United States Patent

Seragnoli

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[54] **APPARATUS FOR FEEDING CIGARETTE CONTAINERS TO THE HOPPER LOADING MECHANISM OF A CIGARETTE PACKAGING-CONDITIONING MACHINE**

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[52] **U.S. Cl.** **214/302**

[51] **Int. Cl.** **B65f 3/02**

[58] **Field of Search** 214/300, 302, 307, 6.2

[56] **References Cited**

UNITED STATES PATENTS

3,140,772	7/1964	Seragnoli	214/6.2 UX
3,239,085	3/1966	Schmermund	214/307
3,342,350	9/1967	Seragnoli	214/6.2

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Attorney—Robert E. Burns and Emmanuel J. Lobato

[57] **ABSTRACT**

Disclosed herein is an apparatus for supplying cigarette containers to the loading mechanisms for hoppers of cigarette packaging-conditioning machines. The apparatus supplies containers filled with cigarettes through a storage device so that the operating continuity of the cigarette packaging-conditioning machine is assured independently of the operating continuity for the cigarette manufacturing machine associated therewith. The storage device intervenes to ensure maximum operating efficiency for both the cigarette manufacturing machines and for the packaging-conditioning machine by storing the containers of cigarettes produced by the manufacturing machine when a failure occurs in the packaging machine; and, by supplying the stored containers to the packaging machine during proper operation of all of the apparatus and upon failure of the manufacturing machine.

3 Claims, 9 Drawing Figures

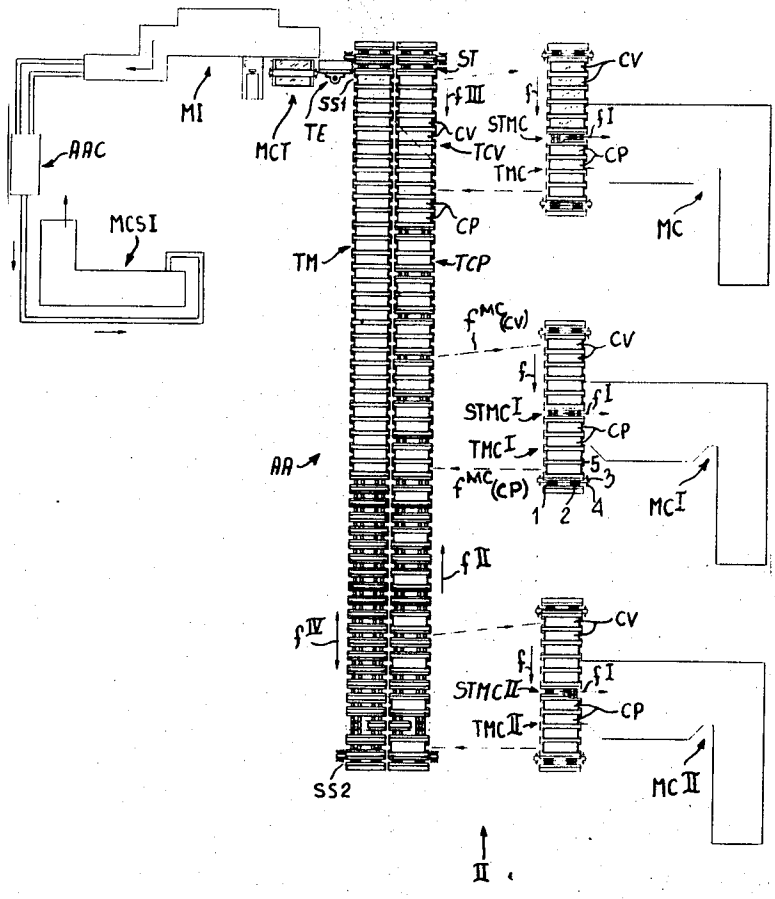
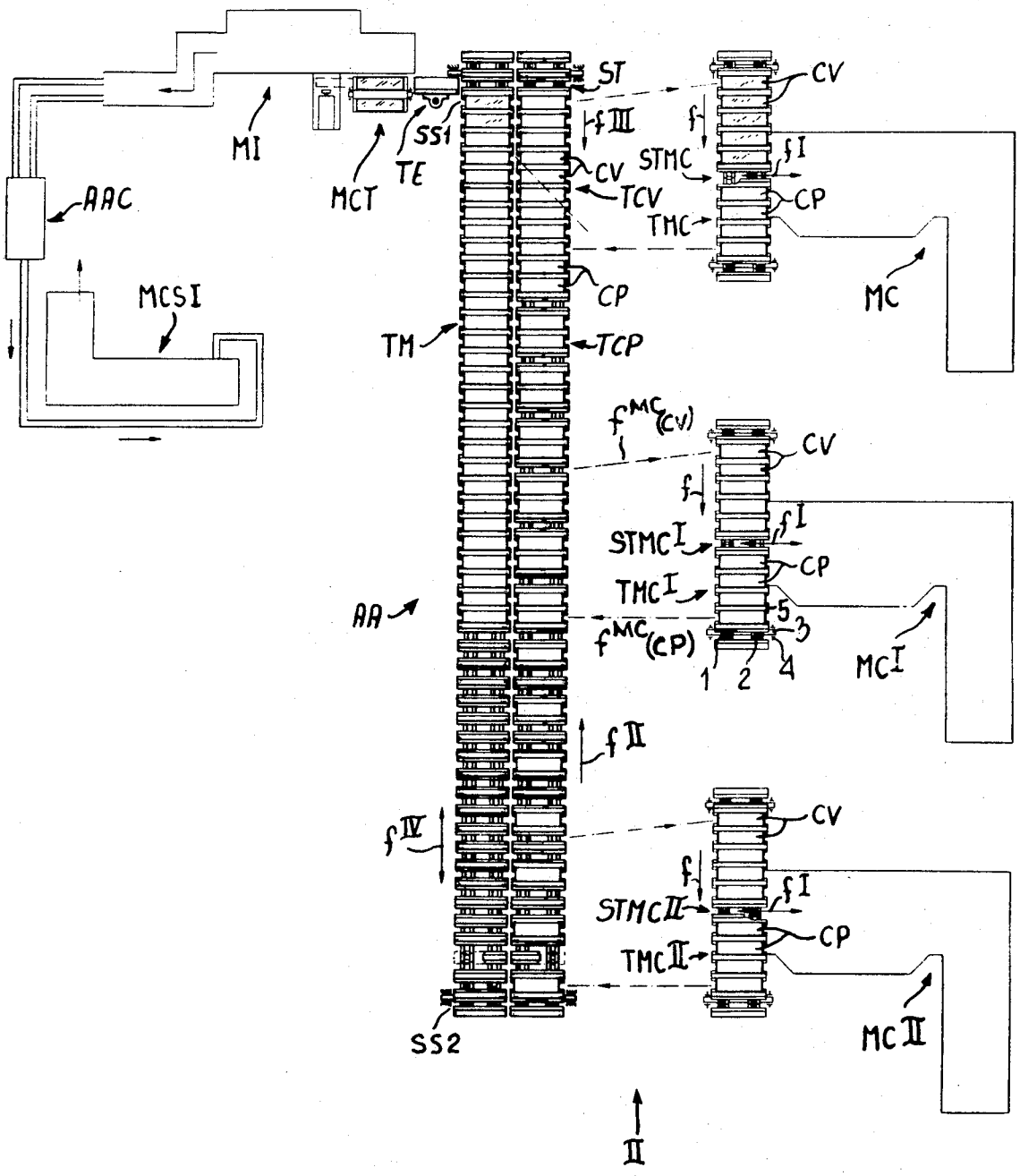


FIG. 1


MI
MCT
TE
SS1
AAC
MCSI
ST
CV
fIII
f
STMC
fI
CV
TCV
CP
TMC
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TM
TCP
fMC(CV)
CV
f
STMCI
fI
CP
TMCI
AA
fMC(CP)
5
3
1
2
4
MCI
fII
fIV
CV
f
STMCII
fI
CP
TMCII
MCII
SS2
II

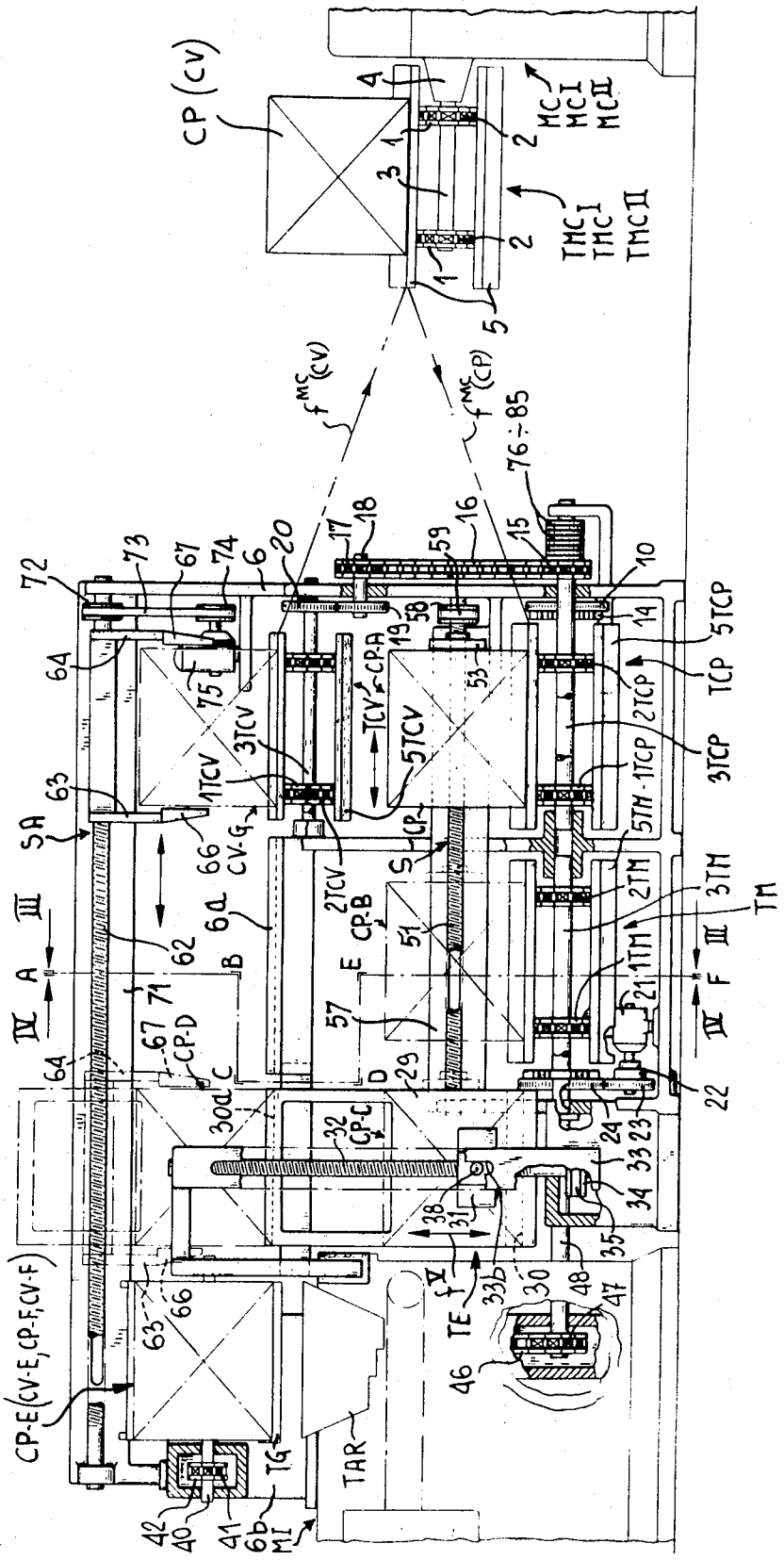

CP (CV)
MC
MCI
MCII
TMC
TMCI
TMCII
f MC (CV)
f MC (CP)
76÷85
CP-E (CV-E, CP-F, CV-F)
TAR
TE
TG
MI
SA
TCV
CP-A
CP-B
CP-C
CP-D
CV-G
TCP
TM
TIM

