The present invention relates to a cigarette packing machine of the type which has a feeding device for feeding the cigarettes to a supply container from which the cigarettes are delivered in batches to a cigarette packaging mechanism. When using such a machine it may happen that one of said devices will stop while the other continues operating. If the feeding device, for example consisting of a conveyor, stops while the packing device, consisting, for example, of a drum, continues operating, the supply container will be quickly emptied and will not deliver any cigarettes to the packing device. If instead the packing mechanism stops while the feeding device continues delivering cigarettes, the supply container will be rapidly overfilled.

The above disadvantages are eliminated by the present invention, and other improvements which will be described hereinafter are brought about.

According to the invention the supply container is provided with an adjustable storage device the capacity of which is increaseable by operating the feeding device and which is arranged to transfer stored cigarettes to the supply container by operating the packaging mechanism. Preferably means, as limit switches, are provided to stop the feeding device when the capacity of the storage device has reached a predetermined maximum value and to stop the packing mechanism when the storage device has been emptied. The device according to the invention can also fulfill an important purpose when the machine is started. According to the invention it can be provided with a device for automatic start of the packaging mechanism when the feeding device operates and has filled the storage device to about half its capacity.

The storage device according to the invention comprises at least one capacity-regulating member.

The one embodiment of the storage device comprises a capacity-regulating member in form of a flexible belt constituting a side wall of a storage box. The belt is wound upon a roller in accordance with the operation of the cigarette feeding device and the cigarette packaging mechanism so as to change the capacity of the storage device.

According to a second embodiment of the invention the feeding device comprises two separate feeding members which are individually driven, but together control the packaging mechanism in such a manner that this mechanism operates with full packing capacity when both the feeding members operate simultaneously, but only with half its packing capacity when one feeding member operates provided that the storage device which may comprise two rotatable, rigid storage plates each forming a side wall of a storage box, contains a predetermined arbitrary quantity of cigarettes in each storage box.

Two embodiments of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

FIGURES 1 and 2 are elevation and a plan respectively, with parts cut away, of the first machine according to the invention.

FIGURE 3 is a circuit diagram showing the control circuits of the machine shown in FIGURES 1 and 2.

FIGURE 4 illustrates certain succeeding cycles of operation of the machine shown in FIGURES 1 to 3.

FIGURE 5 is an elevation, partly in section, of a second machine according to the invention.

FIGURE 6 is a plan partly in section, of the machine shown in FIGURE 5, and FIGURE 7 is a diagram of the control circuits of the machine shown in FIGURES 5 and 6.

A machine using a single storage member according to the first embodiment, shown in FIGURES 1 to 3, will first be described.

Cigarettes, fed, for example, from a cigarette rod machine, are conveyed by an endless belt 1 to a supply container 2 into which the cigarettes will fall and from which batches of cigarettes are fed into pockets 4 in which the cigarettes are packed of a packing drum 3 secured to a shaft 5 that is rotated step by step. This operation and the machine equipment described and shown are well known in the art.

The supply container 2 is provided with a cigarette storage device in the form of a flexible side wall 6 of a box 20 secured to the machine frame 7, which wall consists of a belt of rubber or any other suitable material. The upper portion of the belt 6 is secured to a roller 8 in turn is secured to a horizontal shaft 9 rotatably journaled in a bearing 10 in the machine frame 7. The shaft 9 can be manually connected by a clutch 34 to a shaft 36 which is axially slidable against the bias of a spring (not shown) and provided with a hand wheel 37 by which the shaft 9 and the roller 8 can be manually rotated.

A gear 11 is secured to the shaft 9 and meshes with a gear 12 which is freely rotatably mounted on a shaft 13 secured to a bracket 72 in the machine frame. The gear 12 carries a contact arm 14 for a purpose which will be explained below. A worm wheel 16 is also secured to the shaft 9 and meshes with a worm 17 secured to the upper end of a vertical shaft 18 which is rotatably journaled in brackets 73 in the machine frame 7. A worm wheel 19 is secured to the lower end of the shaft 18 and meshes with a worm 21 which is secured to a horizontal shaft 22 rotatably mounted in a bracket 35 in the machine frame 7. The shaft 22 is provided with a clutch 23 consisting of two dog-clutch members 24, 26 which are rotatably mounted on this shaft, but restrained from axial movement, and a dog-clutch member 27 which is non-rotatably mounted, but axially slidable, on the shaft 22 between the clutch members 24 and 26. A shift- ing arm 28 is engaged with the clutch member 27 and is secured to a vertical shaft 29 which is rotatably journaled in a bracket 74 in the frame 7. Springs 31 are provided to maintain the arm 28 in an idle position between two solenoids 32, 33 mounted on brackets 75 in the frame 7.

