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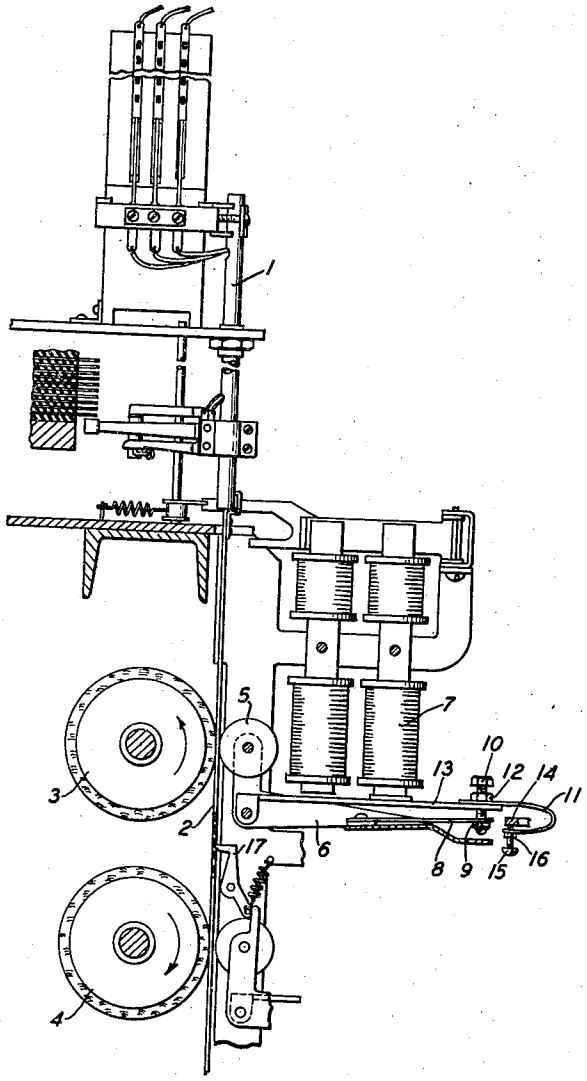


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## CLUTCH MECHANISM

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10 Claims. (Cl. 179—27.53)

This invention relates to switching apparatus for use in automatic and semiautomatic telephone systems, and more particularly to switches of the panel type. Such a switch is capable of accurately and rapidly serving a large number of lines, any line being reached through one of a plurality of multiply connected sets of brushes on a common brush shaft. The stationary terminals are arranged in vertical rows in a plurality of panel banks and are reached by causing the set of brushes having access thereto to be released and then causing said set to traverse the terminals in the bank until the terminals of the desired line are reached. The brushes are normally held in their retracted position and are tripped into operative position by a common brush selecting or tripping device.

The vertical movement of the selector is accomplished through a slotted rack, fastened to the lower end of the brush rod, being pressed against two constantly revolving cork-faced rolls by means of a magnetic clutch assembly including two magnets one of which presses the rack against one roll to give the brush rod an upward movement, and the other of which presses it against the other roll to give the brush rod a downward movement. Each magnet has a heavy retractile spring and a bell crank lever on the short arm of which is mounted a small roller behind the magnet coils. This roller, when the magnet is energized, presses against the rack and so presses the rack against the revolving cork-faced roll. In the clutch assembly is a pawl which slips over the slots in the rack as the rack moves upward, and enters a slot to hold the rack up and keep it from falling when the pressure against the roll is removed. The terminals of the multiple banks are so positioned that when the rack is resting on the pawl, the multiple brush contact springs will center on the corresponding terminals. When the down-drive magnet is energized the rack is pressed against the down-drive roll and the pawl is pulled away from the slot to free the rack for downward movement.

One of the things to be guarded against in the proper operation of a panel selector is excessive "overthrow". That is, an excessive free movement in the direction of travel, occurring after the clutch magnet is released, as a result of acquired momentum. If this overthrow is sufficient it will cause the selector brush set to falsely stop upon a terminal set above the one on which it was intended that it should stop. Therefore, while naturally the selector will always overthrow to some extent, it is necessary to confine this overthrow movement of the selector to something less than the distance between two succeeding slots of the selector rack in order to prevent false selections.

Under ordinary circumstances, overthrow is to be expected purely from the physical fact that the selector acquires momentum during its movement which has to be dissipated through motion after the power is cut off. But besides this, there are many contributory factors connected with the design of the selector and its cooperating mechanisms which tend to accentuate rather than reduce the tendency to overthrow. One of these factors is the power of the clutch magnet, the magnetic field of which does not reduce immediately with the current to the point where the "operated" load of the usual traction spring is sufficient to pull the clutch roller away from the rack, and which has the effect of prolonging the engagement of the selector rack with the cork roll. This means that in dealing with overthrow effects, the power of the magnet is greater than necessary. The breaking of this contact with the roller is further delayed by the excessive amount of kinetic energy generated in the non-rigid parts such as the elasticity of the cork roll which due to high tension of the traction spring, causes the roller to follow the rack to beyond its normal position. Another factor is seasonal variation in the circumference of the cork roll face, which expands during the hot weather to effect an increase in the spring load and thereby generally slightly improves the overthrow condition, and contracts during the cold weather to effect a decrease in the load and to thereby accentuate the overthrow condition. Other factors which affect the release load are: Operation of an adjacent clutch pushes the cork roll away and in releasing at the same time as another clutch causes the cork roll to move back and keep driving the rack of one or maybe both clutches; the tension of the clutch spring which for the proper frictional contact between the rack and the cork roll could be low and for the prevention of overthrow must be high. In practice the tension cannot be increased beyond a certain limit without running the danger of springing the rack into the cork roll, so that within working limits, the tension is not sufficient to guard against overthrow.

