United States Patent [19]

Kruse et al.

[11] **3,750,676**

[45] **Aug. 7, 1973**

[54] **METHOD AND MACHINE FOR THE PRODUCTION OF CIGARETTE PACKS OR THE LIKE**

[75] Inventors: **Friedel Kruse**, Hamburg; **Gunter Wahle**, Reinbeck; **Otto Erdmann**, Hamburg; **Willy Rudszinat**, Dassendorf, all of Germany

[73] Assignee: **Hauni-Werke Korber & Co. KG**, Hamburg, Germany

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[21] Appl. No.: **84,857**

[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **131/25,** 53/29, 53/74, 53/148, 53/183

[51] **Int. Cl.** **A24c 1/30,** A24c 5/35, B65b 47/00

[58] **Field of Search** 53/29, 183, 149, 53/148, 74, 236

[56] **References Cited**

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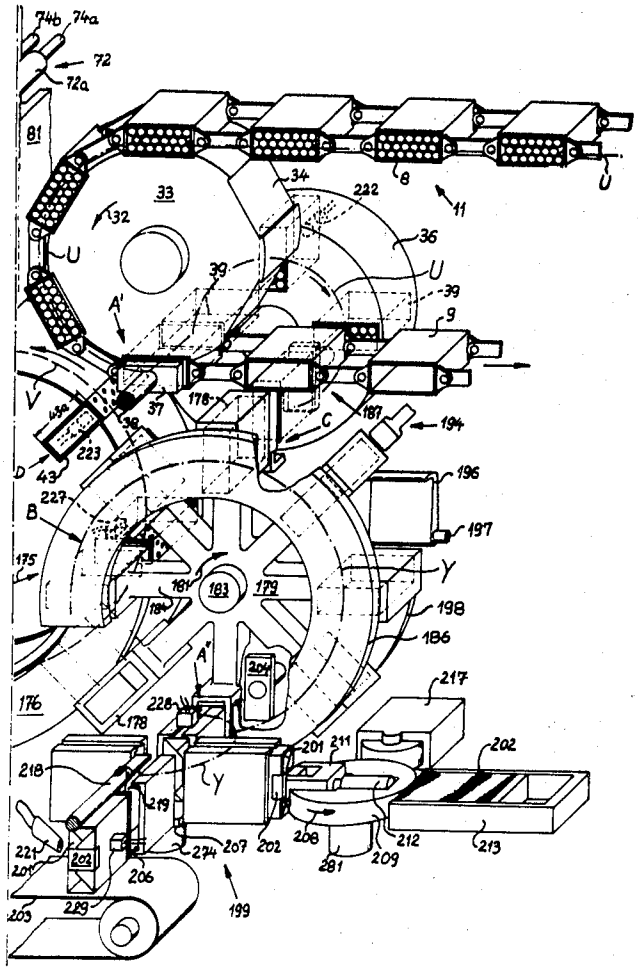
Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—E. F. Desmond
Attorney—Michael S. Striker

[57] **ABSTRACT**

A cigarette packing machine wherein empty packs or their component parts are withdrawn from the respective magazines only when a detector determines the presence of a block of cigarettes which are being transported to a pack filling station. The detector then causes the transfer of a prefabricated empty pack from its magazine to the filling station or the conversion of one or more blanks into an empty pack and the transfer of such pack to the filling station. Each block of cigarettes is introduced into and enclosed in that pack whose transfer from the magazine to the filling station or whose making from one or more blanks was initiated in response to detection of the particular block.

30 Claims, 47 Drawing Figures



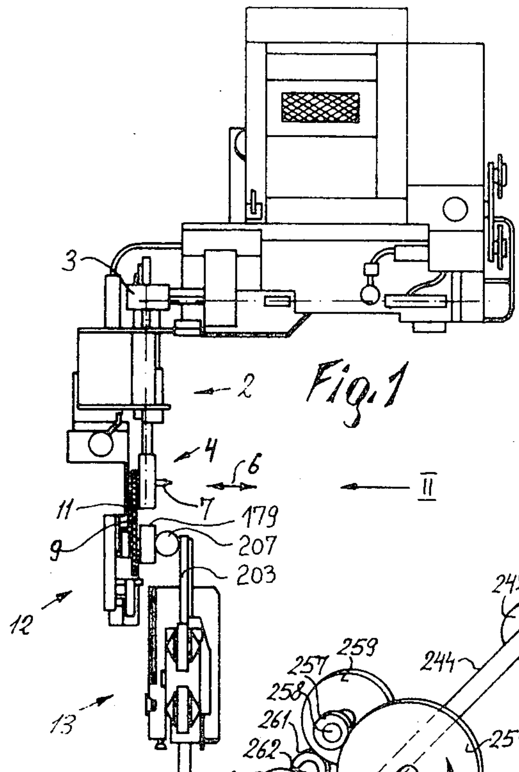


Fig.1

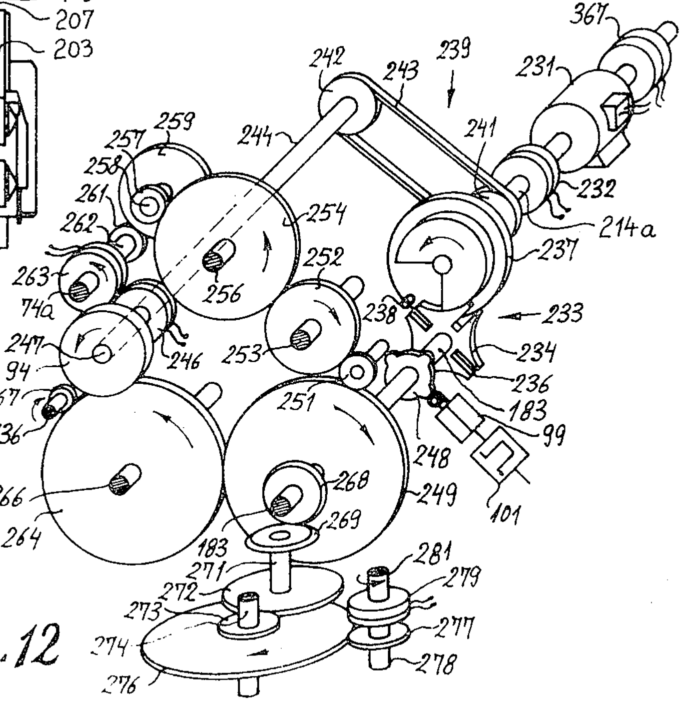


Fig.12

INVENTORS:

FRIEDEL KRUSE
GUNTER WAHLE
OTTO ERDMANN
WILLY RUDSZINAT

BY [signature]

ATTORNEY

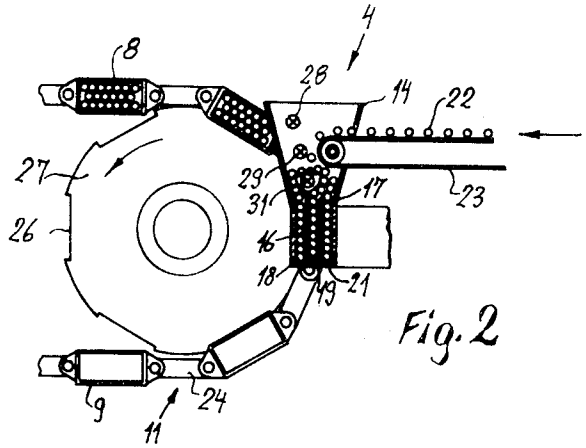


Fig. 2

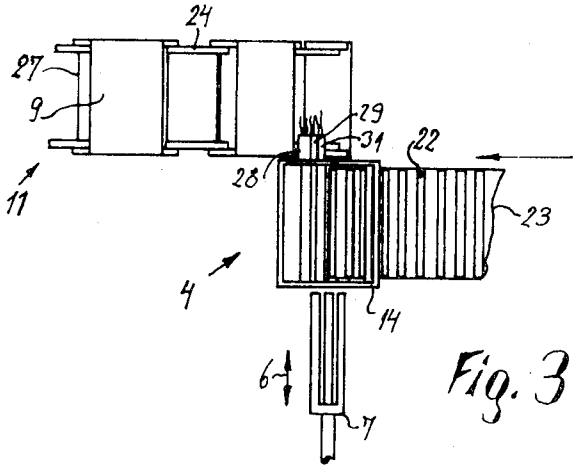


Fig. 3

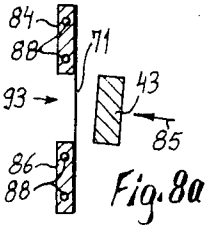


Fig. 8a

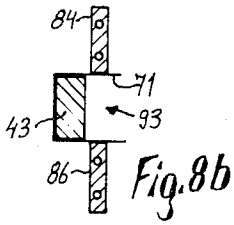


Fig. 8b

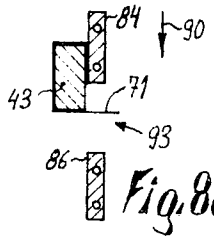


Fig. 8c

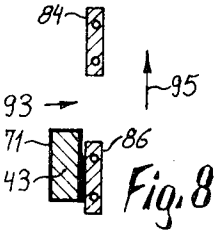


Fig. 8d

INVENTORS:

FRIEDEL KRAUSE

FRANZ LANGE

ERICH [illegible]

