United States Patent [19]

Buchegger

[11] **3,889,240**

[45] **June 10, 1975**

[54] **SYSTEM FOR PROGRAMMING THE STARTING AND STOPPAGE OF APPARATUS FOR THE PRODUCTION AND/OR PROCESSING OF CIGARETTES OR THE LIKE**

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[22] Filed: **Apr. 28, 1972**

[21] Appl. No.: **248,674**

[30] **Foreign Application Priority Data**

Apr. 29, 1971 Germany 2121044
Dec. 11, 1971 Germany 2161611

[52] **U.S. Cl.** ..... **340/172.5;** 131/21 R
[51] **Int. Cl.** **G06f 9/00;** A24b 7/14; A24c 5/34
[58] **Field of Search** ..... 131/21 R, 21 A, 21 B; 200/38 C; 307/41; 340/172.5, 147 MT; 318/85, 571, 574; 235/151.1, 151.11; 93/1 C

[56] **References Cited**

UNITED STATES PATENTS

2,745,410	5/1956	Molins	131/21 R
2,896,636	7/1959	Powell et al.	131/21 R
2,948,281	8/1960	De Voto et al.	131/21 R
3,067,754	12/1962	Pinkham et al.	131/21 R
3,109,074	10/1963	Lewis et al.	200/38 C
3,234,805	2/1966	Slonneger	200/38 C
3,391,393	7/1968	Jaquith et al.	340/172.5
3,412,856	11/1968	Esenwein	131/21 R
3,413,425	11/1968	Lovegrove	200/38 C
3,470,424	9/1969	Flesselles et al.	131/21 RU
3,672,373	6/1972	Dogl et al.	131/21 R
3,720,815	3/1973	Lorenzen	131/21 R

FOREIGN PATENTS OR APPLICATIONS

1,245,649	10/1960	France	131/21 A
609,015	9/1948	United Kingdom	131/21 B
949,493	9/1964	United Kingdom	131/21 A
1,089,764	11/1967	United Kingdom	131/21 R

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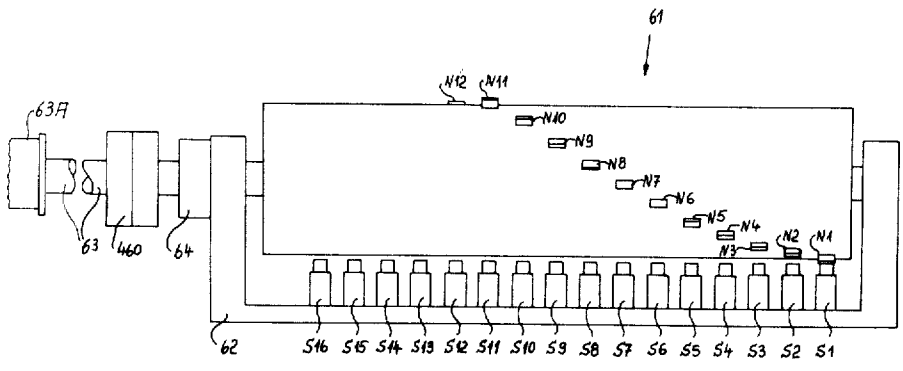
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

A production line for the making of plain or filter-tipped cigars, cigarillos or cigarettes wherein several aggregates of a first type are driven in synchronism with each other by a main motor and several aggregates of a second type are activated and/or deactivated during starting and stoppage of the production line. The aggregates of the second type are activated and/or deactivated in a predetermined sequence and at predetermined intervals by a programming system which actuates a series of signal generators which, in turn, control the respective aggregates of the second type. The programming system employs a rotary drum which is driven by the main motor or by a separate motor, or a counter which receives and counts pulses furnished by a pulse generator receiving motion from the main motor or from a separate motor.

22 Claims, 11 Drawing Figures



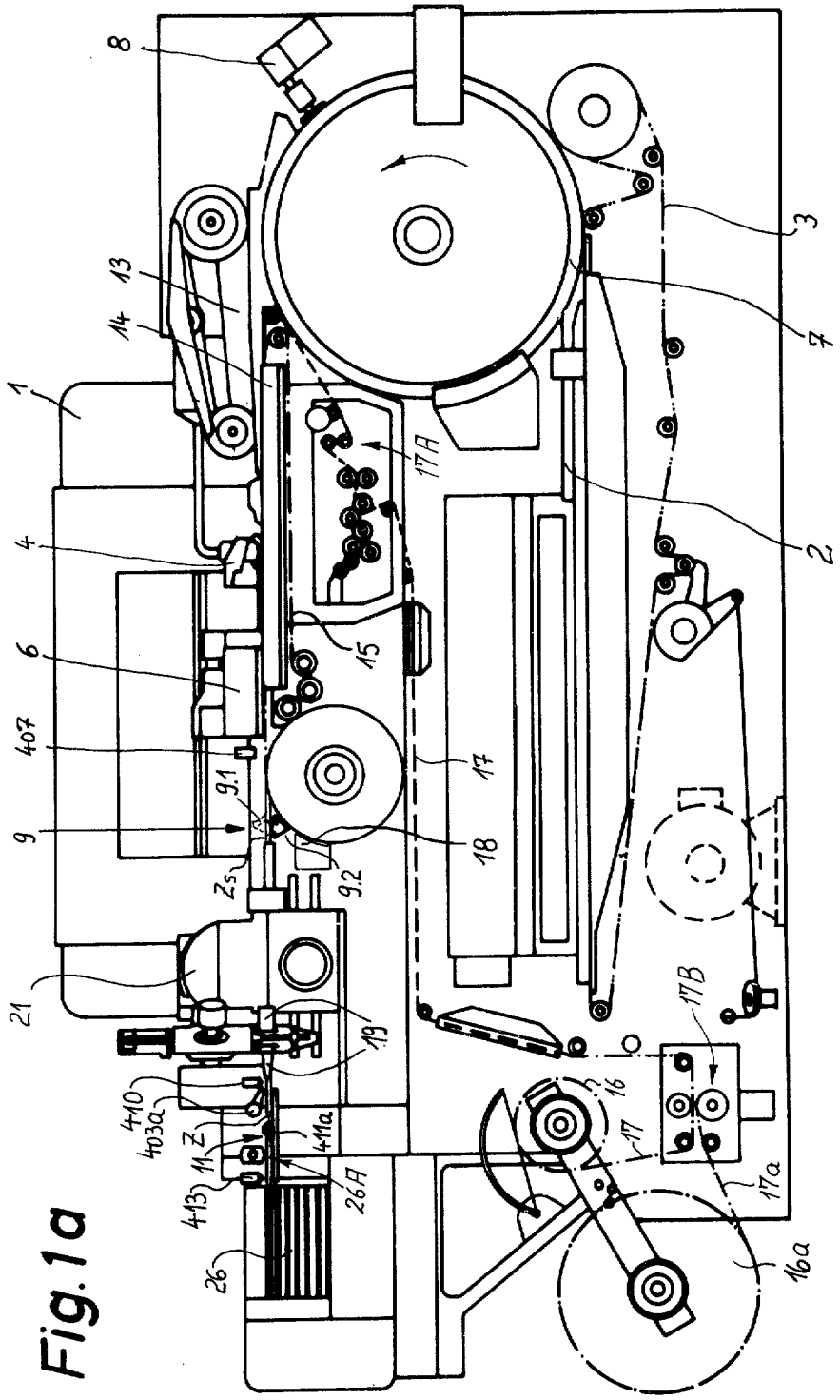

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Fig.1a

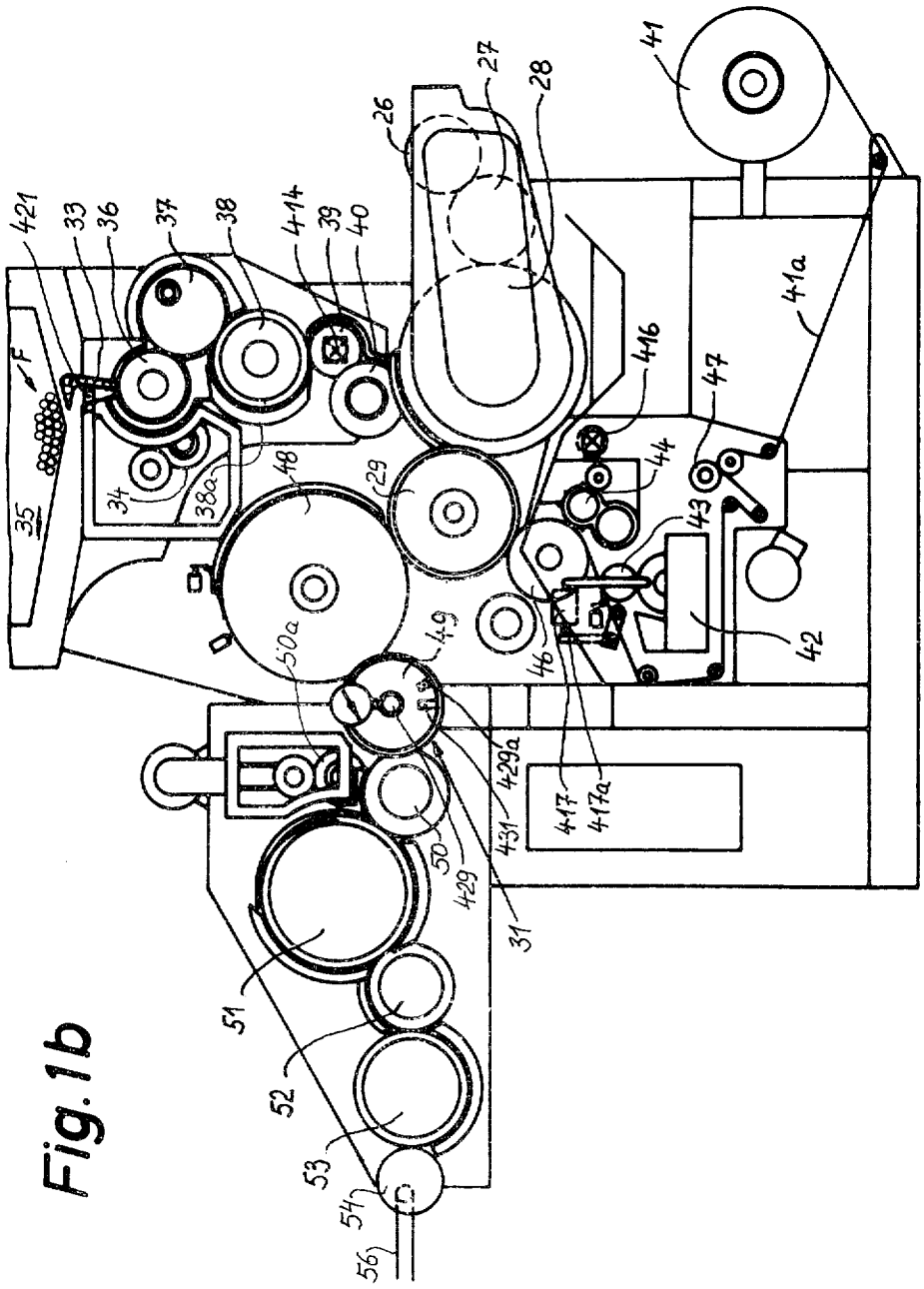
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Fig. 1b

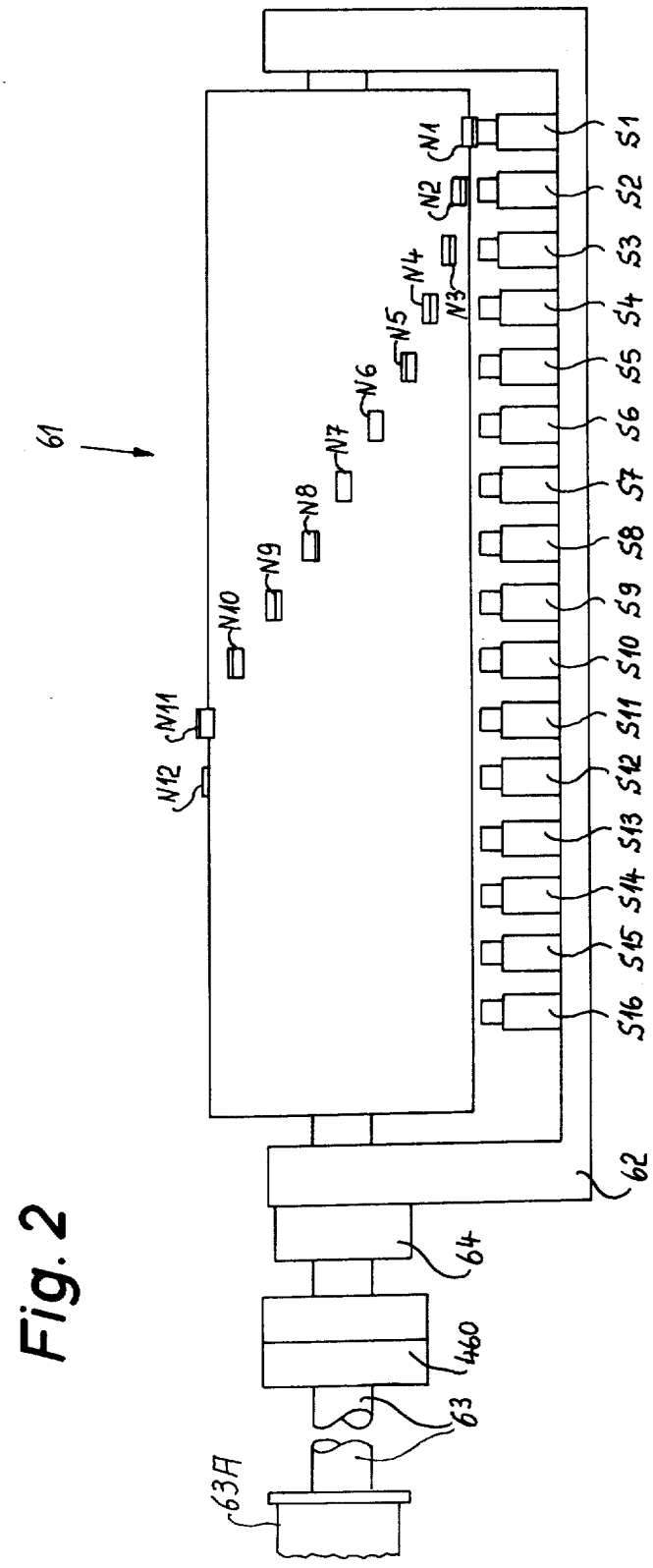
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Fig. 2

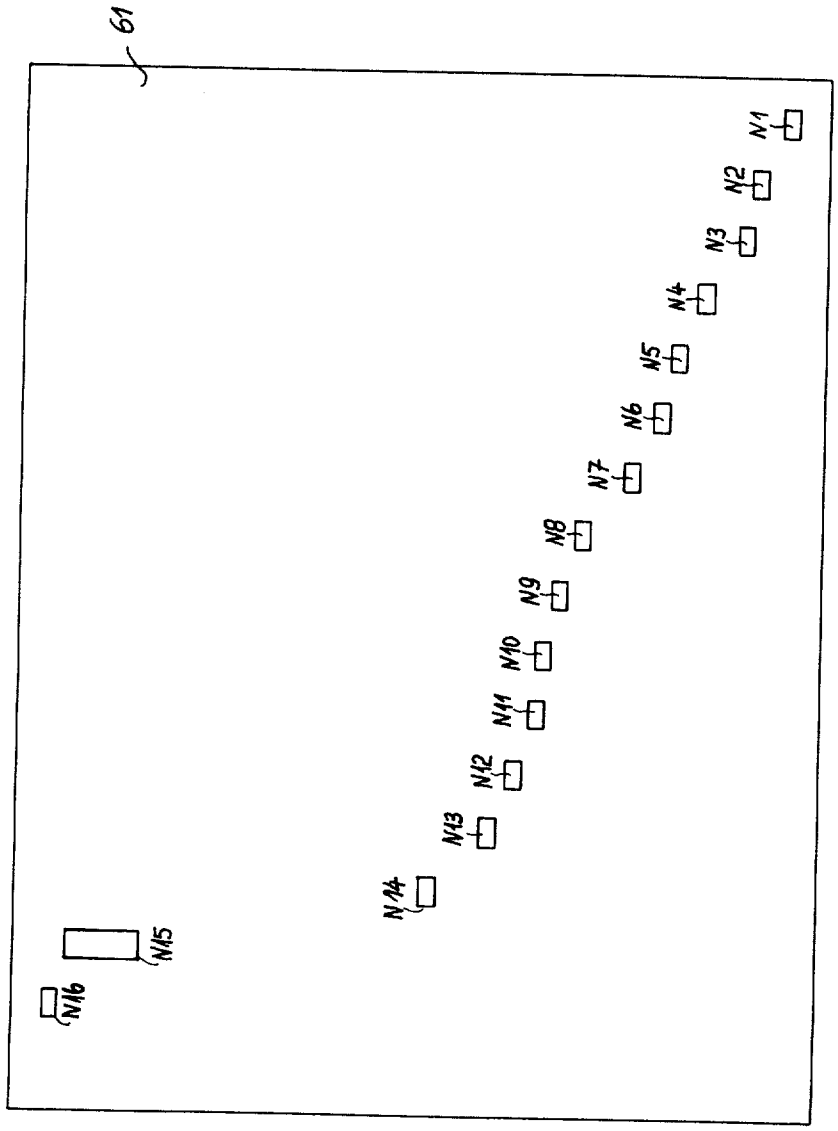

Fig. 3

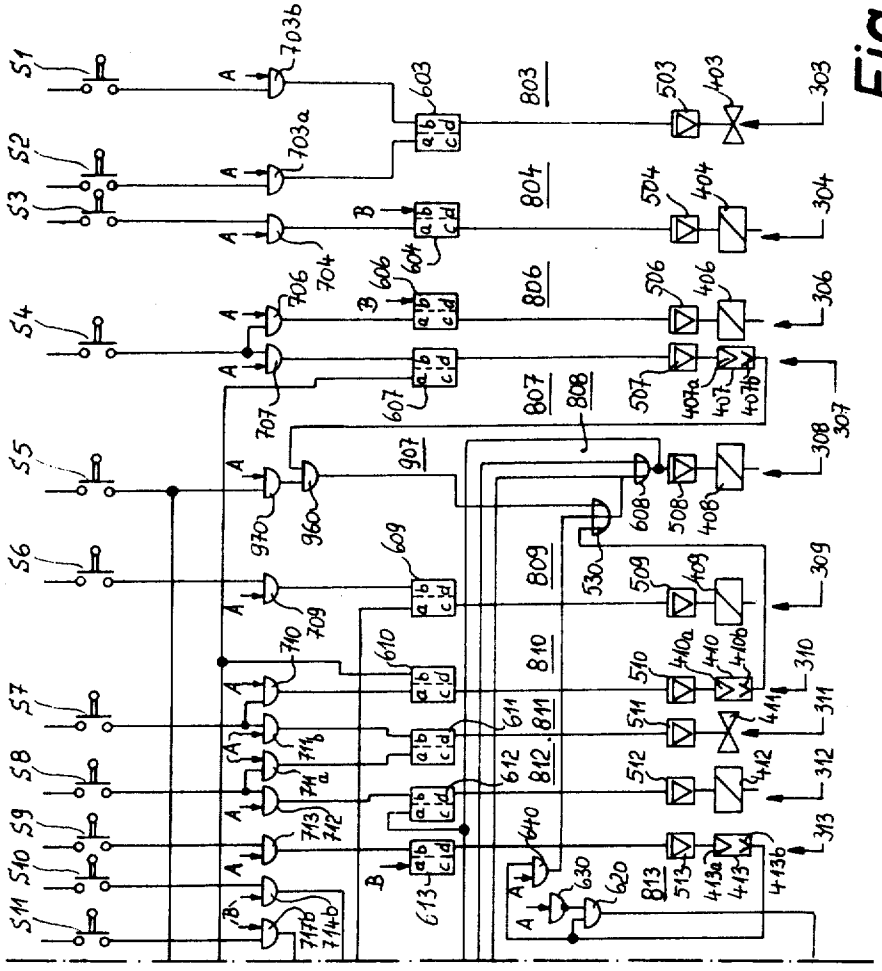

Fig. 4a

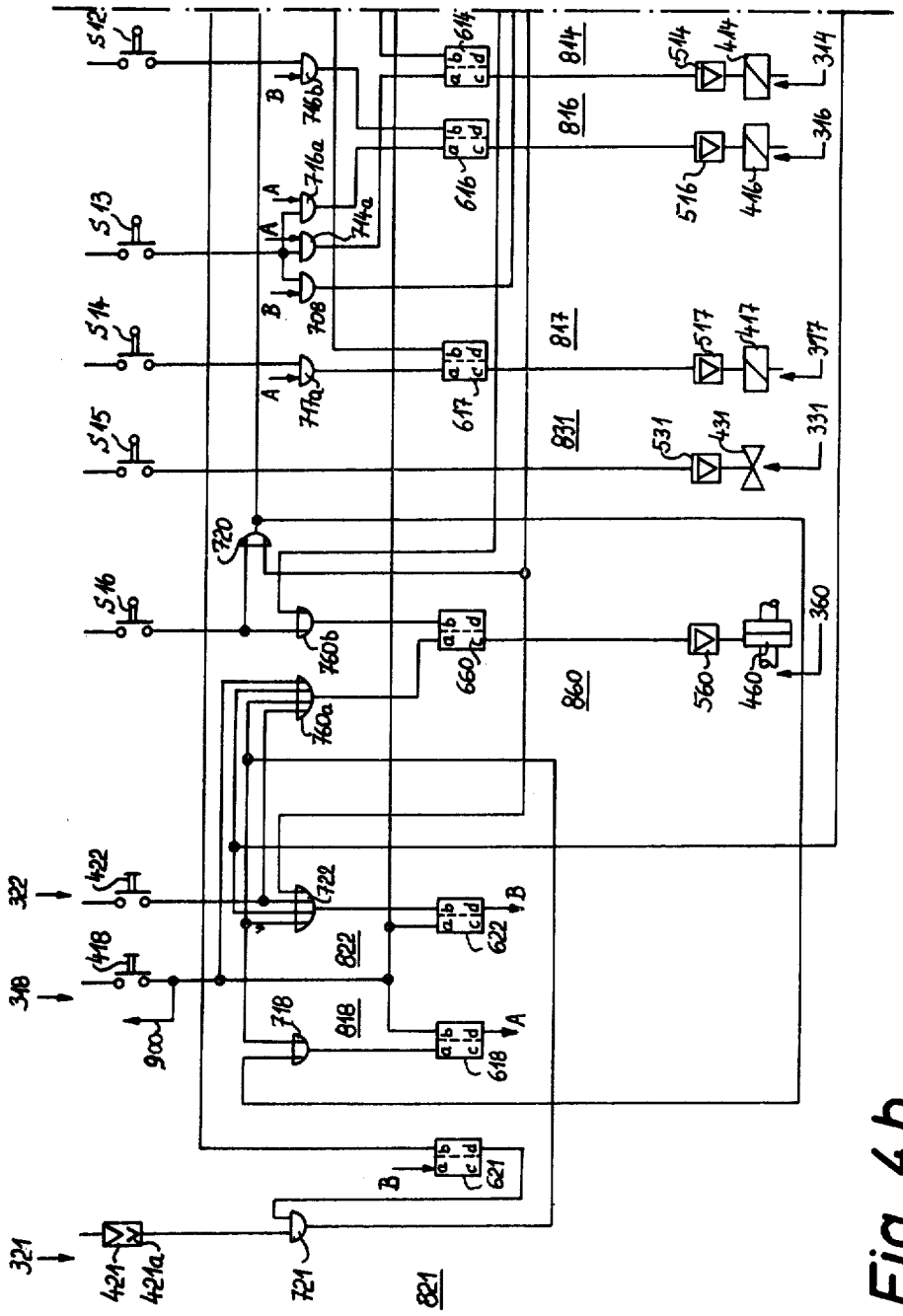
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Fig. 4b