FIG. 2

FIG. 3

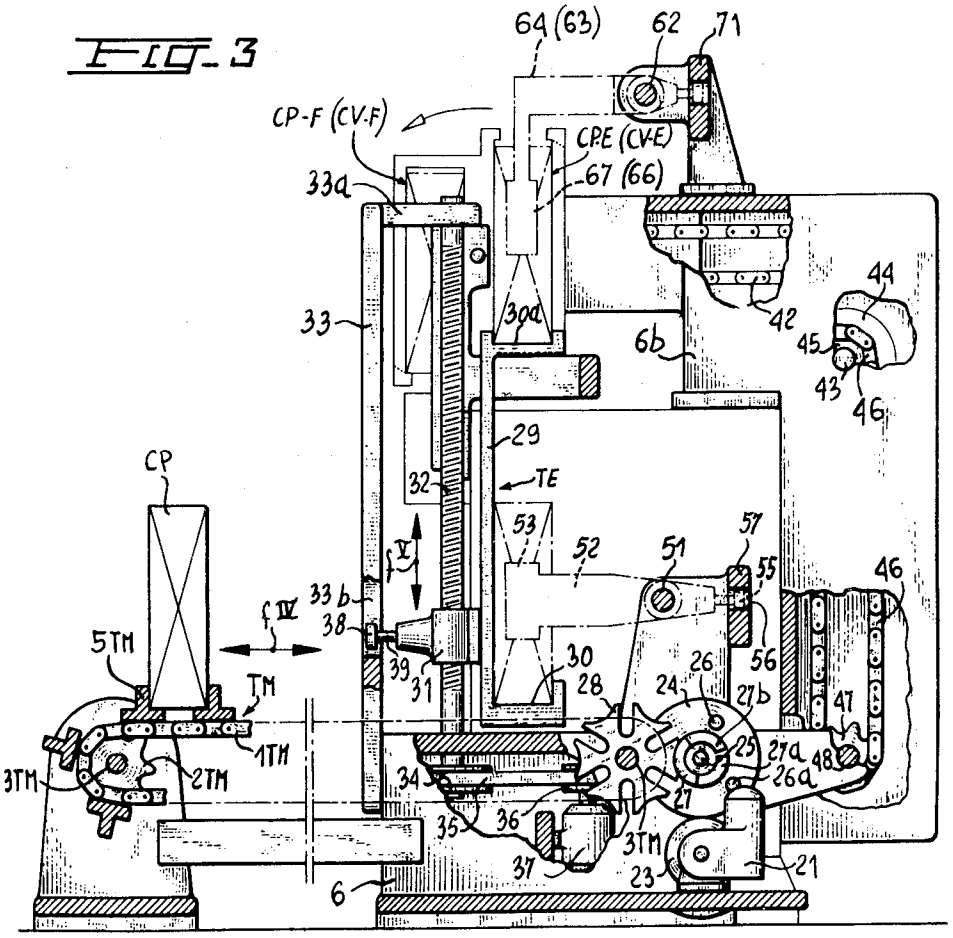
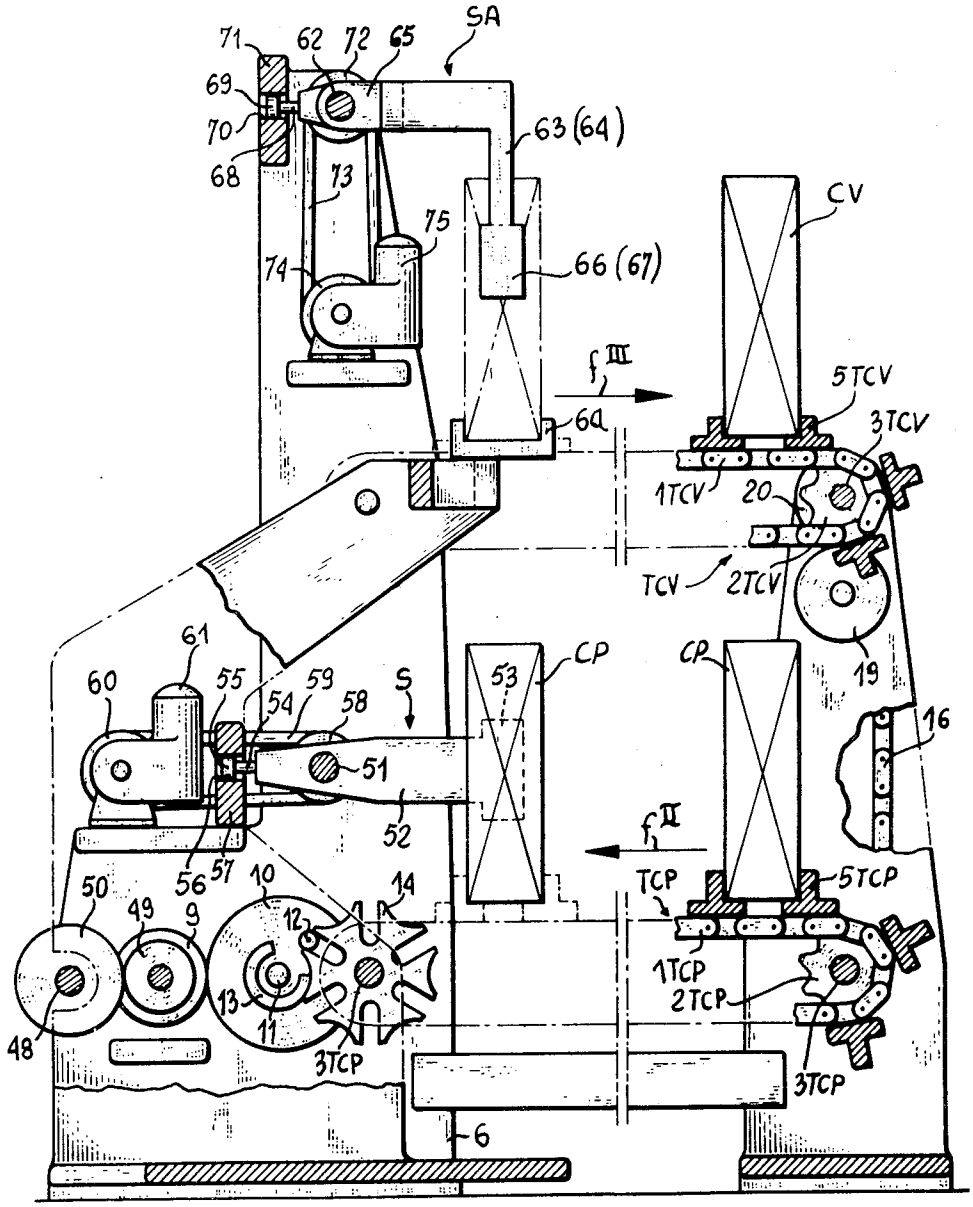

64 (63)
62
71
CP-F (CV-F)
CP-E (CV-E)
67 (66)
33a
33
30a
6b
42
44
45
43
46
29
CP
32
TE
53
52
51
57
55
V
IV
33b
38
39
31
30
28
24
26
27b
25
27a
26a
48
47
5TM
TM
1TM
3TM
2TM
34
35
36
37
27
3TM
23
21
6

FIG. 4


SA
71
62
72
65
69
70
68
63 (64)
73
75
74
66 (67)
CV
III
5TCV
3TCV
64
1TCV
20
TCV
2TCV
19
16
61
60
55
59
54
58
S
53
CP
CP
51
52
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10
12
14
13
11
3TCP
48
6

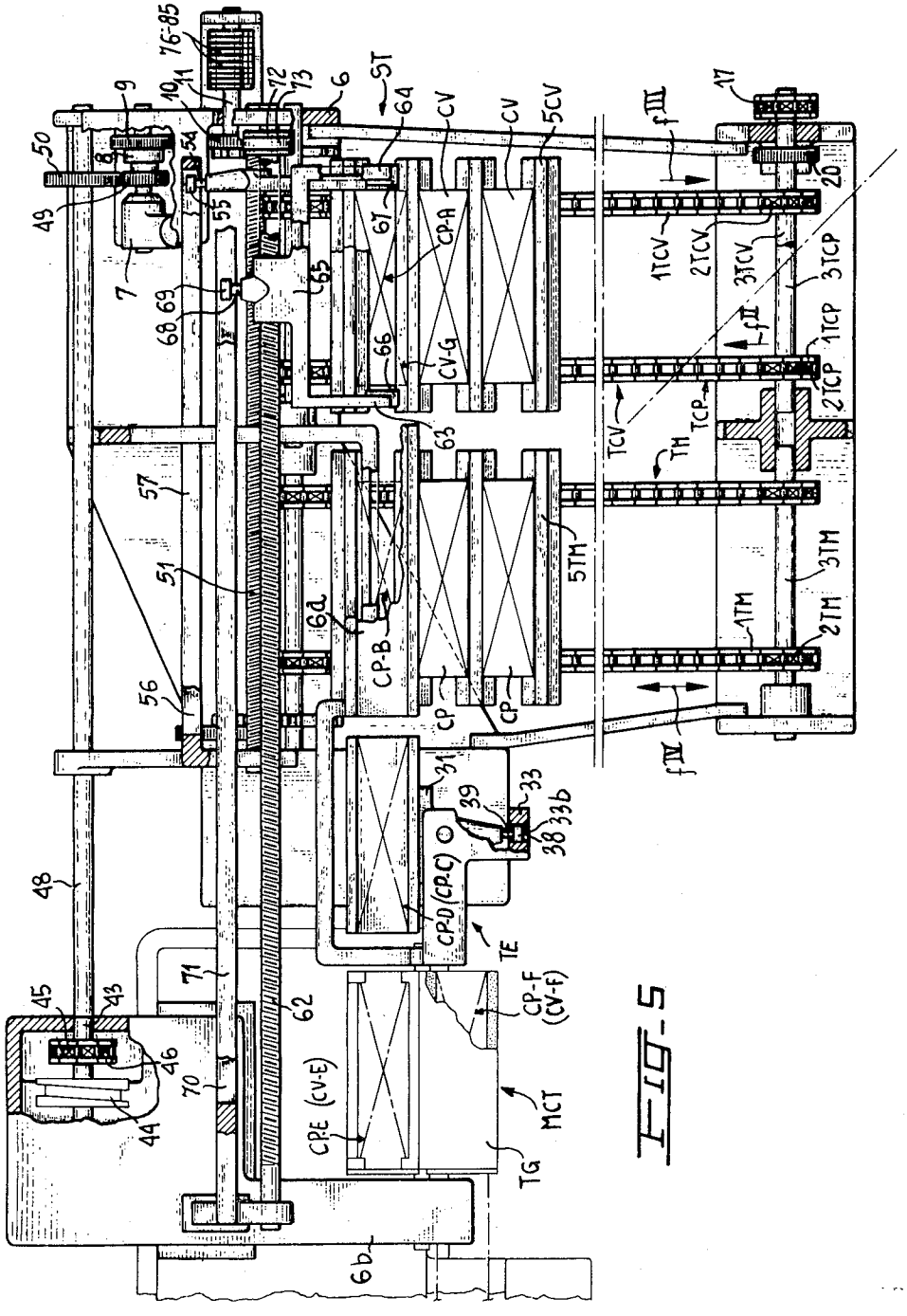

76-85
9
10
11
12
13
6
ST
64
CV
CV
5CV
III
17
50
49
54
55
20
7
68
69
65
67
CP-A
66
CV-G
1TCV
2TCV
3TCV
3TCP
II
1TCP
2TCP
TCV
TH
TCP
63
57
51
5TM
3TM
1TM
2TM
6d
CP-B
56
CP
CP
IV
31
39
33
33b
38
48
CP-D (CP-C)
TE
71
45
43
62
CP-F (CV-F)
46
70
CP-E (CV-E)
MCT
44
TG
6b