IGOR RUDSZINAT

BY Michael J. Striker

ATTORNEY

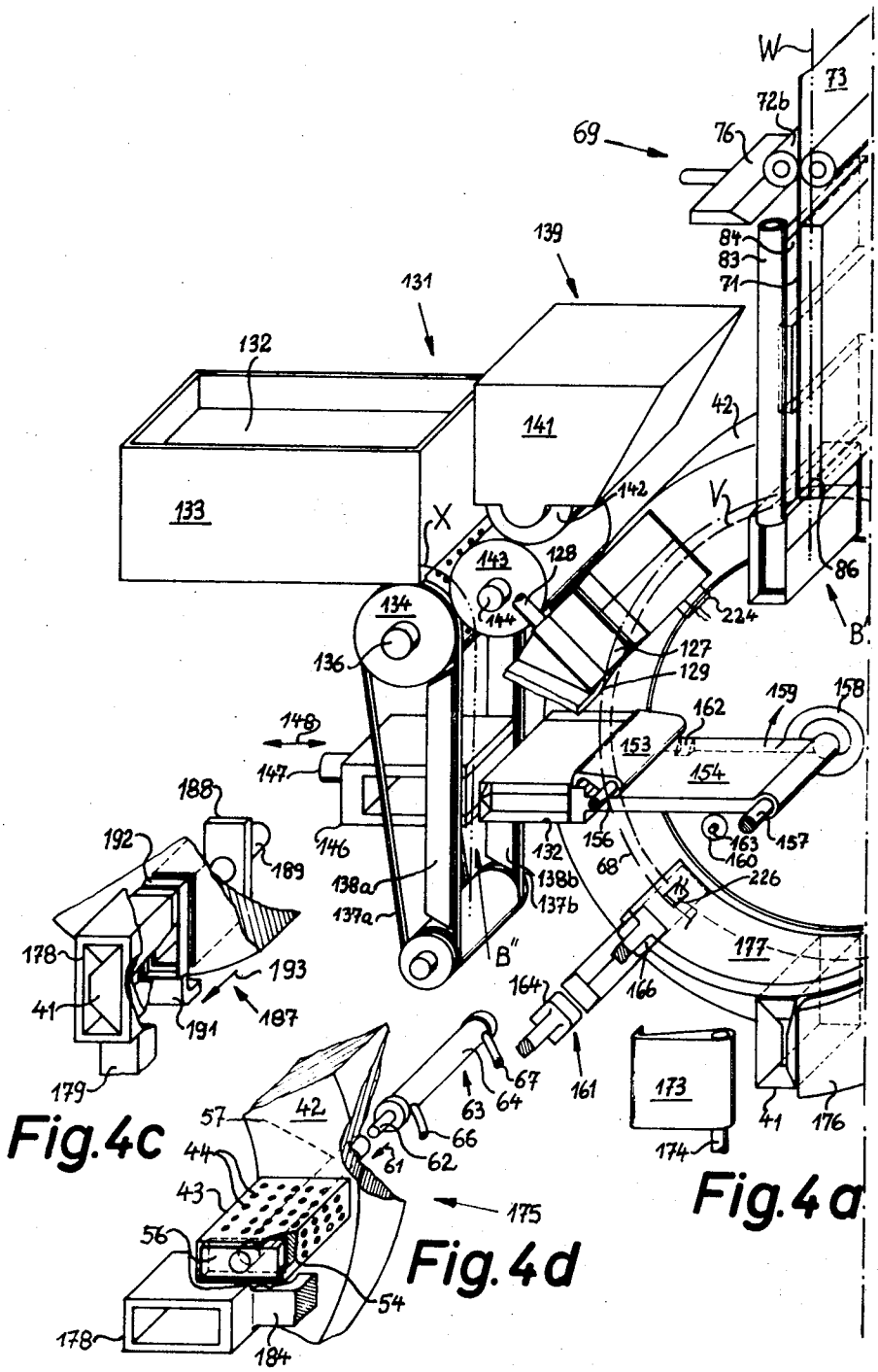


Fig.4c

Fig.4d

Fig.4a

INVENTORS:

FRIEDEL LOUSE
GUNTER WANKE
OTTOERDMANN
WILLY RUBSZINAT

BY Alfred I. Hübner

ATTORNEY

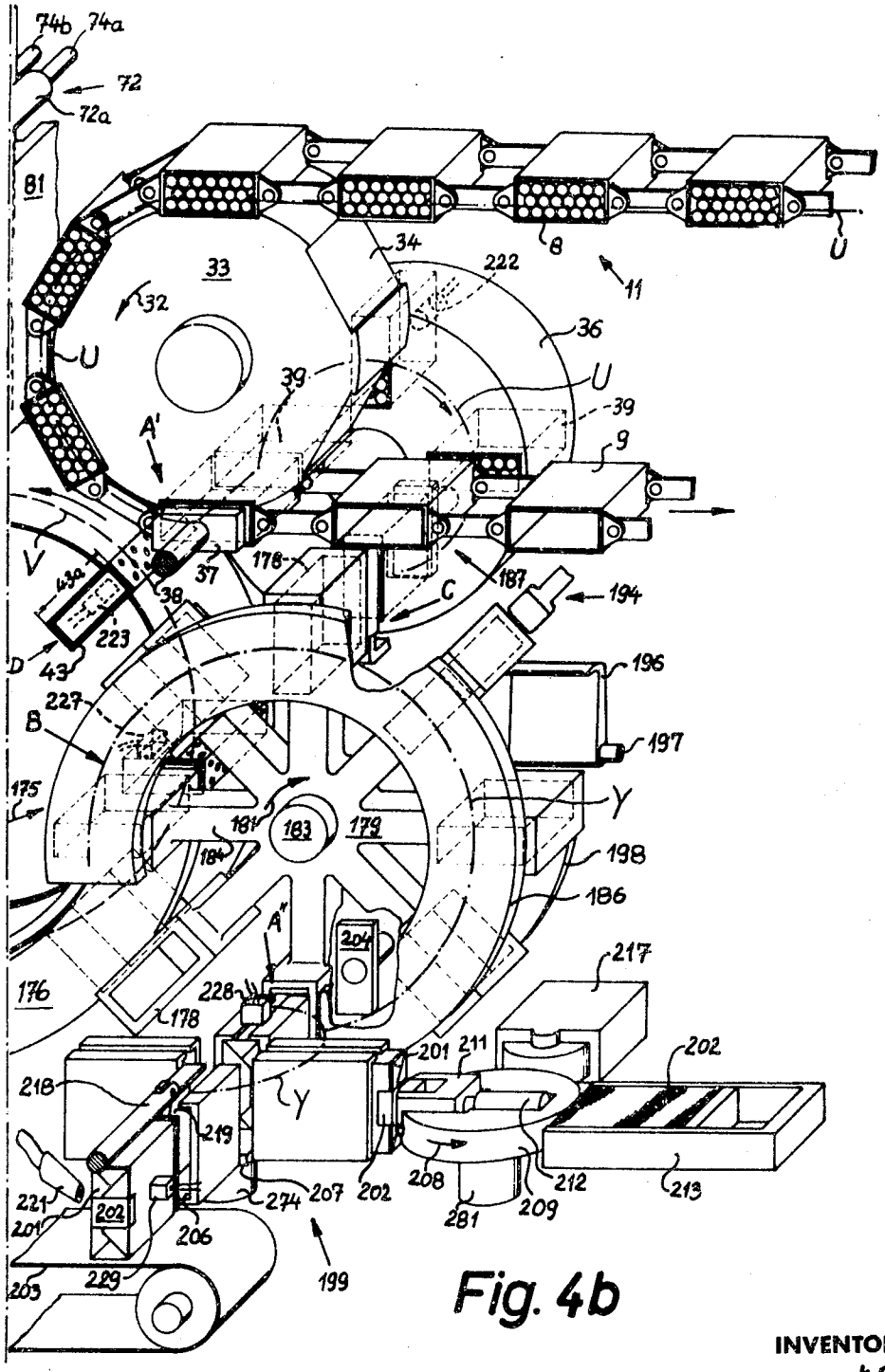


Fig. 4b

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERMANN
WILLY RUDSZINAT

BY Manfred J. Stelter

ATTORNEY

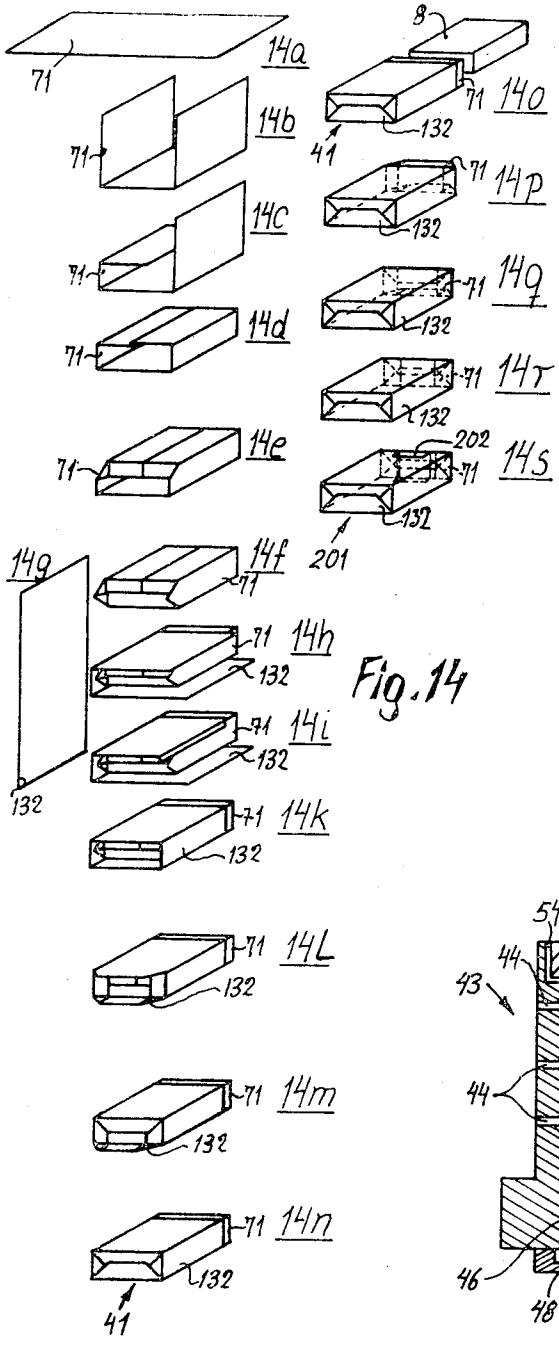


Fig. 14

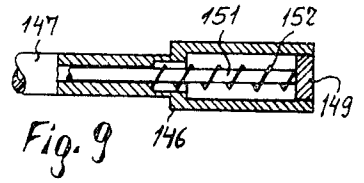


Fig. 9

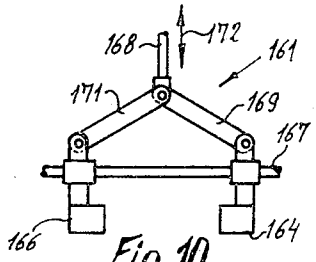


Fig. 10

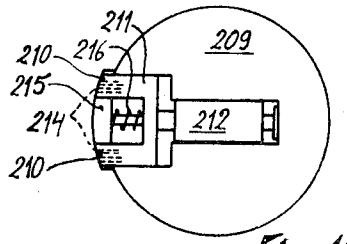


Fig. 11

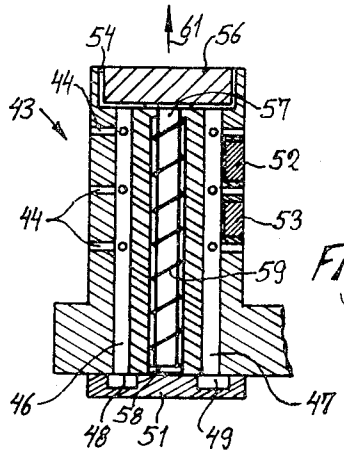


Fig. 5

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUDSZINAT

BY Norman J. Stubbs

ATTORNEY

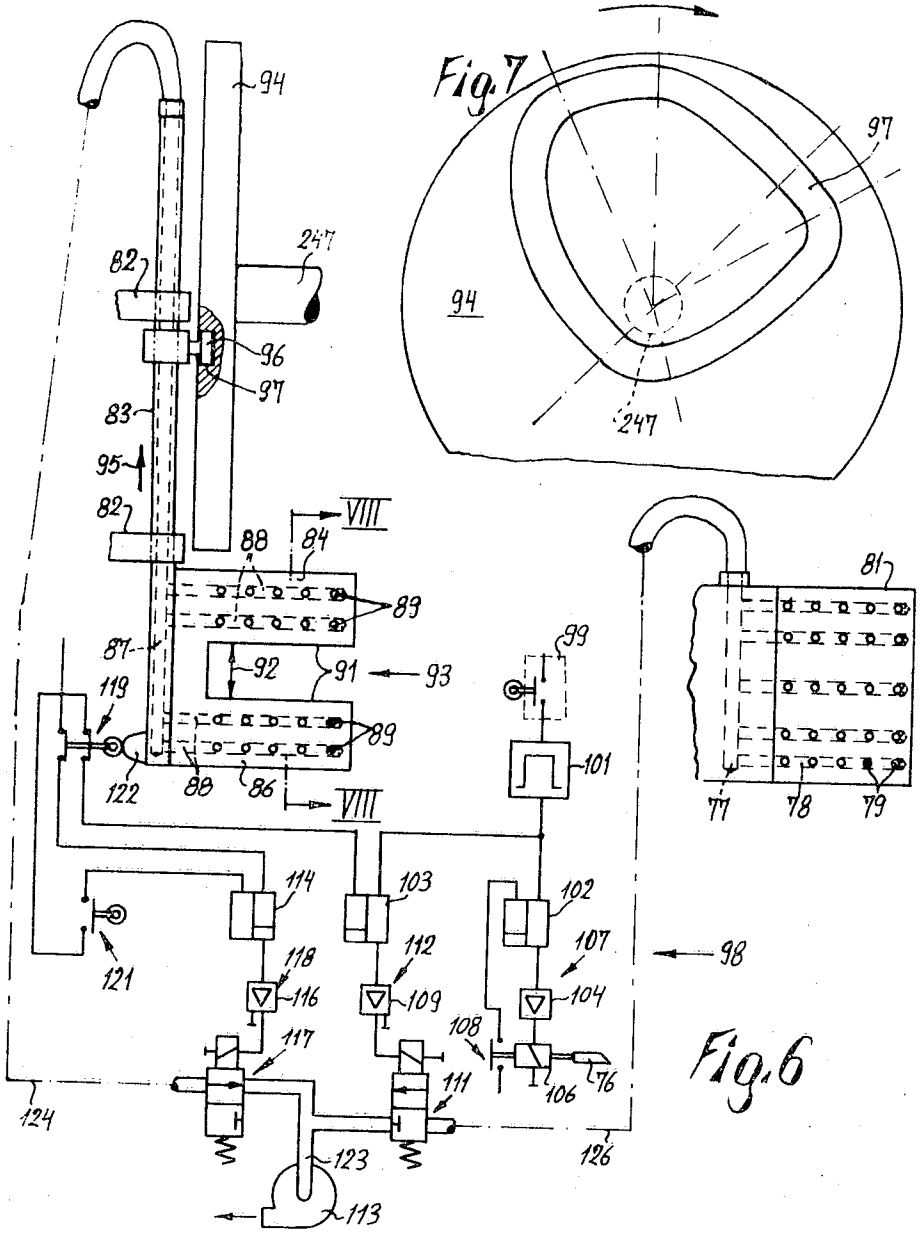


Fig. 6

Fig. 7

INVENTORS:

FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUDZINAT

BY

ATTORNEY

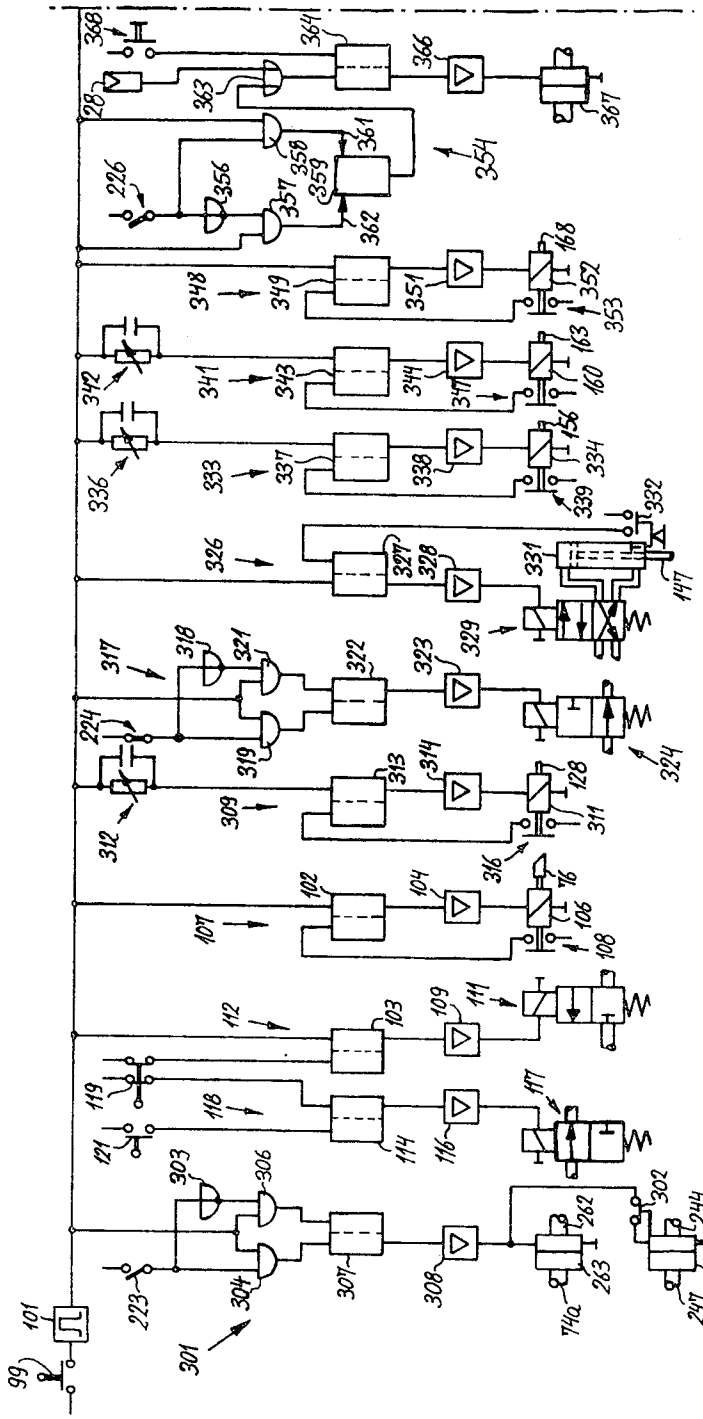


Fig. 13a

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHDE
OTTO ERDMANN
WILLY RUDSZINAT
BY
ATTORNEY

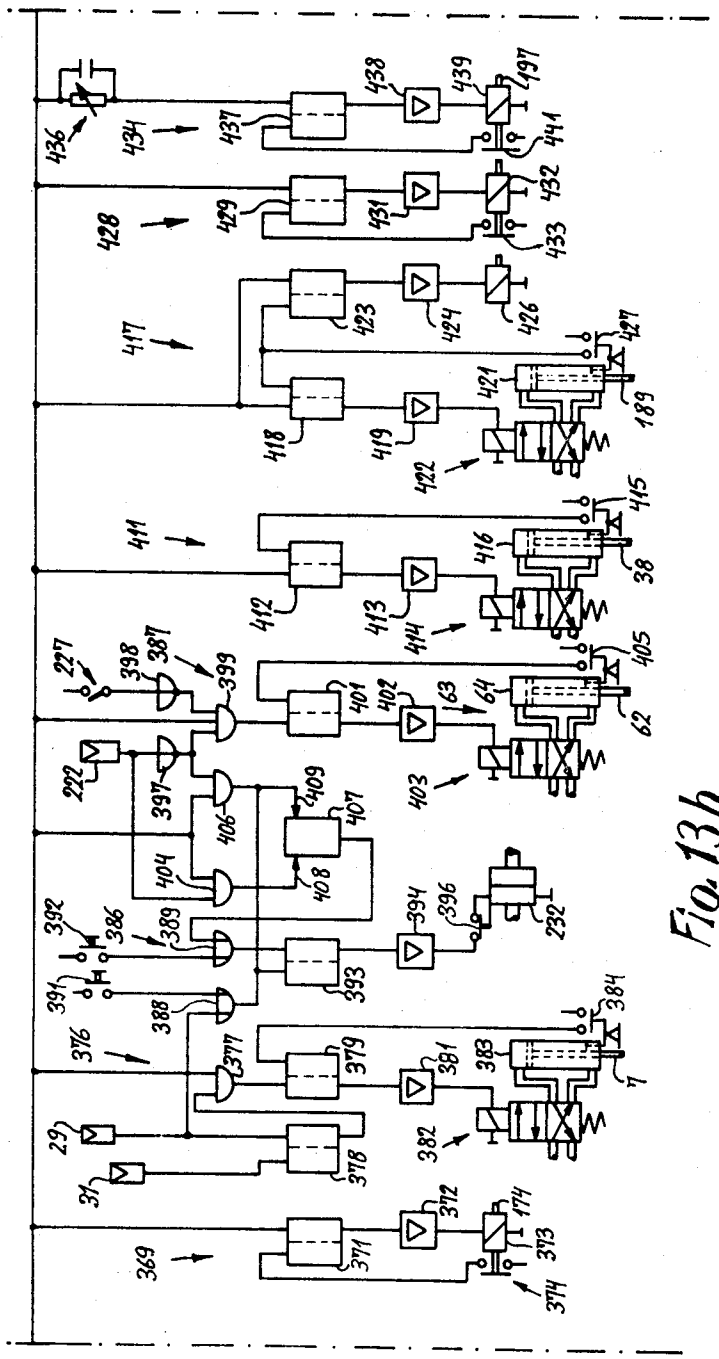


Fig. 13b

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUDSZINAT
BY Michael J. Striker
ATTORNEY

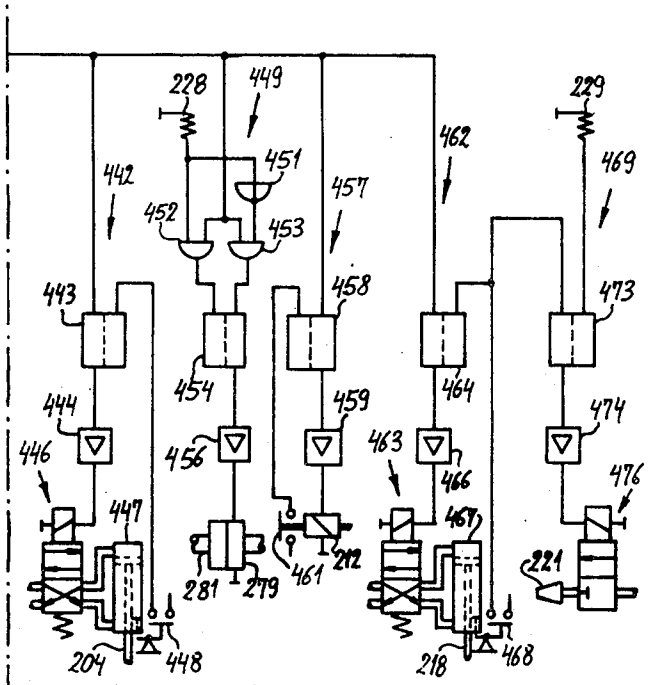


Fig. 13c

INVENTORS:
FRIEDELKRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUßLINAT
BY
ATTORNEY