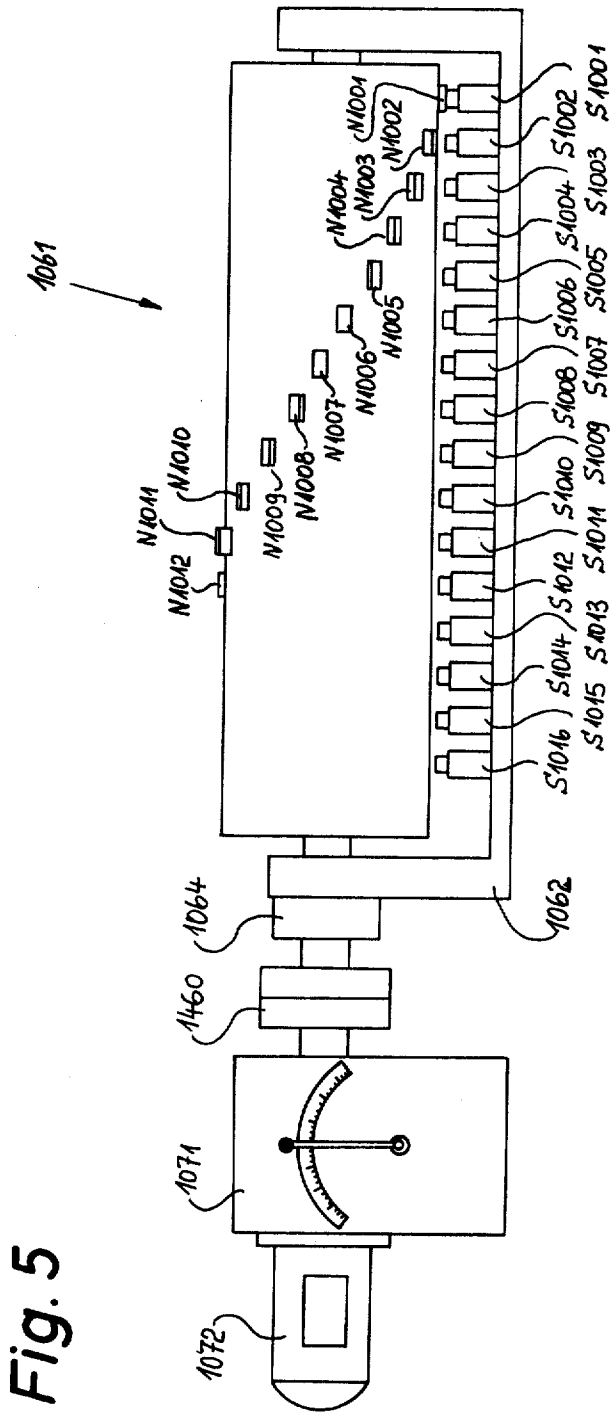
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Fig. 5

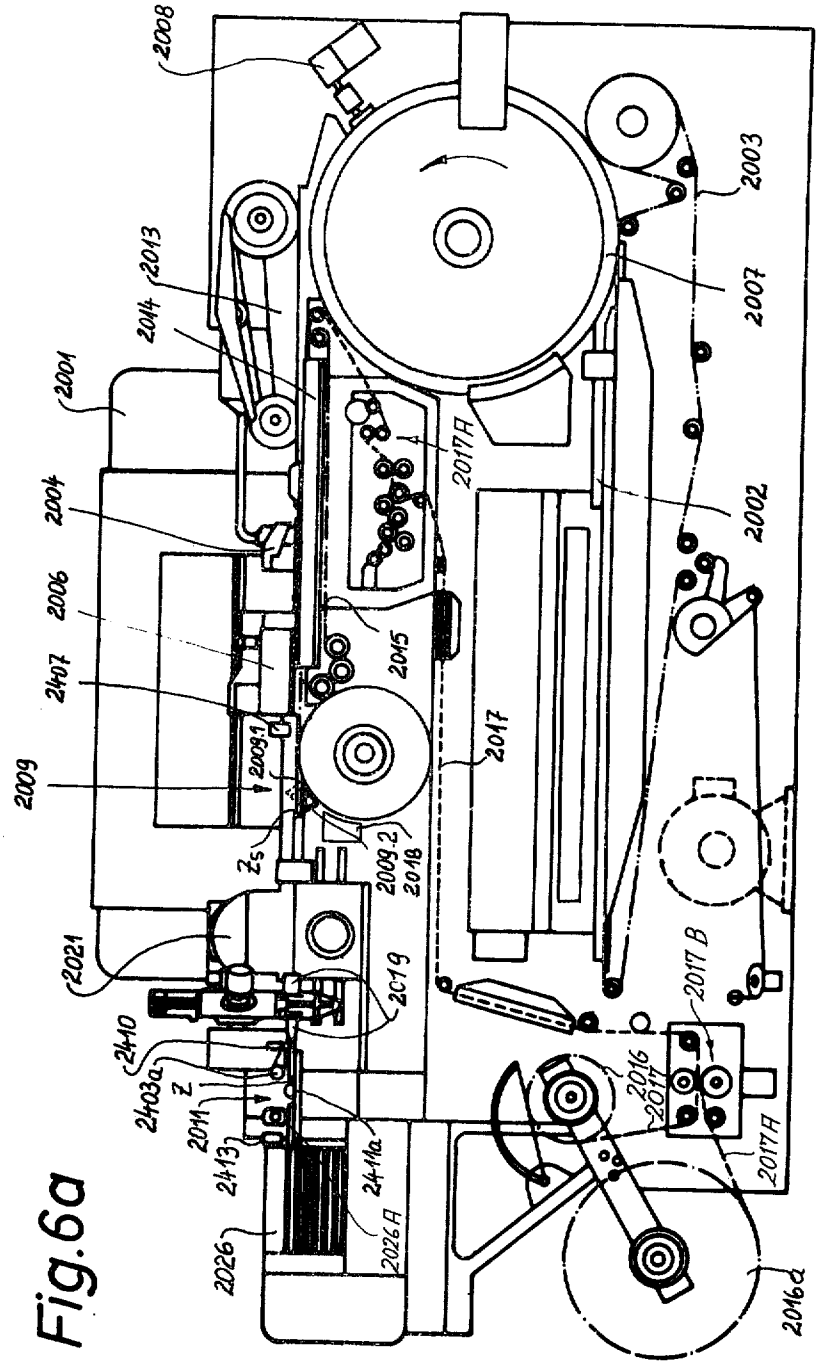
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Fig.6a

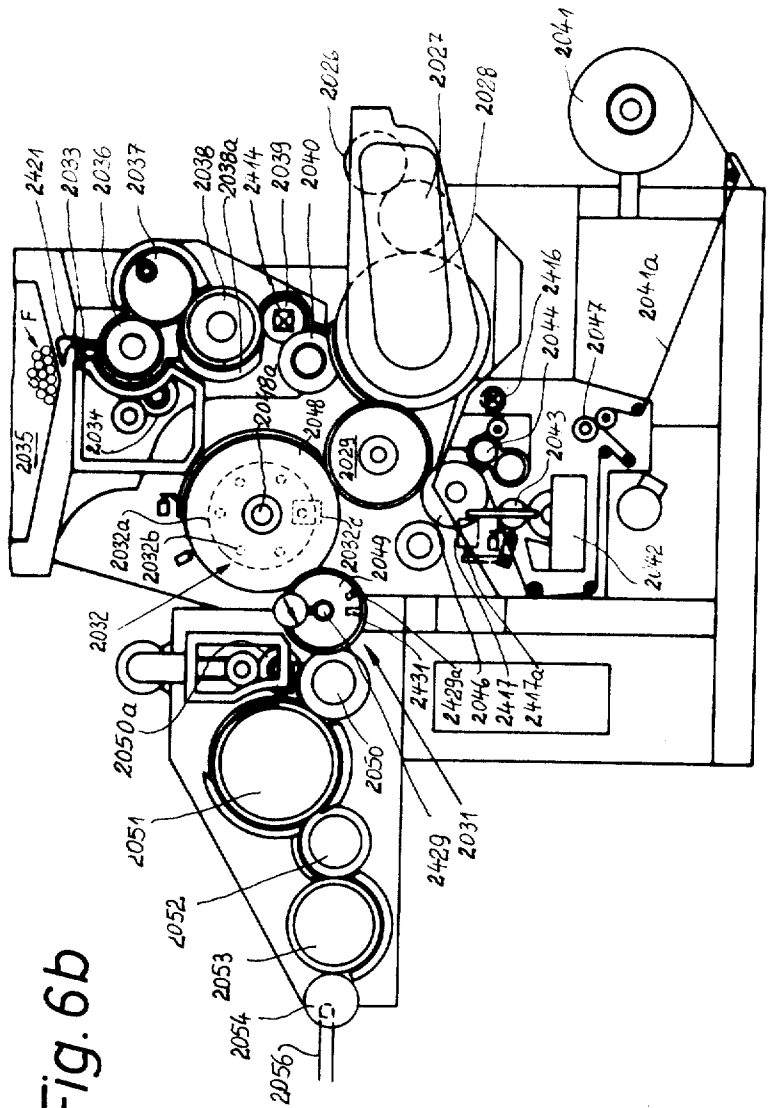
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Fig. 6b

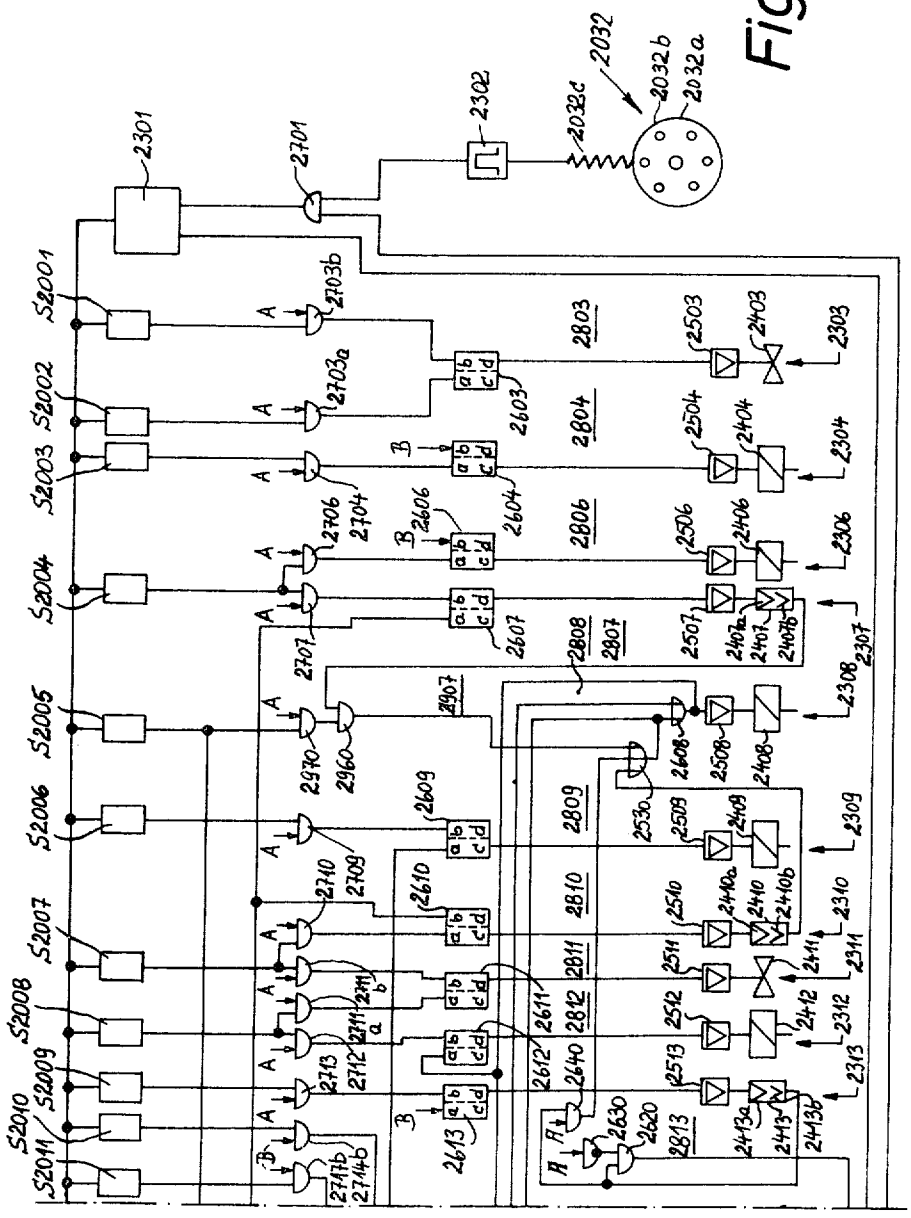

Fig. 7a

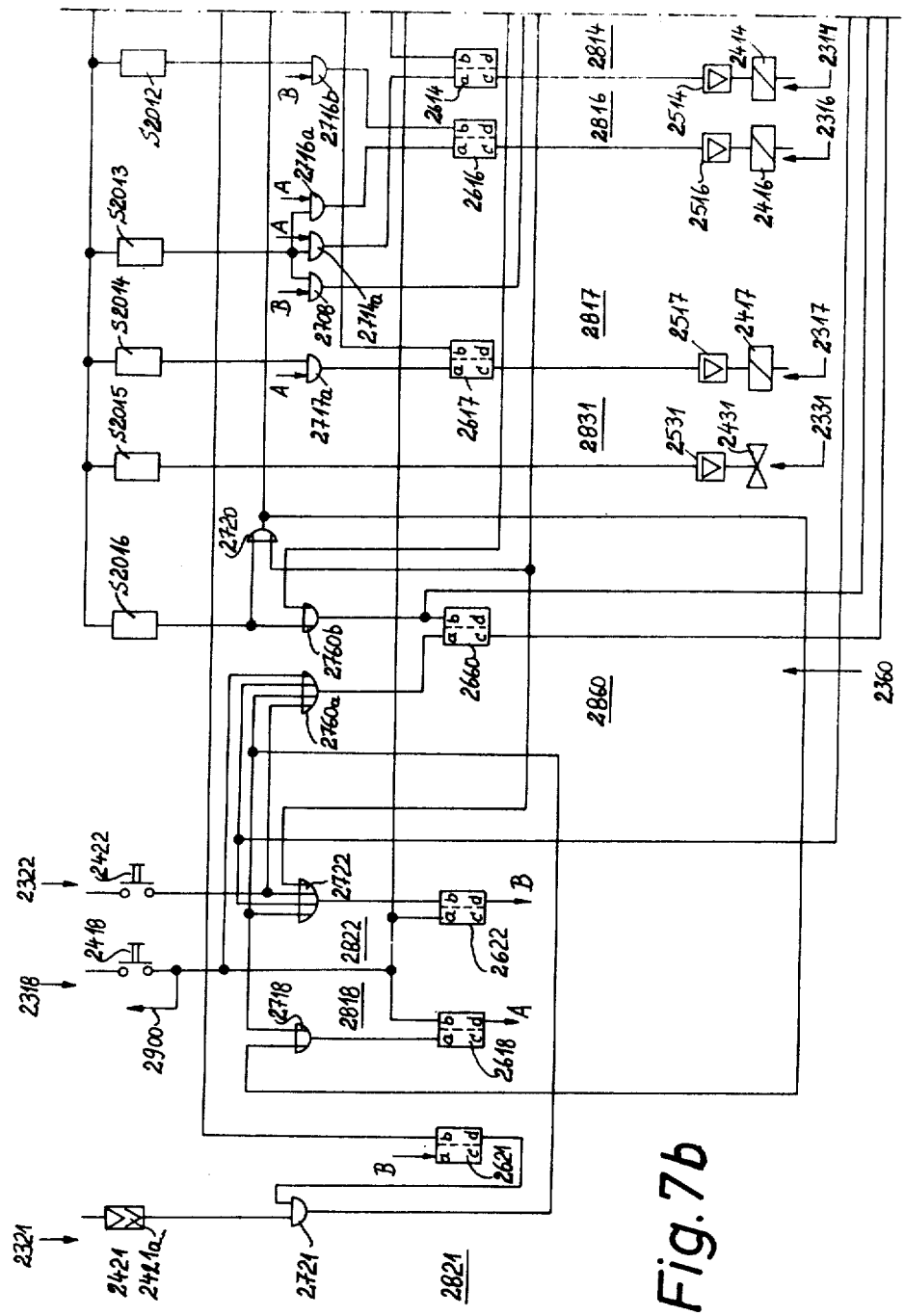
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Fig. 7b

SYSTEM FOR PROGRAMMING THE STARTING AND STOPPAGE OF APPARATUS FOR THE PRODUCTION AND/OR PROCESSING OF CIGARETTES OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for the production and/or processing of smokers' products, such as plain or filter-tipped cigars, cigarillos or cigarettes and simple or composite filter rod sections.

The trend in the cigarette making and related industries is toward complete automation of the production, not only in order to achieve savings in personnel but also to insure an optimum utilization of the machinery with minimal waste in tobacco and/or other materials and maximum output. It is already known to provide a machine for the making of cigarettes or analogous rod-shaped smokers' products with a control system which insures fully automatic operation of the machine once the operation is started, i.e., once the machine operates at normal speed. However, serious problems are still encountered during the starting and stoppage of such machines. Certain presently known machines for the production of plain or filter cigarettes or analogous rod-shaped articles are already equipped with control systems which insure automatic activation and/or deactivation of certain aggregates during starting and stoppage; however, a large number of such aggregates are still controlled by hand so that the length of intervals which are required for starting or stoppage, as well as the number of rejects which are produced during such stages of operation, is still overly dependent on the skill and conscientiousness of attendants.

Apparatus for the production and/or processing of rod-shaped articles (such as plain or filter-tipped cigars, cigarillos, cigarettes or cheroots and/or filter stubs and filter rod sections) to which the present invention pertains embody two types of subassemblies or aggregates, namely, aggregates of a first type whose operation is invariably synchronized because they are normally driven by a common output shaft which receives motion from the main prime mover of the apparatus, and aggregates of a second type whose operation is partially or entirely independent of the operation of aggregates of the first type and which must be activated and/or deactivated in a predetermined sequence during starting and also during stoppage of the apparatus.

The synchronization of operation of aggregates of the first type presents no serious problems since all such aggregates normally receive motion from a common main prime mover. Thus, once the operation of such aggregates (of the first type) is properly synchronized, the adjustment remains intact irrespective of repeated starting and stoppage of the apparatus. Therefore, the aggregates of the first type seldom cause serious problems during the starting, stoppage, normal operation, acceleration or deceleration of the apparatus. In a cigarette rod making machine wherein a continuous wrapped rod-like filler is subdivided into sections of unit length of multiple unit length (e.g., in a machine known as GARANT and produced by the West German Firm of Hauni-Werke, Korber & Co., K.G., of Hamburg-Bergedorf), the aggregates of the first type include the customary distributor whose rollers, drums, belts and/or other movable parts receive motion from the output shaft of the main prime mover and which serves to produce a continuous homogeneous tobacco stream which is thereupon compacted to form a rodlike filler and is wrapped to be converted into a wrapped filler rod; the conveyor or conveyors which transport the tobacco stream, the unwrapped filler rod and the wrapped tobacco rod; the trimming or equalizing device or devices which remove the surplus from the rodlike filler prior to wrapping; the mechanism which imprints various information on cigarette paper; the cutoff which servers the wrapped filler rod to convert it into a succession of plain cigarettes of desired length; the customary accelerating device or kicker which is used to increase the distance between successive plain cigarettes downstream of the cutoff so that the single file of cigarettes can be converted into one or more rows wherein the articles move sideways; and the conveyor mechanism which converts a single file of cigarettes into one or more rows.

In a filter cigarette making machine (such as the machine known as MAX and produced by the West German Firm of Hauni-Werke, Korber & Co., K.G., Hamburg-Bergedorf), the aggregates of the first type include the conveyors which transport plain cigarettes to an assembly station, the device for severing filter rod sections of multiple unit length to yield shorter filter rod sections or stubs, the mechanism which severs filter cigarettes of multiple unit length to convert such cigarettes into filter cigarettes of unit length, one or more testing units which test the quality of filter cigarettes of unit length or multiple unit length, one or more ejecting or segregating devices, and an inverting device which can invert selected filter cigarettes of unit length so that the filter plugs of all such filter cigarettes face in the same direction.

The aggregates of the second type are normally not connected with the output shaft of the main motor. As mentioned above, such aggregates are activated and/or deactivated during starting and during stoppage of the apparatus, and they may receive motion from the main prime mover or are provided with discrete prime movers. For example, the means for activating or deactivating certain aggregates of the second type may include suitable clutches which can be engaged or disengaged to thereby transmit motion from the output shaft of the main prime mover to the respective aggregate or aggregates of the second type or to terminate the transmission of such motion.

In a cigarette rod making machine of the aforediscussed character, the aggregates of the second type include a paster which is used to provide one of the marginal portions of a continuous cigarette paper web with a film of adhesive so that such marginal portion will adhere to the other marginal portion when successive increments of the finished wrapped filler rod issue from the wrapping mechanism, a heating device which is normally employed to heat the freshly formed seam so as to cause rapid setting of the adhesive, a cleaning device which is utilized to expel foreign matter from the tubular element or elements through which a wrapped filler rod passes in the cutoff to be subdivided into plain cigarettes of desired length, a mutilating device which can break off the leading end of a wrapped filler rod so as to insure that the rod which is allowed to enter the cutoff is capable of invariably yielding satisfactory plain cigarettes, and one or more segregating devices which are provided for the purpose of segregating those cigarettes which are produced immediately after start-

ng of the machine and which are likely to be defective even though their seams might be satisfactory.

In a filter cigarette making machine of the above outlined character, the aggregates of the second type include the conveyors for the feed of filter rod sections and stubs as well as for the feed of a tape which is converted into discrete adhesive-coated uniting bands, a paster which is used to coat one side of the tape prior to severing of the tape to yield discrete uniting bands, a segregating device which expels from the normal path those filter cigarettes which are produced immediately after starting of the machine, and one or more detectors which scan the various paths and/or the operation of aggregates of the first type.

When a machine for the making of plain or filter cigarettes is to be started, the aggregates of the second type must be activated or deactivated in a predetermined sequence. For example, the starting of a conventional machine for the making of plain cigarettes is started in the following way: The attendant or attendants thread the leader of the cigarette paper web through various components of the machine (such as an automatic or semiautomatic splicer, the imprinting device and the wrapping mechanism), and the tubular elements of the cutoff are cleaned by resorting to a suitable bottle cleaning brush, a bellows or the like. The main prime mover is started so that the distributor begins to form a continuous cigarette stream which is compacted to form a rod-like filler and enters the wrapping station. The attendant thereupon moves the paster to its operative position so that the paster applies a film of adhesive to one marginal portion of the cigarette paper web in that part of the machine wherein the web is nearly completely draped around the rod-like filler. When the attendant notes that the paster coats one marginal portion of the cigarette paper web with adhesive, he actuates the seam heating device which engages the freshly formed seam and heats the adhesive to promote the setting and to thereby insure that the compacted tobacco shreds which form the filler cannot open the seam while the thus obtained wrapped cigarette rod or filler rod advances toward the cutoff. The attendant observes the formation of the wrapped rod and, after determining that the wrapper on the rod is satisfactory, actuates a mutilating device which breaks off the foremost part of the rod to thus insure that the rod which enters the cutoff is of satisfactory quality for the making of discrete plain cigarettes. The first cigarettes are ejected by a suitable segregating device which is normally started by the operator and can include one or more nozzles for discharge of compressed air. A time delay relay or the like automatically terminates the segregation of first batch of plain cigarettes which are likely to be defective, for example, due to excessive drying of tobacco shreds which remained in the machine after the last stoppage.

If the just discussed cigarette making machine is coupled with a filter cigarette making machine, the latter is provided with a number of detectors which scan the progress of plain cigarettes and activate various aggregates of the second type in a desired sequence. Such detectors can activate the respective aggregates through the intermediary of suitable time delay relays to insure that the activation of the respective aggregates will take place at intervals which are presumably best suited for starting of the filter cigarette making machine with minimal waste in plain cigarettes, filter stubs and/or uniting bands. The aggregates of the second type which are used in such filter cigarette making machine include various conveyors for the delivery of filter rod sections and filter stubs, the advancing means for a tape which is to be subdivided into uniting bands serving to connect plain cigarettes with filter stubs, a paster which coats one side of the tape with a film of adhesive, and a segregating device with ejects the first batch of filter cigarettes of unit length or multiple unit length. All this takes place while the main prime mover of the machine drives the aggregates of the first type at a relatively low speed. Once the attendant has determined that all aggregates operate properly, the main prime mover is adjusted to operate the aggregates at the higher or normal speed.