The clutch member 24 has a sprocket wheel 38 driven through a chain 42 from a sprocket wheel 41 mounted on a driving shaft 15 for the conveyor 1 which shaft is journaled in a bracket 45. A further sprocket 43 is secured to the shaft 15 and is driven by an electromotor 46 through a chain 44 so as to drive the shaft 15 and the clutch member 24 in the direction indicated in FIGURE 2, i.e. counterclockwise as seen in FIGURE 1, the roller 8 thus being driven clockwise (as seen in FIGURE 1) when it is coupled to the shaft 15.

The clutch half 26 is provided with a sprocket wheel 39. A shaft 48, rotatably journaled in bearings 47 in the machine frame 7, carries a sprocket wheel 49 connected to the sprocket wheel 39 by a chain 51. A further sprocket wheel 50 is secured to the shaft 48 and driven through a chain 52 by an electromotor 53, so that the shaft 48 and clutch half 26 are driven in a direction shown in FIGURE 2, i.e. clockwise as seen in FIGURE 1, and the roller 8 will be driven counterclockwise when con-
connected to the shaft 48. The shaft 5 is driven by the shaft 45 through a Geneva, stop motion mechanism. The shaft 5 carries a Geneva wheel 54 which is driven step by step by means of an arm 56 secured to the shaft 48.

The shafts 45 and 48 are each provided with contact devices 57 and 58, respectively, comprising contacts 57a and 58a which are spring biased to close and complete circuits through the solenoids 33 and 32 respectively and which are each coupled to the respective shaft by a slipping clutch so as to be opened when that shaft rotates. If only the conveyor 1 operates i.e. the shaft 48 is stationary, while the shaft 15 rotates the circuit through the solenoid 32 remains closed which by means of the solenoid 33 is opened so that the solenoid 32 attracts the shifting arm 28 so as to connect the clutch member 27 and thus the shaft 22 to the revolving clutch member 24. Thus, while cigarettes are being fed to the container, the shaft 22 will be rotated counterclockwise. This rotary motion is transmitted to the shaft 9 through worm gearing 19, 21, 14 and 16 and the shaft 18 so that the shaft 9 will turn the roller 8 clockwise to slacken the belt 6 so that it will be positioned as indicated by dash-and-dot lines in FIGURE 1.

If instead the conveyor belt 1 and consequently the shaft 15 are stopped and the packing wheel 3 and the shaft 48 rotate, the contact device 58 will break the circuit through the solenoid 32 while the contact device 57 maintains the circuit through the solenoid 33, thereby enabling the solenoid 33 to attract the shifting arm 28. In this case the shaft 22 is connected to the clutch member 26 rotating clockwise, so that it will drive the shaft 9 counter-clockwise and the roller 8 will begin to stretch the belt 6 and transfer cigarettes to the supply container 2 as cigarettes are delivered therefrom to the packing drum 3.

Under normal operating conditions, when the two shafts 15 and 48 are rotating, balance is established between the quantity of cigarettes delivered to and taken from the supply container. In this case the shafts 22 and 48 are kept from sliding, the belt 6 is maintained in its stretched position indicated by full lines in FIGURE 1. The switch arm 14 is now positioned opposite the switch 59, secured to a bracket 30, and holds its contacts whereby a circuit through a solenoid 64 (FIGURE 1) is broken. The control of the machine is started by manually closing a switch 62 which is held closed by its solenoid 61 energised over a holding circuit including contacts 69. The motor 46 when started by switch 62 will drive the shaft 15 counterclockwise (FIGURE 1) and then the storage belt 6 will be slackened by the clockwise rotation of the shaft 9 (FIGURE 1), whereby the arm 14 will rotate counterclockwise from its stop position at the switch 59 (FIGURE 3) thus causing the contacts of the switch to be closed to make it possible for the motor 53 to be started later. The arm 14 continues its clockwise rotation while the supply container 2 is filled with cigarettes and, when it is full, the belt 6 stores cigarettes. When the arm 14, after about half a revolution counterclockwise, reaches a position opposite a switch 63 mounted on a bracket 55 the arm closes the switch so that a circuit through the solenoid 64 and contacts 59 is closed. The energised solenoid 64 closes the switch 66 so that the motor 53 driving the packing drum 3 and related parts will start operating. Simultaneously current is supplied to the solenoid 67 which opens contacts 68 with a predetermined delay time. Prior to this, a holding circuit has been closed to the solenoid 64 enabling the motor 53 to continue in operation. Balance is maintained between the quantity of cigarettes fed to the container 2 and the quantity of cigarettes transferred from the container to the packing drum 3.