FIG. 5

Fig. 6

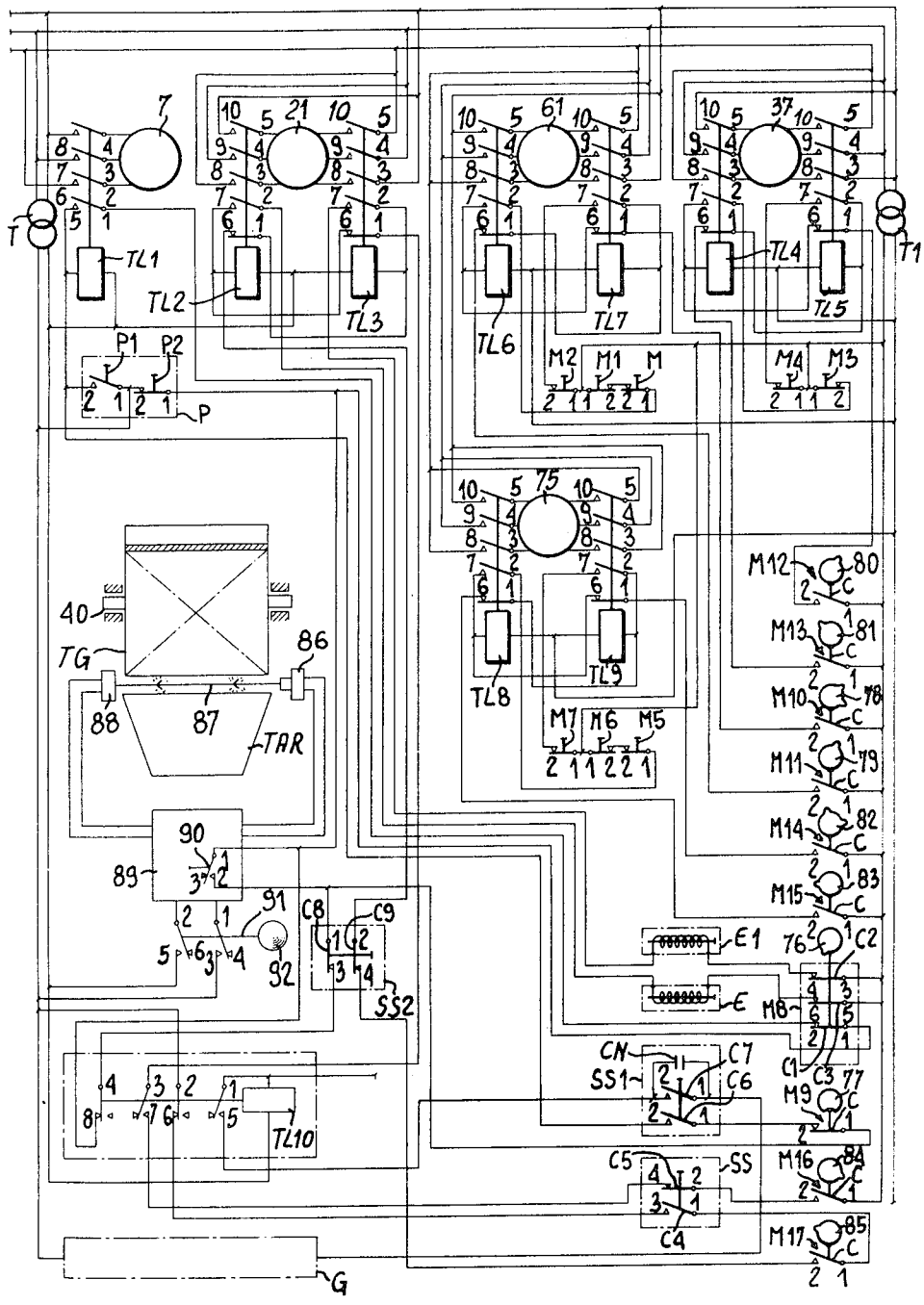

T
T1
TL1
TL2
TL3
TL4
TL5
TL6
TL7
TL8
TL9
TL10
P1
P2
P
M
M1
M2
M3
M4
M5
M6
M7
M8
M9
M10
M11
M12
M13
M14
M15
M16
M17
TG
TAR
40
86
87
88
89
90
91
92
E
E1
C1
C2
C3
C4
C5
C6
C7
C8
C9
CN
SS
SS1
SS2
G

Fig. 7

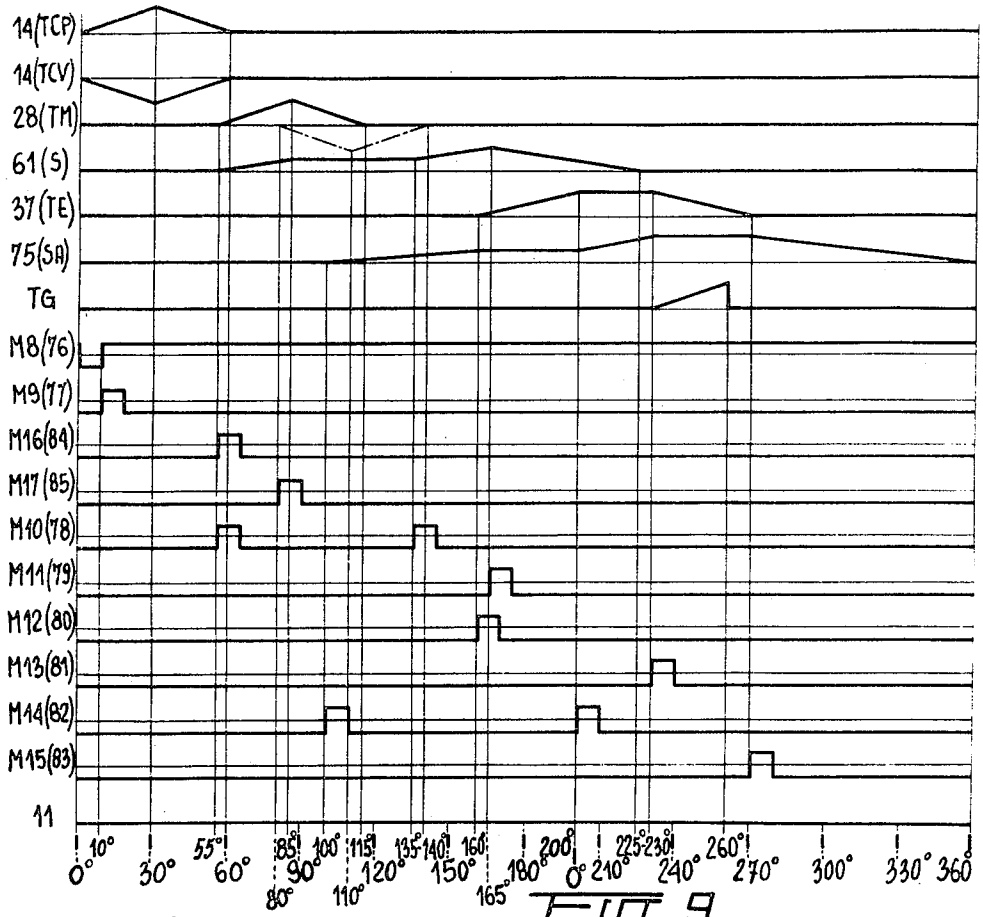


Fig. 8

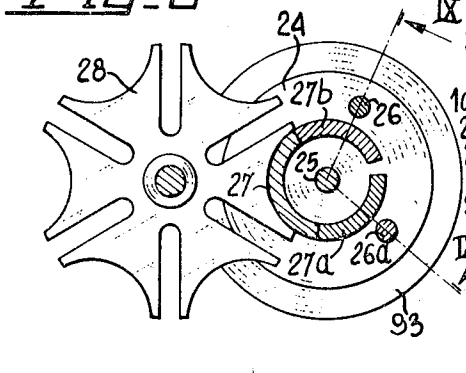
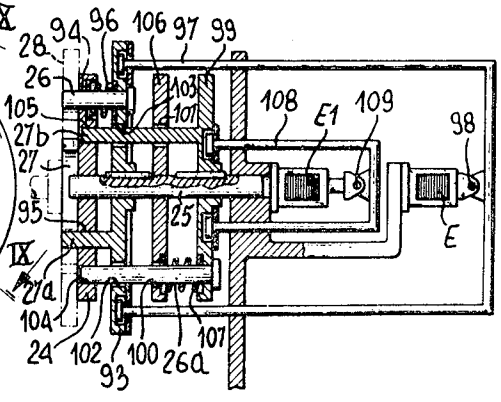


Fig. 9



AN APPARATUS FOR FEEDING CIGARETTE CONTAINERS TO THE HOPPER LOADING MECHANISM OF A CIGARETTE PACKAGING-CONDITIONING MACHINE

This invention relates to apparatus for feeding cigarettes to the hoppers of cigarette packaging-conditioning machines, and, more particularly, to apparatus of the type providing such a feed by containers or boxes which have been previously filled with cigarettes and supplied to a so-called hopper loading mechanism for said cigarette packaging-conditioning machines.

As is well known, cigarette packaging-conditioning machines are fed with cigarettes supplied to the associated feed and assembling hoppers by manual, automatic or semiautomatic operations. However, by increasing the unitary operating speed of these packagingconditioning machines, it has been shown to be increasingly necessary to perform this supply function automatically.

At present, automatic feed is provided so as to operate according to the so-called direct feeding, that is, by directly connecting the outlet of the cigarette manufacturing machines to the inlet of the packaging-conditioning machines, that is, to the feeding and assembling hopper thereof, or by supplying cigarettes to said hoppers by containers or boxes which have been previously filled and brought to a station where they are automatically or semi-automatically unloaded into the hoppers.

This invention particularly relates to the latter type of automatic feeding, that is to the type using containers or boxes previously filled with cigarettes, and is concerned with an apparatus for feeding said cigarette containers to the automatic hopper loading mechanisms of the packaging-conditioning machines, independently of operation continuity of the manufacturing machines by drawing, in case of need, said containers from a store or stock wherein these containers are regularly stored when the manufacturing machines are running, while the packaging machine is not or while it is running irregularly running.

Thus, it is known that conventional parallelepiped-shaped containers or boxes, open at a side face or at the upper face, which, as also known, are manually or automatically filled with cigarettes by mechanical and/or pneumatic systems at the outlet of the cigarette manufacturing machines, are at presently transferred to the hopper loading mechanism of the cigarette packaging and conditioning machines, either manually or through the aid of automatically or semiautomatically operating transfer apparatus, without any chances of compensating for the unbalances which may occur between packaging-conditioning machine operation and manufacturing machine operation.

In the most frequent case of manual feeding, the containers filled with cigarettes are subsequently individually loaded on a frame member rotatable about a horizontal axis, by arranging the same with the open side face thereof against a wall of said frame member. The operator then wraps a flexible material tape, which is usually connected by an end to said frame member, above the open top face of the container thus positioned on the frame member, or arranges a rod, referred to as a bayonet; rotates said frame member about its horizontal axis of rotation overturning the container above the conditioning machine hopper to be supplied, with said face as wrapped by the flexible tape or closed by the bayonet, downwardly facing, removes said tape, or said bayonet, by slipping it out from between the upper level of cigarettes within said hopper and the lower level of cigarettes within the overturned container, so as to enable the downward transfer for the latter within said hopper; and finally, when all of the container cigarettes have moved downward within the hopper, rotates said frame member in a direction opposite to the former and removes the empty container therefrom.

By so operating, it occurs that by manually slipping out the flexible tape or bayonet the cigarettes which are more directly involved by the slipping movement of said tape or bayonet are often deviated from the normal position thereof, whereat they are parallel to one another and to the hopper descending channels. In such deviated position they take up a transverse attitude, so as to hamper the descent thereof through said channels, thereby causing substantial drawbacks with frequent prolonged stoppages in production, or discontinuities in the manufacturing machine operation, as well known to those skilled in the art.

Such drawbacks are also and particularly encountered where there occurs a progressive increase in fall or drop distance of the container cigarettes from the cigarette level within the hopper to be fed, resulting from a somewhat slight delay by the operator in the rate of effecting the above feeding operations for the full containers and removal of empty containers; or when, while using a high speed conditioning machine, this cigarette level within said hopper drops very rapidly.

Such drawbacks, deriving from the increase in drop distance for the cigarettes of the containers overturned above the hopper to be loaded, or from the rapid drop of said level resulting from using packaging-conditioning machines operating at a high output speed, have been overcome by by using hopper loading mechanisms for the conditioning machines capable of accomplishing a rapid automatic substitution above the hopper for the empty containers with full containers.

A mechanism of this character substantially provides a rotatable loading head which is located above the hopper to be loaded, and which is shaped so as always to have thereon two containers at an upset mirror-like symmetrical position so that such containers can be disposed alternately in an overturned position for cigarette supply into the hopper, and responsive means for detecting the unloading occurrence of such overturned container and for controlling half a rotation or revolution for said rotatable head to immediately replace the empty container with a full one. The operations for removing the empty container from the rotatable loading head and replacing it with a full container are provided so as to be carried out either manually, or automatically or semiautomatically.

Assuming that by using such a rotatable loading head mechanism the possibility is provided for avoiding the above drawbacks resulting from the dropping of the cigarette level within the hopper to be loaded, it is realized that by continuously increasing the output speed of the packaging and conditioning machine, the problem has risen of assuring the operating continuity for such fast conditioning machines by assuring a continuous cigarette supply.

Thus, by the provision of these fast cigarette packaging-conditioning machines it could be possible to associate two and even three cigarette manufacturing machines with one of these fast conditioning machines, depending on the number of cigarettes intended to form each packet of cigarettes. However, under such operating conditions it will be apparent that the operating continuity for a packaging-conditioning machine is bound to the operating continuity of a plurality of cigarette manufacturing machines and this, as readily perceptible, and above all, as experienced in practice, is not always possible because of stops in these manufacturing machines.

Therefore, it is the primary object of the present invention to provide an apparatus capable of assuring the feed of containers filled with cigarettes to the hopper loading mechanisms of the cigarette packaging conditioning machines through a supply store of containers filled with cigarettes, so that in a cigarette producing system the operating continuity of the cigarette packaging-conditioning machine is assured, independently of the operating continuity for the cigarette manufacturing machines associated therewith.

In an effort to ensure an operating continuity of the cigarette packaging-conditioning machines it has already been proposed to directly connect the wrapping up members of the conditioning machine to the outlet of a plurality of cigarette manufacturing machines and to arrange a store on the con-

necting line of said machines, or between such machines. If the conditioning machine stops, the store is capable of storing cigarettes as they appear at the outlet of the manufacturing machines, or as gathered in magazines according to a plurality of individual groups, each of which comprises the number of cigarettes intended to form the individual packets to be wrapped up, and even according to a number of these magazines in containers; and, in case of a failure of the manufacturing machine, to supply such stored cigarettes to the conditioning machine directly as said groups to be wrapped up without passing through the usual feeding and grouping hopper of conventional cigarette packaging and conditioning machines.