It is evident that the just described mode of starting a single machine or a production line consisting of two or more directly or indirectly coupled machines is overly dependent on the experience, carefulness and alertness of attendants. As a rule, the interval which elapses between the starting of the main prime mover and the adjustment for operation at normal speed is much longer than absolutely necessary in order to avoid the formation of unsatisfactory acticles. If the change from low speed to normal operating speed is effected too soon, the machine or machines are likely to produce defective articles with attendant losses in tobacco, filter material, wrapping material, adhesive and/or contamination of the machine. On the other hand, if the delay between the starting and operation at full speed is too long, the output of the machine or machines is well below an optimum value, especially when the apparatus includes one or more high-speed machines for the production of cigarettes or the like at the normal rate of about **70** articles per second. Furthermore, it is extremely difficult to visually follow the progress of articles or their components in a machine whose output is so high, even if the machine is operated at the lower or lowest of several speeds.

Certain recent types of tobacco processing machines are already equipped with a system of automatic activating and deactivating devices for various aggregates of the second type. Such automatic system employs discrete time delay devices for aggregates of the second type and means for transmitting impulses to such time delay devices in response to a start or stop signal. The time delay devices then activate or deactivate the respective aggregates of the second type in a given sequence and at intervals which are established empirically as being best suited to insure the activation of successive aggregates with minimal losses in output and with minimal number of rejects.

It was found that the just described automatic activating and deactivating systems cannot invariably insure proper synchronization between the activation and deactivation of various aggregates which are to be activated or deactivated during starting or stoppage of the machine or machines. Thus, the intervals between the activation or deactivation of successive aggregates of the second type are selected without considering the possibility of malfunctioning of one or more aggregates of the first type, the possibility of failure of one or more aggregates of the second type, and/or the possibility that the operation is affected by external influences, such as clogging of certain conveyors, channels, tubes or other parts by adhesive, dust or other matter, exhaustion of the supply of web, tobacco shreds or other

ingredients of smokers' products. If the delays with which the aggregates of the second type are activated and/or deactivated during starting or during stoppage are too long (for example, because the manufacturer wants to make sure that the machine or machines will begin to operate at normal speed only when the likelihood of turning out defective articles is practically nonexistent), the output of the machine or machines will be much less than a maximum output, especially if the operation of one or more machines must be interrupted at frequent intervals, such as for manually splicing the trailing end of an expiring web to the leading end of a fresh web. On the other hand, if the adjustment of the time delay devices is such that the intervals between the activation and/or deactivation of successive aggregates of the second type are reduced to a minimum, the machine or machines are likely to turn out very large numbers of defective articles which might not be detected at all, for example, if defective cigarettes are fed directly into a packing machine.

The situation is analogous when the aggregates of the second type must be activated or deactivated in response to a stop signal which is to bring about complete stoppage of one or more machines. If all aggregates are to be deactivated at the same time, this can lead to substantial losses in tobacco or other ingredients of smokers' products because all such tobacco shreds and/or such cigarettes which remain in a machine during prolonged idleness are likely to lose excessive amounts of moisture and must be discarded prior to entry into a packing machine or into a tray. Attempts to reduce the number of rejects which are obtained as a result of abrupt and untimely stoppage of aggregates of the second type in response to a stop signal are analogous to those which were described above in connection with the starting of such machine or machines. Thus, certain aggregates of the second type are controlled by time delay devices whose delaying action is determined by tests and which deactivate various aggregates in a given sequence in response to generation of a top signal. The delays which are furnished by such time delay devices are selected without consideration of the condition of previously activated or deactivated aggregates of the second type.

It is further known to control the starting and stoppage of tobacco processing machines by a shift register. A drawback of such proposal is that the shift register must comprise an extremely large number of stages because the number of stages must equal the maximum number of articles in the production line. Moreover, a programming system which utilizes a shift register is so complex that it can be installed, adjusted, serviced and/or repaired only by highly skilled technicians.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved system for programming the starting and stoppage of apparatus for the production and/or processing of cigarettes or analogous rod-shaped articles which can be used as parts of or as finished smokers' products.

Another object of the invention is to provide a programming system which can be incorporated into or combined with existing machines or groups of machines for the making and/or processing of rod-shaped articles which constitute or form part of smokers' products.

A further object of the invention is to provide a programming system which is constructed and assembled in such a way that it can control all phases of operation during starting and/or stoppage of one or more machines for the making or processing of plain or filter-tipped cigarettes or analogous rod-shaped articles, and which is constructed and assembled to insure maximum output of and to reduce the number of rejects in such machine or machines.

An additional object of the invention is to provide a programming system which occupies little room, which is relatively simple, and which renders it possible to reduce the number of attendants, particularly in tobacco processing or like plants wherein smokers's products are being produced and processed in a large number of production lines each of which can be composed of two or more directly or indirectly coupled machines.

Still another object of the invention is to provide a programming system which can be used with particular advantage for the production and/or processing of plain or filter-tipped cigarettes, cigars or cigarillos.

A further object of the invention is to provide a programming system which can control all phases of operation of one or more automatic machines, including the operation under normal or optimum conditions, intentional starting or stoppage, as well as automatic stoppage in response to automatic detection of one or more defects in the operation of one or more aggregates and/or in the progress of partly or completely finished articles in their respective paths.

A feature of the invention resides in the provision of an apparatus for the production and/or processing of cigarettes or analogous rod-shaped articles which comprises a plurality of article producing and/or processing aggregates of a first type arranged to operate in synchronism with each other (such aggregates can be driven by the rotary output element of a main prime mover for the machine or machines of the apparatus), a plurality of aggregates of a second type which are to be activated and/or deactivated in a predetermined sequence during starting and/or stoppage of the apparatus (either in response to generation of an intentionally produced start or stop signal or in response to an automatically produced stop signal on detection of one or more defects or malfunctions in the apparatus), a plurality of electric switches or other suitable signal generators each of which is operatively connected with at least one aggregate of the second type (for example, by means of electrical and/or electronic signal receiving and transmitting units which may include starting, condition monitoring and stopping units) and each of which is actuatable (e.g., by means of a projection, cam, lobe or the like) to thereby activate and/or deactivate the respective aggregate or aggregates of the second type, and programming means at least a portion of which is movable and which is operable to actuate the signal generators in a predetermined sequence.

The apparatus may comprise prime mover means for driving at least one aggregate of the first type and a clutch or analogous motion transmitting means for moving the movable portion of the programming means in synchronism with the one aggregate of the first type. The prime mover means may comprise a rotary output member and the programming means may be designed to actuate the signal generators in a predetermined sequence in predetermined angular positions of the output member. This insures that the length of

ntervals between activation and/or deactivation of successive aggregates of the second type is always a function of the speed of the output member.

In accordance with a modification, the movable portion of the programming means is movable between a plurality of positions and the apparatus comprises first or main prime mover means for driving at least one aggregate of the first type and discrete second prime mover means whose speed is preferably variable and which serves to drive the movable portion of the programming means asynchronously with the one aggregate of the first type. For example, the second prime mover means may be designed to move the movable portion of the programming means at a predetermined speed and the movable portion of the programming means may comprise projections or analogous elements for actuating the signal generators in a predetermined sequence and at predetermined intervals independently of the operating speed of the first or main prime mover means.

The movable portion of the programming means may comprise a mobile carrier for a plurality of discrete actuating elements which may but need not be adjustably mounted thereon and each of which is associated with at least one signal generator. The carrier is preferably movable from a predetermined starting position (in response to generation of a start or stop signal) to thereby effect the actuation of signal generators in a predetermined sequence through the intermediary of the respective actuating elements. The carrier may be a rotary drum whose periphery carries projections or analogous actuating elements for signal generators, or the disk of a pulse generator which is driven by or in synchronism or asynchronism with the output element of the main prime mover.

The programming means may further comprise means for furnishing a succession of impulses at timely spaced intervals to thereby actuate the signal generators in a predetermined sequence. Such impulse furnishing means may include a counter which receives pulses from a pulse generator, such as the pulse generator which embodies the aforediscussed disk.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1***a* is a diagrammatic side elevational view of a machine for the making of plain cigarettes which constitutes one component of an apparatus embodying one form of the invention;

FIG. **1***b* is a similar diagrammatic side elevational view of a machine for the making of filter cigarettes which constitutes another component of the improved apparatus;

FIG. **2** is a diagrammatic side elevational view of the prime mover for the machines of FIGS. **1***a* and **1***b*, and further showing one form of programming means for the aggregates of the second type which are incorporated in such machines;

FIG. **3** is a developed view of the carrier of the programming means shown in FIG. **2**;

FIG. **4***a* is a circuit diagram of certain operative connections between various aggregates of the second type and the respective signal generators;

FIG. **4***b* is a similar circuit diagram of the remaining operative connections between such aggregates and the associated signal generators;

FIG. **5** is a schematic side elevational view of modified programming means which can be used to regulate the activation and/or deactivation of aggregates of the second type in the apparatus including the machines of FIGS. **1***a* and **1***b*;

FIG. **6***a* is a diagrammatic side elevational view of a machine which is similar to the machine of FIG. **1***a* but wherein the aggregates of the second type are controlled by modified programming means;

FIG. **6***b* is a diagrammatic side elevational view of a machine which is similar to the machine of FIG. **1***b* but wherein the aggregates of the second type are activated and/or deactivated by the programming means for the machine of FIG. **6***a*;

FIG. **7***a* is a circuit diagram of certain operative connections between various aggregates of the second type and the respective signal generators in the apparatus which embodies the machines of FIGS. **6***a* and **6***b*; and

FIG. **7***b* is a similar circuit diagram of the remaining operative connections between the aggregates of the second type and the respective signal generators in the apparatus embodying the machines of FIGS. **6***a* and **6***b*.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. **1***a* and **1***b*, there is shown an apparatus which constitutes a production line composed to two directly coupled machines which are disposed at right angles to each other. The machine of FIG. **1***a* is a cigarette rod making machine, and the machine of FIG. **1***b* is a filter cigarette making machine.

The machine of FIG. **1***a* is of the type known as GARANT produced by the West German Firm of Hauni-Werke, Korber & Co., KG, of Hamburg-Bergedorf. This machine comprises a distributor **1** which constitutes an aggregate or subassembly of the first type and serves to shower tobacco shreds into a tobacco channel **2** wherein the resulting tobacco stream travels lengthwise in a direction to the right, as viewed in FIG. **1***a*. The tobacco stream in the channel **2** is entrained and accelerated by the endless conveyor belt **3** which also constitutes an aggregate of the first type. The belt **3** delivers successive increments of the tobacco stream into the circumferential groove of a further conveyor **7** here shown as a suction wheel which rotates in a counterclockwise direction, as viewed in FIG. **1***a*. The tobacco stream in the groove of the suction wheel **7** can be compacted before it advances past an equalizing device or trimmer **8** which also constitutes an aggregate of the first type and serves to remove the surplus of tobacco shreds and to thus convert the tobacco stream into a rod-like filler. The resulting rod-like filler is thereupon compacted during travel along the underside of a foraminous conveyor band **13** which is associated with a suitable suction chamber. The compacted rod-like filler enters a wrapping mechanism **14** wherein it is wrapped into a continuous web **17** of cigarette paper in a manner known per se. The web **17** is drawn from a roll **16** by means of a conveyor belt **15** which constitutes an aggregate of the first type and causes successive increments of the web **17** to pass through an im-

printing unit 17A which also constitutes an aggregate of the first type. Prior to entering the imprinting unit 17A, successive increments of the web 17 pass through a conventional splicing device 17B which also receives the leading end of a fresh web 17a which is stored in the form of a roll 16a so that the trailing end of the expiring web 17 can be automatically or semiautomatically spliced to the leading end of the fresh web 17a.

The wrapped rod-like filler constitutes a tobacco rod Zs which is transported lengthwise through and beyond the wrapping mechanism 14 on its way toward a cutoff 21 which constitutes an aggregate of the first type. The draping of the web 17 around the rod-like filler takes place in several stages one of which includes converting the web 17 into a U-shaped body which partially surrounds the compacted filler and another of which includes folding one marginal portion of the U-shaped body over the adjacent portion of the filler whereby the other marginal portion extends tangentially from the filler and in an upward direction, as viewed in FIG. 1*a*. The machine of FIG. 1*a* further comprises a paster 4 which is controlled by an electromagnet 404 shown in FIG. 4*a* and can be moved from a raised or inoperative position to an operative position to thereby apply a film of adhesive to the tangentially extending marginal portion of the web 17 in the wrapping mechanism 14. The machanism 14 thereupon folds the thus adhesive-coated marginal portion of the web 17 over the other marginal portion to complete the conversion of the web into a tubular wrapper or envelope which completely surrounds the compacted rod-like filler and forms therewith the aforementioned wrapped tobacco rod Zs. A seam heating device 6 is located downstream of the paster 4 and can be moved from a raised or inoperative position to an operative position to heat the seam which is formed by the overlapping marginal portions of the tubular wrapper and to thus promote the setting of adhesive that was applied by the paster 4. The means for moving the seam heating device 6 from its raised to its operative position includes an electromagnet 406 which is shown in FIG. 4*a*. The paster 4 and the seam heating device 6 constitute aggregates or subassemblies of the second type.

The seam which is being heated by the device 6 is scanned by a photoelectric detector 407 which forms part of a signal receiving and signal transmitting starting unit 807 shown in FIG. 4*a*. The construction of the photoelectric detector 407 is such that it furnishes a signal as long as the seam on the wrapper of the tobacco rod Zs is defective.

The cigarette rod making machine of FIG. 1*a* further comprises a cigarette rod mutilating device 9 which is located downstream of the photoelectric detector 407 and is movable between a deflecting position 9.1 and a second or idle position 9.2. When the mutilating device 9 assumes its deflecting position 9.1, it directs the wrapped rod-like filler Zs or its components into a receptacle 18. When the mutilating device 9 moves from the deflecting position 9.1 to the position 9.2, it breaks off the rod Zs to thus insure that a straight leader of the rod advances toward two tubular elements 19 which form part of the cutoff 21. The arrangement is such that the mutilating device 9 assumes the deflecting position 9.1 as long as the seam on the rod Zs is defective. The means for moving the mutilating device 9 between its two positions includes an electromagnet 409 which is shown in FIG. 4*a*.

The tubular elements 19 (hereinafter called tubes for short) of the cutoff 21 serve to guide successive increments of the rod Zs during severing by an orbiting knife so that the rod Zs yields a succession of discrete plain cigarettes Z of unit length or multiple unit length. It is assumed that the cutoff 21 is designed to sever the rod Zs at such intervals that the rod yields a succession of plain cigarettes Z of unit length.

A cleaning device for the tubes 19 includes a blowing nozzle 403a which is mounted in a conduit that is connected to a source of compressed air or another suitable gaseous fluid. The purpose of the nozzle 403*a* is to admit one or more blasts of compressed air prior to entry of the rod Zs into the tubes 19 so as to make sure that the tubes are free of foreign matter, such as remnants of the rod Zs. The means for controlling the admission of compressed gas into the blowing nozzle 403*a* includes an electromagnetic valve 403 which is shown in FIG. 4*a*.

A further photoelectric detector 410 which forms part of a signal receiving and signal transmitting starting unit 810 (shown in FIG. 4*a*) is located downstream of the left-hand tube 19 and serves to monitor the cigarettes Z in their path immediately downstream of the cutoff 21. The detector 410 produces a signal when it fails to detect cigarettes Z. The absence of cigarettes Z in the path which is monitored by the photoelectric detector 410 may be due to a jam-up in the tubes 19 of the cutoff 21 or to the fact that the mutilating device 9 deflects the tobacco rod Zs into the receptacle 18. Still further, the detector 410 will produce a signal when the leader of the rod Zs fails to enter the right-hand tube 19 of the cuttoff 21.

The first batch of cigarettes Z which are produced immediately after starting of the machine of FIG. 1*a* is expelled or removed by a segregating device 11 which constitutes an aggregate of the second type. The segregating device 11 comprises a blowing nozzle 411*a* which is connected with a source of compressed gas, preferably air, and which can receive compressed gas in response to opening of an electromagnetic valve 411 shown in FIG. 4*a*. A further photoelectric detector 413 is located downstream of the segregating device 11 and serves to monitor the path of cigarettes Z which are about to enter successive flutes of a transfer conveyor or drum 26. The drum 26 constitutes an aggregate of the first type and it serves to convert a single file of cigarettes Z which are propelled by a conventional accelerating device or kicker 26A into one or two rows of cigarettes which move sideways and are transferred into the filter cigarette making machine of FIG. 1*b*. The purpose of the accelerating device 26A is to increase the distance between successive cigarettes Z which are about to enter the flutes of the transfer conveyor 26 to thus insure that each cigarette enters a separate flute. The photoelectric detector 413 produces a signal when it fails to detect cigarettes Z downstream of the accelerating device 26A. This photoelectric detector forms part of a condition monitoring unit 813 shown in the left-hand portion of FIG. 4*a*. The monitoring action of the photoelectric detector 413 continues when the cigarette rod making machine of FIG. 1*a* operates at normal speed. This detector 413 then takes over the function of the aforementioned detectors 407 and 410. The detectors 407 and 410 are active only during starting of the machine of FIG. 1*a*.

Referring now to FIG. 1b, the filter cigarette making machine therein shown is of the type known as MAX produced by the West German Firm of Hauni-Werke, Korber & Co., KG, of Hamburg-Bergedorf. It is to be noted that the machine of FIG. 1b is mounted at right angles to the machine of FIG. 1*a*. This can be readily understood by comparing the positions of the transfer conveyor **26** in the left-hand portion FIG. 1*a* and in the right-hand portion of FIG. 1b.

The machine of FIG. 1b comprises a magazine or hopper **35** for a supply of filter rod sections F of 6 times unit length. A duct **33** communicates with the lower portion of the magazine **35** and serves to supply a continuous row of filter rod sections F into successive flutes of a so-called cutting conveyor or drum **36.** The conveyor **36** cooperates with two rotary coaxial disk-shaped knives **34** which subdivide each filter rod section F into three shorter filter rod sections or stubs of double unit length. The knives **34** constitute an aggregate of the first type. The feed of filter rod sections F from the magazine **35** to the flutes of the cutting conveyor **36** is monitored by a photoelectric detector **421** which produces a signal in response to detection of the absense of filter rod sections F. The photoelectric detector **421** forms part of a condition monitoring unit **821** which is shown in the left-hand portion of FIG. 4*b*.

The filter stubs which are formed in the flutes of the cutting conveyor **36** are thereupon transferred onto a staggering conveyor **37** which comprises three eccentrically mounted disks serving to shift the originally aligned filter stubs in the circumferential direction of the conveyor **37.** The thus staggered stubs are transferred into successive flutes of a shuffling conveyor **38** which cooperates with suitable cams **38**a to form a single row of filter stubs which are thereupon transferred into successive flutes of a further drum-shaped conveyor **39.** The drive means for rotating the conveyor **39** includes an electromagnetic clutch **414** which constitutes an aggregate of the second type. The shaft of the conveyor **39** drives the aforementioned conveyors **36,** 37, and **38** by means of a suitable gear train, not shown. Thus, when the electromagnetic clutch **414** is disengaged, the withdrawal of filter rod sections F from the magazine **35** and the subdivision of such filter rod sections into discrete stubs of double unit length is terminated.

The transfer conveyor **26** of the cigarette rod making machine of FIG. 1*a* delivers two rows of plain cigarettes Z into a pair of aligning conveyors **27** which are shown in the righthand portion of FIG. 1*b* and form part of the filter cigarette making machine. The conveyors **27** constitute aggregates of the first type and serve to place successive pairs of plain cigarettes Z into axial alignment with each other as well as to deliver the thus aligned pairs of cigarettes Z into successive flutes of an assembly conveyor **28** which also constitutes an aggregate of the first type. The arrangement is such that the pairs of axially aligned cigarettes Z in successive flutes of the assembly conveyor **28** are spaced apart a distance which is sufficient to enable a filter stub of double unit length to enter the space between the aligned cigarettes Z. The stubs are furnished into successive flutes of the assembly conveyor **28** by an accelerating conveyor **40** which receives stubs from the aforementioned conveyor **39.** Thus, once a flute of the assembly conveyor **28** moves beyond the transfer station between the conveyors **28** and **40,** it contains an assembly or group of three coaxial rod-like components including two plain cigarettes Z of unit length and a filter stub of double unit length between such plain cigarettes. The assembly conveyor **28** delivers such groups of rod-shaped articles into successive flutes of a drum-shaped transfer conveyor **29.**

The machine of FIG. 1b further comprises a suction conveyor drum **46** which cooperates with the transfer conveyor **29** and serves to apply to each group of three coaxial rod-shaped articles an adhesive-coated uniting band which is thereupon convoluted around the respective filter stub and the adjacent inner end portions of the respective plain cigarettes of unit length to convert such groups into filter cigarettes of double unit length. The suction conveyor **46** cooperates with a severing device here shown as a rotary knife **44** which cuts across the leader of a paper web or tape **41***a*. Such tape is being drawn from a roll **41** and is being transported by a pair of advancing rolls **47.** Prior to reaching the suction conveyor **46,** successive increments of the tape **41***a* are coated at one side with a film of adhesive which is contained in the tank of a paster **42.** The paster **42** comprises a driven roller-shaped applicator **43** which can apply adhesive to the underside of the adjacent portion of the tape **41***a*.

The advancing rolls **47** receive motion from a drive which includes an electromagnetic clutch **416** constituting an aggregate of the second type. When the clutch **416** is disengaged, the advancing rolls **47** cease to transport the tape **41**a toward the applicator **43** of the paster **42.** An electromagnet **417** has an L-shaped armature or bracket **417***a* which can lower the adjacent portion of the tape **41***a* against the periphery of the applicator **43** to thus initiate the transfer of adhesive to the underside of the tape. The electromagnet **417** constitutes an aggregate of the second type.

As mentioned before, the adhesive-coated uniting bands which are obtained in response to severing of the tape **41**a by the knife **44** are attached to successive groups of rodshaped articles in the flutes of the transfer conveyor **29.** Such groups are thereupon transferred onto the periphery of a drum-shaped wrapping or rolling conveyor **48** whereon the groups are repeatedly rotated about their own axes so as to convert the respective uniting bands into tubes which surround the corresponding filter stubs and the adjacent inner end portions of the respective plain cigarettes Z. This completes the conversion of the groups which are assembled on the conveyor **28** into filter cigarettes of double unit length.

The rolling conveyor **48** delivers filter cigarettes of double unit length into the flutes of a testing conveyor **49** which constitutes an aggregate of the first type. The testing conveyor **49** transports successive filter cigarettes of double unit length past a testing unit **429***a* which is designed to detect eventual leaks or holes in the wrappers of such cigarettes. For example, the testing unit **429***a* can be connected to a source of compressed gaseous fluid and admits into the adjacent ends of successive filter cigarettes of double unit length streams of a compressed gas whose pressure is tested at the other ends of such cigarettes. The differential in pressure at both ends of the cigarettes is indicative of the quality or condition of the respective cigarettes. A transducer **429** monitors the pressure of the gas streams which issue at the other ends of successive filter cigarettes of double unit length on the testing con-

veyor **49** and produces proportional electric impulses which are used to segregate defective cigarettes from satisfactory cigarettes. For example, the transducer **429** may be a diaphragm type transducer such as disclosed in British patent No. 1,083,111.