Since both shaft 15 and the shaft 48 are rotated, the energising circuits to the solenoids 32 and 33 are held open, the shifting arm 28 thus being in its neutral position whereby the storage belt is stationary containing, for example, half its maximum reserve content of cigarettes. During this normal operation batches of cigarettes fed by a plunger out of cigarette passages 25 and into the uppermost pocket 4 of the drum 3 which rotate step by step a quarter of a revolution at a step (FIGURE 1).

Should, however, the cigarette delivery from the cigarette rod machine cease, i.e. if the motor 46 stops running, the solenoid 33 will be energised, thereby connecting the shaft 22 to the shaft 15 so that the roller 8 starts winding in the storage belt 6 while the arm 14 is released clockwise until it has returned to the stop position opposite the switch 59. The contacts 59 of the switch are opened which in turn causes the switch 66 to be opened and the motor 53 to be stopped thus interrupting the operation of the packing drum 3 and its coacting parts, i.e. the machine will stop completely.

When the cause of the non-delivery of cigarettes to the supply container 2 is eliminated, the motor 46 is started again, while the motor 53 remains idle so that the solenoid 32 connects the shaft 22 to the shaft 15 and the arm 14 leaves the stop position at the switch 59. The motor 46 is rotated counterclockwise, thus causing the belt 6 to be slackened to store cigarettes until the arm 14 reaches the switch 63 thereby causing the motor 53 to operate and initiate the packing operation.

Should for any reason the operation of the packing device cease but the feeding of cigarettes from the conveyor 1 continue, the solenoid 32 will be energised and the shaft 22 connected to the shaft 15 so that the belt 6 will be further slackened and its normal content of half a maximum supply increased to a predetermined extent which will be reached when the arm 14 during its counterclockwise movement has reached the stop position of the cigarette feed motor 46 i.e. a position in front of the switch 69 on the bracket 30. The contacts of the switch 69 are then opened, the solenoid 69 deenergised, the switch 62 opened and the motor 46 stopped. Simultaneously the arm 28 brings the clutch member 27 into its neutral position.

From the above description it will be seen that the machine to some extent may be characterised as self-regulating. When starting with a filled container 2, the drum 3 and related parts must first start operating and, when starting with an empty container, the machine is to must first start to deliver cigarettes into the supply container 2. These operations are carried out automatically since the arm 14 is positioned in its end positions at the switches 59 and 69, depending on whether the cigarette storage belt 6 is fully slack or tight. Independently of which part of the machine that is started first, it is arranged automatically to start that part of the machine which is idle at the moment, i.e. the conveyor 1 or the packing drum 3, when the arm 14 has reached a position between the two stop positions. As this position lies midway between the two stop positions, viz: at the switch 63, the storage belt 6 will, during normal machine operation, always be half filled with cigarettes.

FIGURE 4 shows the operation of the machine under certain working conditions. Diagram A illustrates the delivery of cigarettes from the conveyor 1. Diagram B illustrates the operation of the packing drum, and diagram C illustrates variations in the amount of cigarettes stored in the storage pocket formed by the belt 6. During the interval 1-2, it is assumed that the machine is standing still and that the storage belt 6 is emptied. During the interval 1-2, cigarettes are delivered by the conveyor 1 driven by motor 46. No packing operation occurs in this interval. The arm 14 moves counterclockwise in FIGURES 1 and 3 from the switch 59 to the switch 63 and the belt 6 store cigarettes. When the arm 14 reaches switch 63, the driving motor 53 of the
packing drum 3 starts operating and the clutch 27 returns to its neutral position, thereby stopping the rotation of the roller 8 of the storage belt 6.