Although this direct connection feeding approach between the cigarette manufacturing machines and cigarette packaging-conditioning machine would involve a conversion of conventional packaging and conditioning machines, such as removal from such packaging and conditioning machines of the set of members including the cigarette grouping and feeding hopper, the systems are so devised to practically operate only in accordance with certain conditions; that is, when both the manufacturing machines and the conditioning machine are operating there is no intervention by the store (store at a stop), thus limiting the operative performances of the conditioning machine to the delivery rate of the manufacturing machines; when all of the manufacturing machines are idle, the conditioning machine, which is operating, is supplied from the store (store at a feeding condition); and when the conditioning machine is idle, the operating manufacturing machines supply the store (store at a storing condition).

Therefore, a further significant object of the present invention is to provide an apparatus not only capable of assuring the supply of containers filled with cigarettes to the hopper loading mechanisms for the packet cigarette conditioning machines in accordance with the above-mentioned primary object and without any need of changing the structure of the feed portion in conventional conditioning machines, but also capable of causing the store to intervene at any time in the production in accordance with the operating rate both for the conditioning machine (receiving rate or capacity) and for the individual manufacturing machines (delivery rate or capacity), by storing or supplying containers filled with cigarettes, so as to make every machine cycle always entirely usefully at the maximum operating rate, with an obvious substantial increase in the total output.

A still further object of the present invention is to provide such a feeding apparatus of containers filled with cigarettes to the hopper loading mechanisms for conventional packet cigarette conditioning machines which is capable of providing a substantial operating range in the production system through its supply store, by storing or supplying containers filled with cigarettes in accordance with the receiving and/or delivery capacities, respectively, at any time for the system machines and without any need of occupying space in addition to the ordinary plane surface as already involved by said machines forming said production system.

It is also a further object of the invention to provide in such a feeding apparatus an arrangement for the respective parts, so that the containers filled with cigarettes to be supplied and the empty containers to be filled are transferred from the outlet of the manufacturing machines to said feeding apparatus and, respectively, from the latter to the former, as convenient for an operator. That is such container transfers are performed according to vertically overlapping planes, wherein the containers filled with cigarettes arranged on the lower work plane and the empty containers on the upper work plane, respectively, are at levels deemed to be the most convenient for the performance of manual conveyance movement of articles which are more or less heavy.

A still further object of the present invention is to provide such a feeding apparatus for attaining all of the above objects through a particularly simple operating structure, which can be readily carried out and is reliable in operation, simple and practical in use, and which is also and above all of a comparatively low cost in view of the performances provided thereby.

These and still other objects are all attained, according to the invention, the apparatus disclosed herein for supplying cigarette containers to the hopper loading mechanisms for packet cigarette conditioning machines, these mechanisms comprising an overturning member for receiving and carrying a cigarette container from a receiving and transferring position or station to an unloading position or station for the cigarettes into said hoppers of the conditioning machines, and electro-responsive means for detecting the unloading completion of the unloading container and cyclically controlling the repetition of such operations of said overturning member. The feeding apparatus comprises a first continuous feeding conveyor for carrying successive cigarette containers from a transfer position or station to a station or position for receiving and transferring said overturning member; a second continuous conveyor, or store conveyor, for defining a receiving position and a transfer or feed position between said transfer position from the first continuous feeding conveyor and said receiving and transferring position for the overturning member; a third continuous conveyor, or unloading conveyor of empty containers, for defining a receiving position of said empty containers from said receiving and transferring position of the overturning member; driving means electrically connected to said electro-sensitive means associated with said overturning member for independently operating said first, second and third conveyor; electro-sensitive means at said transferring position from the first feeding conveyor, electrically interconnected to the electro-connecting means for the conditioning machine operation; and pushing means also connected to said electro-sensitive means associated with the overturning member. The pushing means is for subsequently transferring containers from said transferring position by the first feeding conveyor to the receiving position of the overturning member, or to the receiving and transferring position or feeding position of the second conveyor for storing, depending upon whether the conditioning machine is operating or not, and respectively, with the conditioning machine operating, from this last supply position of the store conveyor to the receiving position of the overturning member in case a container is not present at said transfer or supply position of the feeding conveyor, and again, from said receiving and transferring position of the overturning member to the receiving position of the third unloading conveyor for the empty containers.

Further features and advantages will be more apparent from the following detailed description of a preferred, but not exclusive embodiment of the feeding apparatus according to the invention, shown by way of non-restrictive example in the accompanying drawings, in which:

FIG. 1 is a plan view, schematically showing a cigarette producing system incorporating the feeding apparatus of the invention;

FIG. 2 is an enlarged elevational view in the direction of arrow II in FIG. 1, schematically showing the same feeding apparatus, wherein some parts have been removed and sectioned for providing a view other parts;

FIGS. 3 and 4 are enlarged views showing again the same feeding apparatus as sectioned along the broken line A–B–C–D–E–F in FIG. 2 and in the direction of arrows III—III and IV—IV, respectively;

FIG. 5 is a plan view of FIG. 2 showing said feeding apparatus;

FIG. 6 is an electromechanical diagram showing the operating principle for a cigarette manufacturing system incorporating the feeding apparatus according to the above figures;

FIG. 7 is a time-step diagram of the moving parts corresponding to an operating cycle of said feeding apparatus;

FIG. 8 is a still more enlarged front view of a portion of FIG. 3; and

FIG. 9 is a sectional view showing the detail of FIG. 8 as taken along line IX—IX in said FIG. 8.

As above mentioned, FIG. 1 is a schematic plan view showing a cigarette manufacturing system, wherein the cigarette packaging-conditioning machine is a high speed type, such as is capable of taking up the output of three conventional cigarette manufacturing machines.

According to the system arrangement, as shown in FIG. 1, these three cigarette manufacturing machines are in parallel alignment on the right hand side of the drawing. The packaging-conditioning machine is positioned on the left hand side, juxtaposed nearly in alignment with the manufacturing machine which is at a higher level in the drawing, whereas the feeding machine according to the invention is positioned between said manufacturing machines and said packaging-conditioning machine, so as to linearly extend from the hopper loading mechanism for the packagingconditioning machine to the end of the manufacturing machine, which in the figure is shown at a lower level.

According to a spiral counterclockwise arrangement, this packaging-conditioning machine is followed by other machines and apparatus for the further processing of the cigarette packets emerging from said packaging-conditioning machine, such as for example an over-wrap by transparent material, usually referred to as packet cellophaning operation; collecting and forming of cellophaned packet bars; collecting and forming of parcels of said bars; etc., for example, according to corresponding machines and apparatus which comprises the subject-matter of further patents in the same Applicant's name and herein not being mentioned as not involving the apparatus of this invention.

In the system arrangement according to FIG. 1, the three cigarette manufacturing machines, respectively designated by MC–MC^{I-II}; the packaging conditioning machine MI; and the machines following said packaging machine MI, such as the storing apparatus AAC and the assembly of cellophaning, barring and parcelling machines, designated as a whole by MCSI, as well as the hopper loading mechanism of said packaging machine MI, designated by MCT, are shown by thin lines, whereas the feeding apparatus according to the invention and designated as a whole by AA is shown by thick lines.

The cigarette manufacturing machines, as schematically shown and usually used in such systems as illustrated in FIG. 1, comprise in association therewith a chain conveyor operated by the corresponding manufacturing machine with an intermittent or stepped movement in the direction of the corresponding arrow *f* and designated as a whole by TMC–TMC^{I}–TMC^{II}.

Each of these conveyors TMC, TMC^{I}, TMC^{II} comprises two chains 1 which are loop coiled, according to respective planes parallel to one another, about corresponding sprocket wheels 2, in pairs keyed on a corresponding shaft 3 carried by fixed bearings 4 and forming part of the base for the corresponding manufacturing machine MC, MC^{I}, MC^{II}. The two chains of each conveyor TMC, TMC^{I}, TMC^{II} are interconnected by cross strips 5, respectively spaced apart along the extent of said chains 1 over a distance which is substantially the same as the horizontal depth of the usual containers used for cigarette transportation in such systems, so as to form between two successive strips a corresponding receiving seating for one of said containers. When said conveyor is conditioned to operate in combination with its associated manufacturing machine, its transport branch will define, as shown hereinafter, at an accurately predetermined position and during the interval of each intermittency or step, two successive lengths operating upstream and downstream, respectively, said position, normally referred to as transfer station and designated by STMC, STMC^{I}, STMC^{II}, of the empty containers CV located on the length upstream of said station, to the respective manufacturing machine, and filled containers CP from said manufacturing machine to the conveyor length downstream of the transfer station (see arrow F^{I} in FIG. 1).

Conversely, and as above stated, the conditioning machine MI, as shown by way of example, is of the fast operating type, wherein the hopper to be supplied for assembling the cigarettes to be packet conditioned, has a plurality of descending channels.

Referring to FIGS. 2–5, said feeding apparatus AA comprises a base 6, involving in a vertical cross-section at the operative plane for supplying filled containers CP and discharging empty containers CV, four spans or bays respectively for, as seen from right to left in FIGS. 1, 2 and 5, the horizontal conveyors superimposed on one another for supplying and discharging said filled and empty containers, designated as a whole by TCP and TCV, respectively; a store or supply conveyor TM, which is also horizontal and the function of which will be better understood from the following description; a vertical elevator conveyor TE; and the rotatable head or overturning member TG of said loading mechanism MCT (FIG. 1) for the cigarette feeding and assembling hopper TAR of said packaging conditioning machine MI.

Said conveyors TCP of filled containers CP and TCV of empty containers CV, as superimposed on each other, as well as store or supply conveyor TM, horizontally extend from about said operative plane (FIG. 1 and 5) to about the end of conveyor TMC^{II} associated with manufacturing machine MC^{II} (FIG. 1), and this in accordance with the storing capacity of store-conveyor TM and the transfer conveniency of filled containers CP and empty containers CV from conveyors TMC, TMC^{I}, TMC^{II} of manufacturing machines MC, MC^{I}, Mc^{II} to conveyor TCP and, respectively, from conveyor TCV to said conveyors TMC, TMC^{I}, TMC^{II} of manufacturing machines MC, MC^{I}, MC^{II} by an operator.

In practice, such an extension for conveyors TCP, TCV and TM, in addition to meeting the above requirements, is deemed, as for store-conveyor TM, suitable for attaining a sufficient system duration (about 30 minutes and more), in case of a total failure in filled container supply, or stoppage, or failure in conditioning machine operation, while remaining within the sphere of the surface already involved by the system machines and only for a single length of the storing conveyor.

The possibility of operating the system through such a duration is an actual technical exploit in the art of these cigarette producing systems, with apparent substantial practical operative and economical advantages in the particular manufacturing field. Further, the superimposition of the two conveyors TCP and TCV, as to meeting the most convenient transfer operations for the filled and empty containers from between the respective positions is also a substantial economical advantage, providing labor savings and better conditions for the operators of said system.

These conveyors TCP, TCV and TM are of the type comprising pairs of chains interconnected by cross strips, so as to form a plurality of seatings or housings for the filled and empty containers, as above described in connection with conveyors TMC, TMC^{I}, TMC^{II} of manufacturing machines MC, MC^{I}, MC^{II}. For this reason, the members comprising said conveyors TCP, TCV and TM are indicated by the same reference numerals as used for the members comprising the conveyors TMC, TMC^{I}, TMC^{II} of manufacturing machines MC, MC^{I}, MC^{II}, but followed by the distinctive letters of the corresponding conveyors TCP, TCV and TM.

For a better understanding of the respective functions of said conveyors TCP, TCV and TM, it is pointed out that such conveyors are provided with an intermittent or stepped movement, the first two of which in the direction of the oppositely directed arrows f^{II} and f^{III}, (FIGS. 1 and 4), and the third in the direction of arrow f^{IV}, or alternately in both directions (FIGS. 1 and 3), as will become more apparent from the following description.

The power drive for conveyors TCP and TCV is carried out as follows: the reducing gear 7, as carried by base 6 (FIG. 5), through any known type of safety clutch 8, connected with its driving portion to the drive shaft of said reducing gear 7, transmits its movement to a gear 9 connected to the driven portion of said clutch 8. In turn, this gear 9 (FIG. 4) drives another gear 10 which is keyed to shaft 11 and provided at an eccentric position with a pawl 12, as well as a concentric cylindrical

surface **13**, making up the drive and control elements, respectively, as known, for a radial vane wheel or Geneva wheel **14** which is keyed to shaft 3TCP, fore of the direction of arrow f^{II}, of said chain conveyor TCP. A sprocket wheel **15** (FIG. 2) is keyed to the rear shaft 3TCP with respect to the direction of said arrow f^{II}, this sprocket wheel **15** driving by chain **16** a sprocket wheel **17** keyed to shaft **18** rotatably carried by base **6** parallel and above said rear shaft 3TCP. To this shaft **18** there is also keyed a gear **19**, driving the upper conveyor TCV through another gear **20** which is keyed to the front shaft 3TCV in the direction of arrow f^{III} (FIGS. 4 and 5).