FIG. **1***b* further shows an electromagnetic valve **431** which forms part of an ejecting device **31.** The valve **431** is energized to admit one or more streams of compressed air or another suitable gas to the nozzle or nozzles of the ejecting device **31** whereby the stream or streams of compressed gas eject those filter cigarettes of double unit length which were found to be defective during travel with the conveyor **49.**

The satisfactory filter cigarettes of double unit length are transferred onto a severing conveyor or drum **50** which constitutes an aggregate of the first type and cooperates with a rotary disk-shaped knife **50***a* to subdivide each filter cigarette of double unit length into two filter cigarettes of unit length. The thus obtained pairs of filter cigarettes of unit length are transferred onto an inverting conveyor **51** which inverts one cigarette of each pair end-for-end so that the filter stubs or plugs of all filter cigarettes of unit length face in the same direction. The inverted filter cigarettes of unit length are preferably placed into the spaces between successive non-inverted cigarettes of unit length so that such cigarettes form a single row wherein the cigarettes move sideways and are introduced into successive flutes of an intermediate conveyor **52** serving to deliver such cigarettes to a transfer conveyor **53.** A further conveyor **54** receives filter cigarettes of unit length from the conveyor **53** and delivers them onto the upper stretch of a belt conveyor **56** so that the latter can transport such cigarettes to a packing machine or into a tray filling device of conventional design.

Referring to FIG. **2,** there is shown the main prime mover **63A** of the production line including the machines of FIGS. **1***a* and **1***b*. This main prime mover **63A** drives all aggregates of the first type and has a rotary output shaft **63** which transmits motion to aggregates of the first type by means of gears, levers, cams and/or other motion transmitting devices, not shown in the drawing. Furthermore, the output shaft **63** of the main prime mover **63A** (which is preferably a pole-reversible electric motor which can be operated at a lower speed and at a higher or normal speed) can also rotate a mobile drum-shaped carrier **61** which constitutes a component of the programming means for the aggregates of the second type in the machines of FIGS. **1**a and **1***b*. The means for transmitting motion from the output shaft **63** of the electric motor **63A** to the carrier **61** includes an electromagnetic clutch **460** which can be energized to thereby rotate the carrier **61.** The periphery of the carrier **61** (hereinafter called programming drum) is provided with a plurality of projections or cams N1–N16 the distribution of which is best shown in FIG. **3.** These projections serve as actuating elements or trips for a row of signal generators or operating means S1–S16 which are mounted in a stationary frame **62** for the programming drum **61** and can be actuated by the projections N1–N16 in a predetermined sequence in response to energization of the electromagnetic clutch **460.** The projections N1–N16 are preferably adjustable circumferentially of the programming drum **61** to thus enable an attendant to change the length of intervals between the actuation of successive signal generators S1–S16 when the programming drum **61** is set in motion in response to energization of the clutch **460.** A conventional resetting mechanism **64** is provided to automatically return the programming drum **61** to its starting position shown in FIG. **2** in response to deenergization of the electromagnetic clutch **460.** Thus, when the programming drum **61** is at a standstill, it invariably assumes the starting position which is shown in the drawing.

FIG. **3** shows the periphery of the programming drum **61** of the programming means for the aggregates of the second type in a developed view. It will be noted that the length of certain projections on the periphery of this drum is different from the length of other projections. Thus, the projection N15 is much longer (as considered in the circumferential direction of the programming drum **61**) than the other projections. This projection serves to determine the number of filter cigarettes which are ejected from the machine of FIG. **1**b immediately after the machine is started.

FIGS. **4***a* and **4***b* illustrate the circuitry which effects the activation and deactivation of various aggregates of the second type in the machines of FIGS. **1***a* and **1***b* in response to generation of a starting or stopping signal for the main prime mover **63A.** More specifically, the sequence in which the aggregates of the second type are activated and/or deactivated is determined by the drum **61** of the programming means in response to energization of the motion transmitting electromagnetic clutch **460.** The signal generators S1–S16 are shown in the form of normally open electric switches which can be closed in response to engagement with the respective projections N1-N16 on the periphery of the programming drum **61.**

The circuitry of FIGS. **4***a* and **4***b* comprises several sub-assemblies which include four start controllers **303, 309, 311** and **318.** These start controllers control the activation of the corresponding aggregates of the second type. Furthermore, the circuitry includes three stop controllers **308, 321** and **322** which serve to deactivate the associated aggregates of the second type. Still further, the circuitry of FIGS. **4**a and **4**b includes nine start-stop controllers **304, 306, 307, 310, 312, 313,** 314, 316 and **317** each of which can effect an activation as well as a deactivation of the associated aggregate of the second type. Still further, the circuitry includes control means **360** for the electromagnetic clutch **460** which can start the drum **61** of the programming means, and control means **331** for the segregating device **31** in the filter cigarette making machine of FIG. **1***b*. The circuitry of FIGS. **4***a* and **4***b* further comprises logical connections between various controllers. Such logical connections include conventional logic circuits such as AND-gates, OR-gates, NO-gates and signal storing circuits (hereinafter called storages for short).

The start controller **303** comprises a starting unit **803** which constitutes a signal responsive signal transmitting means between the signal generator or electric switch S1 and the electromagnetic valve **403** which controls the admission of compressed gas into the blowing nozzle **403***a* of the cleaning device for the tubes **19** in the cutoff **21** of the machine shown in FIG. **1.** The starting unit **803** comprises two AND-gates **703***a*, **703***b*, a storage **603** and an amplifier **503.** The amplifier **503** is connected with the electromagnetic valve **403** which controls the aforementioned blowing nozzle **403***a*. The latter constitutes an aggregate of the second type. The electric switches S1 and S2 are re-

spectively connected with the corresponding inputs of the AND-gates **703***a*, **703***b*, and the outputs of these gates are respectively connected with the inputs *a* and *b* of the storage **603**. The output *d* of the storage **603** is connected with the input of the amplifier **503** whose output is connected with the solenoid of the electromagnetic valve **403**.

The start controller **309** includes a signal receiving and signal transmitting starting unit **809** shown in the middle of FIG. **4**a and including an AND-gate **709**, a storage **609** and an amplifier **509**. The amplifier **509** is connected with the electromagnet **409** which controls the movements of the rod mutilating device **9** in the cigarette rod making machine of FIG. **1***a*. The mutilating device **9** constitutes an aggregate of the second type. The electric switch **S6** is connected with one input of the AND-gate **709** and the output of this gate is connected with the input *b* of the storage **609**. The output *c* of the storage **609** is connected with the input of the amplifier **509**, and the output of this amplifier is connected with the electromagnet **409**.

The start controller **311** includes a signal receiving and signal transmitting starting unit **811** which comprises two AND-gates **711***a*, **711***b*, a storage **611** and an amplifier **511**. The amplifier **511** is connected with the electromagnet **411** which controls the admission of compressed gas into the blowing nozzle **411**a of the segregating device **11** shown in FIG. **1***a*. The electric switches **S8** and **S7** are respectively connected with one input each of the AND-gates **711***a* and **711***b*. The outputs of the AND-gates **711***a* and **711***b* are respectively connected with the inputs *a* and *b* of the storage **611**. The output *d* of the storage **611** is connected with the input of the amplifier **511**, and the output of this amplifier is connected with the electromagnetic valve **411**.

The start controller **318** comprises a signal receiving and signal transmitting starting unit **818** shown in the lefthand portion of FIG. **4***b*. The starting unit **818** comprises a manually operable electric switch **418** which must be closed by the operator in order to start the main prime mover **63A** at the lower of two speeds. The main prime mover **63A** then rotates its output shaft **63** which drives the aggregates of the first type. The starting unit **818** further comprises an OR-gate **718** and a storage **618**. Still further, the start controller **318** includes a control unit **860** shown in the middle of FIG. **4***b* which serves to control the electromagnetic clutch **460**. As mentioned before, the clutch **460** must be energized in order to start rotation of the drum **61** of the programming means for the aggregates of the second type. The control unit **860** includes two OR-gates **760***a*, **760***b*, a storage **660** and an amplifier **560** which is connected with the electromagnetic clutch **460**. The manually operated switch **418** is connected with the input *b* of the storage **618**, with one input of the OR-gate **760***a*, with the main prime mover **63A** (see the arrow **900**), and with the input *a* of a storage **622** which forms part of a stopping unit **822** in the stop controller **322**. Still further, the switch **418** is connected with the input *a* of the storage **609** in the signal responsive and signal transmitting starting unit **809** of FIG. **4***a*. The output of the OR-gate **760***a* is connected with the input *a* of the storage **660**, and the output *c* of the storage **660** is connected with the input of the amplifier **560** whose output controls the energization or deenergization of the electromagnetic clutch **460** for the drum **61** of the programming means.

The electric switch **S16** is connected with one input of the OR-gate **760***b*, and the output of this gate is connected with the input *b* of the storage **660**. The electric switch **S16** is further connected with one input of an OR-gate **720** and the output of this OR-gate is connected with one input of the OR-gate **718**. The output of the OR-gate **718** is connected with the input *a* of the storage **618**.

The start-stop controller **304** of FIG. **4**a includes a starting unit **804** which comprises an AND-gate **704**, a storage **604** and an amplifier **504**. The amplifier **504** is connected with the electromagnet **404** which can move the paster **4** of FIG. **1***a*. The electric switch **S3** is connected with one input of the AND-gate **704**, and the output of this gate is connected with the input *a* of the storage **604**. The output *c* of the storage **604** is connected with the amplifier **504** which, in turn, is connected with the electromagnet **404**.

The start-stop controller **306** comprises a starting unit **806** which includes an AND-gate **706**, a storage **606** and an amplifier **506**. The amplifier **506** is connected with the electromagnet **406** which, as mentioned before, serves to shift the seam heating device **6** of FIG. **1***a*. The electric switch **S4** is connected with one input of the AND-gate **706**, and the output of this gate is connected with the input *a* of the storage **606**. The output *c* of the storage **606** is connected with the input of the amplifier **506**, and the output of this amplifier is connected with the electromagnet **406**.

The start-stop controller **312** includes a starting unit **812** which comprises an AND-gate **712**, a storage **612** and an amplifier **512** which is connected with a relay **412**. The relay **412** must be energized in order to change the speed of the main prime mover **63A** from a lower speed to a higher or normal operating speed. The relay **412** constitutes an aggregate of the second type. The electric switch **S8** is connected with one input of the AND-gate **712**, and the output of this gate is connected with the input *b* of the storage **612**. The output *d* of the storage **612** is connected with the input of the amplifier **512**, and the output of this amplifier is connected with the relay **412**.

The start-stop controller **314** comprises a starting unit **814** which includes two AND-gates **714***a* , **714***b*, a storage **614**, and an amplifier **514** which is connected with the electromagnetic clutch **414** of FIG. **1***b*. As mentioned before, the clutch **414** serves to control the feed of filter stubs to the assembly conveyor **28** of FIG. **1***b*. The electric switches **S13** and **S10** are respectively connected with one input each of the AND-gates **714***a* and **714***b*. The outputs of these gates are respectively connected with the inputs *a* and *b* of the storage **614**. The output *c* of the storage **614** is connected with the input of the amplifier **514**, and the output of this amplifier is connected with the electromagnetic clutch **414**.

The start-stop controller **316** comprises a starting unit **816** which includes two AND-gates **716***a* and **716***b*, a storage **616** and an amplifier **516** which is connected with the electromagnetic clutch **416** of the driver for the advancing rolls **47** shown in FIG. **1***b*. The electromagnetic clutch **416** must be energized in order to start the advancing rolls **47** so that such rolls can transport the tape **41***a* toward the paster **42** and suction conveyor **46** of FIG. **1***b*. The electric switches **S13** and **S12** are respectively connected with one input each of the AND-gates **716***a* and **716***b*. The outputs of the AND-gates **716***a* and **716***b* are respectively connected

with the inputs *a* and *b* of the storage **616**. The output *c* of the storage **616** is connected with the input of the amplifier **516**, and the output of this amplifier is connected with the electromagnetic clutch **416**.

The start-stop controller **317** includes a starting unit **817** which comprises two AND-gates **717***a* and **717***b*, a storage **617** and an amplifier **517** which is connected with the electromagnet **417** of FIG. **1***b*. As mentioned before the electromagnet **417** has an L-shaped armature of bracket **417***a* which can move the adjacent portion of the tape **41***a* into engagement with the rotary applicator **43** of the paster **42** shown in FIG. **1***b*. The electric switches S14 and S11 are respectively connected with one input each of the AND-gates **717***a* and **717***b*. The outputs of these AND-gates are respectively connected with the inputs *a* and *b* of the storage **617**. The output *c* of the storage **617** is connected with the input of the amplifier **517**, and the output of this amplifier is connected with the electromagnet **417**.

The start-stop controller **307** of FIG. **4***a* includes the starting unit **807** and a further starting unit **907**. The starting unit **807** transmits signals to the photoelectric detector **407** which monitors the seam on the tubular wrapper of the rod-shaped filler Zs. This starting unit **807** includes an AND-gate **707**, a storage **607** and an amplifier **507** which is connected with the photoelectric detector **407**. The detector **407** constitutes an aggregate of the second type. The starting unit **907** includes two AND-gates **960** and **970**, and an OR-gate **530** which is connected with the stop controller **308**. The controller **308** serves to arrest the main prime mover **63A** for the machines of FIGS. **1***a* and **1***b*. The electric switch S4 is connected with one input of the AND-gate **707**, and the output of this gate is connected with the input *b* of the storage **607**. The input *a* of the storage **607** is connected with the output of the OR-gate **720** shown in FIG. **4***b*. The output *d* of the storage **607** is connected with the input of the amplifier **507**, and the output of this amplifier is connected with the light source **407***a* of the photoelectric detector **407**. The photosensitive element **407***b* of the photoelectric detector **407** is connected with one input of the AND-gate **960** in the starting unit **907**.

The electric switch S5 is connected with one input of the AND-gate **970** in the starting unit **907**. The output of the AND-gate **970** is connected with the other input of the AND-gate **960**, and the output of the AND-gate **960** is connected with one input of the OR-gate **530**. The output of the OR-gate **530** is connected with one input of the OR-gate **720**, with one input of an OR-gate **608** in the stop controller **308**, and with one input of an OR-gate **722** in the stopping unit **822** of the stop controller **322** shown in FIG. **4***b*.

The start-stop controller **310** includes the starting unit **810** for the photoelectric detector **410** which, as described in connection with FIG. **1***a*, serves to monitor the cigarettes Z issuing from the left-hand tube **19** of the cutoff **21**. The starting unit **810** comprises an AND-gate **710**, a storage **610** and an amplifier **510** which is connected with the photoelectric detector **410**. The aforementioned OR-gate **530** is common to the units **907** and **810**. The detector **410** can transmit signals to the stop controller **308**. The electric switch S7 is connected with one input of the AND-gate **710**, and the output of this gate is connected with the input *a* of the storage **610**. The input *b* of the storage **610** is connected with the output of the OR-gate **720**. The output *c* of the storage **610** is connected with the input of the amplifier **510**, and the output of this amplifier is connected with the light source **410***a* of the photoelectric detector **410**. The photosensitive element **410***b* of the detector **410** is connected with one input of the OR-gate **530**.

The start-stop controller **313** includes the aforementioned condition monitoring unit **813** which controls the photoelectric detector **413** located immediately upstream of the transfer conveyor **26** of FIG. **1***a*. The detector **413** monitors the path of cigarettes Z between the accelerating device **26A** and the flutes of the transfer conveyor **26**. The condition monitoring unit **813** comprises an AND-gate **713**, a storage **613** and an amplifier **513**. The photoelectric detector **413** constitutes an aggregate of the second type. The condition monitoring unit **813** further comprises a NO-gate **630** and two AND-gates **620** and **640**. The AND-gate **640** is connected with one input of the OR-gate **530**. The output signal from the OR-gate **530** is transmitted to the stop controller **308** which thereby arrests the main prime mover **63A**. The AND-gate **620** is connected with the OR-gate **722** of the stop controller **322** shown in FIG. **4***b*. The electric switch S9 is connected with one input of the AND-gate **713**, and the output of this gate is connected with the input *b* of the storage **613**. The output *d* of the storage **613** is connected with the input of the amplifier **513**, and the output of this amplifier is connected with the light source **413A** of the photoelectric detector **413**. The photosensitive element **413***b* of the photoelectric detector **413** is connected with one input of the AND-gate **620** and with one input of the AND-gate **640**. The output of the NO-gate **630** is connected with one input of the AND-gate **620**, and the output of the AND-gate **620** is further connected with one input of the OR-gate **760***a*.

The stop controller **308** of FIG. **4***a* includes a stopping unit **808** which comprises an AND-gate **708** (FIG. **4***b*), an OR-gate **608** and an amplifier **508** connected to a relay **408**. The relay **408** constitutes an arresting means in that, when this relay is energized, the connection between the main prime mover **63A** and the source of electrical energy therefor is interrupted so that all aggregates of the first type are brought to an immediate stop. The relay **408** constitutes an aggregate of the second type. The electric switch S13 is connected with one input of the AND-gate **708**, and the output of this gate is connected with one input of the OR-gate **608**. The output of the OR-gate **608** is connected with one input of the amplifier **508**, and the output of this amplifier is connected with the relay **408**. The output of the OR-gate **608** is further connected with the input *a* of the storage **612** which forms part of the starting unit **812**. As mentioned before, the starting unit **812** includes a relay **412** which can change the speed of the main prime mover **63A** from a lower speed to the higher or normal operating speed. The output of the OR-gate **608** is further connected with one input of the OR-gate **660***b* in the control unit **860**.

The stop-controller **322** is shown in FIG. **4***b*. It includes the stopping unit **822** which can transmit a signal serving to deactivate the aggregates of the second type in a predetermined sequence. The stopping unit **822** includes an OR-gate **722**, the storage **622**, and a manually operated arresting switch **422**. The manually operated switch **422** is connected with one input of the OR-gate **722**, and the output of this gate is connected

ith the input *b* of the storage **622**. The arresting switch 22 is further connected with one input of the OR-gate **60***a* in the control unit **860** which controls the electromagnetic clutch **460** serving as a means for transmitting motion from the output shaft **63** of the main prime mover **63A** to the drum **61** of the programming means.

The stop controller **321** of FIG. **4***b* includes the condition monitoring unit **821** which comprises the aforementioned photoelectric detector **421**, an AND-gate 21 and a storage **621**. The output of the AND-gate 21 is connected with one input of the OR-gate **722** in he stop controller **322**. The electric switch S5 is connected with the input *b* of the storage **621**, and the output *d* of this storage is connected with one input of the AND-gate **721**. The photosensitive element **421***a* of the photoelectric detector **421** is connected with the other nput of the AND-gate **721**. The output of the AND-gate **721** is connected not only with one input of the OR-gate **722** but also with one input of the OR-gate 760*a* and with one input of the OR-gate **718**.

The output *d* of the storage **618** in the starting unit 818 is connected with the AND-gates **703***a* and **703***b*, 709, **711***a* and **711***b* which form part of the starting units **803, 809** and **811**. The output *d* of the storage **618** s further connected with the AND-gates **704, 706,** 712, 714*a* **716***a* and **717***a* of the starting units **804, 806,** 812, 814, 816 and **817**. Still further, the output *d* of the storage **618** is connected with the AND-gate **707** of the starting unit **807,** with the AND-gate **970** of the starting unit **907,** with the AND-gate **710** of the starting unit **810,** and with the AND-gates **713** and **640** of the condition monitoring unit **813.** The signal at the output *d* of the storage **618** is denoted by the reference character A. Still further, the output *d* of the storage **618** is connected with one input of the NO-gate **630** in the condition monitoring unit **813.**

The signal at the output *d* of the storage **622** in the stopping unit **822** is denoted by the reference character B. Such signal is transmitted to the inputs *b* of the storages **604** and **606** in the starting units **804** and **806,** to the inputs *a* of the storages **613** and **621** in the condition monitoring units **813, 821,** to the AND-gates **714***b*, **716***b* and **717***b* of the starting units **814, 816** and **817,** and to the AND-gate **708** of the stopping unit **808.**

The control means **331** which includes a control unit **831** serves to regulate the operation of the segregating device **31** in the machine of FIG. **1***b*. The control unit **831** includes an amplifier **531** which is connected with the electromagnetic valve **431.** The latter constitutes an aggregate of the second type. The electric switch S15 can transmit a signal to the amplifier **531.**

The operation of the production line which includes the machines of FIGS. **1***a* and **1***b*, the programming means of FIGS. **2** and **3**, and the circuitry of FIGS. **4***a* and **4***b* is as follows:

Programmed starting of the machines of FIGS. **1***a* and **1***b* is carried out in the following way. It is assumed that the web **17** of cigarette paper has been threaded through the splicing device **17B**, through the imprinting unit **17A** and into the wrapping mechanism **14** of FIG. **1***a*. Furthermore, it is assumed that the drum **61** of the programming means dwells in its starting position and that the output shaft **63** is idle. The leader of a trimmed rod-like filler of tobacco shreds is located in the wrapping mechanism **14.** In order to activate the aggregates of the second type in a predetermined sequence, the attendant closes the manually operated starting switch **418** of FIG. **4***b* in order to cause the main prime mover **63A** to drive the output shaft **63** and the aggregates of the first type at a lower speed. The closing of the starting switch **418** results in the generation of a signal which is transmitted to the input *b* of the storage **618** whereby the output *d* of this storage transmits the signal A. The output *d* of the storage **618** continues to emit the signal A until the input *a* of this storage receives an erasing signal from the OR-gate **718.** The signal which is generated in response to closing of the starting switch **418** is further transmitted to the erasing input *a* of the storage **622** so that the signal B at the output *d* of the storage **622** disappears. Still further, the signal which is generated on closing of the starting switch **418** is transmitted to the input *a* of the storage **609** in the signal responsive starting unit **809** of FIG. **4***a*, whereby the output *c* of the storage **609** transmits a signal to the amplifier **509** which energizes the electromagnet **409** so that the latter moves the mutilating device **9** to the position **9.1** in which the mutilating device deflects the oncoming improperly wrapped rod-like filler Z*s* into the receptacle **18.** The arrow **900** indicates in FIG. **4***b* the connection between the electric starting switch **418** and the pole-reversible electric motor which constitutes the main prime mover **63A** for the aggregates of the first type. The prime mover **63A** is started at the lower speed.

The signal which is generated in response to closing of the electric starting switch **418** is further transmitted to the OR-gate **760A** which transmits a signal to the input *a* of the storage **660** whereby the output *c* of the storage **660** transmits a signal to the amplifier **560** which energizes the electromagnetic clutch **460** so that the clutch **460** transmits torque from the output shaft **63** of the main prime mover **63A** to the drum **61** of the programming means. As the programming drum **61** rotates in response to energization of the clutch **460,** its projections **N1–N16** actuate the associated electric switches **S1–S16** to thereby activate and/or deactivate the aggregates of the second type in a predetermined sequence which will be described hereinbelow.

When the projection N1 on the periphery of the programming drum **61** actuates the electric switch **S1,** this switch transmits a signal to the left-hand input of the AND-gate **703***b* while the right-hand input of this gate receives the signal A from the output *d* of the storage **618.** Therefore, the output of the AND-gate **703***b* transmits a signal to the input *b* of the storage **603** so that the output *d* of this storage transmits a signal to the amplifier **503** which energizes the electromagnetic valve **403** whereby the blowing nozzle **403***a* discharges one or more blasts of compressed gas to clean the tubes **19** of the cutoff **21.**

As the programming drum **61** continues to rotate at the speed which is determined by the main prime mover **63A**, the projection N2 reaches and actuates the electric switch **S2.** This results in generation of a signal which is transmitted to one input of the AND-gate **703A** while the other input receives the signal A from the output *d* of the storage **618.** The output of the gate **703***a* then transmits a signal to the erasing input *a* of the storage **603** so that the signal at the output *d* of this storage disappears and the electromagnetic valve **403** is closed to thereby terminate the cleaning action of the blowing nozzle **403***a*. The length of the interval during which the nozzle **403***a* discharges a stream of compressed gas for the purpose of cleaning the tubes **19** of

the cutoff **21** depends on the setting of the projections N1 and N2 on the periphery of the programming drum **61.**

The projection N3 thereupon actuates the electric switch S3 so that the switch S3 produces a signal which is transmitted to one input of the AND-gate **704** while the other input of this gate receives the signal A. Therefore, the output of the gate **704** transmits a signal to the input *a* of the storage **604** whereby the output *c* of this storage transmits a signal to the amplifier **504** which energizes the electromagnet **404** so that the latter moves the paster **4** of FIG. **1***a* to its operative position in which the paster applies a film of adhesive to one marginal portion of the web **17** in the wrapping mechanism **14.** Thus, the formation of a seam on the tubular wrapper of the rod Z*s* begins with movement of the paster **4** to its operative position.

