins 61 projecting from said abutments into the ends of said spring. Obviously the spring 59 will tend to absorb the shock of stopping the car-

riage and to assist in reversing the movement thereof.

Certain details of the operating and guiding means for a slide 52 are illustrated in Fig. 7. Preferably the pin 54 has a shank passing through the slot 53 of the slide and a round opening in the flat body 38, and is held against substantial longitudinal movement by a head 62 in a recess countersunk in the face of member 38 at the opposite side from slide 52 and by a nut 63 on a reduced threaded end of pin 54. The nut 63 is limited in its tightening movement by the shoulder at the end of the threaded reduced portion of the shank and acts to hold the slide on the pin without interference with the sliding and swinging movement of the slide.

The pivot 55 has a shank extending through the slot 56 in part 38 and just beyond the far edge of the adjacent run of belt 12, where it is provided with a head 65. At its opposite end, the shank has a reduced portion passing through a hole in the slide 52 and threaded at its outer end to receive a nut 66 by which the slide may be clamped firmly against the shoulder at the adjacent end of the shank proper. Mounted on said shank are a roller 64 of suitable material such as red fibre, adjacent to said head 65 for engagement with the belt, a washer or spacer 68 in a countersunk opening in frame portion 38 and forming a marginal depression around the inclined slot at the face of part 38 adjacent the jaws 43, and a second roller 69 to fit in said inclined slot 56. Rollers 67 and 69 obviously tend to reduce friction and vibration.

The roller 57 at the outer end of each slide 52 is of suitable material to minimize noise and vibration, such as neoprene, and may be mounted on a pivot 70 having a head 71 and a reduced end 72 extending through a suitable opening in slide 52 and secured to the slide as by riveting.

It should be noted that the toothed gripping faces of the jaws 43 when effective for gripping the belt are parallel to the faces of the respective abutments 42 and 42a and that in each case the corresponding pivot 44 is to the front thereof. As a result of this arrangement, downward pressure on the upper reach of the belt 12 will throw the upper jaw member 43 downward and withdraw the right hand end of the toothed face of this jaw downwardly more rapidly than the left hand end. The belt will then be separated from the fixed abutment 42 and will engage only the other end of said toothed face. Also the adjacent portion of the belt will be inclined downwardly and to the left and beneath revolving roller 69. For the lower reach of the belt, the belt will be deflected upwardly and the corresponding jaw 43 in the same direction.

As illustrated in Figs. 1 and 2, the present invention facilitates an arrangement whereby the vertical shaft 24 may be centrally located with respect to two clutches of the flexible gear type on both sides of the same bay, both clutches being used to drive brush carriages. In the form shown, the bracket 18 carrying the second clutching device is inverted with the belt pulley 16 below both the bracket 18 and the flexible gear 25. Also the second flexible gear 25 is above the first mentioned driving gear 26 and therefore a second gear 26 is provided at a higher level. For convenience the two gears 26 may be combined together, as by mounting them on a single sleeve, to assure proper positioning of the parts when two clutches are used as indicated. Obviously the number of brush carriage units driven from shaft 75

24 may be increased as desired by superimposing such units.

The operation of the drive for the brush carriage 2 will now be described briefly. The vertical shaft 24 revolves in a clockwise direction and unless the clutch magnet 29 is energized, the flexible gear 25 is held flexed out of connection or mesh with gear 26, the lower one in Fig. 2, and the belt-driving pulley 16 at the upper left of Fig. 1 will remain at rest. Such flexing is effected by pressure of set screw 32 on armature arm 31 under the influence of the adjustable leaf spring 34. However, energization of the clutch magnet 29, due to selective dialing will act to swing the armature arm 31 downwardly against the action of spring 34 to permit flexible gear 25 to come into gear or mesh with the lower driving gear 26. The flexible gear 25 will then turn in a counter-clockwise direction and cause the outer run or reach of endless belt 12 to move to the left and the inner run to move to the right. The brush carriage, when gripped to the outer reach or run, will travel to the left until the end of its path is reached. At this time the brush carriage is released from the outer run and gripped to the inner run, thus causing the brush carriage to move to the right. Upon movement of the brush carriage to the right hand end of its path, the connection will again be reversed. Deenergization of the clutch magnet will disconnect the clutch and the belt 12 will come to rest.