Thus, through said reducing gear **7** and Geneva wheel device, said two conveyors TCP and TCV are powered by stepped for intermittent movements of opposite direction, as indicated by said corresponding arrows f^{II} and f^{III}, as shown in FIGS. **1** and **4**.

The intermittency or step reciprocation for the store conveyor TM is provided by a reducing gear **21** (FIGS. **2** and **3**) and through a safety clutch **22**, similar to clutch **8**, the driving portion of which is associated with said reducing gear **21**, whereas the corresponding driven portion is associated with a gear **23**. This gear **23** meshes with a gear **24** which is idle mounted on its shaft **25** and provided at an eccentric position with a pawl **26**, as well as a concentric cylindrical surface **27**, making up the drive and control elements, respectively, for a Geneva wheel **28** keyed to one of the front shafts 3TM relative to the direction of arrow f^{I} (FIG. **1**) of said stored conveyor TM.

As already mentioned, the third bay or span of base **6** is associated with the vertical elevator conveyor Te, comprising a support plate or element **29** having two superimposed horizontal seatings **30** and **30***a* which, when said support plate is at the lowermost position of the elevator conveyor, as described hereinafter, are at the level of the upper surfaces of conveyors TCP and TM and, respectively, conveyor TCV and sliding plane **6***a* of said base **6** at a juxtaposed position to said conveyor TCV, above said store-conveyor TM (FIGS. **2**, **3** and **5**). On its face opposite that having said seatings **30** and **30***a*, this support plate **29** is provided with a block which is bored and vertically threaded as a female thread, wherein a screw threaded rod **32** is threadably engaged, and is slidably carried at the bottom within a convenient housing in base **6**, and at the top by the horizontal arm **33***a* of a strip **33** which is secured in any known manner to said base **6**, as shown in said FIGS. **2**, **3** and **5**. To the lower end of said threaded rod **32** there is keyed a pulley **34**, on which a drive belt **35** is wound up as well as on a pulley **36** which is keyed to the drive shaft of a reducing gear **37** (FIG. **3**). Said strip **33** is provided with an aperture or slot **33***b*, extending in the direction of its vertical dimension, wherein a roller **38** is slidably engaged and idly carried by a pin **39** horizontally secured to said female thread block **31** fast with the support plate **29** of the elevator conveyor TE. Thus, the support plate **29** is held vertically guided during its ascending and descending movements imparted thereto by the reducing gear **37** in the direction of arrow f^{I} (FIGS. **2** and **3**).

As above mentioned, the fourth span or bay is involved with the rotatable head TG of the loading mechanism MCT for the supplying and assembling hopper TAR of the packet cigarette conditioning machine MI. This rotatable head TG is provided to operate dependent on the loading mechanism MCT, and it will suffice to state that said head TG is rotated through 180° for each machine cycle, as described below, and is supported by its horizontal shaft **40** from base **6** which at this position bears with its portion **6***b* on the base of the packaging conditioning machine MI.

The rotatable head TG is rotated by the sprocket wheel **41**, keyed to said horizontal shaft **40** thereof, and chain **41** which, in turn, is driven by a drive kinematic means, terminating at a continuously rotating shaft, to which a drum cam is keyed, corresponding in the case as shown in the figures of the accompanying drawings to shaft **43** and drum cam **44** (FIGS. **2**, **3** and **5**).

This shaft **43** is continuously rotated through a sprocket wheel **45**, keyed thereto, and a chain **46** which is also wound upon sprocket wheel **47** which is keyed to shaft **48** (FIG. **3**). This shaft **48** is rotatably carried by support elements on base **6** and derives its continuous rotational movement from the reducing gear **7** for operating the above described conveyors TCP and TCV through the always meshing pair of gears **49** and **50** which are keyed to the drive shaft of said reducing gear **7** and said shaft **48**, respectively.

A pusher S and a follower pusher SA (FIG. **2**) are respectively supported by base **6** and located in the vertical plane through shaft **40** of the rotatable head TG for the loading mechanism MCT and thus through the median location of the horizontal seatings **30** and **30***a* of the support plate **29** for the elevator conveyor TE and horizontal sliding plane **6***a* of base **6**, respectively juxtaposed, as shown from left to right in FIGS. **1**, **2** and **5**, for horizontal reciprocation according to laws better defined below in connection with FIG. **7**, above conveyors TCP and TM and conveyor TCV, respectively, of said horizontal sliding plane **6***a*, said horizontal seatings **30** and **30***a* of the support plate **29** for the elevator conveyor TE, and said rotatable head TG for the loading mechanism MCT.

Pusher S comprises a horizontal threaded rod **51**, rotatably but not axially slidably carried by base **6**, on which an arm **52** is mounted and provided with a pushing portion **53** and a horizontal pin extension **54**, on which a roller **55** is idly mounted and slidably engaged in a guide eye **56** longitudinally in a strip **57** which is horizontally carried by said base **6**, so as to enable said arm **52–53** to slide along said threaded rod **51**, but not to rotate thereabout. At an end of said threaded rod **51**, on the right in FIGS. **2** and **5**, there is keyed a pulley **58**, about which a drive belt **59** is wound and looped about a second pulley **60** which is keyed to the drive shaft of a reducing gear **61** carried by base **6** (FIG. **4**).

Follower pusher SA also comprises a horizontal threaded rod **62** which is also rotatably but not axially slidably carried by base **6** and on which two arms **63** and **64** are threadably mounted, said two arms being interconnected by an element comprising a female thread block **65** at a respective horizontal distance slightly greater than the front dimension of a cigarette container and provided with a pushing and/or following portion **66** and **67**, respectively.

This female thread block **65** is fitted with a horizontal pin extension **68**, on which a roller **69** is idly mounted and slidably engaged in a guide eye **70** longitudinally in a strip **71** which is horizontally carried by base **6**, so as to enable said arms **63–66** and **64–67** to slide along said threaded rod **62**, but not to rotate thereabout. At an end of said rod **62**, on the right in FIGS. **2** and **5**, a pulley **72** is keyed about which a drive belt **73** is wound and looped about a second pulley **74** which is keyed to the drive shaft of a reducing gear **75** carried by base **6** (FIG. **4**).

On the drive shaft **11** of gear **10**, which drives the conveyors TCP and TCV in a step-wise manner, each step corresponding to a machine cycle wherefore it will be referred to as cyclic shaft of the apparatus, there is keyed a pack of cyclic cams, respectively designated by numerals **76** and to **85**, for timing the movements of the above-described moving members at each machine cycle, as better shown below in connection with FIGS. **6** and **7** and from the description of the apparatus operation.

As already shown, said moving members and the relative corresponding movement thereof are as follows:

a. The supply conveyor TCP for the filled containers CP is provided with a unidirectional intermittent movement (feed and dwell at each intermittency).

b. The discharging conveyor TCV for the empty containers CV is provided with a unidirectional intermittent movement (feed and dwell at each intermittency).

c. The supply or store conveyor TM is provided with intermittent movement in both directions (feed and dwell at each intermittency).

d. Pusher S for filled containers CP is provided with an alternate outward and back movement with an intermediate dwell in outward movement at the location of the store conveyor TM.
e. The vertical elevator conveyor TE for filled containers CP is provided with an alternating outward and back movement with a dwell between outward and return movements.
f. The follower pusher SA for filled containers CP and empty containers CV is provided with an alternate outward and back movement with an intermediate dwell at the location of vertical elevator conveyor TE and a dwell between outward and back movements.
g. The rotatable head TG of the leading mechanism MCT for hopper TAR of packaging machine MI is provided with a uniform rotational movement through 180°.

The above feeding apparatus AA, as described in connection with FIGS. 1–5 and coupled in a cigarette producing system in combination with cigarette manufacturing machines MC, MC^{I}, MC^{II}, and a cigarette packaging conditioning machine MI, is subjected to the following operating conditions: (A) (I°) when the manufacturing machines (MC, MC^{I}, MC^{II}) with conveyor TCP having each of its transport positions occupied, and the conditioning machine MI are running, in the operation of the feeding apparatus AA is such that:

a. The supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).
b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).
c. Supply or store conveyor TM is stationary.
d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell at outward movement at the location of store conveyor TM.
e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.
f. Follower pusher SA for filled containers CP and empty containers CV is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of vertical elevator conveyor TE and a dwell between outward and back movements.
g. Rotatable head TG of the loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°.

(II°) When the manufacturing machines (MC, MC^{I}, MC^{II}), with conveyor TCP with gaps at the transport positions, and conditioning machine MI are running, the operation of the feeding apparatus AA is such that:

a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).
b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).
c. Supply or store conveyor TM is running by intermittent supply movement (feed and dwell) at each gap.
d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM.
e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.
f. Follower pusher SA for filled containers CP and empty containers CV is running by alternate outward and back movements with an intermediate dwell in the outward movement at the location of vertical elevator conveyor TE and a dwell between outward and back movements.
g. Rotatable head TG of the loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°.

(B) (I°) When the manufacturing machines (MC, MC^{I}, MC^{II}) are running with conveyor TCP having each position thereof occupied, and conditioning machine MI is stationary, in the operation of the feeding apparatus AA is as follows;

a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).
b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency), idling, or stationary in case of a self-contained drive thereof.
c. Supply or store conveyor TM is running by intermittent storing movement with an intermittency (feed and dwell) at each storing.
d. Pusher S for filled containers CP is operating by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM, or by alternate outward movement to said location of store conveyor TM and back movement.
e. Vertical elevator conveyor TE for filled containers CP is stationary, or running by alternate outward and back movements with a dwell between outward and back movements, at idling condition.
f. Follower pusher SA for filled containers CP and empty containers CV, is stationary or idling moving. outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM, or by alternate outward movement to said store conveyor TM location, and return movement, or is again stationary.
g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is stationary.

(II°) When the manufacturing machines (MC, MC^{I}, MC^{II}) are running with conveyor TCP having gaps at transport positions, and conditioning machine MI is stationary, the operation of the feeding apparatus AA is such that:

a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).
b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell) at each intermittency) at idling condition, or is stationary in case of a self-contained drive thereof.
c. Supply or store conveyor TM is stationary.
d. Pusher S for filled containers CP is running by alternate
e. Vertical elevator conveyor TE for filled containers CP is stationary, or running by alternate outward and back movements with a dwell between outward and back movements, at idling condition.
f. Follower pusher SA for filled containers CP and empty containers CV is stationary, or idling running.
g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is stationary.

(C) (I°) When the manufacturing machines (MC, MC^{I}, MC^{II}) are stationary, with conveyor TCP having each transport position thereof occupied, and when conditioning machine MI is running the operation of the feeding apparatus AA is such that:

1. a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).
b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).
c. Supply or store conveyor TM is stationary.
d. Pusher S for filled containers CP is running by alternate outward and back movements in an intermediate dwell in outward movement at the location of store conveyor TM.
e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.
f. Follower pusher SA for filled containers CP and empty containers CV is running by alternate outward and back movements with an intermediate dwell in the outward movement at the location of vertical elevator conveyor TE and a dwell between outward and back movements.

g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°. This operating condition is the same as that referred to under (A) (I°). Or:

2. a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency) or stationary in case of self-contained drive from discharging conveyor TCV for empty containers CV, and if all of the manufacturing machines (MC, MC′, MC″) are stationary:

b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).

c. Supply or store conveyor TM is running by intermittent supply movement with an intermittency (feed and dwell) at each supply.

d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM, or until presence of filled containers CP on conveyor TCP at the station or step preceding the transfer station for said filled containers CP advancing from said intermediate dwell and returning thereto by said conveyor TCP.

e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.

f. Follower pusher SA for filled containers CP and empty containers CV, is running by alternate outward and back movements with an intermediate dwell in the outward movement at the location of vertical elevator TE and a dwell between outward and back movements.

g. Rotatable head Tg of loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°.

This operating condition, without the alternative forms, is the same as that set forth under (A) (II°).

(II°) When manufacturing machines (MC, MC′, MC″) are stationary, with conveyor TCP having gaps at transport locations, and when conditioning machine MI is running the operation of the feeding apparatus AA is as follows:

1. a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).

b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).

c. Supply or store conveyor TM is stationary.

d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM.

e. Vertical elevator conveyor TE for filled conveyors CP is running by alternate outward and back movements with a dwell between outward and back movements.

f. Follower pusher SA for filled containers CP and empty containers CV is running by alternate outward and back movements with an intermediate dwell in the outward movement at the location of vertical elevator conveyor TE and a dwell between outward and back movements.

g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°.