The projection N4 thereupon actuates the electric switch S4 which transmits a signal to one input each of the AND-gates **706** and **707** while the other inputs of these gates receive the signal A from the output *d* of the storage **618.** The output of the gate **706** furnishes a signal to the input *a* of the storage **606** whereby the output *c* of this storage transmits a signal to the amplifier **506** which energizes the electromagnet **406** which moves the seam heating device **6** of FIG. **1***a* to its operative position so that the device **6** begins to heat the seam which is formed by the adhesive that was applied by the paster **4.**

The signal which is transmitted by the switch S4 to one input of the AND-gate **707** causes the output of this gate to transmit a signal to the input *b* of the storage **607.** Therefore, the output *d* of the storage **607** transmits a signal to the amplifier **507** which completes the circuit of the light source **407***a* in the photoelectric detector **407.** Thus, the detector **407** is activated simultaneously with activation of the seam heating device **6.** As mentioned before, the photosensitive element **407***b* of the photoelectric detector **407** furnishes a signal as long as the detector detects a defective seam. In other words, the detector **407** will furnish a signal until the wrapping mechanism **14** begins to produce a satisfactory rod Z*s*. The signal from the photosensitive element **407***b* of the detector **407** is transmitted to one input of the AND-gate **960** shown in FIG. **4***a* as forming part of the starting unit **907.**

The projection N5 of the programming drum **61** thereupon actuates the electric switch S5 which transmits a signal to one input of the AND-gate **970** while the other input of this gate receives the signal A from the storage **618.** The output of the AND-gate **970** transmits a signal to one input of the AND-gate **960.** If the seam which is being scanned by the photoelectric detector **407** is still defective, the photosensitive element **407***b* transmits a signal to the other input of the AND-gate **960** while the one input of this gate receives an output signal from the AND-gate **970.** Therefore, the AND-gate **960** emits a signal which is transmitted to one input of the OR-gate **530.** The output of the OR-gate **530** transmits a signal to one input of the OR-gate **608** whereby the OR-gate **608** transmits a signal to the amplifier **508** which energizes the arresting relay **408** for the main prime mover **63A.** The energization of arresting relay **408** results in immediate stoppage of the production line.

The output signal from the OR-gate **530** is further transmitted to one input of the OR-gate **720** shown in FIG. **4***b*. The output of the OR-gate **720** transmits a signal to the input *a* of the storage **607** so that the signal at the output *d* of the storage **607** disappears. The amplifier **507** opens the circuit of the light source **407***a* in the photoelectric detector **407** so that the detector is deactivated. Still further, the output signal from the OR-gate **530** is transmitted to one input of the OR-gate **722** in the stop controller **322** of FIG. **4***b*. The output signal from the OR-gate **722** is transmitted to the input *b* of the storage **622** whereby the output *d* of this storage produces the signal B which is transmitted to the inputs *b* of the storages **604** and **606.** The signal at the input *b* of the storage **606** erases the signal at the output *c* so that the electromagnet **406** is deenergized and the seam heating device **6** is caused or allowed to return to its inoperative position. The transmission of signal B to the input *b* of the storage **604** results in erasure of the signal at the output *c* of this storage whereby the electromagnet **404** is deenergized and the paster **4** of FIG. **1***a* is returned to its inoperative position.

If the wrapping mechanism **14** of FIG. **1***a* begins to produce a satisfactory seam before the projection N5 actuates the electric switch S5, the output signal from the AND-gate **970** is transmitted to the left-hand input of the AND-gate **960** at a time when the right-hand input of the gate **960** does not receive a signal from the photosensitive element **407***b* of the detector **407.** Therefore, the AND-gate **960** cannot transmit an output signal to the OR-gate **530** and the arresting relay **408** remains deenergized so that the main prime mover **63A** continues to operate and rotates the programming drum **61.**

As the drum **61** continues to rotate, its projection N6 actuates the electric switch S6 which transmits a signal to one input of the AND-gate **709** while the other input of this gate receives the signal A. Therefore, the output of the AND-gate **709** transmits a signal to the input *b* of the storage **609** whereby the signal at the output *c* of this storage disappears and the electromagnet **409** is deenergized. As mentioned before, the electromagnet **409** controls the position of the mutilating device **9** in the cigarette rod making machine of FIG. **1***a*. When the electromagnet **409** is deenergized, the mutilating device **9** moves from the position **9.1** to the position **9.2** and thereby breaks off the front portion of the wrapped tobacco rod Z*s*. The mutilating device **9** thereupon remains in the idle position **9.2** so that it cannot interfere with lengthwise movement of the rod Z*s* toward and into the tubes **19** of the cutoff **21.** A suitable spring (not shown) is provided to permanently bias the device **9** to the position **9.2.**

An attendant would be unable to observe the seam on the rod Z*s* with maked eye and to activate the multilating device **9** at the exact moment when the rod Z*s* issuing from the wrapping mechanism exhibits a satisfactory seam.

The rotating programming drum **61** thereupon causes its projection N7 to actuate the electric switch S7 so that the switch S7 transmits a signal to the corresponding inputs of the AND-gates **710** and **711***b* while the other inputs of these gates receive the signal A. The output of the AND-gate **710** furnishes a signal which is transmitted to the input *a* of the storage **610** whereby the output *c* of the storage **610** transmits a signal to the amplifier **510** which completes the circuit of the light source **410***a* in the photoelectric detector **410.** The detector **410** is mounted immediately behind the tubes **19**

of the cutoff **21** shown in FIG. **1***a*, and its photosensitive element **410***b* emits a signal as long as or whenever the detector **410** fails to detect plain cigarettes Z. The detector **410** will fail to detect plain cigarettes in the event of a failure of the leader of the broken-off rod Zs to enter the tubes **19** or in the event of a jam-up in the cutoff **21.** The signal from the photosensitive element **410***b* is transmitted to the corresponding input of the OR-gate **530** which transmits a signal to the corresponding input of the OR-gate **608.** The latter causes the amplifier **508** to energize the arresting relay **408** so that the prime mover **63A** is immediately arrested to bring about a stoppage of the machines shown in FIGS. **1***a* and **1***b*. As mentioned before, the output signal from the OR-gate **530** is further transmitted to one input of the OR-gate **720** and this gate transmits a signal to the input *a* of the storage **607.** Therefore, the signal at the output *d* of the storage **607** disappears and the photoelectric detector **407** is deactivated. Still further, the output signal from the OR-gate **530** is transmitted to one input of the OR-gate **722** which transmits a signal to the input *b* of the storage **622** so that the output *d* of the storage **622** furnishes the signal B which is transmitted to the inputs *b* of the storages **604** and **606.** The signal at the output *c* of the storage **604** disappears to thus deenergize the electromagnet **404** which causes the paster **4** to return to its inoperative position. The transmission of signal B to the input *b* of the storage **606** causes the output *c* of this storage to terminate the transmission of a signal to the amplifier **506** and to thus deenergize the electromagnet **406** which causes or allows the seam heating device **6** to reassume its inoperative position.

The closing of the electric switch S7 further results in transmission of a signal to one input of the AND-gate **711***b* while the other input of this gate receives the signal A. Therefore, the gate **711***b* transmits a signal to the input *b* of the storage **611** so that the output *d* of this storage transmits a signal to the amplifier **511** which opens the electromagnetic valve **411** to thereby activate the segregating device **11** of FIG. **1***a*. Thus, the energization of solenoid in the valve **411** causes the blowing nozzle **411***a* to emit a blast of compressed air to expel a predetermined number of plain cigarettes Z which were produced immediately after starting of the machine shown in FIG. **1***a*.

If the machine of FIG. **1***a* operates properly, the activated photoelectric detector **410** does not transmit a signal to the OR-gate **530** so that the arresting relay **408** remains deenergized and the devices **4** and **6** continue to remain in their operative positions. The programming drum **61** then continues to rotate so that its projection **N8** actuates the electric switch **S8** which transmits a signal to the corresponding inputs of the AND-gates **711***a* and **712** while the other inputs of these gates receive the signal A. The output of the AND-gate **711***a* then transmits a signal to the erasing input *a* of the storage **611** so that the signal at the output *d* of the storage **611** disappears and the electromagnetic valve **411** is closed to terminate the admission of compressed gas to the blowing nozzle **411***a* of the segregating device **11.** Thus, the segregating device **11** ceases to eject plain cigarettes Z from the path between the cutoff **21** and the accelerating device **26A.** By properly selecting the position of the projetion **N8** relative to the position of the projection **N7** on the programming drum **61,** the attendant can select the number of plain cigarettes Z which are ejected by the segregating device **11** during the interval which is required by the drum **61** to move the projection **N8** into engagement with the switch **S8** subsequent to actuation of the switch **S7.** As a rule, the positions of the projections **N7** and **N8** will be selected in such a way that the segregating device **11** will eject a minimum number of plain cigarettes Z which is still sufficient to insure that the cigarettes which will reach the transfer conveyor **26** are satisfactory.

The output signal which is produced by the AND-gate **712** in response to closing of the electric switch **S8** is transmitted to the input *b* of the storage **612** whereby the output *d* of the storage **612** transmits a signal to the amplifier **512** which energizes the relay **412.** As mentioned before, this relay adjusts the main prime mover **63A** so that the output shaft **63** begins to rotate at the higher or normal operating speed.

The relay **412** is preferably energized as soon as possible so as to insure that the production line begins to operate at normal speed with a minimal delay. This contributes to a higher output of the production line. Heretofore, the decision to select the exact moment for starting the operation of the main prime mover at normal speed was left to the attendants.

The programming drum **61** continues to rotate and its projection **N9** engages and actuates the electric switch **S9** which transmits a signal to the right-hand input of the AND-gate **713** while the other input of this gate receives the signal A. The resulting output signal which is furnished by the AND-gate **713** is transmitted to the input *b* of the storage **613** which causes the amplifier **513** to complete the circuit of the light source **413***a* in the photoelectric detector **413** which forms part of the aforementioned condition monitoring unit **813.** The photosensitive element **413***b* of the detector **413** produces a signal if the detector **413** fails to detect plain cigarettes Z at the right-hand axial end of the transfer conveyor **26,** as viewed in FIG. **1***a*. Such signal from the photosensitive element **413***b* is then transmitted to one input of the AND-gate **640** the other input of which receives the signal A. Therefore, the output of the AND-gate **640** transmits a signal to one input of the OR-gate **530** which transmits an output signal to one input of the OR-gate **608.** The output signal from the OR-gate **608** causes the amplifier **508** to energize the arresting relay **408** to thus immediately arrest the prime mover **63A.** The output signal from the OR-gate **608** is further transmitted to the input *a* of the storage **612** so that the output *d* of this storage ceases to transmit a signal to the amplifier **512** which deenergizes the relay **412.** This relay serves to change the speed of the prime mover **63A** from a lower speed to the normal operating speed. As explained above, the output signal from the OR-gate **530** is further transmitted to the OR-gate **720** which transmits a signal to the erasing input *b* of the storage **610** and to the erasing input *a* of the storage **607.** Thus, the photoelectric detectors **407** and **410** are deactivated in response to a signal from the photosensitive element **413***b* of the detector **413.** Still further, the output signal from the OR-gate **530** is transmitted to the OR-gate **722** and thence to the input *b* of the storage **622.** The output *d* of the storage **622** produces the signal B which is transmitted to the inputs *b* of the storages **604** and **606.** The signals at the output *c* of the storages **604** and **606** disappear so that electromagnets **404** and **406** are deenergized to effect a return move-

ment of the paster **4** and seam heating device **6** to their inoperative positions. The signal B is further transmitted to the input *a* of the storage **613** whereby the signal at the output *d* of the storage **613** disappears and the amplifier **513** opens the circuit of the light source **413***a* of the photoelectric detector **413.** Thus, the detector **413** is deactivated in response to detection of the absence of plain cigarettes at the right-hand ends of flutes in the peripheral surface of the transfer conveyor **26.**

If the detector **413** fails to detect irregularities in the feed of plain cigarettes Z to the transfer conveyor **26,** the photosensitive element **413***d* does not produce a signal and the programming drum **61** continues to rotate. After a predetermined interval, the projection N13 actuates the electric switch S13 whereby this switch generates a signal which is transmitted to corresponding inputs of the AND-gate **714***a* and **716***a* while the other inputs of such gates receive the signal A. The AND-gate **714***a* then transmits a signal to the input *a* of the storage **614.** The output *c* of the storage **614** transmits a signal which causes the amplifier **514** to energize the electromagnetic clutch **414** in the drive means for the conveyor **39** of FIG. **1***b*. Therefore, the conveyors **36–39** begin to rotate and the accelerating conveyor **40** of the filter cigarette making machine receives a succession of filter stubs of double unit length.

The output signal which is furnished by the AND-gate **716***a* in response to actuation of the electric switch S13 is transmitted to the input *a* of the storage **616** so that the output *c* of this storage transmits a signal to the amplifier **516** which energizes the electromagnetic clutch **416** in the drive for the advancing rolls **47** of the machine shown in FIG. **1***b*. Therefore, the rolls **47** begin to advance the tape **41***a* lengthwise toward the paster **42** and suction conveyor **46.**

The fact that, prior to actuating the electric switch S13, the programming drum **61** actuates the switches S10, S11 and S12 is of no consequence during starting of the production line because one input each of the AND-gates **714***b*, **717***b*, **716***b* does not receive the signal B so that the actuation of switches S10, S11 and S12 does not cause these gates to furnish output signals.

The rotating programming drum **61** thereupon causes the projection N14 to actuate the electric switch S14 which transmits a signal to the right-hand input of the AND-gate **717***a* while the left-hand input of this gate receives the signal A. The output signal from the AND-gate **717***a* is transmitted to the input *a* of the storage **617** which causes the amplifier to energize the electromagnet **417.** The electromagnet **417** causes its armature **417***a* to move the adjacent portion of the tape **41***a* against the periphery of the rotating applicator **43** so that the underside of the tape is coated with a film of adhesive before the tape reaches the suction conveyor **46.**

When the projection N15 of the rotating programming drum **61** actuates the electric switch S15, the resulting signal is transmitted to the amplifier **531** which energizes the solenoid of the electromagnetic valve **431.** This valve admits compressed gas to the nozzle or nozzles of the ejecting device **31** so that the device **31** ejects a predetermined number of foremost filter cigarettes of double unit length. The number of cigarettes which are ejected by the device **31** depends on the length of the projection N15, as considered in the circumferential direction of the drum programming **61** (see FIG. **3**). Once the ejection of the first batch of filter cigarettes of double unit length is completed, the valve **431** can be controlled by the transducer **429** so as to effect an ejection of those cigarettes which are in fact defective.

The projection N16 thereupon actuates the electric switch S16 which transmits a signal to the corresponding input of the OR-gate **720.** The output signal from the OR-gate **720** is transmitted to the inputs *b* and *a* of the storages **610** and **607.** Thus, the photoelectric devices **407** and **410** are deactivated. From there on, the function of these photoelectric detectors is taken over by the photoelectric detector **413** which remains in activated condition and monitors the travel of plain cigarettes Z into successive flutes of the transfer conveyor **26.** The signal which is generated on closing of the electric switch S16 is also transmitted, by way of the OR-gate **720,** to one input of the OR-gate **718** in the starting unit **818.** The output signal from the OR-gate **718** is transmitted to the erasing input *a* of the storage **618** so that the signal A at the output *d* of this storage disappears. The closing of the electric switch S16 by the projection N16 further results in transmission of a signal to one input of the OR-gate **760**b which transmits a signal to the input *b* of the storage **660.** Therefore, the signal at the output *c* of the storage **660** disappears and the amplifier **560** deenergizes the electromagnetic clutch **460** which constitutes the motion transmitting means for the programming drum **61.** Consequently, the programming drum **61** is disconnected from the output shaft **63** of the prime mover **63**A and the resetting mechanism **64** is allowed or caused to automatically return the drum **61** to its starting position. This completes the sequence in which the various aggregates of the second type are activated and/or deactivated in response to rotation of the drum **61,** i.e., in response to energization of the electromagnetic clutch **460.** The production line then continues to operate in the normal way whereby the relay **412** insures that the prime mover **63**A rotates its output shaft **63** at the normal or higher speed.

The automatic stoppage of the production line is effected in the following way:

During the aforementioned automatic starting of the production line, the projection N5 actuates the electric switch S5 so that this switch transmits a signal to the input *b* of the storage **621** and the output *d* of this storage transmits a signal to one input of the AND-gate **721** in the condition monitoring unit **821.** The photoelectric detector **421** scans the duct **33** in the filter cigarette making machine of FIG. **1***b* and its photosensitive element **421***a* produces a signal in response to the detection of the absence of filter rod sections F in the duct. As soon as the photosensitive element **421***a* produces a signal which is immediately transmitted to the other input of the AND-gate **721,** the output of this gate transmits a signal to the OR-gates **718, 722** and **760***a*. It will be noted that the condition monitoring unit **821** is rendered operative as soon as the programming drum **61** causes its projection N5 to actuate the electric switch S5. The photoelectric detector **421** is active at all times and, therefore, the AND-gate **721** is ready to furnish an output signal to the OR-gates **718, 722** and **760***a* as soon as the detector **421** detects the absence of filter rod sections F.

If the feed of filter rod sections F to the cutting conveyor **36** of FIG. **1***b* is interrupted, the output of the

)R-gate **760***a* transmits a signal to the input *a* of the storage **660** whereby the output *c* of this storage causes he amplifier **560** to energize the electromagnetic clutch **460** which couples the programming drum **61** with the output shaft **63** of the main prime mover **63A**. The OR-gate **722** transmits a signal to the input *b* of the storage **622** so that the output *d* of this storage transmits the signal B. If an interruption of the delivery of filter rod sections F takes place during the starting program of the production line, the OR-gate **718** transmits a signal to the input *a* of the storage **618** so that the signal A at the output *d* of this storage disappears. As explained above, the signal A at the output *d* of the storage **618** disappears in automatic response to completion of the starting program, namely, in response to actuation by the switch **S16** by the projection **N16** because the OR-gate **720** then transmits a signal to the left-hand input of the OR-gate **718** which causes the storage **618** to erase the signal A. The signal B which is produced by the output *d* of the storage **622** is transmitted to the storage **604** and **606** so that the signals at the outputs *c* of those storages disappear and the electromagnets **404** and **406** are deenergized with the result that the heater **4** and the seam heating device **6** are caused to reassume their inoperative positions. The signal B is further transmitted to the input *a* of the storage **613** so that the signal at the output *d* of the storage **613** disappears. Therefore, the amplifier **513** opens the circuit of the light source **413***a* in the photoelectric detector **413**, and this detector is thereby deactivated. Still further, the signal B is transmitted to the input *a* of the storage **621** so that the signal at the output *d* of this storage disappears. Therefore, the signal at the output of the AND-gate **721** also disappears and the condition monitoring unit **821** is rendered inoperative.

As the electromagnetic clutch **460** is energized, the programming drum **61** begins to leave its starting position whereby certain of its projections **N1–N16** effect a deactivation of selected aggregates of the second type in a predetermined sequence. Such mode of arresting the production line is desirable in order to make sure that all satisfactory articles which still remain in the production line can be evacuated without any damage thereto. Thus, a stepwise deactivation of certain aggregates of the second type takes place in such a way that all satisfactory plain cigarettes Z which are still located in the filter cigarette making machine of FIG. **1***b* are converted into filter cigarettes of unit length and are delivered onto the belt conveyor **56** before the operation of the main prime mover **63A** is terminated. As mentioned before, the generation of a signal at the output of the AND-gate **721** results in deenergization of the electromagnets **404** and **406** so that the paster **4** and the seam heating device **6** are caused to assume their inoperative positions. Consequently, the product which issues from the wrapping mechanism **14** of FIG. **1***a* does not have a tubular envelope and, therefore, successive increments of such product descend by gravity into the receptacle **18**. When the evacuation of filter cigarettes from the machine of FIG. **1***b* is completed, the projection **N10** on the rotating programming drum **61** reaches and actuates the electric switch **S10**. Therefore, the switch **S10** transmits a signal to the corresponding input of the AND-gate **714***b* which also receives the signal B. The output of the AND-gate **714b** then produces a signal which is transmitted to the input *b* of the storage **614** whereby the signal at the output *c* of this storage disappears and the amplifier **514** deenergizes the electromagnetic clutch **414** of the drive means for the conveyor **39** in the machine of FIG. **1***b*.

The projection **N11** of the rotating programming drum **61** then actuates the electric switch **S11** which transmits a signal to one input of the AND-gate **717***b* while the other input of this gate receives the signal B. The output of the gate **717***b* transmits a signal to the input *b* of the storage **617** whereby the signal at the output *c* of the storage disappears and the amplifier **517** deenergizes the electromagnet **417** so that the armature **417***a* of this electromagnet moves the tape **41***a* away from the applicator **43** of the paster **42**.

When the projection **N12** actuates the electric switch **S12**, the latter transmits a signal to one input of the AND-gate **716***b* while the other input of this gate receives the signal B. Therefore, the output of the gate **716***b* transmits a signal to the erasing input *b* of the storage **616** which causes the amplifier **516** to deenergize the electromagnetic clutch **416**. The clutch **416** disconnects the advancing rolls **47** from their drive means so that the transport of the tape **41***a* is terminated.

The projection **N13** of the rotating drum **61** thereupon reaches and actuates the electric switch **S13** which transmits a signal to one input of the AND-gate **708** while the other input of this gate receives the signal B. The output signal from the AND-gate **708** is transmitted to the OR-gate **608** shown in FIG. **4***a* whereby the output signal from the gate **608** causes the amplifier **508** to energize the arresting relay **408** for the prime mover **63A**. The output signal from the OR-gate **608** is further transmitted to the erasing input *a* of the storage **612** so that the signal at the output *d* of this storage disappears and the amplifier **512** deenergizes the relay **412** which serves to change the speed of the prime mover **63A** from a lower speed to the normal operating speed.

The projection **N16** of the programming drum **61** finally reaches the electric switch **S16** which transmits a signal to the corresponding input of the OR-gate **760***b*. The output signal from this gate is transmitted to the erasing input *b* of the storage **660** whereby the signal at the output *c* of the storage **660** disappears and the amplifier **560** deenergizes the electromagnetic clutch **460** so that the programming drum **61** is arrested. At the same time, the resetting mechanism **64** returns the programming drum **61** to its starting position.

The condition monitoring unit **813** which was activated during automatic starting of the production line in response to actuation of the electric switch **S9** is not deactivated when the rotation of the programming drum **61** is terminated, namely, when the production line operates at the normal speed. In response to detection of a malfunction, for example, when the photoelectric detector **413** of the condition monitoring unit **813** detects the absence of plain cigarettes Z at the right-hand end of the transfer conveyor **26** of FIG. **1***a*, the photosensitive element **413***b* of this detector furnishes a signal which is transmitted to the corresponding inputs of the AND-gates **620** and **640**. The gate **640** does not produce a signal because the signal A is not being transmitted thereto by the output *d* of the storage **618**. As mentioned before, the transmission of signal A is terminated when the resetting mechanism **64** returns the programming drum **61** to its starting position upon completed activation and/or deactivation of various ag-

gregates of the second type. However, since the input of the NO-gate **630** does not receive the signal A, the output of this gate transmits a signal to the corresponding input of the AND-gate **620.** If the signal from the NO-gate **630** is received by the gate **620** simultaneously with an error signal from the photosensitive element **413***b* of the photoelectric detector **413,** the gate **620** transmits a signal which is transmitted to the OR-gate **722** and by way of this gate to the input *b* of the storage **622.** Therefore, the output *d* of the storage **622** transmits the signal b. This results in a stoppage of the entire production line in a manner as described above. The output signal from the AND-gate **620** is further transmitted to the OR-gate **760**a so as to reach the input *a* of the storage **660.** The output *c* of the storage **660** then transmits a signal to the amplifier **560** which energizes the electromagnetic clutch **460** so that the programming drum **61** is set in motion. The rotation of programming drum **61** then results in automatic deactivation of various aggregates of the second type in the aforedescribed manner. Thus, the projections on the drum **61** actuate the switches **S10, S11, S12, S13** and **S16** with the result which was described above. The actuation of switches **S1–S9** and **S14** is of no consequence because the associated AND-gates do not receive the signal A.