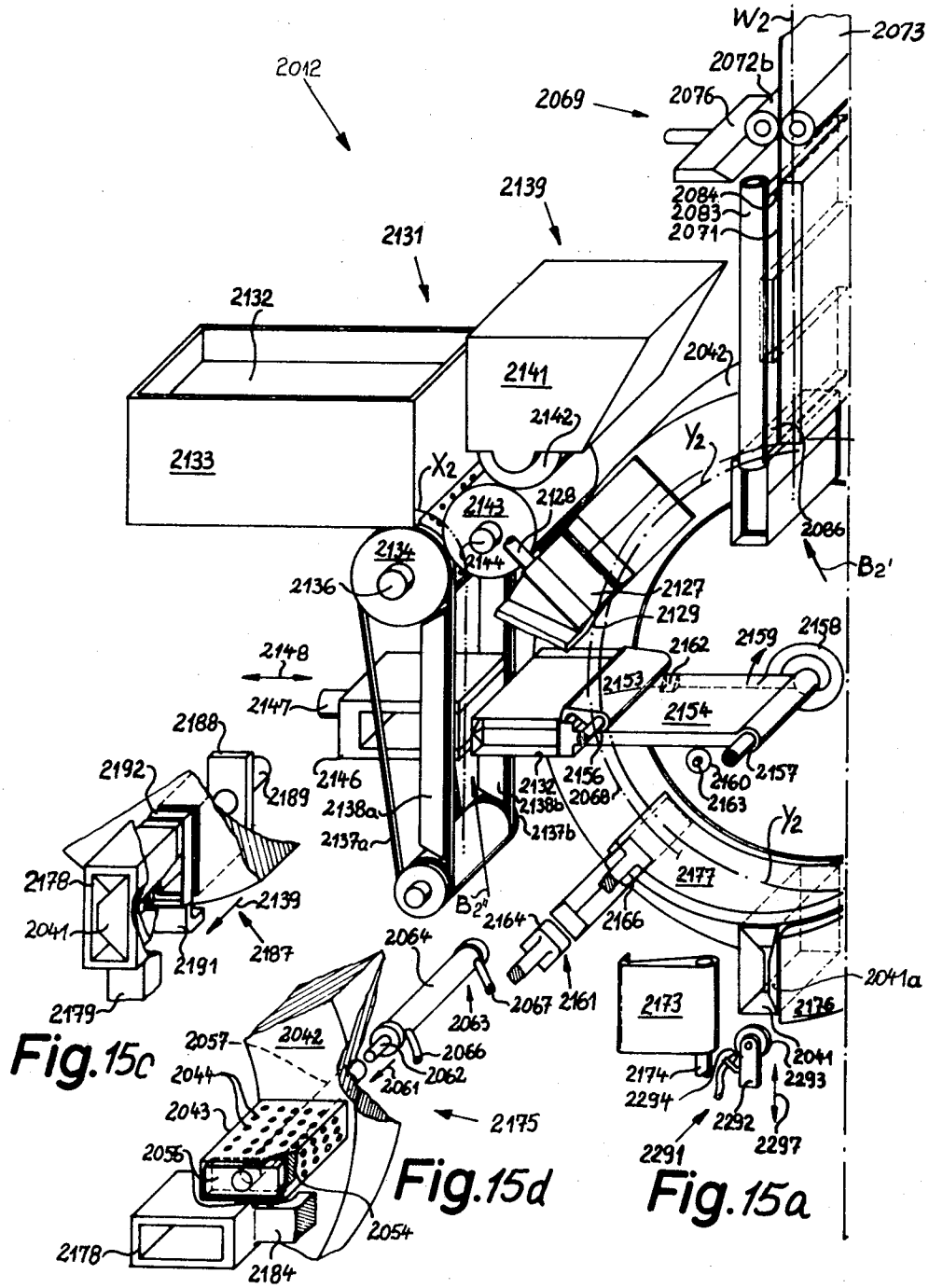


Fig. 15c

Fig. 15d

Fig. 15a

INVENTORS:
FRIEDEL KRUSE
GÜNTER HAHLE
OTTO ERMANN
WILLY RUNSZINAT
BY Michael J. Striker
ATTORNEY

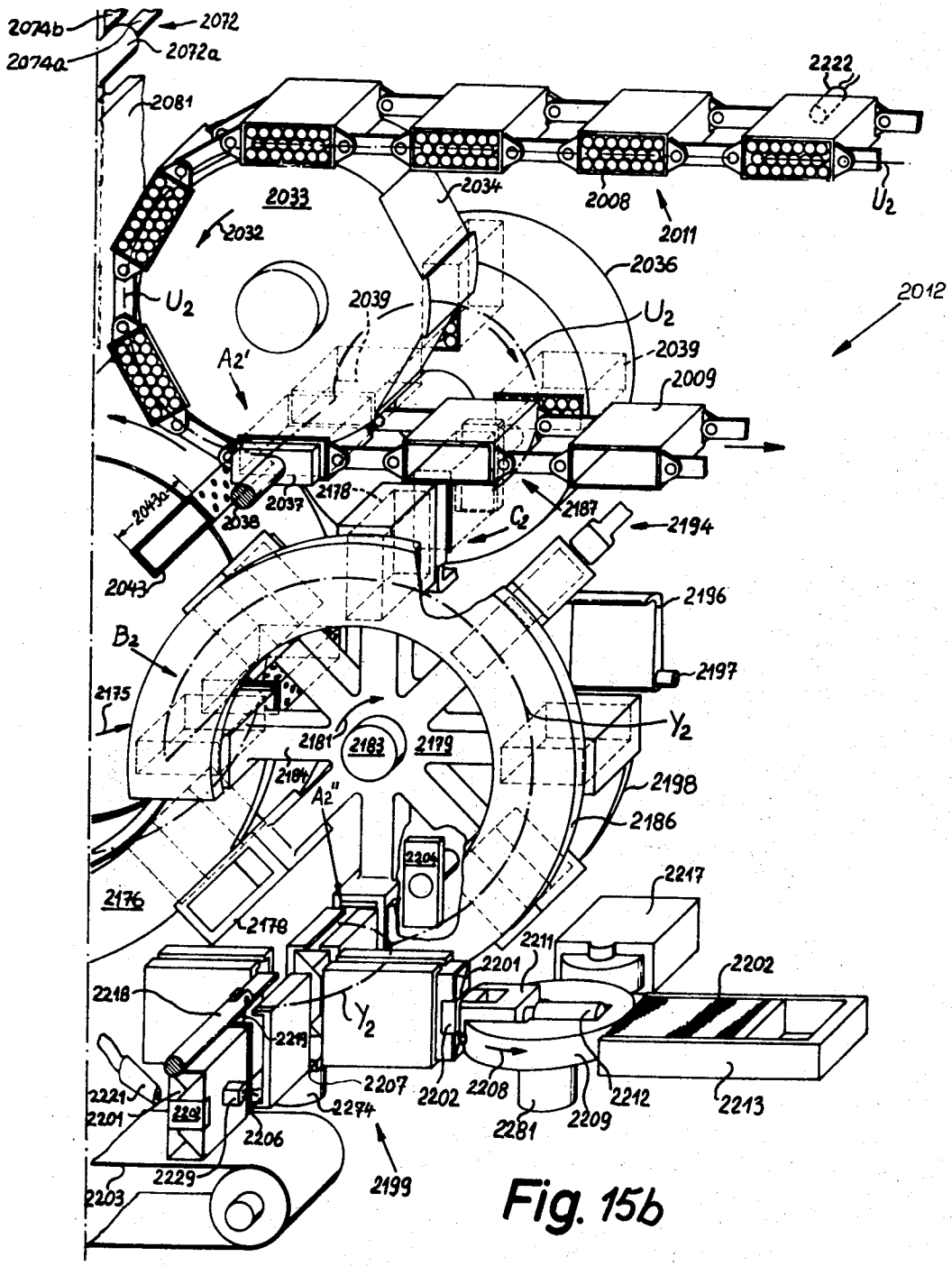


Fig. 15b

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO EHMANN
DILLY RUDSZINAT
BY Richard J. Streich
ATTORNEY

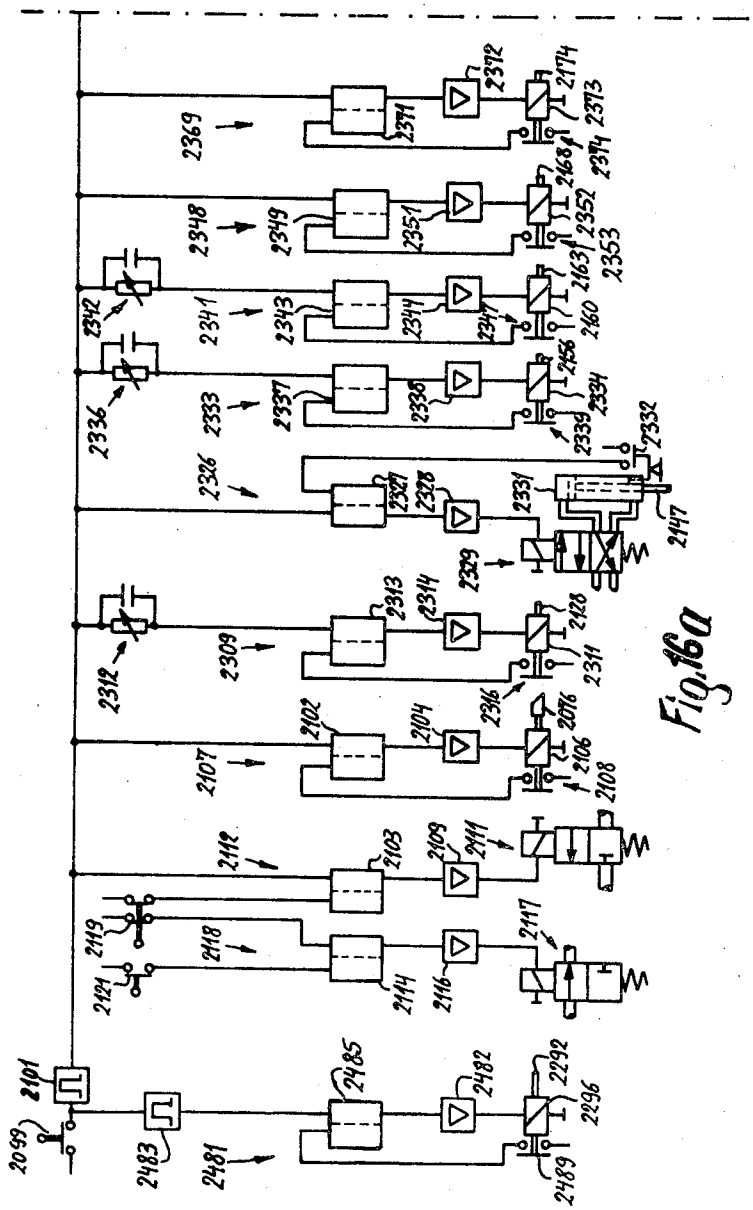


Fig. 16a

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUDSZINAT
BY Richard S. Sciascia
ATTORNEY