During the time interval 2–3, the conveyor 1 and the drum 3 operates in synchrony whereby the number of cigarettes delivered by the conveyor 1 is equal to the number of cigarettes transferred to the drum 3 and accordingly the quantity of cigarettes stored in the belt 6 remains constant.

During the interval 3–4, cigarettes are still delivered to the container 2 but for some reason the packing drum 3 has stopped, thereby causing the belt 6 to store cigarettes while the arm 14 turns counterclockwise to the switch 6b towards the switch 69. When the arm 14 reaches the switch 69 and opens it the conveyor belt 1 will be automatically stopped.

During the interval 4–5, the machine is idle and the belt 6 has stored its maximum quantity of cigarettes.

At 5 the cause of the machine stopping has been eliminated. The switch 66 is closed to start the motor 53 to start the drum 3 thus starting the packing operation, but the delivery of cigarettes to the container 2 is still interrupted. The arm 14 then moves clockwise from the switch 69 towards the switch 63 and the quantity of cigarettes stored by the belt 6 is successively decreasing.

At 6 the arm 14 has reached the switch 63 during its movement in clockwise direction and closes it so that the motor 46 starts running thereby starting a new cigarette delivery operation. During the interval 6–7 delivery and packing means work in balance relation to each other thereby maintaining the quantity of stored cigarettes constant.

For some reason the motor 46 stops at 7, interrupting the delivery of cigarettes to the container 2 for the interval 7–8, but the packing operation continues, the quantity of stored cigarettes successively decreasing. The arm 14 moves while the storage belt 6 is stretched, until the switch 59 is opened so that the motor 53 stops running. The machine is then stopped.

The second embodiment of the invention will now be described with reference to FIGURES 5 to 7.

As shown in FIGURE 5 the feeding mechanism consists of two separate endless belts 76a and 76b extending from cigarette rod machines. Cigarettes are fed by the belts to a supply container into which they fall and are fed in batches into pockets 78 of a drum 77 secured to a shaft 79 and rotating step by step.

In the embodiment of the machine illustrated the adjustable cigarette storage device consists of two separate storage members each having a rigid, rotatable plate or side wall 80a and 80b, respectively. The plates which can be of an arbitrarily shape but preferably rectangular, have each a substantially straight edge secured to a shaft 81a and 81b, respectively and are positioned opposite each other at the mouth 82 of the supply container.

The circumference of each plate, the straight pivot edge excepted, is surrounded by a fixed box-shaped casing forming an adjustable storage member together with the plate. Each wall portion of the casing which is normal to the shafts 81a and 81b, respectively, consists of a sector of a circle. The area of the sectors on both sides of each plate are connected to each other by a wall portion 118 having a radius of curvature substantially equal to the length of the plate. Each shaft 81a and 81b is mounted in the machine frame and carries two freely rotatable gears 84a and 83b, 84b, respectively. Each shaft 81a, 81b can be connected to one of the gears 83a and 84a and 83b and 84b, respectively, when a solenoid-controlled clutch 85a, 85b, respectively, shown diagrammatically, is actuated. The gears 83a and 83b mesh with each other and so do the gears 84a and 84b.

The gear 84b meshes also with the gear 86b, secured to a shaft 87b which is journalized in the machine frame.

The shaft 87b carries also two sprockets 88 and 89b. The sprocket 91 secured to the shaft of a motor M4. The gear 83a also meshes with a gear 86a secured to a shaft 87a mounted in the machine frame. The shaft 87a carries also a sprocket 89a which is connected to the sprocket 89b by a chain 90a.

The conveyor belts 76a, 76b, transporting cigarettes, are individually driven from motors M1 and M2, respectively, in directions indicated by arrows, through chains 92a and 92b, respectively, and shafts 93a and 93b which are mounted in the machine frame.

A motor M3 drives by sprockets and a chain 94 shaft 95 which is journalized in a bracket 96 secured to the frame. One end of the shaft 95 carries an arm 97 which, when the motor M3 operates, rotates a Geneva wheel 98 step by step. The Geneva wheel is secured to a shaft 79 transmitting the movement to the packing drum 77.

In the illustrated embodiment of the packing machine, the packing drum 77 is arranged to start operating, if the supply container is emptied, only when the storage device contains a predetermined quantity of cigarettes and to be stopped when the container is entirely emptied. The conveyor belts 76a, 76b are arranged to be stopped when the storage device is wholly filled with cigarettes.