The entire production line can further be arrested in response to actuation of the normally open arresting switch **422** shown in FIG. **4***b*. When the operator closes this switch, the corresponding input of the OR-gate **722** receives a signal and transmits a signal to the input *b* of the storage **622.** Therefore, the output *d* of the storage **622** transmits the signal B. The closing of arresting switch **422** further results in transmission of a signal to the input *a* of the storage **660** by way of the OR-gate **760***a* whereby the output *c* of the storage **660** transmits a signal which causes the amplifier **560** to energize the electromagnetic clutch **460** to thus begin the rotation of the programming drum **61.** Again, the rotating programming drum **61** causes certain of its projections **N1–N16** to actuate the corresponding electric switches and to effect a stepwise deactivation of the associated aggregates of the second type.

An important advantage of the production line which is shown in FIGS. **1***a* and **1***b* is that the aggregates of the second type are controlled by a programming means whose movable portion, namely, the programming drum **61** with the projections **N1–N16** thereon, receives motion directly from the output shaft **63** of the main prime mover **63A** so that the activation and/or deactivation of various aggregates of the second type can take place in exact synchronism with the movements of aggregates of the first type which receive motion directly from the output shaft **63.** This insures that the starting and/or stoppage of the production line can be effected with minimal losses in output and with the production of a minimal number of defective rod-shaped articles. Still further, such mode of operating the programming means insures that the interval which is required to effect deactivation of various aggregates of the second type in response to starting of the main prime mover **63A** is extremely short. The activation and/or deactivation of aggregates of the second type takes place in predetermined angular positions of the output shaft **63.** As mentioned before, the exact angular positions of the shaft **63** in which the aggregates of the second type will be activated and/or deactivated can be selected by the attendant or attendants by changing the positions of the projections **N1–N16** in circumferential direction of the programming drum **61.**

In a production line of the type as shown in FIGS. **1***a* and **1***b*, the load upon the prime mover **63A** is relatively small. Therefore, the operating conditions in such production line are practically unchanged. It was found that, in such production lines, one can also utilize a programming means wherein the movable portion or portions need not be driven in synchronism with the output element of the main prime mover which transmits motion to aggregates of the first type. FIG. **5** shows a programming means which can be utilized in the production line of FIGS. **1***a* and **1***b* without unduly affecting the output of the production line. This programming means comprises a rotary programming drum **1061** which constitutes a carrier for adjustable projections in the form of cams **N1001 – N1016** (only the projections **N1001 – N1016** are actually shown in FIG. **5**). The projections **N1001 – N1016** can actuate the associated signal generators **S1001 – S1016** which are mounted on the frame **1062** for the shaft of the programming drum **1061** and each of which constitutes an electric switch. The shaft of the programming drum **1061** can be rotated by a discrete second prime mover **1072** which is an electric motor and is connected with the input element of a infinitely variable-speed transmission **1071.** The output element of the transmission **1071** can drive the shaft of the programming drum **1061** through the intermediary of an electromagnetic clutch **1460.** A resetting mechanism **1064** is provided to automatically return the programming drum **1061** to a starting position in response to deenergization of the electromagnetic clutch **1460.**

It will be seen that, contrary to operation of the programming means shown in FIGS. **2** and **3** wherein the aggregates of the second type are activated and/or deactivated in predetermined angular positions of the output shaft **63** of the main prime mover **63A**, the programming means of FIG. **5** operates in such a way that the signal generators **S1001 – S1016** are actuated at predetermined time intervals. When the main prime mover **63A** is started, the signal which results in such starting of the main prime mover also effects the starting of electric motor **1072** of the programming means shown in FIG. **5.** Otherwise, the signal generators **S1001 – S1016** can activate and/or deactivate the corresponding aggregates of the second type in the same way as described in connection with the signal generators **S1 – S16** of FIGS. **4***a* and **4***b*. The length of intervals between the actuation of successive signal generators **S1001 – S1016** can be regulated by the attendant not only by changing the positions of but also by changing the speed of the infinitely variable speed transmission **1071.**

It is further clear that the programming means shown in FIGS. **2–3** and **5** can be modified in a number of ways without departing from the spirit of the invention. For example, the moving portion of such programming means can perform a translatory rather than a rotary movement. The movable portion may constitute a magnetic tape, a series of punched cards, or a web-like carrier of information which can be scanned by photoelectric tracking means. It was found, however, that a programming drum of the type shown in FIGS. **2–3** and **5** is particularly suited for use in the programming means of the present invention because the positions of the ac-

tuating means N1 - N16 or N1001 – N1016 can be selected at will to thereby select the length of intervals between successive activations or deactivations of aggregates of the second type or the angular positions of the output shaft **63** of the main prime mover **63A** in which such activations and/or deactivations take place.

An advantage of the condition monitoring units **813** and **821** is that they can insure a deactivation of aggregates of the second type in a predetermined optimum sequence whenever the detectors **413, 421** detect improper feed of cigarettes Z and/or filter rod sections F while the production line is operated at normal speed. In presently known production lines, such detectors bring about an immediate stoppage of all aggregates.

FIGS. **6***a* and **6***b* show two machines which are similar to the machines of FIGS. **1***a* and **1***b* and which together constitute an apparatus or production line for the manufacture of filter cigarettes of unit length. The filter cigarette making machine of FIG. **6***b* is again mounted at right angles to the cigarette rod making machine of FIG. **6***a*.

Referring first to FIG. **6***a*, the cigarette rod making machine comprises a distributor **2001** which discharges a shower of tobacco shreds into a channel **2002.** The resulting tobacco stream is transported and accelerated by an endless conveyor belt **2003** which delivers successive increments of the tobacco stream into the circumferential groove of a conveyor **2007** here shown as a suction wheel which transports the tobacco stream from a lower level to a higher level and past an equallizing device or trimmer **2008.** The thus trimmed tobacco stream is thereupon compacted during travel along and with the lower stretch of a foraminous conveyor band **2013** to be converted into a rod-like filler which thereupon enters a wrapping mechanism **2014.** The wrapping mechanism **2014** also receives successive increments of a web of cigarette paper **2017** which is being drawn from a roll **2016** and passes through a splicing device **2017B** and thereupon through an imprinting unit **2017A.** An endless conveyor belt **2015** transports the cigarette paper web **2017** and the rod-like filler of tobacco shreds to the wrapping mechanism **2014** so as to form a continuous wrapped tobacco rod Z*s* which advances toward the tubes **2019** of the cutoff **2021.** The manner in which the paster **2004** and the seam heating device **2006** cooperate with the elements of the wrapping mechanism **2014** to provide the tubular wrapper of the tabacco rod Zs with a reliable seam is the same as described in connection with FIG. **1***a*. The paster **2004** is movable to its operative position in response to energization of an electromagnet **2404** which is shown in FIG. **7***a*. A second electromagnet **2406** (also shown in FIG. **7***a*) serves to move the seam heating device **2006** to and from its operative position. A photoelectric detector **2407** which is located immediately downstream of the seam heating device **2006** monitors the condition of the seam which is formed in the wrapping mechanism **2014** and produces a signal as long as the seam is defective. The detector **2407** forms part of a signal responsive starting unit **2807** which is shown in FIG. **7***a* and which in turn forms part of a start-stop controller **2307.**

FIG. **6***a* further shows a fresh roll **2016***a* of cigarette paper web **2017***a* the leader of which extends into the splicing device **2017B.**

The cigarette rod making machine of FIG. **6***a* further comprises a rod mutilating device **2009** which is located downstream of the photoelectric detector **2407** and is movable between a first position **2009.1** and a second position **2009.2** at the opposite sides of the path for the wrapped tobacco rod Z*s*. When it assumes the position **2009.1,** the mutilating device **2009** automatically deflects the tabacco rod Z*s* or its components into a receptacle **2018.** The multilating device **2009** is moved from the position **2009.1** to the position **2009.2** in response to energization or deenergization of an electromagnet **2409** which is shown in FIG. **7***a*. During such movement, the multilating device **2009** breaks off the tobacco rod Zs so that a clean leader of the rod is free to advance toward the tubes **2019.**

A cleaning device **2403***a* is located immediately downstream of the cutoff **2021** to expel from the tubes **2019** the remnants of tabacco rod and/or other impurities prior to delivery of freshly formed plain cigarettes Z into the flutes of the transfer conveyor **2026.** Once the rod Zs is free to enter the tubes **2019,** it is severed by the orbiting knife of the cutoff **2021** so as to yield a single file of discrete plain cigarettes Z of unit length.

The cutoff **2021** is followed by a photoelectric detector **2410** which scans the path for the absence of plain cigarettes Z between the left-hand tube **2019** and an accelerating device **2026A.** The photoelectric detector **2410** forms part of a starting unit **2810** which in turn forms part of a start-stop controller **2310** shown in FIG. 7a. The detector **2410** produces a signal as long as it fails to detect plain cigarettes Z at the discharge end of the cutoff **2021.** The cigarettes Z may be absent due to failure of the leader of the rod Zs to enter the right-hand tube **2019** or due to the failure of wrapping mechanism **2014** to produce a satisfactory rod. The first batch of plain cigarettes Z which are produced immediately after starting of the machine shown in FIG. **6a** is expelled by a segregating device **2011** which is mounted between the cleaning device **2403***a* and the accelerating device **2026A.** The segregating device **2011** comprises a blowing nozzle **2411a** which can receive compressed gas from a suitable source (not shown) in response to opening of an electromagnetic valve **2411** shown in FIG. **7***a*.

A further photoelectric detector **2413** is disposed between the accelerating device **2026A** and the transfer conveyor **2026** to monitor the entry of plain cigarettes Z into successive flutes of the conveyor **2026.** The detector **2413** forms part of a condition monitoring unit **2813** which is shown in FIG. **7a.** The detector **2413** produces a signal as long as or whenever the transfer conveyor **2026** fails to receive plain cigarettes Z at regular intervals. When the automatic starting of the production line is completed, the photoelectric detectors **2407** and **2410** are deactivated and their function is thereupon performed by the photoelectric detector **2413.**

Referring to FIG. **6b,** there is shown a filter cigarette making machine which comprises a magazine or hopper **2035** for a supply of filter rod sections F of 6 times unit length. The lowermost portion of the magazine **2035** communicates with the intake end of a duct **2033** which conveys a single row or stack of filter rod sections F into successive flutes of a rotary cutting conveyor **2036.** The conveyor **2036** cooperates with two coaxial rotary disk-shaped knives **2034** to subdivide each filter rod section F into three coaxial filter plugs or stubs of double unit length. The feed of filter rod sections F to the conveyor **2036** is monitored by a pho-

toelectric detector **2421** which forms part of a condition monitoring unit **2821** shown in the left-hand portion of FIG. 7*b*. The photosensitive element **2421***a* of the detector **2421** produces a signal in response to detection of the absence of filter rod sections F in the duct **2033.**

The filter stubs which are formed in the flutes of the conveyor **2036** are transferred onto the eccentrically mounted disks of a staggering conveyor **2037** which staggers the originally axially aligned stubs in the circumferential direction of the axes of rotation of the disks, and the thus staggered stubs are transferred into successive flutes of a shuffling conveyor **2038** which cooperates with suitable cams **2038**a to form a single row of aligned stubs which travel sideways and enter successive flutes of a conveyor **2039.** The drive means for the conveyor **2039** includes an electromagnetic clutch **2414** which must be energized in order to transmit torque to the conveyor **2039.** The shaft of the conveyor **2039** drives the conveyors **2036, 2037, 2038** and the knives **2034** through the intermediary of a suitable gear train, not shown.

The plain cigarettes Z which are propelled into successive flutes of the transfer conveyor **2026** of the cigarette rod making machine by accelerating device **2026**A of FIG. **6**a form on the conveyor **2026** two rows wherein the cigarettes of one row are staggered with respect to the cigarettes of the other row, as considered in the axial circumferential direction of the conveyor **2026.** The two rows of cigarettes Z are transferred onto a pair of aligning conveyors **2027** shown in the right-hand portion of FIG. **6**b. The purpose of the conveyors **2027** is to align each cigarette Z of one row with a cigarette of the other row and to transfer the thus aligned pairs of cigarettes Z into successive flutes of an assembly conveyor **2028.** The width of the gap between each pair of coaxial plain cigarettes Z in the flutes of the assembly conveyor **2028** at least equals the length of a filter stub, namely, the width of such gap at least equals one-third of the length of a filter rod section F.

The single row filter stubs which are transferred onto the conveyor **2039** is accelerated by a conveyor **2040** which introduces successive stubs into consecutive flutes of the assembly conveyor **2028** so that each flute of the conveyor **2028** which moves beyond the transfer station between the conveyors **2028** and **2040** contains a group of three coaxial rod-shaped articles including two plain cigarettes Z of unit length disposed at the opposite axial ends of a filter stub of double unit length. Such groups are transferred into successive flutes of a transfer conveyor **2029.**

The filter cigarette machine of FIG. **6**b further comprises a suction conveyor or drum **2046** which cooperates with a severing device here shown as a rotary knife **2044** to form a succession of adhesive-coated uniting bands which are applied to successive groups of rod-shaped articles in the flutes of the transfer conveyor **2029.** A roll **2041** contains a supply of convoluted web or tape **2041**a which can be moved lengthwise by two advancing rolls **2047** so as to move along a paster **2042** and toward the suction conveyor **2046.** The paster **2042** comprises a rotary applicator **2043** which can coat the underside of the tape **2041**a with a film of adhesive paste before the tape reaches the suction conveyor **2046.** The drive means for the advancing rolls **2047** includes an electromagnetic clutch **2416** which must be energized in order to initiate the lengthwise movement of tape **2041**a toward the suction conveyor **2046.** An electromagnet **2417** has an L-shaped armature **2417***a* over which the tape **2041**a passes. In order to provide the underside of such tape with a film of adhesive, the electromagnet **2417** must be energized so that its armature **2417***a* moves the adjacent portion of the tape into contact with the peripheral surface of the rotary applicator **2043.**

The adhesive-coated uniting bands which are formed by the suction conveyor **2046** in cooperation with the rotary knife **2044** are attached to successive groups of rod-shaped articles in the flutes of the transfer conveyor **2029** in such a way that each uniting band adheres to the respective filter stub as well as to the adjacent inner end portions of the respective plain cigarettes Z. Such groups are thereupon transferred onto a wrapping or rolling conveyor **2048** which cooperates with means for effecting repeated rotary movements of the groups about their respective axes so as to insure that each uniting band is converted into a tube which surrounds the respective filter stub and the adjacent inner end portions of the corresponding plain cigarettes Z whereby such groups form filter cigarettes of double unit length.

The shaft **2048***a* of the rolling conveyor **2048** drives the disk **2032***a* of a pulse generator or timer **2032** which forms part of the programming means for the aggregates of the second type in the production line of FIGS. **6**a and **6**b. The disk **2032***a* carries an annulus of equidistant magnetic heads **2032***b* whose number equals the number of flutes on the rolling conveyor **2048.** It will be noted that the disk **2032***a* rotates in synchronism with the conveyor **2048.** Successive magnetic heads **2332***b* travel past an induction coil **2032***c* which is thereby caused to produce a series of pulses which are transmitted to a pulse shaper **2302** shown in the right-hand portion of FIG. **7**a.

The filter cigarettes of double unit length which are produced on the rolling conveyor **2048** are transferred onto a testing conveyor **2049** which cooperates with a testing unit **2449***a* serving to test the condition or quality of such cigarettes. The testing unit **2429***a* comprises means for blowing through successive filter cigarettes of double unit length streams of a gaseous fluid, and the pressure of such streams at the downstream ends of the cigarettes is evaluated by a transducer **2429.** This transducer may be of the type disclosed in British Pat. no. 1,083,111 and may comprise a diaphragm which is flexed to the extent determined by the pressure of the gas streams. The transducer **2429** produces electric signals which are utilized to effect a segregation of defective articles if the nature of signals is such that they are indicative of a defective article. An ejecting device **2031** comprises an electromagnetic valve **2431** which can admit a stream of compressed gas to an ejector nozzle serving to expel from the machine of FIG. **6***b* those filter cigarettes of double unit length which are produced immediately after the machine is started. Such cigarettes are often defective, and the provision of the ejecting device **2031** constitutes a safety measure to insure that no defective cigarettes can be discharged at the normal outlet of the machine of FIG. **6***b*.

The testing conveyor **2049** delivers satisfactory cigarettes of double unit length to a severing conveyor or drum **2050** which cooperates with a rotary knife **2050***a* to subdivide each filter cigarette of double unit length into a pair of coaxial filter cigarettes of unit length.

such pairs of filter cigarettes of unit length are transferred onto an inverting conveyor **2051** wherein one cigarette of each pair is inverted end-for-end so that the filter stubs of all such cigarettes face in the same direction when the cigarettes (which preferably form a single row) are transferred onto an intermediate conveyor **2052.** The conveyor **2052** delivers the single row of filter cigarettes of unit length to a transfer conveyor **2053** which, in turn, delivers the cigarettes to the upper stretch of a belt conveyor **2056** through the intermediary of a further conveyor **2054.** The belt conveyor **2056** can deliver filter cigarettes of unit length to a packing machine (not shown) or to a tray filling device (not shown).

FIGS. **7***a* and **7***b* illustrate the electric circuitry of the production lines which include the machines of FIGS. **6***a* and **6***b*. The circuitry includes four start controllers **2303, 2309, 2311** and **2318.** Furthermore, the circuitry includes three stop controllers **2308, 2321** and **2322,** as well as nine start-stop controllers **2304, 2306, 2307,** 2310, 2312, 2313, 2314, 2316 and **2317.** Still further, the circuitry of FIGS. 7a and 7b includes a counter control circuit **2360** which controls a counter **2301** forming part of the programming means for the aggregates of the second type, and a circuit **2331** for the ejecting device **2031.** FIGS. **7***a* and **7***b* further show various logical connectons between the aforementioned controllers and the signal generators **S2001** to **S2016.** These signal generators can be called decoding devices and are operatively connected with the counter **2301** of the programming means. The counter **2301** can be of the "minidigit" type **3010** produced by the West German Firm Electronic GmbH of Berlin. The signal generators **S2001** – **S2016** can be decoders of the type **2021** ("minidigit") produced by the West German Firm Electronic GmbH of Berlin.

The counter **2301** is connected with the aforementioned pulse shaper **2302** by means of an AND-gate **2701** so that it can receive pulses which are generated in response to rotation of the disk **2032***a* of the pulse generator **2032.** The counter **2301** totals continuously the signals which are furnished by the pulse shaper **2302** through the intermediary of the AND-gate **2701** and transmits encoded impulses which are indicative of the number of received signals. Such impulses are transmitted to the signal generators **S2001** – **S2016** which, in turnn, cause activate and/or deactivate the associated aggregates of the second type in a predetermined sequence. In the embodiment of FIGS. **6***a*, **6***b*, **7***a* and **7***b*, the adjustment of the signal generators **S2001** – **S2016** is such that they furnish output signals in a response to reception of the following impulses from the counter **2301**: The signal generator **S2001** will furnish a signal in response to an impulse which is furnished by the counter **2301** in response to reception of eleven signals from the pulse shaper **2302**; the signal generator **S2002** will furnish a signal in response to reception of an impulse which is furnished by the counter **2301** in response to a reception of sixteen signals from the pulse shaper **2302,** the signal **S2003** in response to an impulse which is produced in response to transmission to the counter **2301** of 18 signals, **S2004** in response to 25 signals, **S2005** in response to 32 signals, **S2006** in response to 37 signals, **S2007** in response to 45 signals, **S2008** in response to 48 signals, **S2009** in response to 51 signals, **S2010** in response to 52 signals, **S2011** in response to 56 signals, **S2012** in response to 60 signals, **S2013** in response to 70 signals, **S2014** in response to 76 signals, **S2015** in response to 120 signals, and **S2016** in response to 130 signals.

The circuitry of FIGS. **7***a* and **7***b* further comprises a large number of known logic circuits of the type known as AND-gates, OR-gates, NO-gates and storages.

The start controller **2303** includes a signal responsive and signal transmitting starting unit **2803** which comprises two AND-gates **2703***a* and **2703***b*, a storage **2603** and an amplifier **2503** which is connected with an electromagnetic valve **2403.** The valve **2403** must open in order to admit a stream of compressed gas to the cleaning device **2403***a* which serves to expel foreign matter from the tubes **2019** of the cutoff **2021.** The signal generators **S2001** and **S2002** are connected with one input each of the AND-gates **2703***b* and **2703***a*. The outputs of the AND-gates **2703***a* and **2703***b* are respectively connected with the inputs *a* and *b* of the storage **2603,** and the output *d* of this storage is connected with the inp;ut of the amplifier **2503.** The output of the amplifier **2503** is connected with the electromagnetic valve **2403.**

The start controller **2309** includes a starting unit **2809** which comprises an AND-gate **2709,** a storage **2609** and an amplifier **2509** which is connected with the aforementioned electromagnet **2409.** The electromagnet **2409** must be energized or deenergized in order to move the mutilating device **2009** from the position **2009.1** to the position **2009.2** The signal generator **S2006** is connected with the input of the AND-gate **2709,** and the output of this gate is connected with the input *b* of the storage **2609.** The output *c* of the storage **2609** is connected with the input of the amplifier **2509** whose output is connected with the electromagnet **2409.**

The start controller **2311** comprises a starting unit **2811** which includes two AND-gates **2711***a*, **2711***b*, a storage **2611** and an amplifier **2511** which is connected with the electromagnetic valve **2411** for the nozzle **2411***a* of the segregating unit **2011** shown in FIG. **6***a*. The signal generators **S2008** and **S2007** are respectively connected with one input each of the AND-gates **2711***a* and **2711***b*. The outputs of the AND-gates **2711***a* and **2711***b* are respectively connected with the inputs *a* and *b* of the storage **2611.** The output *d* of the storage **2611** is connected with the input of the amplifier **2511,** and the output of this amplifier is connected with the electromagnetic valve **2411.**

The start controller **2318** comprises a starting unit **2818** which includes a manually operated starter switch **2418,** an OR-gate **2718** and a storage **2618.** Furthermore, the start controller **2318** comprises a control unit **2860** which controls the counter **2301.** The control unit **2860** includes two OR-gates **2760***a*, **2760***b* and a storage **2660.**

The manually operable starter switch **2418** is connected with the input *b* of the storage **2618,** with one input of the OR-gate **2760***a*, with the main prime mover of the production line (not shown but corresponding to the electric motor **63A** of FIG. **2,** see the arrow **2900** in FIG. 7b), with the input *a* of a storage **2622** which forms part of a control unit **2822,** and with the input *a* of the storage *s***609** in the starting unit **2809.** The output of the OR-gate **2760***a* is connected with the input *a* of the storage **2660,** and the output *c* of this storage is connected with one input of the AND-gate **2701.**

The signal generator **S2016** is connected with one input of the OR-gate **2760***b*, and the output of this gate is connected with the input *b* of the storage **2660** as well as with a resetting input of the counter **2301.** Furthermore, the signal generator **S2016** is connected with one input of the OR-gate **2720,** and the output of this gate is connected with one input of the OR-gate **2718.** The output of the OR-gate **2718** is connected with the input *a* of the storage **2618.**

The start-stop controller **2304** includes a starting unit **2804** which comprises an AND-gate **2704,** a storage **2604,** and an amplifier **2504** which is connected with the electromagnet **2404** for activation of the paster **2004** in the machine of FIG. **6***a*. As mentioned before, the electromagnet **2404** must be energized in order to move the paster **2004** to its operative position in which the paster furnishes a film of adhesive to be applied to one marginal portion of the web **2017** in the wrapping mechanism **2014** of FIG. **6***a*. The signal generator **S2003** is connected with one input of the AND-gate **2704** and the output of this gate is connected with the input *a* of the storage **2604.** The output *c* of the storage **2604** is connected with the input of the amplifier **2504,** and the output of this amplifier is connected to the electromagnet **2404.**

The start-stop controller **2306** includes a starting unit **2806** which comprises an AND-gate **2706,** a storage **2606** and an amplifier **2506** which is connected with the electromagnet **2406** for activation of the seamm heating device **2006.** As explained in connection with FIGS. **1***a*–**4***b*, the seam heating device **2006** constitutes one of several aggregates of the second type, and the energization of electromagnet **2406** results in movement of this heating device to its operative position in which the device **2006** heats the seam which is formed in the wrapping mechanism **2014** of FIG. **6***a*.