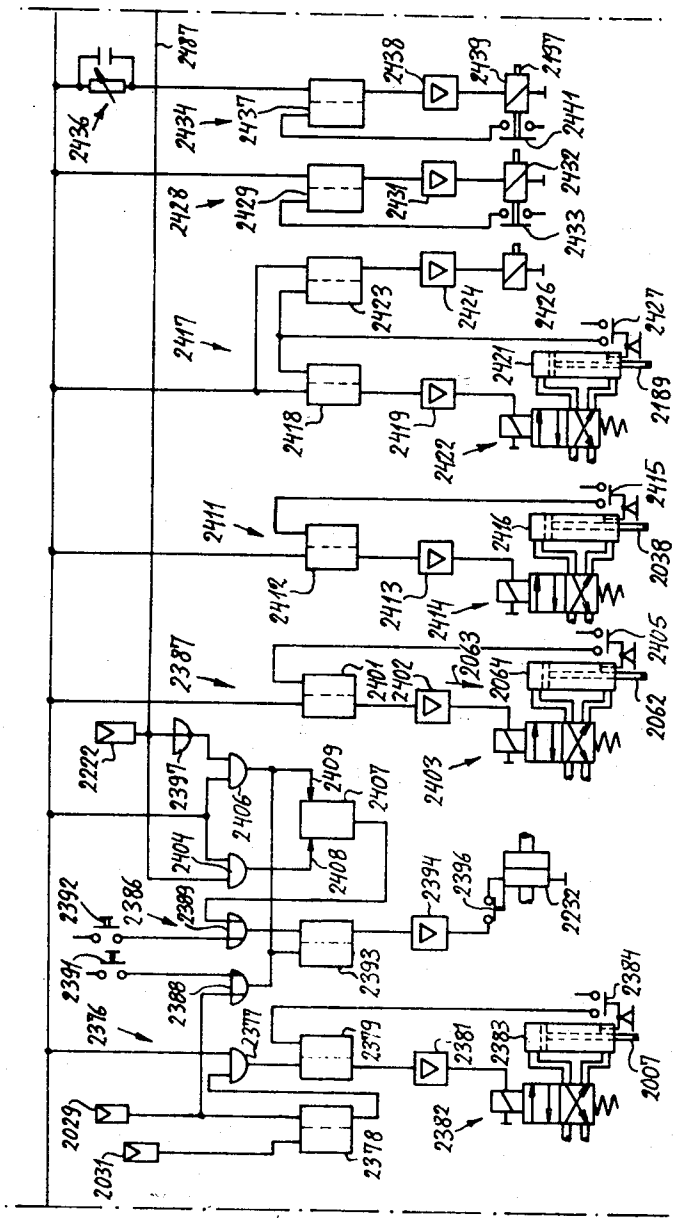


Fig. 16b

INVENTORS:

FRIEDEL KRAUSE
GÜNTER WAHDE
OTTO ERDMANN
VILLY RUDSZINAT

BY Michael J. Striker

ATTORNEY

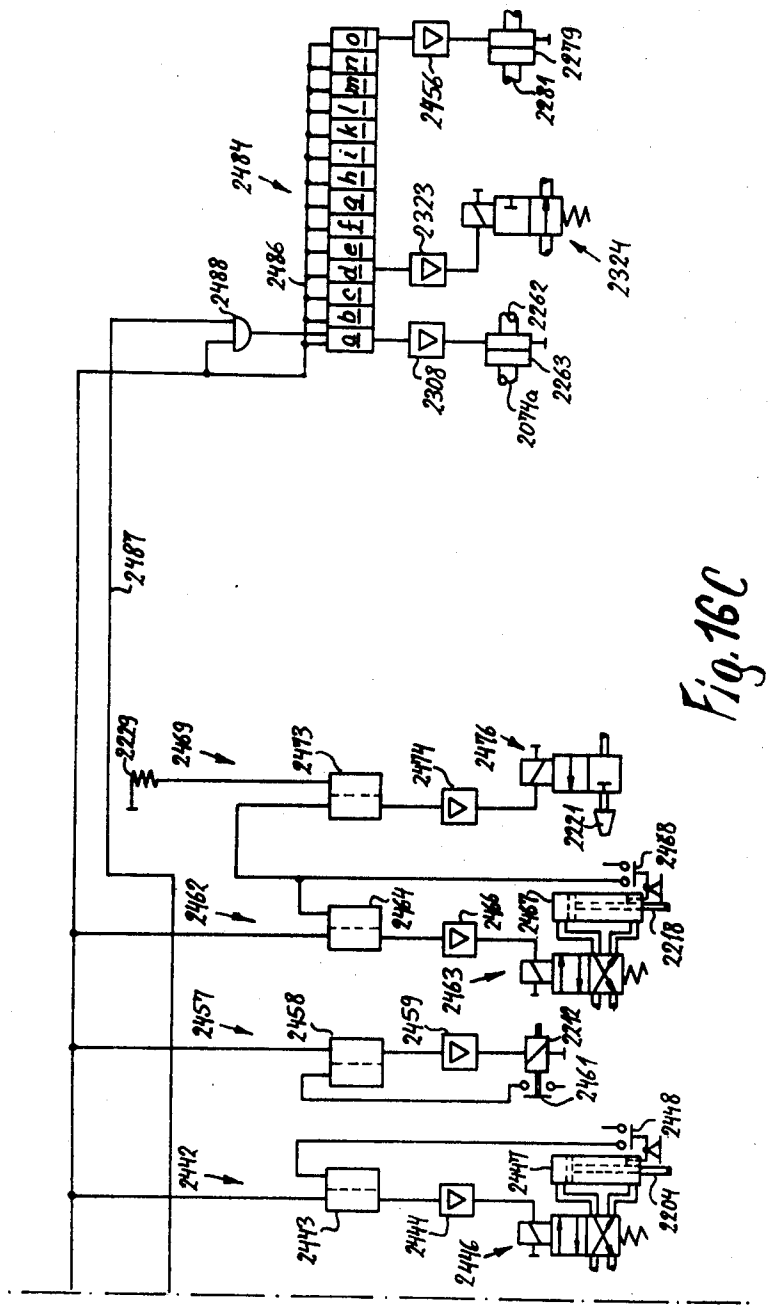


Fig. 16C

INVENTORS:
FRIEDEL KRUSE
GÜNTER WAHLE
OTTO ERDMANN
WILLY RUDSZINAT
BY Milton I. Wilder
ATTORNEY

METHOD AND MACHINE FOR THE PRODUCTION OF CIGARETTE PACKS OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to a method and to a machine for the making of packs or analogous containers for groups of cigarettes or other commodities. More particularly the invention relates to improvements in a method and machine for the making, filling and closing of soft packs, hinged-lid packs, or analogous containers for reception of groups of cigarettes, cigars, cigarillos cheroots and/or other commodities.

Packing machines constitute important components of production lines for plain or filter cigarettes, cigars, cigarillos and/or other tobacco-containing products. Reliability is one of the most important requirements which must be met by a modern packing machine, especially if the packing machine is to receive the output of one or more high-speed machines for the production of plain or filter cigarettes, as well as when the packing machine is directly coupled to one or more high-speed producing machines. Even short-lasting interruptions in the operation of a packing machine can cause substantial losses in output and costly interruptions in the operation of associated producing machines. Since a producing machine (for example, a machine for the mass-production of plain or filter cigarettes) is much more likely to require attention than a packing machine, the number of attendants in a production line for cigarette packs is normally selected in such a way that each attendant is practically continuously occupied with the producing machine or machines and can give little attention to packing machine or machines which receive the output of the corresponding producing machines. For example, a modern cigarette making machine consumes a bobbin of cigarette paper within a few minutes so that the expiring web must be spliced to the leading end of a fresh web at frequent intervals. If the splicing devices which are used in the cigarette making machines must be manipulated by hand, an attendant must be present almost continuously to make sure that a fresh reel of cigarette paper is at hand and that the leading end of the web on the fresh reel is spliced to the expiring web without excessive delay. Since a cigarette making machine can produce up to 4,000 cigarettes per minute, even short-lasting interruptions in its operation must be avoided whenever possible. The attendant who is in charge of a cigarette making machine must further supervise the supply of adhesive in the paster which delivers adhesive to the running web of cigarette paper, check the delivery of shredded tobacco to the distributor of the machine, and perform certain other operations so that his or her attention is mostly focussed on the producing machines. Therefore, the packing machines which receive the output of mass-producing cigarette making machines are preferably constructed and controlled in such a way that they are arrested in automatic response to stoppage of the corresponding producing machine or machines and that they are started in automatic response to starting of such producing machines, regardless of whether the producing machines are arrested due to a defect or on purpose.

A drawback of presently known direct connections between the controls of producing and packing machines is that a packing machine is likely to be arrested while its parts perform an operation which must be completed in order to avoid the making of a defective pack. For example, if a strip of conventional (wet) adhesive is left exposed for a certain period of time, it is likely to set or dry so that it cannot properly connect two overlapping portions of a pack when the packing machine resumes its operation. Analogously, it is undesirable to interrupt certain folding, tucking or like operations which are carried out in the packing machine to convert one or more blanks into a pack, for example, into a pack containing an inner envelope consisting of tinfoil and an outer envelope consisting of plastic, paper or cardboard.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved method of making, filling and sealing packs for cigarettes, cigars, cigarillos or other types of commodities, particularly for the making of packs which are to receive commodities as soon as they issue from one or more producing machines, such as machines for the production of plain or filter cigarettes.

Another object of the invention is to provide a method of making, filling and sealing cigarette packs or like containers for tobacco-containing products or other commodities according to which the quality of packs is not dependent on the frequency and length of interruptions in the operation of machines which produce commodities for introduction into such containers.

A further object of the invention is to provide a method according to which packs or analogous containers for tobacco-containing products or other commodities can be produced with a high degree of uniformity and with a minimum of waste in the material of packs as well as in commodities which are to be received in the packs.

An additional object of the invention is to provide a novel and improved packing machine, particularly a machine for packing groups or blocks of rod-shaped tobacco-containing articles, which can be directly coupled to one or more producing machines and requires a minimum of supervision so that the attendant or attendants can concentrate on the supervision and servicing of the producing machines.

Still another object of the invention is to provide a packing machine which can store a desired number of empty packs for immediate reception of commodities as soon as the associated packing machine or machines are started and which can continue to produce packs during the periods of idleness of producing machines.

An additional object of the invention is to provide a packing machine which can be combined with existing producing machines, whose operation is fully automatic, which can be started and/or arrested without any attention on the part of workmen, and which can process the output of one or more high-speed producing machines, particularly machines for the production of plain cigarettes, filter cigarettes and/or other tobacco-containing products.