The belt gripping device is always effective to grip one of said two runs of the driving belt. As the brush carriage approaches the left end of its path, the roller 57 on the leading slide 52 engages the buffer 58 and this slide is stopped while the carriage continues to advance against the action of spring 59. The pin 54 then moves to the left in the slot 53 and the inclined slot 56 forces the pin 55 downwardly and consequently swings the right end of the slide 52 downwardly about pin 54 as a pivot until the roller 67 on the pin 55 engages the outer run of the belt in advance of the gripped portion, and exerts pressure therethrough to throw the adjacent dog or jaw 43 away from the abutment 42. This causes the corresponding ball detent on the flat spring 48 to snap from the gripping recess 50 to the idle recess 50. This movement of the adjacent jaw 43 is transmitted through the lugs or tails 51 of said gripping members to the inner or lower gripping jaw 43 which is snapped to effective position to grip the inner run of the belt, the snapping action being effected by the ball detent associated with the last-mentioned jaw 43.

Upon reversal of movement of the brush carriage, the roller 57 which engages the buffer 58 remains in engagement therewith until the spring 59 has expanded sufficiently for the right end of slot 53 to engage pin 54 and the pin 55 to reach its normal position at the high end of inclined slot 56. This shifting of the gripping action from one run to the other will continue as long as the belt 12 continues to travel.

It will be seen that a very small movement of the gripped run of the belt by the roller on the adjacent pin 55 will be sufficient to cause the corresponding jaw 43 to snap to ineffective position, due to the application of the jaw-shifting action of the belt at a point much closer to the axis than the detent device. This enables the gripping of the outer run of the belt to be released before contact if any between the roller on pin 55 and the end of the slot 56. Furthermore, there is sufficient lag between the release

of the upper gripping device (Fig. 4) and effective gripping of the lower run to avoid excessive shocks, particularly in view of the urging of the carriage in reverse direction by the compressed spring 59.

Although metal bands and other metal belts could be used for the belt 12, they would have the disadvantageous features of noise, the possibility of transmitting vibration and the possibility of corrosion. Preferably use should be made of a textile or plastic belt 12. A belt of this character should be noiseless and practically free from vibration because of the slow speed and the damping nature of the textiles and plastics. The proper belt should be capable of standing all climatic conditions and of holding the brush carriage in position.

Although one embodiment of the invention has been shown and described for the purpose of illustration, modifications occurring to those skilled in the art may be made without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a selector switch of the kind used in automatic telephone systems or the like, the combination, with a brush carriage mounted for reciprocation along a flat terminal bank, of means for reciprocating said carriage including an endless driving belt having two parallel runs arranged to travel in opposite directions, gripping means on said carriage positioned adjacent both of said runs and adapted to engage either of said runs for movement of the carriage in one direction with one and in the opposite direction with the other of said runs, respectively, and belt deflecting means operative upon arrival of said carriage in either of two extreme positions to deflect a respective run so as to disengage said gripping means from the deflected run and engage said gripping means with the undeflected run, whereby the direction of travel of said carriage will be reversed.

2. The combination according to claim 1 wherein said gripping means comprises a pair of pivoted members each having an effective and an ineffective position, said members being provided with means operatively linking them together so that each member will assume its effective position when the other member is forced into its ineffective position.

3. The combination according to claim 2, further comprising resilient detent means arranged to locate each of said members alternatively in the said effective or ineffective position thereof.