This operating condition is the same as that set forth under (A) (I°) and (C) (I) (1). Or:

2. a. Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency).

b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).

c. Supply or store conveyor TM is running by intermittent supply movement with an intermittency (feed and dwell) at each gap.

d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM.

e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.

f. Follower Pusher SA for filled containers CP and empty containers CV is running by alternate outward and back movements with an intermediate dwell in outward movement at the location ofvertical elevator conveyor TE and a dwell between outward and back movements.

g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotation movement through 180°. This operating condition is the same as that set forth under (A) (II°). Or:

3. *a.* Supply conveyor TCP for filled containers CP is running by unidirectional intermittent movement (feed and dwell at each intermittency), or stationary in the case of a self-contained drive from discharging conveyor TCV of empty containers CV and if all of the manufacturing machines (MC, MC′, MC″) are stationary.

b. Discharging conveyor TCV for empty containers CV is running by unidirectional intermittent movement (feed and dwell at each intermittency).

c. Supply or store conveyor TM is running by intermittent supply movement with an intermittency (feed and dwell) at each supply.

d. Pusher S for filled containers CP is running by alternate outward and back movements with an intermediate dwell in outward movement at the location of store conveyor TM, or until the presence of filled containers CP on conveyor TCP at the station or step preceding the transfer station of said filled containers CP from said conveyor TCP to advance from said intermediate dwell and to return thereto.

e. Vertical elevator conveyor TE for filled containers CP is running by alternate outward and back movements with a dwell between outward and back movements.

f. Follower pusher SA for filled containers CP and empty containers CV is running by alternate outward and backward movements with an intermediate dwell in outward movement at the location of vertical elevator conveyor TE and a dwell between outward and back movements.

g. Rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI is running by uniform rotational movement through 180°.

This operating condition, without alternative forms, is the same as that mentioned under (A) (II°) and (C) (I°) (2).

(D) (I°) When manufacturing machines (MC, MC′, MC″) are running, with conveyor TCP having each of the transport positions thereof occupied, and when packaging machine MI stationary, the operation of the feeding apparatus AA running with completed store conveyor TM is as follows;

a. Supply conveyor TCP for filled containers CP will be stopped, and, as a result, so also of will manufacturing machines (MC, MC′, MC″).

(II°) When manufacturing machines (MC, MC′, MC″) are running, with conveyor TCP having gaps at transport positions, and when packaging machine MI is stationary, the operation of the feeding apparatus AA running with completed store conveyor TM is as follows:

a. Supply conveyor TCP for filled containers CP will be stopped, and, as a result, so also will manufacturing machines (MC, MC′, MC″).

(E) (I°) When manufacturing machines (MC, MC′, MC″) are stationary, with conveyor TCP having any transport positions thereof occupied, and when packaging machine MI is running, the operation of the supply apparatus AA running with empty store conveyor TM is such that:

a. The members will operate as under (A) (I°) (1) until exhaustion of filled containers CP on conveyor TCP, and then

b. The packaging machine MI and conveyor TCP of filled containers CP will stop.

(II°) When manufacturing machines (MC, MC', MC'') are stationary, with conveyor TCP having gaps at transport positions, and when packaging machine MI running the operation of the feeding apparatus AA running with empty store conveyor TM is as follows:

(a) The members will operate as under (A) (I°) and (C) (I°) (1) omitting the gap cycles, and also during a slowing down of the speed of packaging machine MI and until exhaustion of filled containers CP on conveyor TCP, and then;

b. The packaging machine MI and conveyor TCP for filled containers CP will stop.

(F) (I°) When manufacturing machines (MC, MC', MC'') are stationary, with conveyor TCP having each of the transport positions thereof occupied, and when packaging machine MI is stationary, the operation of the feeding apparatus AA running with the store conveyor TM under storing conditions is as follows:

a. The members operate as under (B) (I°) to completion of store conveyor TM, and then

b. The supply conveyor TCP for filled containers CP stops as under (D) (I°) (a).

(II°) When manufacturing machines (MC, MC', MC'') are stationary, with conveyor TCP having gaps at transport positions, and when packaging machine MI is stationary, the operation of the feeding apparatus AA running with the store conveyor TM under storing conditions is such that:

a. The members operate as under (B) (I°) and (B) (II°) until completion of store conveyor TM, and then

b. The supply conveyor TCP for filled containers CP stops as under (D) (I°) (a) and (F) (I°) (b).

(G) (I°) When manufacturing machines (MC, MC', MC'') are stationary, with conveyor TCP having each of transport positions thereof occupied, and when packaging machine MI is stationary, the operation of the feeding apparatus AA with completed store conveyor TM is such that:

a. The supply conveyor TCP for filled containers CP stops as under (D) (I°) (a).

(II°) When manufacturing machines (MC, MC', MC'') are stationary, with conveyor TCP having gaps at transport positions, and when packaging machine MI is stationary, the operation of the feeding apparatus AA with completed store conveyor TM is such that:

a. The supply conveyor TCP for filled containers CP stops as under (D) (II°) (a).

As mentioned above, FIG. **6** shows by way of example one of the possible electromechanical diagrams for carrying out the above operating conditions for the feeding apparatus AA connected in a cigarette producing system, such as according to FIG. **1**, and exemplarily practiced as above described in connection with FIGS. **2–5**, whereas FIG. **7** shows a time-step diagram of the moving parts corresponding to an operative cycle for said feeding apparatus AA and relative to said exemplary electromechanical diagram in FIG. **6**.

This electromechanical diagram shows the reducing gear **7** for actuating conveyors TCP for filled containers CP and conveyors TCV for empty containers CV; reducing gear **21** for actuating store conveyor TM; reducing gears **37**, **61** and **75** for actuating vertical elevator conveyor TE, pusher S and follower pusher SA, respectively; a remote control switch TL1 coupled to reducing gear; a pair of remote control switches coupled to each of reducing gears **21**, **37**, **61** and **75**, and designated by TL2–TL3, TL4–TL5, TL6–TL7 and TL8–TL9, respectively; electrical transformers T and T1 having a **24**-volt output for supplying said remote control switches; a pushbutton board P comprising two contacts **P1** and **P2** which are, respectively, normally open for manually starting the apparatus and normally closed for manually stopping it; a set of three limit microswitches M, M1, M2, a set of two limit microswitches M3–M4 and a further set of three limit microswitches M5, M6, M7 associated with pusher S, vertical elevator conveyor TE and follower pusher SA, respectively, and not arranged as shown in FIGS. **2-5**, but so as to be operated by said pusher S, vertical elevator conveyor TE and follower pusher SA at the end of respective path lengths, as seen from the diagram shown in FIG. **7**; a set microswitches respectively designated by reference characters M8–M17 and associated with cyclic timing switches **76-85**, wherein the switch, which is associated with cam **76** has three contacts C1, C2, C3 and the other have only one contact C; a sensor SS having two contacts C4, C5, which are respectively normally open and normally closed, not arranged as shown in said FIGS. **1-5** in the transfer station ST (FIGS. **1** and **5**) for filled containers CP to be supplied by conveyor TCP; and two sensors SS1 and SS2 not arranged as shown in said FIGS. **1–5** at the position of store conveyor TM preceding that of said transfer line for filled containers CP, and respectively at the last storing position of said store conveyor TM; which for the purpose of clearness are designated by the only reference characters of these sensors SS1 and SS2, which have two contacts C6, C7 closed by a container being at the position, and respectively two contacts C8 and C9, normally closed, and open on completion of store conveyor TM, or by a container CP at this last storing position.

The remote control switch TL1 coupled to reducing gear **7** has four movable contacts 1–2–3–4 and associated fixed contacts 5–6–7–8, normally open, of which the pair of contacts 1–5 are self-exciting, while the remote control switches from TL2 to TL9 coupled to reducing gears **21**, **37**, **61** and **75** have five movable contacts 1–2–3–4–5 and associated fixed contacts 6–7–8–9–10, of which the pair of contacts 1–6 are normally closed and the pairs of contacts 2–10 are respectively normally open, the pair of contacts 2–7 being self-exciting contacts for the respective remote control switch.

This electromechanical diagram also shows those parts of packaging machine MI and loading mechanism MCT for cigarette assembling and supplying TAR of said packaging machine MI which are effective in operating the feeding apparatus AA of the invention, and more particularly said hopper TAR, remote control switch TL**10** and operation conditioning unit G, and not for said packaging machine MI, and schematically the rotatable head TG for said loading mechanism MCT; said remote control switch TL**10** being schematically shown with its only two parts herein involved, that is with four movable contacts 1–2–3–4 and associated fixed contacts 5–6–7–8, of which the pairs of contacts 1–5 and 3–7 are closed and the pairs of contacts 2–6 and 4–8 are open when it is energized and packaging machine MI is running, the pair of contacts 1–5 being self-exciting contacts for said remote control switch.

There is also shown for the loading mechanism MCT, in combination with said rotatable head TG, below thereto and above the upper edge of hopper TAR, a sensitive unit comprising a lamp **86** which has a projection device for a light beam **87** to a photocell **88**, so arranged as to be struck by a light beam **87** when the cigarettes supplied to said hopper TAR have dropped to a level lower than that of said light beam **87**. This sensitive unit further comprises an amplifying device **89**, a microcontact **90** of which is shown and movable from a closed position 1–2 to an open position 1–3. This amplifying device **89** is coupled to a microswitch **91** having two contacts **1-2**, respectively movable from a closed position 1–3 and 2–5 to an open position 1–4 and 2–6. In turn, this microswitch **91** is coupled to a member **92** suitable for presetting and excluding the operation of loading mechanism MCT, and particularly rotatable head TG, by its convenient manual positioning.

FIG. **7** shows the time-step diagram for the moving parts corresponding to an operative cycle of supply apparatus AA relative to the electric operating diagram exemplarily shown in FIG. **6** and corresponding to a 360° rotation of drive shaft **11** of gear **10** for stepwise driving of conveyors TCP and TCV. In the case where Geneva wheel **14** drives said conveyors TCP and TCV, and Geneva wheel **28** drives store conveyor TM, the

line above the base line of the relative diagram will indicates the time at which said Geneva wheels are operating, or the time taken by said conveyors TCP, TCV and TM to move through a step, while for reducing gears **61**, **37**, **75** for operating pusher S, vertical elevator conveyor TE and follower pusher SA, the slanting line indicates the operating time for said reducing gears and correspondingly the movement time for said pusher S, vertical elevator conveyor TE and follower pusher SA; and the line parallel to the base of the respective diagram indicates the dwell time for said reducing gears and hence of said pusher S, vertical elevator conveyor TE and follower pusher SA, at the position being reached.

In the diagram concerning Geneva wheel **28** for operating store conveyor TM, said line above the base line indicates the time for its movement relatively to the feed of said store conveyor during the supply step, while the dash-dot line below the base line indicates the time for its movement relatively to reverse direction feed of store conveyor TM at the storing step.

FIGS. **8** and **9** show the mechanical passage from one to another step of movement for store conveyor TM, or the supply step and storing step, respectively, whereas the respective coupling to the corresponding condition of apparatus AA may be seen from the electrical operating diagram of FIG. **6**, as explained below. Thus, from said FIGS. **8** and **9** it will be seen that gear **24** which, as above seen is driven for operating Geneva wheel **28**, has its pawls **26** and **26***a* angularly positioned according to the diagram line in FIG. **7** relatively to movements of store conveyor TM and, as it will be seen below, movable to be brought from an inoperative position to an operative position for operating Geneva wheel **28** according to said diagram and system operating conditions, as described below. Cylindrical surface **27** which is designed, as known, to cooperate with Geneva wheel **28** in a Geneva wheel drive device, is provided in accordance with the arrangement of said pawls **26** and **26***a*, having a common portion **27** fixed to gear **24**, with a portion **27***a* integrally movable with pawl **26** and a portion **27***b* integrally movable with pawl **26***a*. For this purpose (FIG. **9**), a disc **93** is keyed to and axially slides on shaft **25**, to which gear **24** is keyed, and pawls **26** and cylindrical surface portion **27***a* are fast with said disc **93** and engaged in apertures **94** and **95**, respectively, formed in gear **24** and normally at a retracted inoperative position, relative to that in FIG. **9**, due to resisting action of springs **96** interposed between said disc **93** and gear **24**. A system of rods **97** terminates at said disc **93**, which rods are slidably guided into base **6** and connected to the disc so as to allow the rotational movement of the latter, but not a translational movement relative thereto in the direction of shaft **25**. The armature of an electromagnet E carried by base **6** is pivoted at **98** to said rods **97** so as to cause, upon energization of said electromagnet E as better seen below, said rods **97** and disc **93** to slide on said shaft **25** thereof bringing pawl **26** and corresponding cylindrical surface portion **27***a* to an operative position with Geneva wheel **28**. A second disc **99** is further keyed to this shaft **25** in a slidable manner. Pawl **26***a* and cylindrical surface portion **27***b* are fast with this second disc **99** and engaged, respectively, in openings **100–101**, **102–103** and **104–105** in a disc **106**, which is keyed to said shaft **25**, in disc **93** and gear **24**, and normally, as shown in FIG. **9**, at a retracted position of non-operation due to the resisting action of springs **107** interposed between said disc **99** and said disc **106**. A system of rods **108** terminates at said disc **99**, which rods **108** are slidably guided into base **6** and connected to the disc so as to enable the latter to rotate, but not to move relative thereto in the direction of shaft **25**. The armature of an electromagnet E1 carried by base **6** is pivoted at **109** to said rods **108** so as to cause upon energization of said electromagnet E1, as seen below, said rods **108** and disc **99** to slide on said shaft **25** thereof, bringing pawl **26***a* and corresponding cylindrical surface portion **27***b* to an operative position with Geneva wheel **28**.