An ancillary object of the invention is to provide the improved packing machine with novel means for the formation and feeding of blanks which are used for the making of empty containers, for the transport of parts on which the blanks are deformed to form empty packs, for temporary storage of empty containers, for scanning of containers for the presence or absence of defects, and for performing several other operations

which contribute to the reliability, higher output and versatility of the packing machine.

Still another object of the invention is to provide the packing machine with a novel control system which insures that the packing machine is stopped without any supervision and in an optimum position of each of its component parts when such stoppage is dictated by the condition of the associated producing machine or machines, and that the packing machine is started without any supervision as soon as the starting becomes desirable in view of the condition of the associated producing machines.

A further object of the invention is to provide a packing machine which can produce acceptable containers when it operates continuously or when its operation is interrupted at frequent or infrequent intervals.

A concomitant object of the invention is to provide a packing machine which is particularly suited for the packing of cigarettes or other rod-shaped tobacco-containing products as soon as they issue from one or more producing machines.

The method of the present invention can be employed for the making, filling and treatment of containers, particularly packs for reception of groups of rod-shaped tobacco containing articles or analogous commodities, and comprises the steps of conveying commodities along a first path (for example, in the cells of an endless chain or analogous transporting means), scanning the first path (for example, by a photosensitive detector) to detect the presence or absence of commodities in a selected portion of the path, establishing at least one source of deformable bodies each of which constitutes at least a portion of a container (such source may include two or more discrete sources of blanks which can be converted into containers or a supply of prefabricated empty containers), withdrawing from the source a body in response to detection of a commodity in the first path and conveying the thus withdrawn body along at least one second path into a third path, conveying the thus transferred body and the corresponding commodity (namely, that commodity whose detection triggered the withdrawal of the respective body from the source) to a filling station, assembling the commodity with the body at the filling station (if the body is a finished empty container, the assembling step comprises introducing the commodity into the container), and thereupon subjecting tee resulting assembly (e.g., a filled container) to at least one treatment which may include closing and sealing the open end of the filled container and/or the application of a tax stamp if the commodities are arrays of rod-shaped tobacco-containing articles such as plain or filter cigarettes.

A feature of the just described method resides in that the commodity whose detection triggered the introduction of a body into the third path is thereupon assembled with the thus introduced body, i.e., that the withdrawal of a body from the source takes place only when a commodity (namely, the scanned commodity) is certain to arrive at the filling station.

If the container comprises several components, for example, an envelope consisting of tinfoil and an envelope consisting of paper, plastic or cardboard, each such component is withdrawable from a discrete source along a separate second path. The withdrawing step then comprises withdrawing components from the respective discrete sources and conveying the thus withdrawn components along the respective second paths and into the third path. The method then also comprises the step of deforming the components to convert them into an empty container at least during transport along the third path so that the body which reaches the filling station is an empty container which is ready to receive the corresponding commodity.

Furthermore, if the containers are assembled of several components, the withdrawal of at least one of the components from the respective discrete source takes place prior to withdrawal of another component. This renders it possible to at least partially deform the one component prior to its assembly with the other component. For example, if the one component is a tinfoil blank, it can be converted into a tube or into an open-ended envelope prior to draping therearound of a paper blank which is thereupon converted into an outer envelope at least partially surrounding the tinfoil envelope. The two envelopes together constitute an open-ended empty container which can receive the corresponding commodity when it reaches the filling station.

The method preferably further comprises the step of regulating the speed of transport of the body and of the corresponding commodity in such a way that the body reaches the filling station simultaneously with the corresponding commodity.

If the aforementioned bodies constitute prefabricated empty containers, the method preferably further comprises the steps of establishing at least one source of deformable sheet-like blanks, withdrawing such blanks from the respective source and converting the thus withdrawn blanks into empty containers which are accumulated in the first mentioned source. The withdrawal of blanks from the respective source can take place in response to detection of commodities or independently of such detection, i.e., the containers can be fabricated only in response to detection of commodities or independnetly of the transport of commodities along the first path. If the containers are produced independently of the transport of commodities, the first mentioned source may constitute of magazine or reservoir wherein the empty containers are stored and are ready to be withdrawn in immediate response to detection of commodities along the first path. In each instance, the detected commodity is introduced into that container whose arrival at the filling station was caused by such detected commodity.

In accordance with a presently preferred embodiment of the method, the commodities and the bodies are transported in stepwise fashion, preferably in such a way that each transport takes up a first predetermined interval of time, and that each stepwise advance is followed by a second predetermined interval of dwell. If the empty containers are formed by blanks which undergo deformation, coating with adhesive, heating, cooling and/or other treatments during travel along the second and/or third paths, each such treatment is preferably started and terminated during a period of time which does not exceed the combined length of a first and a second interval. This is desirable in order to insure that freshly applied adhesive cannot be exposed for extended periods of time. In accordance with still another feature of the invention, the stepwise advances of commodities and bodies and the aforementioned treatment or treatments of blanks in the third and/or second paths cannot be interrupted so that each stepwise advance is completed and each treatment is

also completed before the operation of the machine which is constructed for the practice of our method can be interrupted or terminated. This reduces the number of rejects and the likelihood of damage to or contamination of the machine.

The adhesive which is applied to one or more selected portions of the bodies, for example, to selected portions of paper blanks which are thereupon converted into outer envelopes of cigarette packs, can be a wet adhesive which sets in response to heating or a heat-activatable adhesive which produces a reliable bond in response to heating and, if necessary, in response to subsequent cooling.

In accordance with still another feature of our method, the commodities are introduced into the first path as soon as or immediately after they are produced. This can be achieved by delivering the output of one or more cigarette machines or other producing machines directly to the conveyor which transports the commodities past the detecting or scanning station. The method can be practiced with particular advantage for the making of packs containing arrays of plain cigarettes, filter cigarettes, plain or filter cigars or cigarillos and/or other rod-shaped tobacco-containing articles.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved packing machine 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 is a schematic plan view of a production line for cigarettes and cigarette packs including two producing machines and two packing machines, one of the packing machines being constructed in accordance with a first embodiment of the present invention and being designed to produce soft cigarette packs;

FIG. 2 is an enlarged fragmentary partly side elevational and partly sectional view of a portion of the novel packing machine and illustrates a magazine of the novel packing machine as seen in the direction of arrow II shown in FIG. 1;

FIG. 3 is a plan view of the structure shown in FIG. 2;

FIG. 4 (composed of FIGS. 4*a* and 4*b*) is an enlarged perspective view of essential component parts of the novel packing machine;

FIG. 4*c* is a perspective view of a pack filling unit in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 4*d* is a perspective view of a transfer unit in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 5 is an enlarged longitudinal sectional view of a mandrel in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 6 is a diagrammatic partly sectional view of certain parts of a blank forming apparatus in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 7 is a fragmentary front elevational view of a cam in the structure of FIG. 6;

FIG. 8 (composed of FIGS. 8*a*, 8*b*, 8*c* and 8*d*) is a sectional view as seen in the direction of arrows from the line VIII—VIII of FIG. 6 and illustrates various stages in the conversion of a tinfoil blank into a tube in the apparatus of FIG. 6;

FIg. 9 is a sectional view of a portion of a draping member for deformation of paper blanks in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 10 is an elevational view of a tucking device in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 11 is a plan view of a portion of a tax stamp applicator in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 12 is a perspective view of the drive for the moving parts of the packing machine shown in FIGS. 4*a* and 4*b*;

FIG. 13 (composed of FIGS. 13*a*, 13*b* and 13*c*) illustrates the control system of the packing machine shown in FIGS. 4*a* and 4*b*;

FIG. 14 (including the portions 14*a* –14*k* and 14*m*–14*s*) illustrates the conversion of two blanks into an empty pack, the filling of the pack, the closing of the filled pack, and the application of a tax stamp to the closed pack in the packing machine of FIGS. 4*a* and 4*b*;

FIG. 15 (composed of FIGS. 15*a* and 15*b*) is a perspective view of essential component essential component parts of a second packing machine which constitutes a modification of the machine shown in FIGS. 4*a* and 4*b*;

FIG. 15*c* is a perspective view of a pack filling unit in the packing machine of FIGS. 15*a* and 15*b*;

FIG. 15*d* is a perspective view of a transfer unit in the packing machine of FIGS. 15*a* and 15*b*; and

FIG. 16 (componsed of FIGS. 16*a*, 16*b* and 16*c*) illustrates the control system of the packing machine shown in FIGS. 15*a* and 15*b*.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is shown a production line for the manufacture of packs containing arrays of filter cigarettes. The production line includes two series-connected producing machines and two series-connected consuming machines. The producing machines include a cigarette rod making machine 1, for example, a machine of the type known as GARANT (produced by the firm HAUNI-WERKE, KÖRBER & CO. KG, 205 Hamburg 80, Western Germany) and a filter tipping machine 2, for example, a machine of the type known as MAX (manufactured by HAUNI-WERKE, KÖRBER & CO. KG). The connection between the two producing machines is established by a rotary transfer drum 3 which receives plain cigarettes from the machine 1 and transfers such cigarettes into the filter tipping machine 2. It is clear that the two producing machines can be replaced with other types of producing machines without departing from the spirit of the present invention.

The filter tipping machine 2 discharges filter cigarettes into a magazine 4 which is provided with a transfer member or pusher 7 reciprocable in directions indicated by a double-headed arrow 6 and serving to transfer groups or blocks of filter cigarettes into successive cells 9 of an endless transporting chain 11. Each group of cigarettes may consist of twenty filter cigarettes in the customary array, namely, two outer layers of seven filter cigarettes each and a median layer containing six filter cigarettes. The filter cigarettes of the median layer are preferably staggered with reference to the filter cigarettes of the two outer layers. In FIG. 2, the groups or blocks of filter cigarettes 22 are shown at 8.

The chain 11 constitutes a conveyor which transports groups 8 of filter cigarettes 22 in a first consuming ma-

chine **12** here shown as a packing machine which serves to produce open empty packs **41** (see FIGS. **4***a* and **4***b*) and thereupon introduces groups **8** into such empty packs to convert them into filled packs and closes the open end of each filled pack to form a closed or sealed pack **201** (FIG. **4***b*). The packing machine **12** is further provided with a device (hereupon called applicator and numbered **199** in FIG. **4***b*) which serves to apply to one end of each closed pack **201** a tax stamp **202.** The thus stamped packs **201** are thereupon introduced into a second consuming machine **13** which also constitutes a packing machine and serves to provide each pack **201** with a transparent envelope consisting of synthetic plastic material and preferably provided with a customary tear strip.

The packs **41** which are produced in the first packing machine **12** are so-called soft packs. In the embodiment which is illustrated in FIGS. **1** to **13,** the packing machine **12** is designed to form soft empty packs **41** each of which comprises two envelopes or layers, namely, an inner layer consisting of tinfoil, and an outer layer consisting of paper which is preferably provided with suitable printed matter including the trade mark, the name of the manufacturer, the customary warning of the dangerous nature of tobacco, and other printed matter and/or symbols.