In accordance with distribution of the cigarettes in the two storage devices and the working conditions of the conveyor belts the packing drum 77 is also arranged to operate at full or half speed. The operation and position of the different parts are controlled by switch actuating arms 99a and 99b secured to the shafts 81a and 81b respectively. The switch actuating arm 99a carries a switch actuating arc 100a and the switch actuating arm 99b carries a switch actuating arc 100b.

The switch actuating arm 99a cooperates with two limit switches 101a and 101b and with an intermediate switch 103a. The arm 99b cooperates with two limit switches 101b and 102b and with an intermediate switch 102b. The switch actuating arc 100a mounted on the arm 99a cooperates with a switch 104a, and the switch actuating arc 100b mounted on the arm 99b cooperates with a switch 104b.

The operation of the machine under different conditions will now be described with reference to FIGURES 5 to 7. The electrical control circuits of the machine are arranged with regard to the desideratum that under normal operation, i.e. when both the feeding members and the packing member are operating, the feed members are filled with cigarettes to a predetermined mean level. To start the machine, a switch 112 is closed, thereby energising the relay 110 and starting the motor M4 through the contact K24. The different parts of the machine will then be automatically started.

If it is assumed that the machine is started with both the storage members emptied, the two plates 80a, 80b are in the position shown in FIGURE 5 and the two arms 99a and 99b are substantially vertical so that the switches 101a and 101b are actuated by them and the switches 104a and 104b are actuated by the switch actuating arcs 100a and 100b, the following cycle of operation will be started.

The relay 105 is energised in a circuit from positive potential through the switch 104a, the diode or other unidirectional conducting device L3, the winding of the relay 105, a switch 113, the start switch 112 to negative potential. The relay then holds itself over a circuit from positive potential through the limit position switch 102a and contacts K3. The motor M1 is started by contacts K4 and drives the left hand conveyor belt 76a through the chain 92a. A circuit is simultaneously closed to a clutch solenoid Y1 from positive potential through the switch 104a the unoperated switch 103a and a diode L2 and in parallel from positive potential through contacts K7 and hence through the contacts K12 and K2 (now closed) and the winding of the solenoid to negative potential. The solenoid Y1 actuates the clutch 85a.
in such a manner that the shaft 81a will be connected to the gear 84a and driven from the motor M4 counter-clockwise as seen in FIGURE 1 thereby causing the plate 80a to be rotated counterclockwise and to begin storing cigarettes falling down from the belt 76a.

The relay 111 is energized simultaneously with the relay 105 over a circuit from positive potential through the switch 104b acted upon by the arc 100b, the diode L5, the winding of the relay 111 and the switch 114, the starting switch 112 to negative potential. The relay 111 closes the contacts K27 to provide a holding circuit from negative potential through the limit position switch 102b and closes the contacts K28 to complete a circuit to the motor M2 which is thus started and drives the right hand conveyor belt 76b through the chain 92b in the direction of the arrow shown in FIGURE 2. The circuit of a clutch solenoid Y3 is completed from positive potential through the switch 104b, the switch 103b and the diode L4 and in parallel from positive potential through contacts K8, and hence through contacts K13 and K26 and the winding of the solenoid to negative potential with the result that the solenoid operates the clutch 85b. In such a manner that the shaft 81b is connected to the gear 84b and driven from the motor M4 clockwise as seen in FIGURE 5. The storage plate 80b of the right hand storage device secured to the shaft 81b will thus be rotated clockwise so that cigarettes falling from the belt 76b will be stored.

The storage cycle continues until the mean level of one or both storage members has been reached. It is assumed that the mean level is first reached in the right hand storage member which means that the plate 80b is positioned as indicated with dash-dot-dot lines in FIGURE 1 and in which position the switch actuating arm has reached and operated the switch 108b the following will occur.

A circuit to the relay 109 is closed from positive potential through the switch 104b, which is held in its shifted condition by the switch actuating arc 100b as long as the stored quantity of cigarettes does not exceed the mean level desired, through the now shifted switch 103b, the diode L6 and the winding of the relay 109 and the start switch 112 to negative potential. As a result a circuit is closed to a starting relay 106 from positive potential through contacts K19 of the relay 108 through the contacts K22 and K14, a switch 115 and the winding of the relay 106 to negative potential at the earth ground 112. The starting relay 106 closes its contacts K9 to establish a circuit to the motor M3 which starts running at half speed driving the packing member 77 as stated before. When the switch 103b is actuated by the arm 99a, one circuit through the clutch solenoid Y3 is opened and on energising the relay 106 the other circuit is opened by the contacts K8, thereby deenergising the solenoid Y3 so that the clutch 85b returns to its neutral position and interrupts the rotation of the shaft 81b and thus the rotary motion of the plate 80b.