The signal generator **S2004** is connected with one input of the AND-gate **2706,** and the output of this gate is connected with the input *a* of the storage **2606.** The output *c* of the storage **2606** is connected with the input of the amplifier **2506,** and the output of this amplifier is connected with the electromagnet **2406.**

The start-stop controller **2312** comprises a starting unit **2812** which includes an AND-gate **2712,** a storage **2612** and an amplifier **2512** connected with a relay **2412** which must be energized in order to change the speed of the main prime mover of the production line from a lower speed to the higher or normal operating speed. The signal generator **S2008** is connected with one input of the AND-gate **2712,** and the output of this gate is connected with the input *b* of the storage **2612.** The output *d* of the storage **2612** is connected with the input of the amplifier **2512,** and the output of this amplifier is connected with the relay **2412.**

The start-stop controller **2314** comprises a starting unit **2814** which includes two AND-gates **2714***a* and **2714***b*, a storage **2614,** and an amplifier **2514** which is connected with the electromagnetic clutch **2414.** As mentioned before, the clutch **2414** is installed in the drive means for the conveyor **2039** in the filter cigarette making machine of FIG. **6***b*. This clutch also constitutes an aggregate of the second type. The signal generators **S2013** and **S2010** are connected with one input each of the AND-gates **2714***a* and **2714***b*. The outputs of these gates are respectively connected with the inputs *a* and *b* of the storage **2614.** The output *c* of the storage **2614** is connected with the input of the amplifier **2514,** and the output of this amplifier is connected with the electromagnetic clutch **2414.**

The start-stop controller **2316** comprises a starting unit **2816** which includes two AND-gates **2716***a* and **2716***b*, a storage **2616,** and an amplifier **2516** which is connected with the electromagnetic clutch **2416** for the advancing rolls **2047** in the filter cigarette making machine of FIG. **6***b*. When the clutch **2416** is energized, the rolls **2047** advance the tape **2041***a* toward the electromagnet **2417.** The electromagnetic clutch **2416** also constitutes an aggregate of the second type. The signal generators **S2013** and **S2012** are respectively connected with one input each of the AND-gates **2716***a* and **2716***b*. The outputs of the gates **2716***a* and **2716***b* are respectively connected with the inputs *a* and *b* of the storage **2616.** The output *c* of the storage **2716** is connected with the input of the amplifier **2516** which is connected with the electromagnetic clutch **2416.**

The start-stop controller **2317** comprises a starting unit **2817** which includes two AND-gates **2717**a and **2717**b, a storage **2617,** and an amplifier **2517** which is connected with the electromagnet **2417.** This electromagnet constitutes an aggregate of the second type, and its L-shaped armature or bracket **2417***a* can move the tape **2041***a* into contact with the peripheral surface of the rotary applicator **2043** in response to energization of the electromagnet **2417.** The signal generators **S2014** and **S2011** are respectively connected with the corresponding inputs of the AND-gates **2717***a* and **2717***b*. The outputs of the gates **2717***a* and **2717***b* are respectively connected with the inputs *a* and *b* of the storage **2617.** The output *c* of the storage **2617** is connected with the input of the amplifier **2517,** and the output of this amplifier is connected with the electromagnet **2417.**

The start-stop controller **2307** comprises the starting unit **2807** and a further starting unit **2907.** The starting unit **2807** includes an AND-gate **2707,** a storage **2607** and an amplifier **2507** which is connected with the photoelectric detector **2407.** The detector **2407** constitutes an aggregate of the second type. The starting unit **2907** includes two AND-gates **2960, 2970** and an OR-gate **2530.** The output of the OR-gate **2530** is connected with the stop controller **2308** which serves to immediately arrest the main prime mover of the prime mover of the production line. The signal generator **S2004** is connected with one input of the AND-gate **2707,** and the output of this gate is connected with the input *b* of the storage **2607.** The input *a* of the storage **2607** is connected with the output of the OR-gate **2720,** and the output *d* of the storage **2607** is connected with the input of the amplifier **2507.** The output of the amplifier **2507** is connected with the light source **2407***a* of the photoelectric detector **2407.** The photosensitive element **2407***b* of the detector **2407** is connected with one input of the AND-gate **2960** in the starting unit **2907.**

The signal generator **S2005** is connected with one input of the AND-gate **2970** in the starting unit **2907.** The output of the AND-gate **2970** is connected with one input of the AND-gate **2960,** and the output of the AND-gate **2960** is connected with one input of the aforementioned OR-gate **2530.** The output of the OR-gate **2530** is connected with the input of the OR-gate **2720,** with one input of an OR-gate **2608** in the stop controller **2308,** and with one input of an OR-gate **2722** which forms part of the control unit **2822.**

The start-stop controller **2310** includes the starting unit **2810** which comprises an AND-gate **2710**, a storage **2610** and an amplifier **2510** which is connected with the photoelectric detector **2410**. The detector **2410** constitutes an aggregate of the second type. The aforementioned OR-gate **2530** also forms part of the starting unit **2810**. The signal generator S**2007** is connected with one input of the AND-gate **2710**, and the output of this gate is connected with the input *a* of the storage **2610**. The input *b* of the storage **2610** is connected with the output of the OR-gate **2720**, and the output *c* of the storage **2610** is connected with the input of the amplifier **2510**. The amplifier **2510** can complete the circuit of the light source **2410**a in the photoelectric detector **2410**. The photosensitive element **2410**b of the photoelectric detector **2410** is connected with one input of the OR-gate **2530**.

The start-stop controller **2313** includes the condition monitoring unit **2813** which in turn includes the photoelectric detector **2413** between the accelerating device **2026**A and the transfer conveyor **2026** of FIG. **6***a*. The condition monitoring unit **2813** further includes an AND-gate **2713**, a storage **2613**, and an amplifier **2513** which is connected with the photoelectric detector **2413**. This detector constitutes an aggregate of the second type. Still further, the conditioning monitoring unit **2813** includes a NO-gate **2630** and two AND-gates **2620** and **2640**. The AND-gate **2640** is connected with the OR-gate **2530** which can transmit signals to the stop controller **2308**. The AND-gate **2620** is connected with the stop controller **2322**.

The signal generator S**2009** is connected with one input of the AND-gate **2713**, and the output of this gate is connected with the input *b* of the storage **2613**. The output *d* of the storage **2613** is connected with the input of the amplifier **2513**, and the output of this amplifier is connected with the light source **2413***a* of the photoelectric detector **2413**. The photosensitive element **2413***b* of the photoelectric detector **2413** is connected with one input of the AND-gate **2620** and with one input of the AND-gate **2640**. The output of the NO-gate **2630** is connected with one input of the AND-gate **2620**. The output of the AND-gate **2620** is connected with one input of the OR-gate **2760***a* and with one input of the OR-gate **2722** in the stop controller **2322**.

The stop controller **2308** includes a stopping unit **2808** which comprises an AND-gate **2708** (FIG. 7b), the OR-gate **2608** and an amplifier **2508** which is connected with the arresting relay **2408**. The relay **2408** must be energized in order to arrest the main prime mover of the production line. This relay constitutes an aggregate of the second type.

The signal generator S**2013** is connected with one input of the AND-gate **2708**, and the output of this gate is connected with one input of the OR-gate **2608**. The output of the OR-gate **2608** is connected with the input of the amplifier **2508**, and the output of this amplifier is connected with the arresting relay **2408**. Furthermore, the output of the OR-gate **2608** is connected with the input *a* of the storage **2612** in the starting unit **2812**. As mentioned before, the electromagnet **2412** which is controlled by the starting unit **2812** can change the speed of the main prime mover from a lower speed to the normal or operating speed. The output of the OR-gate **2608** is further connected with one input of the OR-gate **2760***b* in the control unit **2860**.

The stop controller **2322** includes the control unit **2822** which comprises the OR-gate **2722**, the storage **2622** and a manually operable arresting swithc **2422**. The arresting switch **2422** is normally open and is connected with one input of the OR-gate **2722**. The output of the OR-gate **2722** is connected with the input *b* of the storage **2622**. The arresting switch **2422** is further connected with one input of the OR-gate **2760***a* in the unit **2860** which controls the counter **2301**.

The stop controller **2321** includes the condition monitoring unit **2821** which comprises the photoelectric detector **2421**, an AND-gate **2721**, and a storage **2621**. The unit **2821** further includes the OR-gate **2722** of the control unit **2822** in the stop controller **2308**. The signal generator S**2005** is connected with the input *b* of the storage **2621**, and the output *d* of this storage is connected with one input of the AND-gate **2721**. The photosensitive element **2421**a of the photoelectric detector **2421** is connected with a further input of the AND-gate **2721**. The output of the AND-gate **2721** is connected with one input of the OR-gate **2760***a*, with one input of the OR-gate **2722** and with one input of the OR-gate **2718**. The output *d* of the storage **2618** in the starting unit **2818** is connected with one input each of the AND-gates **2703***a* and **2703***b*, **2709**, **2711***a* and **2711***b* in the starting units **2803**, **2809** and **2811**. The output *d* of the storage **2618** is further connected with the AND-gates **2704**, **2706**, **2712**, **2714***a*, **2716***a* and **2717***a* of the starting units **2804**, **2806**, **2812**, **2814**, 2816 and **2817**. Still further, the output *d* of the storage **2618** is connected with the AND-gate **2707** in the starting unit **2807**, with the AND-gate **2970** of the starting unit **2907**, with the AND-gate **2710** of the starting unit **2810**, and with the AND-gates **2713** and **2640** of the condition monitor unit **2813**. The output *d* of the storage **2618** is also connected with one input of the NO-gate **2630** in the condition monitoring unit **2813**. The signal which is furnished by the output *d* of the storage **2618** is shown at A.

The output *d* of the storage **2622** in the control unit **2822** is connected with the following logic circuits of the circuitry shown in FIGS. 7*a* and 7*b*: the inputs *b* of storages **2604**, **2606** in the starting units **2804** and **2806**; the inputs *a* of storages **2813** and **2622** in the condition monitoring units **2813** and **2821**; the AND-gates **2714**b, **2716**b and **2717**b in the starting units **2814**, **2816** and **2817**; and the AND-gate **2708** of the stopping unit **2808**. The signal which is furnished by the output *d* of the storage **2622** is shown at B.

The circuit **2331** includes a control unit **2831** which controls the electromagnetic valve **2431**. This valve constitutes an aggregate of the second type and is a component part of the ejecting device **2031** shown in FIG. **6***b*. The control unit **2831** includes an amplifier **2531** which is connected with the signal generator S**2015** and with the electromagnetic valve **2431**.

The operation of the production line shown in FIGS. **6***a*, **6***b*, 7*a* and 7*b* is as follows:

The starting of the production line should take place after the cigarette paper web **2017** has been introduced into the wrapping mechanism **2014** of the cigarette rod making machine shown in FIG. **6***a* and while the leading end of the condensed rod-like filler is also located in the wrapping mechanism. The attendent thereupon closes the manually operated starting switch **2418** of the start controller **2318** shown in FIG. 7*b*. The closing of switch **2418** results in the generation of a signal

which is transmitted to the main prime mover of the production lines by way of the connection which is indicated by the arrow **2900.** The resulting signal is also transmitted to the input *b* of the storage **2618** in the starting unit **2818** so that the output *d* of the storage **2618** generates the signal A. The storage **2618** continues to emit the signal A until it receives an erasing signal at the input *a*. Furthermore, the signal which is generated in response to closing of the starting switch **2418** is transmitted to the input *a* of the storage **2622** so that the signal B at the output *d* of this storage disappears. Still further, the signal which is generated in response to closing of the starting switch **2418** is transmitted to the input *a* of the storage **2609** so that the output *c* of this storage transmits a signal to the amplifier **2509** which energizes the electromagnet **2409.** This electromagnet than causes the mutilating device **2009** of FIG. **6***a* to move from the idle position **2009.2** to the position **2009.1** whereby the mutilating device extends across the path of the rod Z*s* and deflects the rod and/or its components into the receptacle **2018.** The main prime mover which is started at a lower speed in response to closing of the electric switch **2418** drives the aggregates of the first type in the machines of FIGS. **6***a* and **6***b*. On closing of the starting switch **2418,** one input of the OR-gate **2760***a* receives a signal so that the output of this gate transmits a signal to the input *a* of the storage **2660.** The output *c* of the storage **2660** transmits a signal to one input of the AND-gate **2701.** The other input of this gate receives pulses from the pulse shaper **2302** because the disk **2302***a* of the pulse generator **2032** begins to rotate in immediate response to starting of the main prime mover. As explained above, the disk **2032***a* is rotated by the shaft **2048***a* of the rolling conveyor **2048** which constitutes an aggregate of the first type and is set in rotary motion by the output shaft of the main prime mover. The output of the AND-gate **2701** transmits signals to the corresponding input of the counter **2301** which counts the number of such signals and transmits impulses which are utilized to actuate the signal generators S**2001** – S**2016.** When the output of the AND-gate **2701** transmits 11 consecutive signals, the impulse furnished by the counter **2301** actuates the signal generator S**2001** which transmits a signal to the corresponding input of the AND-gates **2703***b* while the other input of this gate receives the signal A from the output *d* of the storage **2618.** The output of the AND-gate **2703**b then transmits a signal to the input *b* of the storage **2603** whereby the output *d* of the storage **2603** transmits a signal to the amplifier **2503** which opens the electromagnetic valve **2403.** Therefore, the cleaning device **2403***a* discharges a stream of compressed gas which is utilized to expel foreign matter from the tubes **2019** of the cutoff **2021.**

The impulse which is furnished by the counter **2301** is response to reception of 16 signals from the output of the AND-gate **2701** actuates the signal generator S**2002** so that this signal generator transmits a signal to the corresponding input of the AND-gate **2703***a*. Since the other input of the AND-gate **2703***a* receives the signal A, its output transmits a signal to the erasing input *a* of the storage **2603.** Consequently the signal at the output *d* of the storage **2603** disappears and the electromagnetic valve **2403** is closed to thus terminate the cleaning action of the device **2403***a* in the machine of FIG. **6***a*.

The impulse which is furnished by the counter **2301** in response to 18 signals from the output of the AND-gate **2701** actuates the signal generator S**2003** which transmits a signal to the corresponding input of the AND-gate **2704.** The other input of the gate **2704** receives the signal A so that its output furnishes a signal to the input *a* of the storage **2604.** The output *c* of the storage **2604** transmits a signal to the amplifier **2504** which energizes the electromagnet **2404** so that the paster **2004** of the cigarette rod making machine shown in FIG. **6***a* is moved to its operative position and begins to apply a film of adhesive to one marginal portion of the web **2017** of cigarette paper which is draped around the compacted rod-like filler in wrapping the mechanism **2014** of FIG. **6***a*.

After the counter **2301** receives seven additional signals from the AND-gate **2701,** it furnishes an impulse which actuates the signal generator S**2004.** This signal generator transmits signals to the corresponding inputs of the AND-gates **2706** and **2707.** At the same time, the other inputs of the AND-gates **2706** and **2707** receive the signal A from the output *d* of the storage **2618.** The output of the AND-gate **2706** furnished a signal which is transmitted to the input *a* of the storage **2606.** Therefore, the output *c* of the storage **2606** transmits a signal to the amplifier **2506** which energizes the electromagnet **2406** whereby the electromagnet moves the seam heating device **2006** to its operative position. Thus, the wrapping mechanism **2014** begins to discharge a finished wrapped tobacco rod Z*s*.

The output of the AND-gate **2707** furnishes a signal to the input *b* of the storage **2607** whereby the output *d* of the storage **2607** transmits a signal to the amplifier **2507.** This amplifier completes the circuit of the light source **2407**a in the photoelectric detector **2407.** Thus, the detector **2407** is activated simultaneously with activation of the seam heating device **2006.** The detector **2407** begins to monitor the seam of the rod Zs which issues from the wrapping mechanism **2014** of FIG. **6***a*, and its photosensitive element **2407***b* transmits a signal as long as the seam is defective. The output signal from the photosensitive element **2407***b* of the detector **2407** is transmitted to one input of the AND-gate **2960.**

After the counter **2301** receives seven additional signals from the AND-gate **2701,** the impulse which is furnished by its output actuates the signal generator S**2005.** The signal generator S**2005** transmits a signal to the corresponding input of the AND-gate **2970** while the other input of this gate receives the signal A from the output *d* of the storage **2618.** The output signal from the AND-gate **2970** is transmitted to one input of the AND-gate **2960.** If the other input of the gate **2960** simultaneously receives a signal from the photosensitive element **2407***b* of the seam monitoring detector **2407,** its output furnishes a signal to one input of the OR-gate **2530.** The OR-gate **2530** transmits a signal to the OR-gate **2608** which in turn transmits a signal to the amplifier **2508** so that the relay **2408** is caused to immediately arrest the main prime mover of the production line.

The output signal from the OR-gate **2608** is further transmitted to the OR-gate **2760***b* shown in FIG. **7***b* whereby the output signal from the gate **2760***b* reaches the storage **2660** at the erasing input *b*. Therefore, the signal at the output *c* of the storage **2660** disappears and the transmission of pulses from the pulse shaper **2302** to the counter **2301** by way of the AND-gate

2701 is terminated. This will be readily understood since the AND-gate **2701** can transmit signals to the corresponding input of the counter **2301** only when its two inputs respectively receive signals from the pulse shaper **2302** and from the output *c* of the storage **2660.** Still further, the output signal from the OR-gate **2760***b* is transmitted to the resetting input of the counter **2301** so that the counter is immediately reset to zero.

The signal at the output of the OR-gate **2530** is further transmitted to one input of the OR-gate **2720** shown in the middle of FIG. **7***b*. The output of the OR-gate **2720** transmits a signal to the input *a* of the storage **2607** so that the signal at the output *d* of the storage **2607** disappears. Consequently, the amplifier **2507** opens the circuit of the light source **2407***a* in the photoelectric detector **2407** whereby the detector is deactivated. The output signal from the OR-gate **2530** is also transmitted to the OR-gate **2722** which furnishes an output signal to the input *b* of the storage **2622.** Therefore, the output *d* of the storage **2622** furnishes the signal B which is transmitted to the inputs *b* of the storages **2604** and **2606.** The signal at the output *c* of the storage **2604** disappears so that the electromagnet **2404** is deenergized and the paster **2004** is allowed or caused to reassume its inoperative position. The transmission of signal B to the input *b* of the storage **2606** results in erasure of signal at the output *c* of this storage whereby the amplifier **2506** deenergizes the electromagnet **2406** which causes or allows the seam heating device **2006** to return to its inoperative position.

If the seam of the rod Z*s* is satisfactory within the allotted interval of time, the photosensitive element **2407***b* of the detector **2407** does not transmit a signal to the AND-gate **2960** when the signal generator S**2005** is actuated to transmit a signal to one input of the AND-gate **2970.** Therefore, the AND-gate **2960** cannot transmit a signal to the OR-gate **2530** and the relay **2408** allows the prime mover of the production line to continue its operation. Thus, the operation of the production line is not interrupted. As the counter **2301** continues to receive signals from the AND-gate **2701,** it actuates the signal generator S**2006** in response to reception of a total of **37** signals whereby the signal generator S**2006** transmits a signal to one input of the AND-gate **2709** while the other input of this gate receives the signal A. The output signal from the AND-gate **2709** is transmitted to the input *b* of the storage **2609.** The signal at the output *c* of the storage **2609** disappears so that the amplifier **2509** deenergizes the electromagnet **2409** which causes or allows the mutilating device **2009** to move from the position **2009.1** to the position **2009.2** whereby the mutilating device breaks off the rod Z*s*. For example, the machine of FIG. **6***a* may comprise a suitable spring permanently biasing the mutilating device **2009** to the position **2009.2.**

In response to reception of eight additional signals from the AND-gate **2701,** the counter **2301** furnishes an impulse which actuates the signal generator S**2007.** The signal generator S**2007** then transmits signals to the corresponding inputs of the AND-gates **2710** and **2711***b* while the other inputs of these gates receive the signal A from the output *d* of the storage **2618.** The output of the AND-gate **2710** transmits a signal to the input *a* of the storage **2610** whereby the output *c* of this storage transmits a signal to the amplifier **2510** which completes the circuit of the light source **2410***a* in the photoelectric detector **2410.** The photosensitive element **2410***b* of the detector **2410** transmits a signal to the corresponding input of the OR-gate **2530** in the event that the left-hand tube **2019** of the cutoff **2021** fails to discharge an orderly file of cigarettes Z. Such situation may arise when the leader of the rod Z*s* fails to enter the right-hand tube **2019.** The OR-gate **2530** then transmits a signal to the OR-gate **2608** which causes the amplifier **2508** to energize the arresting relay **2408,** and this results in immediate stoppage of the main prime mover of the production line. The output signal from the OR-gate **2608** is further transmitted to the corresponding input of the OR-gate **2760**b whereby the output of this gate transmits a signal to the input *b* of the storage **2660.** Therefore, the output *c* of the storage **2660** ceases to transmit a signal to the AND-gate **2701** so that the transmission of further signals to the right-hand input of the counter **2301** is terminated. The output signal of the OR-gate **2760***b* is further transmitted to the left-hand input of the counter **2301** so that this counter is reset to zero.

The output signal from the OR-gate **2530** is further transmitted to one input of the OR-gate **2720.** The output signal from the OR-gate **2720** is transmitted to the erasing input *a* of the storage **2607** so that the signal at the output *d* of this storage disappears. Therefore, the amplifier **2507** opens the circuit of the light source **2407***a* and the photoelectric detector **2407** is deactivated. Still further, the output signal from the OR-gate **2720** is transmitted to the input *b* of the storage **2610** whereby the signal at the output *c* of the storage **2610** disappears and the amplifier **2510** opens the circuit of the light source **2410***a* with the result that the photoelectric detector **2410** is deactivated.

The output signal from the OR-gate **2530** is also transmitted to the OR-gate **2722** which transmits a signal to the input *b* of the storage **2622** whereby the output *d* of the storage **2622** produces the signal B. The signal B is transmitted to the inputs *b* of the storages **2604** and **2606.** Therefore, the signals at the outputs *c* of these storages disappear and the amplifiers **2504** and **2506** respectively cause deenergization of the electromagnets **2404** and **2406.** Consequently, the paster **2004** and the seam heating device **2006** are caused to reassume their inoperative positions.

The output signal from the AND-gate **2711***b* is transmitted to the input *b* of the storage **2611.** The output *d* of the storage **2611** then produces a signal which is transmitted to the amplifier **2511** whereby the amplifier opens the electromagnetic valve **2411** which controls the blowing nozzle **2411.** Thus, the segregating device **2011** is activated and ejects a predetermined number of cigarettes Z which were produced during the initial stage of operation of the machine shown in FIG. **6***a*.

If the operation of the machine of FIG. **6***a* is satisfactory, the photosensitive element **2410***b* of the detector **2410** does not produce a signal which results in stoppage of the main prime mover. Therefore, the right-hand input of the counter **2301** continues to receive signals from the AND-gate **2701.** In response to reception of forty-eight signals, the counter **2301** transmits an impulse which actuates the signal generator S**2008.** The signal which is furnished by the signal generator S**2008** is transmitted to the corresponding inputs of the AND-gates **2711***a* and **2712.** At the same time, the other inputs of the gates **2711***a* and **2712** receive the signal A. The output signal from the gate **2711***a* is transmitted to the erasing input *a* of the storage **2611**

whereby the signal at the output *d* of this storage disappears and the amplifier **2511** closes the electromagnetic valve **2411** so that the operation of the segregating device **2011** is terminated. By properly selecting the number of signals which the counter **2301** must receive subsequent to actuation of the signal generator S2007 and prior to actuation of the signal generator S2008, the attendent can determine the number of cigarettes Z which are segregated by the device **2011.** As a rule, the length of the interval during which the segregating device **2011** is operative will be selected with a view to reduce the number of segregated cigarettes Z to a minimum.