The second packing machine **13** may be of the type known as TRABANT (produced by HAUNI-WERKE). The details of the second packing machine **13** and the details of the producing machines **1** and **2** form no part of the present invention. An important feature of the production line shown in FIG. **1** is that the second producing machine **2** delivers groups **8** of arrayed rod-shaped articles **22** directly to the receiving end of a path U (see FIG. **4***b*) defined by the chain **11** and a further conveyor **36** and serving for transport of groups **8** to the pack filling station C of the packing machine **12.** The details of the packing machine **12** are illustrated in FIGS. **2** to **13.**

The magazine **4** of FIGS. **2** and **3** forms part of the packing machine **12** and comprises a receptacle of hopper **14** the upper portion of which receives filter cigarettes **22** from a conveyor belt **23** which preferably receives filter cigarettes directly from the filter tipping machine **2.** The lower portion of the hopper **14** is provided with two vertical internal partitions or walls **16** and **17** which define with the outer walls of the lower portion of the hopper three parallel vertical ducts **18, 19, 21** each of which can accommodate a stack or row of parallel horizontal filter cigarettes **22.** For the sake of simplicity, the commodities which are packed by the machine **12** will hereinafter be referred to as cigarettes.

FIGS. **2** and **3** further show the details of the chain **11.** This chain comprises a set of cells **9** which are coupled to each other by means of links **24** and are arranged to travel about two sprocket wheels of which only the sprocket wheel **27** is shown in FIGS. **2** and **3.** FIG. **2** further shows that the periphery of the sprocket wheel **27** is provided with sockets **26** each of which can receive a portion of a cell **9** so that the chain **11** cannot slip with reference to the sprocket wheel. The sprocket wheel **27** is located behind the lower portion of the hopper **14,** as viewed in FIG. **2,** and the pusher **7** (see particularly FIG. **3**) has three parallel plate-like prongs each of which can enter into and be retracted from one of the ducts **18, 19, 21.** When the pusher **7** performs a working stroke (upwardly, as viewed in FIG. **3**), its prongs expel a group **8** into the adjacent empty cell **9.**

The magazine **4** is further provided with three photoelectric detectors or level indicators **28, 29, 31** which respectively serve to scan an uppermost, a medium and a lowermost level of cigarettes **22** in the hopper **14.** The purpose of the detectors **28, 29** and **31** will be described in detail with reference to FIGS. **13***a*, **13***b* and **13***c*. It suffices to say here that each of the detectors **28, 29, 31** comprises a light source which is mounted in one wall of the hopper **14** (see FIG. **3**) and a photosensitive receiver which is in registry with the respective light source and is mounted in the opposite wall of the hopper **14.**

Referring now to FIGS. **4***a* and **4***b*, there are shown all important components of the packing machine **12.** The path along which the transporting means, namely, the endless chain **11** and the conveyor **36,** transports the groups **8** of arrayed cigarettes **22** is denoted by the reference character U. The second sprocket wheel for the chain **11** is shown at **33.** This sprocket wheel is driven at regular intervals in the direction indicated by arrow **32** and is provided with sockets **34** for portions of the cells **9** so that the chain **11** cannot slip with reference to the sprocket wheel **33.** The drive which indexes the sprocket wheel **33** at regular intervals will be described with reference to FIG. **12.** FIG. **4***b* illustrates a transfer station A′ where the contents (groups **8**) of filled cells **9** are evacuated by a transfer member or pusher **37** to be introduced into successive chambers **39** of the conveyor **36.** This conveyor is a turret which serves to subject the groups **8** to a condensing or compacting action. The pusher **37** receives motion from a piston rod **38** forming part of a pneumatic cylinder **416** shown in FIG. **13***b*. The construction of the turret **36** is similar to that of the condensing or compacting conveyor described in U.S. Pat. No. 1,608,163. In addition to serving as a part of transporting means for delivery of groups **8** of cigarettes **22** to the transfer station A′, the chain **11** also serves as a magazine for storage of a predetermined number of groups **8.** The number of such groups may vary but the maximum number is determined by the number of cells **9** which can be accommodated between the station where the cells receive groups **8** from the pusher **7** and the station A′ where the pusher **37** delivers such groups into the chambers **39** of the condensing or compacting turret **36.**

The packing machine **12** further comprises three additional basic assemblies, namely, one or more sources of deformable blanks consisting of sheet material (such sources together constitute a blank supplying means), and a converting assembly which receives blanks from the blank supplying means and deforms such blanks while the blanks travel along a predetermined path V to convert each blank into an open-ended empty pack **41,** and a transporting assembly which transports empty packs **41** along at least one endless path Y wherein the empty packs circulate and are ready to be united or assembled with groups **8** which are expelled or removed from successive chambers **39** of the compacting turret **36.** As stated before, each empty pack **41** comprises two envelopes one of which is telescoped into the other and consists of tinfoil. The outer envelope of each empty pack **41** consists of paper. Such packs are known as soft packs.

The converting assembly comprises a conveyor here shown as a turret **42** which is indexible at predetermined intervals and receives blanks from the blank sup-

plying means. The aforementioned path V is defined by the turret **42** which is provided with and/or travels along suitable deforming devices which subject the blanks to a series of deforming actions in order to convert such blanks into the respective envelopes of empty packs **41**. The deforming devices include draping, tucking and folding members which will be described later. Furthermore, the converting assembly comprises at least one paster which can apply adhesive to selected portions of paper blanks so as to insure that, upon deformation of selected portions of paper blanks, the portions which overlap are caused to adhere to each other and are held by the adhesive with a force which is sufficient to insure that the pack **41** does not open during subsequent processing in the packing machine **12**.

The turret **42** of the converting assembly is provided with a set of radially extending axially parallel mandrels **43** which are indexible to travel stepwise along the path V and to which the blanks are applied to be converted thereon into inner and outer envelopes so that they together form empty packs **41**. The details of a mandrel **43** are illustrated in FIGS. **4**d and **5**. As shown, the walls of each mandrel **43** are formed with suction ports **44**. The inner ends of the suction ports **44** communicate with longitudinally extending suction channels **46, 47** provided in the respective mandrel **43**, and the discharge ends of the channels **46, 47** can communicate with suction grooves **48, 49** provided in a stationary valve plate **51** which is adjacent to the path V. The grooves **48, 49** are connected with a suitable suction generating device, for example, with a suction fan. As the turret **42** travels about its axis, selected suction channels **46, 47** are moved into or from communication with the grooves **48, 49** to thereby connect or disconnect the suction ports **44** of the respective mandrel **43** from the suction fan.

One narrow side of each mandrel **43** is provided with two permanent magnets **52, 53** which are recessed into the respective wall of the mandrel. The purpose of the magnets **52, 53** is to temporarily attract a folding member which will be described later. The outer end face of each mandrel **43** is provided with a recess **54** for a reciprocable pack stripping member or plunger **56**. The plunger **56** is provided with a rod or stem **57** which is movable in a centrally located longitudinally extending bore of the mandrel **43** and is surrounded by a helical spring **59** which tends to retract the plunger **56** to the position shown in FIG. **5**. The spring **59** reacts against an internal surface of the body of the mandrel **43** and bears against a ring-shaped flange **48** provided at that end of the rod **57** which is remote from the plunger **56**. The means for moving the plunger **56** in the direction indicated by an arrow **61** shown in FIG. **5** comprises a pneumatic cylinder **63** shown in FIG. **4**d. The cylinder **63** comprises a piston rod **62** which can engage the free end of the rod **57** to expel the plunger **56** from the recess **54** against the opposition of the helical spring **59**. the cylinder **63** is stationary; it is mounted adjacent to the path of mandrels **43** and at a point where the flanged ends of the rods **57** do not travel along the stationary valve plate **51**. The cylinder **63** is of the double-acting type and its tubular body **64** comprises two ports **66, 67** one of which admits fluid when the other port permits fluid to escape from the respective chamber and vice versa. The stationary valve plate **51** extends along that portion of the path V which is indicated in FIG. **4**a by the broken line **68**.

The aforementioned blank supplying means of the converting assembly comprises a blank forming apparatus **69** which is shown in FIGS. **4***a*, **4***b* and **6**. The purpose of the blank forming apparatus **69** is to deliver to the mandrels **43** of the turret **42** a succession of tinfoil blanks **71** which are supplied along a path W. Such blanks **71** are delivered to successive mandrels **43** at the transfer station B' shown in FIG. **4**a. In the first stage of deformation of a blank **71**, the blank is draped around the respective mandrel **43** to form a tube open at both ends.

The blank forming apparatus **69** comprises a feeding device **72** including two driven rollers **72***a*, **72***b* which advance a web **73** of tinfoil lengthwise along the path W. The web **73** is drawn from a bobbin or reel, not shown, and passes through a suitable magazine with dancer rolls, not shown, which prevent excessive tensioning of web. The drive for the rollers **72***a*, **72***b* of the feeding device **72** comprises shafts **74***a*, **74***b* (shown at the top of FIG. **4***b*). The severing device which cuts the web **73** at regular intervals to form a succession of tinfoil blanks **71** comprises a knife **76**. A suction plate **81**, provided with suction ports **79** and suction channels **77, 78** shown in FIG. **6**, is positioned adjacent to the path W to temporarily retain the web **73** and the tinfoil blank **71** during transport toward the path V.

The apparatus **69** further comprises a carrier **83** which is movable up and down in ways **82** and is provided with two rigidly mounted draping elements or wings **84, 86**. It is to be noted that the parts **81, 83, 84** and **86** are shown in proper positions with reference to each other in FIG. **4***a* but not in FIG. **6**. The carrier **83** is provided with a suction channel **87** shown in FIG. **6**. The suction channel **87** communicates with suction channels **88** provided in the draping elements **84, 86**, and the suction channels **88** communicate with suction ports **89** of the draping elements **84, 86**. FIG. **6** further shows the edge faces **91** of the draping elements **84, 86**. The distance between the edge faces **91** is denoted by the reference numeral **92** and corresponds to the width **43***a* (see FIG. **4***b*) of a mandrel **43**. The draping elements **84** and **86** together form a substantially U-shaped draping member **93** (see FIG. **6**) whose function is to convert an originally flat tinfoil blank **71** into a U-shaped body which is partially draped around the respective mandrel **43**. The arrangement is such that the tinfoil blank **71** which is severed from the web **73** by the knife **76** overlies the suction ports ports **89** of the draping elements **84, 86** and the space between their edge faces **91**. The mandrel **43** is thereupon advanced through the space between the edge faces **91** whereby the tinfoil blank **71** is automatically draped around three surfaces of the mandrel.

The carrier **83** is movable up and down by a disk-shaped cam **94** (see the top of FIG. **6** and FIG. **7**). The cam **94** has a specially configurated endless cam groove **97** (see FIG. **7**) which receives a roller follower **96** provided on the carrier **83**.