When the plate 80a of the left hand storage member has reached its mean position the arm 99a actuates the switch 103c which completes the circuit to the relay 108 from positive potential through the contacts 104a, still operated by the switch actuating arc 100a, through the shifted switch 103c, the diode L3 and the relay winding to negative potential at the storage switch 112. The relay 108, when energised, holds itself through the contacts K16 from positive potential and through the switch 101a which is in the sitting shown.

Now both storage members contain the desired mean quantity of cigarettes so that the packing member should run at full speed. This is brought about by energising the relay 107 in a circuit from positive potential through the contacts K21, the contacts K17, the relay winding and the switch 115 to negative potential at the starting switch 112. Consequently the relay 107 closes its contacts K15 causing the motor M3 to operate at full speed.

The circuit to the solenoid Y1 is opened at contacts K12 upon energisation of the relay 107 whereby the clutch 85a automatically returns to neutral position thereby interrupting the rotation of the shaft 81a and the plate 80a.

Now the machine operates normally and the quantity of cigarettes delivered to the supply container is assumed to be the desired. The quantity of cigarettes transferred to the packing member operating at full speed.

If, for any reason, the conveyor of one of the cigarette rod machines should not be supplied with cigarettes the motor, driving the conveyor, will be stopped manually or automatically, in known manner. As shown in FIGURE 3 the starting relays 105 and 111 of the motors M1 and M2, respectively, are each provided with a control switch 113 and 114, respectively. In case of a fault in the left hand cigarette rod machine the contacts of the switch 113 will break the circuit of the relay 105 which will thereby deenergise thereby opening its contacts K4 and the circuit to the motor M1. On deenergising of the relay 105, the circuit to the clutch solenoid Y2 is completed at the contacts K1. The solenoid is energised over a circuit from positive potential through the unoperated contacts 101a, the contacts K10 and K4 and the winding of the clutch 85a to negative potential. The solenoid Y2 operates the clutch 85a so that the shaft 81a is connected to the gear 83a rotating clockwise, whereby the storage plate 80a begins to rotate clockwise transmitting stored cigarettes to the supply container. The packing member is still running at full speed. Finally all cigarettes stored in the left hand storage device have been transferred to the supply container and the plate 80a is raised so that the contacts 101a are actuated by the switch actuating arm 99a. The circuit to the solenoid Y2 is opened by these contacts and the shaft 81a is unclutched as a result of the return of the clutch member 85a to its neutral position. The self-holding circuit of relay 108 will be opened when the contacts 101a are actuated by the arm 99a, the relay thus being deenergised so as to open the circuit to the relay 107 by opening the contacts K17. Consequently the relay 107 will be deenergised and opens the “full speed” circuit of the motor M3 through the contacts K15. The contacts K14, however, close, at the same time, the energising circuit of the relay 106 which, in turn, closes the contacts K9 and completes the “half speed” circuit of the motor M3. The packing member then operates at half speed until the left hand cigarette machine has stopped and until the left hand storage device has been filled with cigarettes up to the desired level whereas the motor M3 again will be switched over to its full speed circuit, as already described.

A similar sequence of operations will be started if the right hand cigarette machine interrupts the delivery of cigarettes. Such an interruption is effected by opening the contacts of the switch 114.

Should one storage device, when starting the machine, contain cigarettes up to the predetermined mean level indicated by the actuated state of the switch 104a or 104b, whereas the other storage device is emptied or contains such a small quantity of cigarettes that the arm 99a or 99b has left the intermediate level switch 103a or 103b, the packing member will operate at half speed until both the storage members contain cigarettes up to the desired mean level. The relay 108 and the relay 109 are energised. The full speed relay 107 will be energised through the contacts K17 and K21 only when these two relays 108 and 109 are energised.