4. The combination according to claim 1 wherein said gripping means comprise a pair of members each having a belt-engaging surface and pivot means rotatably securing said members to said carriage, said pivot means being displaced with respect to the belt-engaging surface of a respective member in the general direction of travel of the respective belt run engageable by said member, said deflecting means comprising a pair of projections each associated with a respective member and arranged to bear upon the respective run engageable by the associated member at a point which is displaced with respect to the belt-engaging surface of said associated member in the general direction of travel of said respective run by a lesser distance than the said pivot means securing said associated member to said carriage.

5. In an apparatus of the general character described, a carriage reciprocable along a linear

path; a stationary buffer at each end of said path; an endless driving belt having two runs extending on opposite sides of said carriage parallel to said path, said runs being arranged to travel in opposite directions; gripping means on said carriage alternatively engageable with either of said runs for displacing said carriage in a respective direction along said path; and mechanism for reversing the direction of travel of said carriage upon approach of either of said bumpers, said mechanism comprising a pair of members displaceable relative to said gripping means, each of said members having a normal position and being engageable by a respective bumper for displacement into an off-normal position in which said member operatively bears upon said gripping means to move the latter out of contact with one and into contact with the other of said belt runs, and spring means for restoring each of said members to its normal position upon disengagement from a respective bumper.

6. The combination according to claim 5 wherein each of said members is arranged to bear upon said gripping means through the intermediary of a respective belt run.

7. The combination according to claim 5 wherein said carriage is provided with a pair of elongated slots inclined toward said path, said mechanism further comprising guide means allowing for longitudinal and pivotal movement of said members, each of said members being provided with a projection slidably held in a respective one of said slots and arranged to operatively bear upon said gripping means upon longitudinal displacement of the member through engagement with a respective bumper.

8. The combination according to claim 7 wherein each of said projections is arranged to bear upon said gripping means through the intermediary of a respective belt run.

9. A mechanism for reciprocating contact brushes or the like along a linear path, a carriage displaceable along said path, a stationary buffer at each end of said path, an endless driving belt having two runs extending on opposite sides of said carriage parallel to said path, said runs being arranged to travel in opposite directions, a pair of jaws each associated with a respective belt run, each of said jaws being provided with a belt-gripping surface facing the associated run, pivot means swingably securing said jaws to said carriage, said jaws being thus swingable from an ineffective position into an effective position in which the said belt-gripping surface of the jaw engages the associated belt run whereby the carriage will be entrained in the direction of travel of the run thus engaged, said members being further provided with lug means operatively linking them together so that each member will assume its effective position when the other member is swung into its ineffective position, a pair of slides, guide means securing said slides to said carriage while permitting longitudinal and pivotal movement of said slides, said carriage being provided with a pair of elongated slots inclined toward said path, each of said slides having in an extremity carrying a projection slidable in one of said slots and having another extremity engageable by a respective bumper to displace the slide from a normal position whereby said projection-carrying extremity thereof will operatively bear upon a respective jaw to disengage the same from its associated belt run and swing said jaw into its ineffective position, and spring means for restoring each of said slides to its normal

position upon disengagement from a respective bumper.

10. A mechanism according to claim 9 wherein each of said jaws is formed with a pair of holes, further comprising a flexible member secured to said carriage and carrying a pair of ball detents each arranged to cooperate with a respective pair of holes so as to locate each jaw alternatively in the said effective or ineffective position thereof.

11. A mechanism according to claim 9 wherein each of said projection-carrying extremities is arranged to bear upon a respective jaw through the intermediary of the associated belt run.

12. A mechanism according to claim 11 wherein said pivot means comprise a pair of studs each displaced relative to the belt-engaging surface of the respective jaw secured thereto in the general direction of travel of the associated belt run, the said projection-carrying extremity of a respective slide being arranged to bear upon said associated belt run at a point which is displaced relative to said belt-engaging surface in the same

general direction but by a lesser distance than the respective stud.

13. A mechanism according to claim 12 wherein each of said projection-carrying extremities carries a roller engageable with a respective belt run.

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