In said diagram shown in FIG. **7**, the line above the neutral line as shown by a thinner line is, the closing time for the associated microswitches of cyclic cams **76–85**, whereas the line below said neutral line is the opening time for said associated microswitches.

The operation of the above described feeding apparatus is as follows:

The cigarette-filled containers CP are led, either by hand or any known conveyor device not shown in the appended drawings, on conveyor TCP so that the bottom thereof will rest within the seating provided by two successive cross steps **5** of said conveyor TCP, the open front face thereof facing the feeding direction of said conveyor TCP according to arrow f^{II} (see figures).

The feeding apparatus is then set for automatic cyclic operation (FIG. **6**) by acting upon presetting member **92** so as to bring the contacts of microswitch **91** to closed position 1–3 and 2–5.

Assuming the conditions described above as (A) (I°), that with manufacturing machines (MC, MC^{I}, MC^{II}) running, with conveyor TCP having all of its positions occupied, excepted that designated as transfer station ST, and with packaging machine MI also running, so that remote control switch TL**10** is energized with its contacts 1 and 3 at the respective closed position 1–5 and 3–7 and contacts 2 and 4 open; the pushbutton microswitch **P1** is then operated, bringing the contact thereof to closed position 1–2. Thus, through said closed microswitch **P1**, remote control switch TL**1** is energized, thus closing its contacts and remaining self-excited with closed contact 1–5 through contact C**1** closed at 1–2 of microswitch M**8** associated with limit cycle cam **76** and microswitch P**2** with normally closed contact at 1–2 for manually stopping said apparatus. By closing contacts 2–6, 3–and 4–8 of remote control switch TL**1**, reducing gear **7** is started and through gear **9** rotates gear **10** and its respective shaft **11** through one revolution, said shaft **11** carrying in addition to cyclic cams **77–85** also said cyclic cam **76** which, therefore, at each revolution of said shaft **11** will open said self-exciting circuit of remote control switch TL**1**, releasing it and opening its contacts and stopping said reducing gear **7**.

Thus, by its operating pawl, **12**, the rotation of gear **10** provides for an angular excursion of Geneva wheel **14** and keying shaft STCP thereof and, accordingly, a release or step of conveyor TCP carrying the first container CP thereon to transfer station ST at position CP-A (FIGS. **1** and **5**), wherein sensor SS is located, thus opening contact C5 and closing contact C4 of said sensor SS at position 1-3.

During the rotation of its cycle revolution, said shaft **11** rotates all of said cyclic cams, the cyclic timing angular position of which can be seen from the diagram shown in FIG. **7**. Thus, in addition to the angular excursion of Geneva wheel **14** and thus the above mentioned feed step of conveyor TCP, by closing 1–2 of contact C of microswitch M**10** as accomplished by cyclic cam **78**, the energization will occur for remote control switch TL**6** through normally closed safety contact 1–6 of remote control switch TL**7**, this remote control switch TL**6** remaining self-excited through its so closed contact 2–7 and normally closed limit microswitches M, M**1**. By closing of contacts 3–8, 4–9 and 5–10 of remote control switch TL**6**, reducing gear **61** is started, causing, through drive **58**, **59**, **60**, threaded rod **51** to rotate and accordingly said arm **52–53** of pusher S to move thereon, carrying the filled cigarette container from position CP-A to transfer position CP-B on stationary store conveyor TM.

At the time said container reaches said position CP-B, in a manner not shown in the drawings, limit microswitch M is abutted by moving parts forming said pusher S, such as arm **52–53**. On opening its contact, this limit microswitch M breaks the self-exciting circuit of remote control switch TL**6** which, by opening in turn its contacts, will stop reducing gear **61** and hence the movement of arm **52–53** of pusher S. After some dwell of arm **52–53** of pusher S (FIG. **7**), the second lobe of said cyclic cam **78** again closes the exciting circuit of remote control switch TL**6** which, self-excited as above set forth, starts againsaid reducing gear **61** causing arm **52–53** of

pusher S to move again, thereby transferring the container from position CP-B on store conveyor TM to position CP-C in the lower seating **30** of support plate **29** for vertical elevator conveyor TE, which is at its lowered position. At the time the container reaches said position CP-C, as above mentioned, the limit microswitch **M1** is abutted, by opening its contact this limit microswitch breaking again the self-exciting circuit for remote control switch **TL6**, stopping arm **52–53** of pusher S which, having completed its function, returns then to its starting position. This is accomplished through cyclic cam **79** which, by closing at position **1-2** the contact C of its associated microswitch **M11**, through closed safety contact 1—6 of now de-energized remote control switch **TL6**, will as above set forth excite remote control switch **TL7**, the latter remaining self-excited through its so closed contact 2–7, and limit microswitch **M2**, which is normally closed. By closing of contacts 3–8, 4–9 and 5–10 of remote control switch **TL7**, reducing gear **61** is started with a reverse direction of rotation to the former and thus pushers S is returned to its starting or original position, stopping thereat because of its abutment with said limit microswitch **M2** which, by opening its contact, breaks the self-exciting circuit of remote control switch **TL7**.

In the meantime (see also the respective diagram in FIG. **7**), the follower pusher SA is moved to reach the position shown by thin dash-dotted line in FIG. **2**, so as to accommodate between its arms **63–66** and **64–67** said container which, as seen hereinafter, is carried from position CP-C to position CP-D. The movement of said follower pusher SA occurs on closing 1–2 of contact C of microswitch **M14** by cyclic cam **82** energizing remote control switch **TL8** through the position 1–6 of the normally closed contact of de-energized remote control switch **TL9**. This energized remote control switch **TL8** remains self-excited through closing of contacts **2-7** of its self-exciting contact and normally closed limit microswitches **M5**, **M6**. Closing of contacts 3–8, 4–9 and 5–10 of remote control switch **TL8** provides for starting of reducing gear **75** which, through drive **72, 73, 74** causes threaded rod **62** to rotate and, accordingly, the arms **63–66** and **64–67** of said follower pusher SA to move thereon to said position where the container is lifted between said arms **63–66** and **64–67** thereof. This position being attained, said arms **63–66** and **64–67** will much in the same manner as above described for the stopping of arm **52–53** of pusher S abut the limit microswitch **M5** which, by opening its contact, breaks the self-exciting circuit of remote control switch **TL8**, which in turn, on releasing, opens its contacts stopping said reducing gear **75** and thus stopping the movement of arms **63–66** and **64–67** at this position.

When the container has arrived at the position CP-C on vertical elevator conveyor TE, by the cyclic cam **80** closing at position 1–2 the contact C of its associated microswitch **M12** and through the normally closed safety contact 1–6 of remote control switch **TL5**, remote control switch **TL4** is excited and remains self-excited through its so closed contact 2–7 and limit microswitch **M3**. By closing of contacts 3–8, 4–9 and **5-10** of remote control switch **TL4**, reducing gear **37** is started which, through drive **34, 35, 36**, causes threaded rod **32** to rotate and, accordingly, the support plate **29** of vertical elevator conveyor TE to move upwardly thereon, carrying the container from position CP-C to said position CP-D at the level of rotatable head TG of loading mechanism MCT and between arms **63–66** and **64–67** of said follower pusher S. At the time the container reaches said position CP-D, in much the same manner as previously described for stopping arm **52–53** of pusher S and those of follower pusher SA, limit microswitch **M3** is abutted by a moving portion of vertical elevator conveyor TE, which limit microswitch **M3**, on opening its contact, will break the self-exciting circuit of remote control switch **TL4** which, on releasing, opens its contacts, thereby stopping said reducing gear **37** and thus stopping the upward movement of support plate **29** of said vertical elevator conveyor TE with said container at this attained position CP-D.

By the second lobe of cyclic cam **82**, contact C of microswitch **M14** is now closed again at 1–2, re-energizing and self-exciting again said remote control switch **TL8**, as previously set forth, so as to restart said reducing gear **75** and, accordingly, to move again in the same direction as before the arms **63–66** and **64–67** of follower pusher SA, thus carrying the container from the position CP-D on vertical elevator conveyor TE to position CP-E on rotatable head TG of loading mechanism MCT (FIGS. **2, 3** and **5**). This position being attained, arms **63–66** and **64–67** of follower pusher SA abut limit microswitch **M6** which, by opening its contact, breaks the self-exciting circuit of remote control switch **TL8** which, on releasing, opens its contacts stopping said reducing gear **75** and thus the movement of said arms **63–66** and **64–67** at this attained position. Thereafter (FIG. **7**) support plate **29** of vertical elevator conveyor TE is brought back to its bottom starting position for the next cycle.

This occurs upon energization of remote control switch **TL5** by the closing 1–2 of contact C of microswitch **M13** by means of cyclic cam **81** and through closed safety contact 1–6 of the now de-energized remote control switch **TL4**, and through the resulting self-excitation through its contact 2–7 and limit microswitch **M4**. By closing of contacts 3–8, 4–9 and 5–10 of remote control switch **TL5**, the reducing gear **37** is started by a reverse direction of rotation to the former and, accordingly, support plate **29** is downwardly moved, bringing its seating **30*a*** to the level previously attained by seating **30**, that is at the level of rotatable head TG, sliding plane **6*a*** being above store conveyor TM and conveyor TCV being above conveyor TCP. Microswitch **M4** is now abutted and, by opening its contact, breaks the self-exciting circuit of remote control switch **TL5**, stopping said reducing gear **37** and thus stopping support plate **29** at this lower position.

Assume now that on rotatable head TG of loading mechanism MCT there is at position CP-F (FIG. **3**) a container unloading cigarettes within supplying and assembling hopper TAR for packaging machine MI, and that this packaging machine MI is running and taking up cigarettes, successively moving down therefore from the container into said hopper TAR and breaking the light beam **87**. When such unloading from the container at this position CP-F has been completed, or when no more cigarettes pass in front of light beam **87** emitted from source **86** and, accordingly, the cigarette level within hopper TAR has dropped below the level of the light beam joining this light source **86** with photocell **88**, in-phase with cyclic cam **77** which at each cycle end closes contact C at 1–2 of its associated microswitch **M9**, and cyclic cam **76** at each cycle end opening and immediately closing again at 1–2, 3–4 and 5–6 the contacts **C1-C2-C3** of its associated microswitch **M8**, the remote control switch **TL1** is energized again through said contact C closed at 1–2 of microswitch **M9**, through contact **C6** closed at 1–2 of sensor **SS1**, through said microcontact **90** closed at 1–2 and through microswitch **P2** normally closed at 1–2, for manually stopping the apparatus. This stopping is due to the automatic operation presetting being attained, as above set forth, by member **92** and thus the closing 1–2 of microswitch **90** for amplifier **89**.

As above shown, this remote control switch **TL1** then remains self-excited and reducing gear **7** is then started again for a new cycle. As a result, shaft **48** is also operated and, in accordance with the above-mentioned Italian Pat. No. 779,386 in the same Applicant's name, causes said rotatable head TG to rotate through 180°, carrying the container from unloading position CP-F, or hereinafter referred to as container emptying position CV-F, to position CP-E and thus CV-E, between arms **63–66** and **64–67** here in dwell of follower pusher SA, and filled container which, as above set forth, has reached position CP-E from said position CP-E to said unloading position CV-E.

Arms **63–66** and **64–67** of follower pusher SA are then returned to the original position thereof to carry the empty container from said position CV-E on the rotatable head TG to the position CV-G on conveyor TCV in moving in the

reverse direction relative to conveyor TCP, as set forth hereinabove, passing by the upper seating **30***a* of lowered support plate **29** of elevator conveyor TE and sliding plane **6***a* overlying store conveyor TM. This occurs upon energization of remote control switch TL**9** by closing 1–2 of contact C of microswitch M**15**, by means of cyclic cam **83**, and through closed safety contact 1–6 of the now de-energized remote control switch TL**8** due to contact 2–7 and limit microswitch M**7**. By closing contacts 3–8, 4–9, and 5–10 of remote control switch TL**9**, reducing gear **75** is started rotating in a reverse direction to the former and, accordingly, said arms **63–66** and **64–67** of follower pusher SA are moved to said original position where, upon reaching it, they abut limit microswitch M**7** which, by opening its contact, breaks the self-exciting circuit of remote control switch TL**9** which, on releasing, removes the supply to reducing gear **75**, stopping it as well as stopping themselves.