If, for any reason, the packing member should stop the contacts of the switch 105 are manually or automatically opened to open the circuit to the relay 106 or to the relay 107 whichever is energised, thus causing the motor M3 to be stopped. The clutch solenoids Y1 and Y3 are energised over circuits from positive potential through the contacts K7 and K8, respectively, to connect the shafts 93a and 93b to the rotating gears 84a and 84b,
respectively. Thus the plate 80a will be rotated counterclockwise and the plate 80b clockwise so that the capacity of the storage member is increased. When the arm 99a reaches the limit position switch 102a and actuates it, the circuit of the relay 105 is opened. The relay 105 is, thus, deenergized and opens the contacts K4 and the circuit of the motor M1 thereby causing the left hand conveyor belt 76a to be stopped. When the right hand storage member has been filled, implying that the plate 80b has been turned clockwise to such an angle that the arm 99b operates the switch 102b, the holding circuit of the relay 111 through the contacts K27 is opened. The relay is accordingly deenergized and opens the contacts K28 and the circuit of the motor M2, thereby causing the belt 76b to be stopped.

When the machine then is started with filled storage members, first of all the circuit of the relay 108 is closed from positive potential through the unoperated contacts of the switch 104a, through the winding of the relay and to negative potential at the starting switch 112. The circuit of the relay 109 is simultaneously completed from positive potential at the unoperated contacts of the switch 104b, through the winding of the relay to negative potential at the starting switch 112. Since both the relay 108 and the relay 109 are energized, the circuit of the full speed relay 107 is closed by the contacts K17 and K21 thus enabling the packing member to operate at full speed. When the relay 107 is energized the circuits of the clutch solenoids Y2 and Y4 are closed by the contacts K10 and K11, respectively, so that the plates 80a and 80b are given such a rotary motion that the storage members begin to be emptied. When the switch actuating arms 99a and 99b have reached the switch 103a and 103b, respectively, the related switch contacts are actuated. In this position of the arms the switch actuating arms 100a and 100b also operate the corresponding switches 104a and 104b, respectively. The circuits of the relays 105 and 111 are closed by the respective contacts. The motors M1 and M2 begin to operate and the machine operates under normal conditions.

The invention should obviously not be restricted to the embodiments shown but can be modified in various manners. The machine may, for example, be provided with means for manual control of the movable storage members, as indicated by the handles 116 and 117 in FIGURE 6. The various switches sensing the positions of the movable storage members can be replaced by known sensing devices involving photo cells.

I therefore claim:

1. A cigarette packing machine comprising a supply container for the cigarettes, a feeding device for feeding cigarettes into said supply container, means for feeding cigarettes from said supply container to a packing mechanism, said supply container being comprised of at least one movable storage member, means for said movable storage member, first control means associated with said feeding device and sensitive to the operative condition of the feeding device, said reversible driving means being connected to said first control means and operated thereby in dependence on the condition sensed to drive said bounding member in a first direction to increase the capacity of the supply container when inactive condition of the packing mechanism is sensed by the second control means.

2. A cigarette packing machine comprising walls forming a supply container for the cigarettes having an upper inlet opening and a lower outlet opening, a feeding device for feeding cigarettes through said inlet opening into the supply container, means for feeding cigarettes from said outlet opening to a packing mechanism, one wall of said supply container being a rigid plate, a reversible driving means connected to said second control means and operated thereby in dependence on the condition sensed to increase the length between said inlet opening and said outlet opening of said flexible belt when said first control means senses inactive condition of said feeding device, second control means associated with said packing mechanism and sensitive to the operative condition of the packing mechanism, said reversible driving means being connected to said second control means and operated thereby in dependence on the condition sensed to increase the length between said inlet opening and said outlet opening of said flexible belt when said second control means senses inactive condition of said feeding device, second control means associated with said packing mechanism and sensitive to the operative condition of the packing mechanism, said reversible driving means being connected to said second control means and operated thereby in dependence on the condition sensed to increase the length between said inlet opening and said outlet opening of said flexible belt when said second control means senses inactive condition of said packing mechanism.