The output of the AND-gate **2712** transmits a signal to the input *b* of the storage **2612** whereby the output *d* of this storage transmits a signal to the amplifier **2512** which energize the relay **2412.** This relay then causes the main prime mover for the aggregates of the first type to change its speed from the lower speed to a higher or normal operating speed.

The counter **2301** thereupon actuates the signal generator S2009 which transmits a signal to one input of the AND-gate **2713** while the other input of this gate receives the signal A. Therefore, the output of the gate **2713** transmits a signal to the input *b* of the storage **2613** and the output *d* of this storage transmits a signal to the amplifier **2513** which completes the circuit of the light source **2413***a* in the photoelectric detector **2413.** The photosensitive element **2413***b* transmits a signal in response to detection of the absence of cigarettes Z between the accelerating device **2026***a* and the transfer conveyor **2026.** If the detector **2413** detects an irregularity in the feed of cigarettes A, the photosensitive element **2413***b* transmits a signal to the AND-gate **2640** while the other input of this gate receives the signal A. The output of the gate **2460** transmits a signal to the OR-gate **2530** which causes the OR-gate **2608** to transmit a signal to the amplifier **2508** which energizes the relay **2408** so that the relay immediately arrests the main prime mover of the production line. The output signal from the OR-gate **2608** is also transmitted to the input *a* of the storage **2612** whereby the signal at the output *d* of the storage **2612** disappears and the amplifier **2512** immediately deenergizes the relay **2412** which, as explained before, is energizable to change the speed of the main prime mover from a lower speed to a higher speed. The output signal from the OR-gate **2608** is further transmitted to the OR-gate **2760***b* which transmits a signal to the erasing input *b* of the storage **2660** whereby the signal at the output *c* of the storage **2660** disappears and the AND-gate **2701** ceases to transmit signals to the counter **2301.** At the same time, the signal from the output of the OR-gate **2760** reaches the left-hand input of the counter **2301** so that the counter is reset to zero.

Still further, the output signal from the OR-gate **2530** is transmitted to the OR-gate **2720** which transmits signals to the inputs *b* and *a* of the storages **2610** and **2607.** The signal at the output *d* of the storage **2607** disappears with the result that the amplifier **2507** opens the circuit of the light source **2407***a* and thus deactivates the photoelectric detector **2407.** Analogously, the termination of emission of signal at the output *c* of the storage **2610** results in an opening of the circuit of the light source **2410***a* so that the photoelectric detector **2410** is deactivated. The signal which is furnished by the OR-gate **2530** to the OR-gate **2722** is transmitted to the input *b* of the storage **2622** whereby the output *d* of this storage produces the signal B. Such signal is transmitted to the inputs *b* of the storages **2604** and **2606** with the result that the paster **2004** and the seam heating device **2006** are returned to their inoperative positions. The signal B is further transmitted to the input *a* of the storage **2613** whereby the signal at the output *d* of the storage **2613** disappears. Therefore, the amplifier **2513** opens the circuit of the light source **2413***a* with the result that the photoelectric detector **2413** between the accelerator **2026A** and the transfer conveyor **2026** is deactivated.

If the transport of cigarettes Z into successive flutes of the transfer conveyor **2026** is orderly, the photosensitive element **2413***b* of the photoelectric detector **2413** does not transmit a signal to the AND-gate **2640** so that the main prime mover continues to drive the aggregates of the first type and the counter **2301** receives additional signals from the output of the AND-gate **2701.** In response to reception of additional nineteen signals, the counter **2301** produces an impulse which actuates the signal generator S2013. This signal generator transmits signals to the corresponding inputs of the AND-gates **2714***a* and **2716***a*. At the same time, the other inputs of the gates **2714***a* and **2716***a* receive the signal A from the output *d* of the storage **2618.** The output signal from the AND-gate **2714***a* is transmitted to the input *a* of the storage **2614** whereby the output *c* of the storage **2614** causes the amplifier **2514** to energize the electromagnetic clutch **2414** in the drive means for the conveyor **2039.** Therefore, the accelerating conveyor **2040** begins to receive a succession of filter stubs of double unit length which are transferred into successive flutes of the assembly conveyor **2028.**

The output signal from the AND-gate **2716***b* is transmitted to the input *b* of the storage **2616** whereby the signal at the output *c* of the storage **2660** causes the amplifier **2516** to energize the electromagnetic clutch **2416** in the drive means for the advancing rolls **2047** which begin to transport the tape **2041***a* lengthwise toward the paster **2042** and suction conveyor **2046.**

After receiving six additional signals, the counter **2301** transmits an impulse which actuates the signal generator S2014. This signal generator transmits a signal to the corresponding input of the AND-gate **2717***a* while the other input of the gate **2717***a* receives the signal A. Therefore, the output of the gate **2717***a* transmits a signal to the input *a* of the storage **2617** and the output *c* of this storage transmits a signal to the amplifier **2517** which energizes the electromagnet **2417.** Consequently, the armature **2417***a* of the electromagnet **2417** moves the adjacent portion of the tape **2041***a* into engagement with the adhesive-coated peripheral surface of the rotating applicator **2043.**

In response to reception of **24** additional signals, the counter **2301** furnishes an impulse which actuates the signal generator S2015. The signal from the signal generator S2015 is transmitted to the amplifier **2531** which opens the electromagnetic valve **2531** so that the ejecting device **2031** furnishes a stream of compressed gas which expels a predetermined number of filter cigarettes of double unit length. Such cigarettes are the first cigarettes which are produced upon starting of the machine shown in FIG. **6***b*, and it has been found that the foremost batch of such cigarettes is likely to exhibit certain defects. The electromagnetic valve **2431** is controlled by or embodies a time-delay relay which auto-

natically closes the valve after the elapse of a predetermined interval of time to thus determine the number of filter cigarettes of double unit length which are ejected by the device **2031**.

Finally, an impulse from the counter **2301** actuates the signal generator **S2016** whereby this signal generator transmits a signal to the OR-gate **2720**. The gate **2720** transmits signals to the inputs *b* and *a* of the storages **2610** and **2607** so that the signals at the outputs *c* and *d* of these storages disappear. Consequently, the photoelectric detectors **2407** and **2410** are deactivated. The photoelectric detector **2413** in the condition monitoring unit **2813** remains active and takes over the functions of the deactivated photoelectric detectors **2407** and **2410**.

The signal which is furnished by the OR-gate **2720** is further transmitted to one input of the OR-gate **2718** whereby the output signal from the gate **2718** enters the input *a* of the storage **2718** and erases the signal A. The signal which is generated in response to actuation of the signal generator **S2060** is further transmitted to the input *b* of the storage **2660** (by way of the OR-gate **2760***b*) whereby the signal at the output *c* of the storage **2660** disappears and the transmission of signals from the AND-gate **2701** to the corresponding input of the counter **2301** is terminated. At the same time, the OR-gate **2760***b* transmits a signal to the left-hand input of the counter **2301** whereby the counter is reset to zero. This completes the automatic activation and deactivation of aggregates of the second type during the starting of the production line.

The automatic deactivation of various aggregates of the second type during stoppage of the production line is carried out as follows:

During automatic starting, the signal which is produced in response to actuation of the signal generator **S2005** is transmitted to the input *b* of the storage **2621** which results in activation of the condition monitoring unit **2821**. Thus, the output *d* of the storage **2621** transmits a signal to the right-hand input of the AND-gate **2721** the left-hand input of which is connected with the photosensitive element **2421***a* of the photoelectric detector **2421**. This detector is in continuous operation and monitors the travel of filter rod sections F from the magazine **2034** of the filter cigarette making machine to the cutting drum **2036**. When the detector **2421** detects the absence of filter rod sections F, the photosensitive element **2421***a* transmits a signal to the corresponding input of the AND-gate **2721** whereby the output of and AND-gate transmits a signal to the OR-gates **2722** and **2760***a*. The output of the AND-gate **2721** is further connected to the OR-gate **2718**. As soon as the OR-gate **2760***a* receives a signal from the output of the AND-gate **2721**, it transmits a signal to the input *a* of the storage **2660** so that the output *c* of this storage transmits a signal to the corresponding input of the AND-gate **2701**. Consequently, the output of the gate **2701** begins to transmit pulses to the counter **2301** which thereupon actuates the signal generators **S2001** – **S2016** in response to reception of a certain number of signals in a manner as described above. When the output signal from the AND-gate **2721** reaches the OR-gate **2722**, the output of the gate **2722** transmits a signal to the input *b* of the storage **2622** whereby the output *d* of the storage **2622** emits the signal B. If the detector **2421** detects an irregularity in delivery of filter rod sections F during starting of the production line, the output signal from the AND-gate **2721** also reaches the OR-gate **2718** whereby the output signal from the gate **2718** reaches the erasing input *a* of the storage **2618** so that the output signal A disappears.

The signal B is transmitted to the inputs *b* of the storages **2604** and **2606** so that the output signals from the storages **2604** and **2606** disappear with the result that the paster **2004** and the seam heating device **2006** return to their inoperative positions. The signal B is further transmitted to the input *a* of the storage **2613** so that the output signal of this storage disappears. The photoelectric detector **2413** in the condition monitoring unit **2813** is deactivated. Furthermore, the signal B is transmitted to the input *a* of the storage **2621** so that the signal at the output *d* of the storage **2621** disappears and the condition monitoring unit **2821** is rendered inoperative because the transmission of a signal to the right-hand input of the AND-gate **2721** is terminated.

As the counter **2301** again receives signals from the AND-gate **2701**, it causes stepwise deactivation of aggregates of the second type for the purpose of insuring that all satisfactory articles are evacuated from the machine of FIG. **6***b* prior to stoppage of the main prime mover. In other words, the programming system which includes the pulse generator **2032** and the timer **2301** insures that all such pairs of plain cigarettes Z which have entered or are about to enter the filter cigarette making machine of FIG. **6***b* are provided with filter stubs and adhesive-coated uniting bands and are converted into filter cigarettes of unit length prior to stoppage of the main prime mover. As soon as the photosensitive element **2421***a* produces a signal which causes the electromagnets **2404** and **2406** to effect a return movement of the paster **2004** and seam heating device **2006** to their inoperative positions, the wrapping mechanism **2014** terminates the formation of a tubular wrapper around the compacted rod-like filler so that the material which issues from the wrapping mechanism **2014** automatically descends by gravity and enters the receptacle **2018**.

The impulse from the counter **2301** actuates the signal generator **S2010** when the filter cigarette making machine of FIG. **6***b* is empty. The signal generator **S2010** then transmits a signal to the right-hand input of the AND-gate **2714***b* while the left-hand input of this gate receives the signal B. The output of the gate **2714***b* then furnishes a signal to the input *b* of the storage **2614** whereby the signal at the output *c* of the storage **2614** disappears and the amplifier **2514** disengages the electromagnetic clutch **2414** to thereby terminate the delivery of filter stubs to the accelerating conveyor **2040** in the filter cigarette making machine of FIG. **6***b*. When the counter **2301** actuates the signal generator **S2011**, the signal generator **S2011** transmits a signal to one input of the AND-gate **2717***b* while the other input of the gate **2717***b* receives the signal B. Therefore, the gate **2717***b* transmits a signal to the input *b* of the storage **2617** so that the signal at the output *c* of the storage **2617** disappears. This causes the amplifier **2517** to deenergize the electromagnet **2417** with the result that the armature **2417***a* moves the tape **2041***a* away from the applicator **2043** of the paster **2042**.

When the signal generator **S2012** is actuated, it transmits a signal to one input of the AND-gate **2716***b* while the other input of this gate receives the signal B. Therefore, the gate **2071***b* transmits a signal to the input *b* of the storage **2616** and the storage **2616** causes the am-

plifier **2516** to disengage the electromagnetic clutch **2416** in the dirve for the advancing rolls **2047.** Consequently, the forward movement of tape **2041***a* is terminated.

The actuation of the signal generator **S2013** results in transmission of a signal to one input of the AND-gate **2708.** The other input of the gate **2708** receives the signal B so that the output of the gate **2708** transmits a signal to the OR-gate **2608** and through the intermediary of this gate to the amplifier **2508** which causes the arresting relay **2408** to open the circuit of the main prime mover for the production line. The output signal from the OR-gate **2608** is further transmitted to the input *a* of the storage **2612** so that the signal at the output *d* of the storage **2612** disappears and the amplifier **2512** deenergizes the relay **2412** which, as disclosed above, is energizable to accelerate the main prime mover from a lower speed to the normal operating speed. Still further, the signal from the output of the OR-gate **2608** is transmitted to the OR-gate **2660***b* which transmits a signal to the storage **2660** so that the signal at the output *c* of the storage **2660** disappears and the AND-gate **2701** is unable to transmit signals to the counter **2301.** At the same time, the signal from the OR-gate **2760***b* reaches the left-hand input of the counter **2301** so that the counter is reset to zero.

As mentioned above, the condition monitoring unit **2813** is activated during automatic starting of the production line in response to transmission of an impulse to the signal generator **S2009.** When the machines of FIGS. **6***a* and **6***b* operate normally, the condition monitoring unit **2813** remains operative so that the photoelectric detector **2413** continues to scan the path for the cigarettes Z between the accelerating device **2026**A and the transfer conveyor **2026.** If the detector **2413** detects the absence of cigarettes Z, the photosensitive element **2413***b* transmits a signal to the corresponding input of the AND-gates **2620** and **2640.** Since the gate **2640** does not receive the signal A, the transmission of a signal to its right-hand input from the photosensitive element **2413***b* does not result in the generation of a signal which would be transmitted to the OR-gate **2530** and would result in immediate stoppage of the main prime mover. The NO-gate **2630** does not receive the signal A so that the output of this gate transmits a signal to the right-hand input of the AND-gate **2620.** Consequently, when the gate **2620** receives a signal from the photosensitive element **2413***b* of the detector **2413,** it transmits a signal to the OR-gate **2722.** The output of the gate **2722** transmits a signal to the input *b* of the storage **2622** whereby the output *d* of this storage produces the signal B. The operations which are started or terminated in response to generation of the signal B were described hereinabove.

Furthermore, the output signal from the AND-gate **2620** is transmitted to the OR-gate **2760***a* and through the intermediary of this gate to the input *a* of the storage **2660.** The output *c* of the storage **2660** transmits a signal to the left-hand input of the AND-gate **2701** so that the counter **2301** starts to receive signals and transmits impulses to the signal generators **S2001 – S2016** with the result that the aggregates of the second type are deactivated in a sequence as described above.

If the production line is to be stopped at the will of the attendent, the manually operated arresting switch **2422** of the stop controller **2322** is closed. This results in transmission of a signal to the OR-gate **2722** which transmits the signal to the input *b* of the storage **2622** so that the storage **2622** produces the signal B. The closing of the arresting switch **2422** further results in transmission of a signal to the OR-gate **2760***a*. The signal from the output of the gate **2760***a* is transmitted to the input *a* of the storage **2660** so as to enable the AND-gate **2701** to begin the transmission of signals to the counter **2301** whereby the counter begins to transmit impulses to the signal generators **S2001 – S2016** with the result that the aggregates of the second type are deactivated in a predetermined sequence.

An advantage of the programming means including the pulse generator **2032** and the counter **2301** is that such programming means can be readily incorporated into the existing production lines. It was found that the amount of work involved in installing in an existing production line programming means which utilize rotary drums of the type shown in FIGS. **2 – 3** and **5** is much greater than the amount of work which is involved in providing an existing production line with the programming means of FIG. **7***a*. As mentioned above, the signal generators **S2001 – S2016** may constitute suitable decoding circuits for the impulses which are furnished by the timer **2301.** Furthermore, such signal generators may constitute amplifiers, mechanical or electronic switching stages or analogous circuits which are capable of generating signals in response to reception of specific impulses from the counter **2301.**

An important advantage of the programming means which are shown in the drawing is that the activation and/or deactivation of various aggregates of the second type can be timed with a very high degree of precision. The programming means of FIGS. **1***a* to **4***b* and FIGS. **6***a* to **7***d* insure that all movements of the movable part or parts of the programming means are exactly synchronized with movements of the output element of the main prime mover of the production line. On the other hand, the programming means of FIG. **5** is somewhat more versatile because it enables the attendant to select the length of intervals between actuations of successive signal generators independently of the angular positions of the output element of the main prime mover. The programming means is designed to arrest the production line by deactivating the aggregates of the second type in a predetermined sequence either in response to an intentionally produced signal, such as the closing of the manually operated arresting switch **2422** shown in FIG. **7***b*, or in response to detection of malfunction of one or more aggregates of the first type and/or in response to detection of improper transport or travel of components or finished products along their respective paths.

It was further found that the programming means of the present invention can bring about substantial savings in time delay elements and similar devices which are utilized in presently known production lines to insure the activation and/or deactivation of various aggregates of the second type in a desired sequence. Proper synchronization of activation and/or deactivation of aggregates of the second type results in substantial savings in material which are being processed in the production line, such as tobacco, cigarette paper, tape which is to be converted into adhesive-coated uniting bands, adhesive and filter rod sections. Furthermore, such mode of operation further insures that the production line is arrested only subsequent to evacuation of finished or semi-finished products. This reduces the

number of rejects during starting of the production line. It is well known that the articles or parts of articles which remain in the production line after stoppage are normally defective or are likely to be defective so that they should be segregated in order to avoid the transfer of unsatisfactory smokers' products into a packing machine or into a tray filling apparatus.

Still further, the improved programming means renders it possible to reduce the number of attendants in a tobacco processing plant because a single attendant can readily supervise the operation of several production lines. Also, such attendant or attendants need not be concerned with the sequence in which various aggregates of the second type are being activated and/or deactivated when one or more machines are to be started or arrested. The provision of the condition monitoring units renders it possible to automatically restart the production line as soon as the cause of malfunction is eliminated. This also contributes to a higher output of the production line.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. In an apparatus for the production and/or processing of cigarettes or analogous rod-shaped articles which constitute or form part of smokers' products, a combination comprising a plurality of article producing and processing first subassemblies arranged to operate in synchronism with each other; a plurality of second subassemblies arranged to be activated and/or deactivated in a predetermined sequence during starting and/or stoppage of the apparatus; a plurality of signal generating operating means each operatively connected with at least one of said second assemblies and actuatable to thereby activate and/or deactivate the respective second subassemblies; programming means at least a portion of which is movable between plural positions, said programming means being operable to actuate said operating means in a predetermined sequence; prime mover means for driving at least one of said first subassemblies; and motion transmitting means for moving said portion of said programming means in synchronism with said one of said first subassemblies.

2. A combination as defined in claim **1,** wherein said portion of said programming means comprises a mobile carrier and a plurality of discrete actuating elements on said carrier, each of said actuating elements being associated with at least one of said operating means and said carrier being movable from a predetermined starting position to thereby effect the actuation of said operating means in a predetermined sequence through the intermediary of the respective actuating elements.

3. A combination as defined in claim **2,** wherein said carrier is a rotary drum and said actuating elements are projections provided on the periphery of said drum.

4. A combination as defined in claim **1,** wherein said prime mover means comprises a rotary output member and said programming means is arranged to actuate said operating means in a predetermined sequence in predetermined angular positions of said output member.

5. A combination as defined in claim **1,** wherein said programming means further comprises means for furnishing a succession of impulses at spaced intervals to thereby actuate said operating means in a predetermined sequence.

6. A combination as defined in claim **5,** wherein said impulse furnishing means comprises an impulse transmitting counter.

7. A combination as defined in claim **1,** further comprising signal responsive units operatively connected with said operating means and with the respective second subassemblies to activate and/or deactivate the respective second subassemblies in response to signals from the respective operating means.

8. A combination as defined in claim **7,** wherein at least one of said signal responsive units is a condition monitoring unit and the respective second subassembly comprises detector means which is activated by said condition monitoring unit in response to a signal from the respective operating means, said detector means being arranged to monitor the operation of at least one of said first subassemblies and to effect a deactivation of at least one of said second subassemblies in response to detection of a faulty operation of said one first subassembly.

9. A combination as defined in claim **8,** wherein said one first subassembly forms part of a machine for the processing of filter rod sections and includes conveyor means for transporting filter rod sections along a predetermined path, said detector means being activatable to monitor said path and to effect a deactivation of at least one of said second subassemblies in response to detection of the absence of filter rod sections in said path.

10. A combination as defined in claim **8,** wherein at least one of said first subassemblies forms part of a machine for the production of a wrapped rod-like filler and for conveying such filler and/or sections thereof along a predetermined path, said detector means being activatable to monitor said path and to effect a deactivation of at least one of said second subassemblies in response to detection of the absence of wrapped filler and/or sections thereof in said path.

11. A combination as defined in claim **7,** wherein at least one of said signal responsive units is a starting unit for the respective second subassembly.

12. A combination as defined in claim **11,** wherein at least one of said first subassemblies forms part of a machine for the production of a wrapped rod-like filler and includes a cutoff for severing the wrapped filler at predetermined intervals, said cutoff having at least one tubular element through which the wrapped filler passes and said last mentioned second subassembly comprising a cleaning device for said tubular element, said cleaning device being activated in response to transmission of a signal from the respective operating means to said starting unit.

13. A combination as defined in claim **11,** wherein said last mentioned second subassembly comprises a paster and means for rendering said paster operative, said starting unit being arranged to render said paster operative through the intermediary of said moving means in response to a signal from the respective operating means.

14. A combination as defined in claim **11,** wherein said last mentioned second subassembly comprises a

heating device and means for moving said heating device to and from an operative position, said starting unit being arranged to effect a movement of said heating device to said operative position by way of said moving means in response to a signal from the respective operating means.

15. A combination as defined in claim **11**, wherein at least one of said first subassemblies forms part of a machine wherein a web of wrapping material is draped around a rod-like filler of fibrous material so as to form a seam extending lengthwise of the resulting wrapped filler rod, said last mentioned second subassembly comprising mutilating means activatable to break the wrapped filler rod and said starting unit being arranged to activate said mutilating means in response to a signal from the respective operating means.

16. A combination as defined in claim **11**, wherein at least one of said first subassemblies forms part of a machine which is operable to produce a succession of rod-like articles and said last mentioned second subassembly comprises a segregating device activatable to segregate a predetermined number of rod-like articles which are produced immediately following the start of operation of said machine, said starting unit being arranged to activate said segregating device in response to a signal from the respective operating means.

17. A combination as defined in claim **11**, further comprising variable-speed prime mover means for driving at least one subassemblies of said first type, said last mentioned second subassembly including speed changing means activatable to increase the speed of said prime mover means and said starting unit being arranged to activate said speed changing means in response to a signal from the respective operating means.

18. A combination as defined in claim **11**, wherein at least one of said first subassemblies forms part of a machine for the processing of sections of filter rods and said last named second subassembly includes drive means activatable to feed filter rod sections in said machine, said starting unit being arranged to activate said drive means in response to a signal from the respective operating means.

19. A combination as defined in claim **11**, wherein said last mentioned second subassembly includes detector means which is activatable by said starting unit in response to a signal from the respective operating means.

20. A combination as defined in claim **19**, wherein at least one of said first subassemblies forms part of a machine wherein a web of wrapping material is draped around a rod-like filler to form on the resulting wrapped filler rod a longitudinally extending seam, said last mentioned second subassembly comprising arresting means operable to arrest said machine and said detector means being arranged to monitor said seam in response to activation by said starting unit and to operate said arresting means when the condition of said seam deviates from a predetermined condition.

21. A combination as defined in claim **19**, wherein at least one of said first subassemblies forms part of a machine for the production of a wrapped filler rod and includes a cutoff for subdividing the rod into sections of predetermined length whereby such sections advance along a predetermined path, said detector means being activatable to monitor said path and to arrest said machine in response to detection of the absence of sections in said path.

22. A combination as defined in claim **11**, wherein at least one of said first subassemblies forms part of a machine wherein a web is converted into a succession of adhesive-coated uniting bands and said last mentioned second subassembly comprises a device for advancing the web in said machine and drive means activatable to operate said advancing device, said starting unit being arranged to activate said drive means in response to a signal from the respective operating means.

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