The object of this invention is to provide a simple and effective means whereby the possibilities of overthrow are greatly reduced, and is accomplished by the use of two separate springs on the clutch magnet, one to carry only the tension

required for the proper frictional contact between the rack of the selector and the cork roll when the selector is in motion and the other to carry the high tension required to increase the load on the magnet when fully operated and thereby prevent overthrow when the magnetic force is removed from the selector, whereby said selector will the more quickly be brought to rest. Moreover, because the traction tension can in operation be lower the clutch may be made slightly faster.

Referring to the drawing which is a side elevation of the switch with certain parts removed and other parts broken away, 1 is the brush rod, 2 is the selector rack, 3 and 4 are the oppositely revolving cork rolls against which the rack 2 is pressed for upward and downward movement, for example, by the roller 5 attached to the bell crank 6 associated with the up-drive magnet 7. In accordance with the present invention the reed spring 8 which is secured to the bell crank 6 and engages the nut 9 on the screw 10 secured to the armature 13 is supplemented by the U-spring 11 one end of which is attached to the end of the armature by the lock nut 12 on the screw 10 and the other end of which is supported under the stationary post 14 by the screw 15 and lock nut 16.

When the selector is to be moved into a selective position, the up-drive magnet 7 is operated, as a consequence of which, armature 13 is attracted to the magnet core faces and the bell crank 6 is tilted forward until the roller 5, engages the rack 2, and presses it against the surface of the revolving cork roll 3.

Because the total tension which previously was entirely carried by a single reed spring can now be divided between the reed spring 8 and the added U-spring 11, the amount of tension placed upon spring 8 can be made just sufficient to insure a resilient grip of the rack 2 between the revolving roll 3 and the roller 5, and to provide sufficient yielding tension to allow for variations in the surface of the roll 3.

At the time the armature 13 pulls up against the magnet pole-pieces, the spring 11 is placed under tension by virtue of its anchorage under the post 14. This tension, however, is not transmitted to the bell crank 6 which, on the upward movement of the selector, is only under the control of the tension stored in spring 8, but is solely for the purpose of insuring a more rapid release of the armature when the power is cut off from the windings of the magnet 7. Hence, while the selector on its upward movement is solely controlled by the comparatively slight amount of tension in spring 8, which tension can be adjusted to yield to the eccentricities of the cork roll surface and thereby prevent the bowing of the rack 5, yet when the circuit of the magnet 7 is opened, the armature, being under the tension of spring 11, can release more quickly than the former type of clutch magnet because it will be pulled down by the combined tension of spring 11 and spring 8. In consequence, the effect is to "weight down" the armature so as to start its release at an earlier period in the decay of the current in the magnet, that is, to curtail the interval during which the armature remains in an operated position between the instant power is cut off from the magnet and the time the current has decayed to the value which will permit the armature to release. The consequent effect is to cause the selector to begin dissipating its acquired momentum at a correspondingly earlier period so that the length of travel by virtue of the momentum need only be sufficient to cause the pawl 17 to engage the succeeding notch in the rack 2. This quantity of travel can, of course, be easily regulated by regulating the tension of spring 11 so that the magnet may release sooner or later as the case may be, to insure that the travel due to momentum shall never be greater than necessary.

What is claimed is:

1. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with an armature and a roller clutch, of a first spring adapted to provide sufficient tension of said roller clutch when pressing the selector shaft against said cork roll and of a second spring attached to said armature to supplement the tension on said first spring to insure a quick release of the selector shaft from said cork roll when said clutch mechanism is released.

2. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll and a second spring acting on said armature to insure the quick release of said selector shaft from said cork roll when said magnet is deenergized.

3. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll, a second spring acting on said armature, and means controlled by said armature for tensioning said second spring while said magnet is energized, said second spring being effective to quickly restore said armature when said magnet is deenergized.

4. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll and a U-shaped spring opened by said armature when said magnet is energized and acting on said armature to insure the quick release of said selector shaft from said cork roll when said magnet is deenergized.

5. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll, a U-shaped spring, and means controlled by said armature for tensioning said U-shaped spring while said magnet is energized, said U-shaped spring being effective to quickly restore said armature when said magnet is deenergized.

6. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination

with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll and a U-shaped spring anchored at one end, opened by said armature when said magnet is energized and acting on said armature to insure the quick release of said selector shaft from said cork roll when said magnet is deenergized.

7. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll, a U-shaped spring anchored at one end, and means controlled by said armature for tensioning said U-shaped spring while said magnet is energized, said U-shaped spring being effective to quickly restore said armature when said magnet is deenergized.

8. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to press said selector shaft against said cork roll and a second spring acting on said armature independent of said roller clutch to insure the quick release of said selector shaft from said cork roll when said magnet is deenergized.

9. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a magnet, an armature for said magnet and a roller clutch, of a light tension spring acting between said armature and said roller clutch to press said selector shaft against said cork roll and a heavy tension spring acting on said armature to insure the quick release of said selector shaft from said cork roll when said magnet is deenergized.

10. In a clutch mechanism for a panel drive selector in which the selector shaft is adapted to be engaged with a continuously revolving cork roll by said clutch mechanism, the combination with a frame, a magnet mounted on said frame, an armature for said magnet and a roller clutch, of a first spring acting between said armature and said roller clutch to control the pressure of said selector shaft against said cork roll and a second spring acting between said frame and said armature independent of said roller clutch to insure the quick restoration of said shaft from said cork roll when said magnet is deenergized, and means to adjust the tension of said second spring to regulate the speed of restoration of said armature.

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