Following the above description, it is deemed useful to specify that the diagram in FIG. **7** shows the time step relationship for moving members as repeated at each machine cycle without taking into account the corresponding initial location, that is cycle phasing within the 360° rotation of shaft **11** which is considered as basic rotation for said cycle. Since, as just seen, each cycle is automatically started at each unloading of a container into hopper TAR of packaging machine M**1** with a resulting re-energization of light beam **87**, it is apparent that a cycle will start at any time, that is from the position indicated in said diagram at 200°, which therefore can be referred to as cycle start position, or 0° position of said cycle.

As above stated, when remote control switch TL**1** is energized, a new cycle is started, so that, in accordance with the corresponding above-cited operating condition (A) (I°) and corresponding step of conveyor TCP, a container CP is carried to position CP-A and then to the successive positions and finally to position CV-G on conveyor TCV for unloading the empty containers, as just described.

In summary, in the normal cycle of operation of the system, an empty container CV is carried by the rotatable head TG from position CV-F in FIG. **3** to the position CV-E whereupon it is moved by pusher element SA to position CV-C where it is deposited on conveyor TCV. The empty container is then carried by the conveyor TCV to one of the respective manufacturing machines MC, MC^{I}, MC^{II}, along the path f^{III}, whereupon the empty container moves along the path f^{MC}(CV) from the upper conveyor TCV to the manufacturing machine for loading, and the just filled container moves back along the path f^{MC}(CP) to the lower conveyer TCP, as illustrated in FIGS. **1** and **2**. The conveyor TCP then carries the filled conveyor CP to the position CP-A along the path f^{II}, whereupon pusher element S sequentially moves the filled container through position CP-B on conveyor TM and into position CP-C on the elevator conveyor TE. The filled container CP is then elevated to position CP-D and into the arms of pusher element SA, which then moves the filled container to the position CP-E where it is received by the rotatable head TG for emptying the contents of the container CP into the hopper TAR, thus completing the cycle.

When the manufacturing machines cease to supply filled containers to the conveyor TCP, so that position CP-A is not occupied, then storage conveyor TM is caused to advance automatically in the direction f^{IV} toward the packaging machine MI, whereupon a filled container is moved from conveyor TM at position CP-B onto conveyor TE by pusher element S, so that the packaging machine MI continues to receive filled containers. Then, if the packaging machine MI ceases to operate, the conveyor TM automatically reverses its direction along the path f^{IV} away from the packaging machine MI so that filled containers arriving at position CP-B are retained on the conveyor TM. The details of such operation are as follows.

If the resulting step of conveyor TCP does not carry containers to said position CP-A, or if container gaps appear on said conveyor, as contemplated by the above mentioned operating condition under (A) (II°), the supply of a filled container to rotatable head TG of loading mechanism MCT for hopper TAR of packaging machine MI, is also assured by withdrawing the container from store conveyor TM. Thus, a lack of container at position CP-A causes contact C**5** of sensor SS to be held closed at its position 2–4 so that, at the time cyclic cam **84** closes at 1–2 the contact C of its associated microswitch M**16**, remote control switch TL**2** is energized through said closed contact C of microswitch M**16**, this contact C**5** being closed at 2–4, through closed contact 3–7 of remote control switch TL**10**, which is energized due to operation of packaging machine MI and through closed safety contact 1–6 of remote control switch TL**3**. Thus, said remote control switch TL**2** remains self-excited through its so closed contact 2–7 and closed contact C**3** at 5–6 of microswitch M**8** associated with cyclic cam **76**. By means of excitation and self-excitation of remote control switch TL**2** and thus by closure of its contacts 3–9, 4–9 and 5–10, reducing gear **21** is started, thus causing store conveyor TM to move over a step, carrying the first container stored thereon to position CP-B in line with transfer station ST on conveyor TCP and with the lower seating **30** of support plate **29** of vertical elevator conveyor TE, and thus in line with positions CP-A and CP-C. This movement or step of store conveyor TM occurs as a result of energization of electromagnet E, which is series connected in the self-exciting circuit of said remote control switch TL**2**. Thus, energization of said electromagnet E (FIG. **9**) moves pawl **26** and the associated portion of cylindrical surface **27***a* to an operative position with Geneva wheel **28**, the latter being keyed to shaft 3TM of said store conveyor TM. During the cycle, the container is then gradually carried from position CP-B to the next positions much in the same manner as previously described in connection with operating condition (A) (I°). If non-transportation of containers CP at position CP-A continues in the next cycles, the just described cycle of withdrawing containers from store conveyor TM will be repeated, according to operating condition (A) (II°), whereas when a container reaches said position CP-A, the above-mentioned cycle (A) (I°) will be repeated.

Assume now that packaging machine MI stops and the operating conditions are those referred to under (B) (I°), wherein containers from conveyor TCP are stored on the store conveyor TM: Upon stopping of packaging machine M**1**, remote control switch TL**10** releases, opening its contacts 1–5 and 3–7, and closing its contacts 2–6 and 4–8.

Thus the automatic cycle repetition, or energization and self-excitation of remote control switch TL**1** and, as a result, the start of reducing gear **7** and resulting feed or step of conveyor TCP, instead of occurring by means of light beam **87** and through the resulting closure of microcontact of amplifier **89**, is assured through closed contact 4–8 of said de-energized remote control switch TL**10** and contact C**8** of completed store sensor SS**2**, at closed position 1–3, as said store is capable of storing. Therefore, when a container on conveyor TCP reaches the position CP-A, the contact C**5** of sensor SS opens and contact C**4** closes so that, at the time cyclic cam **85** closes at 1–2 contact C of its associated microswitch M**17**, the remote control switch TL**3** is energized through closed contact 1–6 of the now deenergized remote control switch TL**2**, through contact C**9** of sensor SS**2** closed at 2–4, through said contact C of microswitch M**17** closed at 1–2, through contact C**4** of said sensor SS closed at 1–3, through the contact closed at 2– 6of deenergized remote control switch TL**10** of stationary packaging machine MI. Then, this remote control switch TL**3** remains self-excited through closure 2–7 of its self-exciting contact and closure at 3–4 of contact C**2** of microswitch M**8** associated with cyclic cam **76**. Through excitation and self-excitation of remote control switch TL**3** the contacts 3–8, 4–9 and 5–10 thereof are closed, and thus the reducing gear **21** is started in the opposite direction. In the meantime, see FIG. **7**, pusher S moves the container from position CP-A on conveyor TCP to position CP-B on store conveyor TM and hence, through the starting of reducing gear **21** as just mentioned, said store conveyor TM is rearwardly moved through a

step, as described hereinafter. In the self-exciting circuit of remote control switch TL3, as just shown, the series connected electromagnet E1 which, being thus energized, moves pawl 26*a* and cylindrical surface portion 27*b* associated therewith to an operative position with Geneva wheel 28 (FIG. 9) which is keyed to shaft 3TM of said store conveyor TM, so as to provide for said rearward movement of conveyor TM.

The repetition of this cycle continues until said operating condition (B) (I°) exists where, due to absence of a container or conveyor TCP, the operating condition should occur as provided under (B) (II°), that is presence of gaps on said conveyor TCP, so that the cycle is repeated, while leaving said store conveyor TM stationary. Thus, the absence of a container at position CP-A will leave contact C4 of sensor SS open, whereby the excitation of remote control switch TL3, as above seen, cannot occur.

The operating conditions referred to under (C), (D), (E), (F), (G) are all met by the apparatus operation according to the above described conditions (A) (I°), (A) (II°), (B) (I°), (B) (II°), except for the conditions of completed and respectively empty store conveyor TM, as set forth under (D) and (E).

The case contemplated by (D), that is completed store conveyor TM, means that packaging machine MI is stationary and that, as above set forth, container CP at the last rear position of said store conveyor TM has opened the contacts C8 and C9 of sensor SS2, whereby excitation cannot occur for remote control switch TL1 which accordingly provides for maintaining conveyor TCP and cyclic shaft 11 stationary. On the other hand, in the case according to (E), or empty store conveyor TM, it means that conveyor TCP is also empty and that because of there is no container at sensor SS1, the contact C7 of the latter is open, whereby it being series connected with other sensors, schematically assembled in unit G of packaging machine MI, in the self-exciting circuit of remote control switch TL10, it will cause said remote control switch TL10 to release and then stop said packaging machine by opening its self-exciting contacts 1–5.

A capacitor CN is parallel connected to the circuit of said contact C7 of sensor SS1, the capacitance of this capacitor CN being such as to maintain at an active condition the same electrical circuit, to which said contact C7 is connected, for a time at least equal to that required for carrying out the feed of a corresponding intermittency, or step, of store conveyor TM and this, obviously, in order to avoid any disturbance to the operational regularity of packaging machine MI.

In practice it was found that the feeding apparatus according to the invention perfectly attains all of the above-described objects. Thus, by using all of the operative cycles of packaging machine MI and supply conveyor TCP with such an apparatus, the output continuity can be assured for said packaging machine and a substantial duration can be conferred to a cigarette producing system both for said packaging machine and manufacturing machines, independently of the operational continuity of the individual machines.

The invention may be subjected to many modifications and changes provided by technically equivalent elements, which, however, fall within the covering field of the appended claims.

WHAT IS CLAIMED IS:

1. An apparatus for supplying cigarette containers to the loading mechanism for hoppers of cigarette packaging-conditioning machines said mechanism comprising an overturning member including means for repeatedly receiving and carrying a cigarette container from a receiving and transferring position thereof to a cigarette unloading position at said hoppers to unload said cigarettes into said hoppers, and electro-sensitive means for detecting the end of an unloading operation and for cyclically controlling the repetition of said operations of said overturning member, said electro-sensitive means including a first continuous supply conveyor for successively carrying cigarette containers from a transfer position thereof to said receiving and transfer position of said overturning member, a second continuous conveyor defining a receiving and supply position between said transfer position from the first continuous supply conveyor and said receiving and transfer position of the overturning member, a third continuous conveyor for empty containers defining a receiving position of said empty containers from said receiving and transfer position of the overturning member, motor means electrically connected to said electrosensitive means associated with said overturning member for independently operating said first, second and third conveyors, and pusher means also connected to said electro-sensitive means associated with the overturning member for successively transferring containers from said transfer position of the first supply conveyor to the receiving position of the overturning member when the conditioning machine is running, and to the receiving and supply position of the second conveyor for storing when the conditioning machine is not running, and respectively, with the conditioning machine running, from the supply position of said second conveyor to the receiving position of said overturning member, in a case where there are no containers at said transfer position of said first conveyor, and from said receiving and transfer position of the overturning member to the receiving position of the third conveyor for unloading the empty containers.

2. A supply apparatus according to claim 1, comprising a fourth conveyor located between the transfer position from the first supply conveyor and the receiving and supply position of the second conveyor, and respectively the receiving and transfer position of the overturning member, and independent drive means electrically connected to the electro-sensitive means associated with said overturning member for operating said fourth conveyor.

3. A supply apparatus according to claim 2, wherein the overturning member comprises a rotatable head provided with at least two seating means for carrying a cigarette container at opposed positions including said receiving and transfer position for said containers and said unloading position for the cigarettes from said containers into the hopper of the conditioning machine, and wherein said electro-sensitive means for detecting the end of the unloading operation for the unloading container is for cyclically controlling the rotation of said rotatable head so as to switch the respective seating means from one to another of said opposed positions, wherein said first, second and third conveyors are of the endless transport surface type and include means for moving said conveyors intermittently, and said fourth conveyor is of the vertical elevator type and includes means for moving said fourth conveyor reciprocably between a lower receiving position and an upper transfer position, the transfer position from the first supply conveyor, the receiving and supply position of the second store conveyor and the lower receiving position of the fourth vertical elevator conveyor being respectively horizontally juxtaposed and aligned to one another and to the receiving and transfer seating means of the rotatable head at a level vertically lower than the latter, wherein said fourth conveyor has a sliding and transfer surface, whereas the upper supply position of said vertical elevator conveyor and the receiving position of the third discharging conveyor for empty containers, as well as said sliding and transfer surface associated with said vertical elevator conveyor are, respectively, for the lower and upper positions of said vertical elevator conveyor, horizontally juxtaposed and aligned to one another and at the same level as said receiving and transfer seating means of said rotatable head; said pusher means comprises a first pusher, reciprocable with an outward movement from said transfer position of the first supply conveyor to the receiving and supply position of the second conveyor with a dwell at this position and from this swell position to the lower receiving position of the fourth vertical elevator conveyor, and a back movement to the original position, and a second pusher, also receiprocable with an outward movement from the receiving position of the third discharging conveyor for empty containers to the upper transfer or supply position of the vertical elevator conveyor

with a dwell at this position and from this dwell position to the receiving and transfer position of the rotatable head with a dwell also at this second position, and a back movement to the original position, limit microswitch means electrica-ly associated with the drive means for operating said first and second pushers and positioned at dwell positions of the pushers for being abutted by said pushers so as to break the supply circuit of the respective operating drive means, stopping the movement of said pushers at said respective positions.

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