3. A cigarette packing machine comprising walls forming a supply container for the cigarettes having an upper inlet opening and a lower outlet opening, a feeding device for feeding cigarettes through said inlet opening into the supply container, means for feeding cigarettes from said outlet opening to a packing mechanism, one wall of said supply container being a rigid plate, a reversible driving means connected to said outlet opening and operatively connected to said upper end portion, first control means associated with said feeding device and sensitive to the operative condition of the feeding device, said reversible driving means being connected to said first control means and operated thereby in dependence on the condition sensed to decrease the length between said inlet opening and said outlet opening of said flexible belt when said first control means senses inactive condition of said feeding device, second control means associated with said packing mechanism and sensitive to the operative condition of the packing mechanism, said reversible driving means being connected to said second control means and operated thereby in dependence on the condition sensed to decrease the length between said inlet opening and said outlet opening of said flexible belt when said second control means senses inactive condition of said packing mechanism.
feeding control means cooperating with said second feeding means and sensing the operative condition thereof, packing control means cooperating with said packing mechanism and sensing the packing capacity thereof, said first reversible driving means being connected to said first feeding control means and to said packing control means to be operated thereby in dependence on the combination of the conditions sensed by the first feeding control means and by the packing control means such that said first driving member swings said first rigid plate in a direction to decrease the capacity of the supply container when said first feeding control means senses inactive condition of said first feeding means and said packing control means senses normal packing capacity of said packing mechanism, and such that said first driving member swings said first rigid plate in opposite direction to increase the capacity of said supply container when said first feeding control means senses active condition of said first feeding means and said packing control means senses decreased packing capacity of said packing mechanism, said second reversible driving means being connected to said second feeding control means and to said packing control means to be operated thereby in dependence on the combination of the conditions sensed by the second control means and by the packing control means such that said second driving member swings said second rigid plate in a direction to decrease the capacity of the supply container when said second feeding control means senses inactive condition of said second feeding means and said packing control means senses normal packing capacity of said packing mechanism, and such that said second driving member swings said second rigid plate in opposite direction to increase the capacity of said supply container when said second feeding control means senses active condition of said second feeding means and said packing control means senses decreased packing capacity of said packing mechanism.

5. A cigarette packing machine comprising a supply container for the cigarettes comprised of at least one movable bounding member, a feeding device for feeding cigarettes to said supply container, means for feeding cigarettes from said supply container to a packing mechanism, a reversible driving means for said movable bounding member, first control means cooperating with said feeding device and sensitive to the operative condition of the feeding device, said reversible driving means being connected to said first control means and operated thereby in dependence on the condition sensed to drive said bounding member in a first direction to decrease the capacity of the supply container when inactive condition of the feeding device is sensed by the first control means, said second control means cooperating with said packing mechanism and sensitive to the operative condition of the packing mechanism, said reversible driving means being connected to said second control means and operated thereby in dependence on the condition sensed to drive said bounding member in a second direction to increase the capacity of the supply container when inactive condition of the feeding device is sensed by the second control means.

6. A cigarette packing machine comprising a supply container for the cigarettes comprised of at least one movable bounding member, a feeding device for feeding cigarettes into said supply container, means for feeding cigarettes from said supply container to a packing mechanism, a reversible driving means for said movable bounding member, first control means cooperating with said feeding device and sensitive to the operative condition of the feeding device, said reversible driving means being connected to said first control means and operated thereby in dependence on the condition sensed to drive said bounding member in a first direction to decrease the capacity of the supply container when inactive condition of the feeding device is sensed by the first control means, said second control means cooperating with said packing mechanism and sensitive to the operative condition of the packing mechanism, said reversible driving means being connected to said second control means and operated thereby in dependence on the condition sensed to drive said bounding member in a second direction to increase the capacity of the supply container when inactive condition of the feeding device is sensed by the second control means.
said second driving means swings said second rigid plate in a direction to decrease the capacity of the supply container when said second feeding control means senses inactive condition of said second feeding means and said packing control means senses normal packing capacity of said packing mechanism and such that said second driving member swings said second rigid plate in opposite direction to increase the capacity of said supply container when said second feeding control means senses active condition of said second feeding means and said packing control means senses decreased packing capacity of said packing mechanism, first switching means operating in dependence on the movement of said first rigid plate, second switching means operating in dependence on the movement of said second rigid plate, said first and second switching means being connected to the packing mechanism to control the operation thereof in dependence of the combined operation of the first and second switching means such that said packing mechanism is caused to start operating with half packing capacity when one of said first and said second switching means senses that the cooperating rigid plate is in a predetermined position between said two limit positions and such that said packing mechanism will operate with normal packing capacity when said first and said second switching means sense that said first and said second plate are in predetermined positions between their respective limit positions.

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