The means for regulating and timing the movements of the knife **76** and carrier **83** in the apparatus **69** comprises a control arrangement **98** which is shown in FIG. **6**. The control arrangement **98** comprises a switch **99** which is connected in the circuit of the packing machine **12**. The switch **99** can transmit signals to a pulse shaper **101** which is connected with one input of a logical circuit **102** of a type known as flip-flop. The pulse shaper **101** is designed to furnish to the flip-flop **102**

substantially rectangular signals. The output of the pulse shaper **101** is further connected with one input of a second flip-flop **103.** Each of the flip-flops **102, 103,** is a bistable switching circuit having two inputs and a single output. Each flip-flop produces a continuous output signal until one of its inputs receives a signal which causes an interruption of the respective output signal. The output signal is interrupted until the other input of the respective flip-flop receives a resetting signal. It can be said that each flip-flop constitutes a signal storing device.

The flip-flop **102** is connected with the input of an amplifier **104** which is connected with an electromagnet **106** whose armature is rigid with the knife **76.** The parts **102, 104, 106** together constitute a control unit **107.** The purpose of the control unit **107** is to regulate the movements of the knife **76.** A resetting switch **108** can be closed by the armature of the electromagnet **106** to transmit a signal to the other input of the flip-flop **102** so as to restore the output signal to the amplifier **104.**

The second flip-flop **103** constitutes with an amplifier **109** and an electropneumatic solenoid-operated valve **111** a second control unit **112** which regulates the flow of air in a conduit **126** connected to a suction generating device here shown as a fan **113.** The conduit **126** is connected to the channel **77** of the suction plate **81** and with a conduit **123** which leads to the intake of the suction fan **113.** The conduit **123** is further connected with a conduit **124** which is connected to the suction channel **87** of the carrier **83.** The conduit **124** contains a second electropneumatic valve **117** which receives signals from the output of a third flip-flop **114** by way of an amplifier **116.** The parts **114, 116, 117** together constitute a third control unit **118** which regulates the evacuation of air by way of ports **89** in the elements **84, 86** of the draping member **93.**

The circuit of the flip-flop **114** comprises two limit switches **119, 121** which are located in the path of movement of an actuating member or trip **122** provided on the carrier **83.** The limit switches **119, 121** constitute resetting switches for the flip-flops **103, 114.**

The elements **84, 86** of the draping member **93** first convert successive tinfoil blanks **71** into U-shaped bodies. The transformation of blanks **71** into tubes is thereupon completed by the draping elements **84, 86** in a manner as shown in FIGS. **8***c* and **8***d*. Reference may also be had to FIG. **14** wherein the portion **14***a* illustrates a flat tinfoil blank **71.** The portion **14***b* of FIG. **14** illustrates the partially deformed blank **71** as it appears after it is taken over by a mandrel **43,** i.e., after the mandrel has stripped the blank **71** off the elements **84, 86** of the draping member **93.** The portion **14***c* of FIG. **14** illustrates the next step in the conversion of the blank **71** into a tubular body. This step is carried out by the draping element **84** (FIG. **8***c*). The conversion of a blank **71** into a tube (see the portion **14***d* of FIG. **14**) is completed by the draping element **86** in a manner as shown in FIG. **8***d*.

Referring again to FIG. **4***a*, the folding of the upper wide flaps at the front end of tinfoil tubes which have left the station B′ is carried out by a pivotable folding member **127** which is mounted on a shaft **128** and is adjacent to the path V between the stations B′ and B″. The operation which the member **127** performs is shown in the portion **14***e* of FIG. **14.** The shaft **128** is pivoted at regular intervals in synchronism with the operation of means for indexing the turret **42.**

A stationary folding member **129** is adjacent to the path V betweeen the pivotable folding member **127** and transfer station B″ and serves to perform the folding operation shown in the portion **14***f* of FIG. **14.**

The blank supplying means of the packing machine **12** further comprises a blank feeding apparatus **131** which is shown in FIG. **4***a*. This apparatus comprises a magazine **133** for a stack of prefabricated paper blanks **132.** Each paper blank can be provided with suitable inscriptions and other indicia, for example, the manufacturer's name, the trade mark, the customary warning which must be applied to cigarette packs, and/or others. The path along which the paper blanks **132** are fed from the magazine **133** to successive mandrels **43** which advance along the path V is shown at X. The transfer station where the path X merges into the path V is shown at B″. The means for withdrawing the lowermost paper blank **132** of the stack in the magazine **133** comprises a withdrawing roller **134** here shown as a suction drum which is rotatable by a horizontal shaft **136.** The shaft **136** receives motion from the drive of the packing machine. The feeding mechanism of the apparatus **131** further comprises two air-permeable bands **137***a*, **137***b*, whose right-hand stretches (as viewed in FIG. **4***a*) travel along two vertical suction chambers **138***a*, **138***b* so that the stretches which travel along the respective suction chambers can attract the marginal portions of the paper blank **132** which was drawn from the magazine **133** by the suction drum **134.** The purpose of the bands **137***a*, **137***b* is to temporarily hold a withdrawn paper blank **132** during the initial stage of draping around the tube obtained in response to partial conversion of the previously applied tinfoil blank **71** into an open-ended envelope.

The blank feeding apparatus **132** further comprises a customary paster **139** which costs selected portions of successive paper blanks **132** with strips of adhesive. The paster **139** comprises a tank **141** for a supply of adhesive. The bottom portion of the tank **141** supports a rotary roller **142** which draws a film of adhesive and transfers it onto a coating roller **143** which is driven by a shaft **144.** The configuration of the peripheral surface on the coating roller **143** is such that the roller **142** can apply adhesive only to selected portions of the roller **143,** namely, to those portions which are to transfer strips of adhesive to the adjacent paper blank **132.** The shaft **144** is rotated by the drive of the packing machine **12.**

The converting assembly of the packing machine **12** further comprises a reciprocable draping member **146** which is disposed in the space between the bands **137***a*, **137***b* and is movable in directions indicated by the double-headed arrow **148.** The means for reciprocating the draping member **146** comprises a piston rod **147.** When the draping member **146** performs a working stroke, namely, when it moves in a direction toward the right, as viewed in FIG. **4***a*, a paper blank **132** is held by the right-hand stretches of the bands **137***a*, **137***b*. The two plate-like prongs of the draping member **146** then convert the paper blank into a U-shaped body which partially surrounds the tinfoil tube on the adjacent mandrel **143.** The piston rod **147** is reciprocable by a pneumatic cylinder which will be described later.

The draping member **146** contains a plunger **149** which is shown in FIG. **9.** The plunger **149** is biased

outwardly by a helical spring **152** which surrounds its rod **151.** The manner in which the rod **151** can be shifted against the opposition of the spring **152** will be described later. The purpose of the plunger **149** is to insure that the partially deformed paper blank **132** assumes a predetermined position with reference to the adjacent mandrel **43** when the draping member **146** is being withdrawn.

Referring again to FIG. **4***a*, there are shown two pivotable folding members **153, 154** which complete the conversion of successive paper blanks **132** into tubes. The folding member **153** is pivotable by a shaft **156.** The folding member **154** consists at least in part of ferromagnetic material and is pivotable on a shaft **157.** A torsion spring **158** tends to turn the folding member **154** in the direction indicated by an arrow **159.** The folding member **154** performs the additional function of insuring that the seam formed by the overlapping portion of the paper blank **132** (after such blank is converted into a tube as shown in the portion **14***k* of FIG. **14**) cannot open before the adhesive which was applied by the coating roller **143** sets. The folding member **154** performs such function while the respective mandrel **143** moves from the station B'' toward a tucking device **161** which is located downstream of the blank feeding apparatus **131.** The folding member **154** has an inclined notch **162** whose function is to displace a spring-biased pin-shaped armature **163** forming part of an electromagnet **160.**

The details of the tucking device **162** are shown in FIGS. **4***a* and **10.** The purpose of the tucking device **161** is to fold the two small tucks or flaps against the adjacent end face of the respective mandrel **43** in a manner as shown in the portion **14L** of FIG. **14.** This tucking device has two tucking fingers **164, 166** each of which can simultaneously tuck a portion of the inner tube (consisting of tinfoil) and a portion of the outer tube (consisting of paper). The tucking fingers **164, 166** are reciprocable along a guide rail **167** and are connected to the armature **168** of an electromagnet **352** (shown in FIG. **13***a*) by two links **169, 171.** The armature **168** is reciprocable in directions indicated by a double-headed arrow **172** shown in FIG. **10.**

The converting assembly further comprises a pivotable folding member **173** (shown in the lower part of FIG. **4***a*) which is mounted on a shaft **174** and serves to perform a further operation in conversion of a tinfoil blank **71** and the corresponding paper blank **132** into an empty pack **41.** The purpose of the folding member **173** is to fold down one of the two wide flaps at the front end of the adjacent mandrel **43.** The function of the folding member **173** will be readily understood by looking at the portion **14***m* of FIG. **14.** The construction and mounting of the folding member **173** are similar to that of the folding member **127.** The folding member **173** merely folds the adjacent flap of the paper blank **132** because the corresponding flap of the tinfoil blank **71** has been folded by the folding member **127.** A heated stationary folding member **176** is mounted adjacent to the path V downstream of the pivotable folding member **173** and serves to complete the conversion of a pair of blanks **71, 132** into an empty pack **41.** This is clearly shown in the lowerpart of FIG. **4***a* where the front portion of the heated folding member **176** is about to fold the second flap at the forward end of the mandrel **43.** The folding member **176** thereupon remains in engagement with the freshly folded flap to heat the adhesive between the two abutting flaps and to thus insure the formation of an empty pack **41** which can stand the introduction of a group **8** at the station C and the additional treatments which are necessary to convert the pack **41** and its contents into a finished pack **201.** A stationary heating member **177** is adjacent to the path V and serves to heat the seam between the longitudinally extending overlapping portions of the paper tube while such tube advances with the respective mandrel **43** toward a transfer station B. The manner in which the folding member **176** and the heating member **177** can be heated forms no part of the present invention. For example, such parts can be provided with resistance wires or with infrared heaters. The heating member **177** is of arcuate shape so that it conforms to the outline of the adjacent portion of the path V.

The heretofore described components of the converting assembly in the packing machine **12** cooperate to convert blanks **71, 132** into empty packs **41** each of which has an open end to permit the introduction of a condensed or compacted group **8** consisting of twenty cigarettes **22.** It will be seen that the turret **42** forms part of the just described converting assembly. Furthermore, this turret constitutes a magazine for temporary storage of empty packs **41.** Thus, the path V not only serves for transport of blanks **71, 132** during conversion of such blanks into empty packs **41** but also for temporary storage of empty packs.

Certain empty packs **41** which travel along the path V and reach the transfer station B are transferred into the pockets **178** of an assembly conveyor **179** here shown as a turret which is indexible about the axis of a shaft **183** in the direction indicated by arrow **181.** The path along which the pockets **178** of the turret **179** travel is indicated at Y. A transfer unit **175** which serves to transfer empty packs **41** from the path V into the path Y is shown in detail in FIG. **4d.** The pockets **178** of the turret **179** advance the packs **41** along several treating instrumentalities which complete the closing and sealing of packs before the thus closed and sealed packs **201** are removed from the path Y at a transfer station A''. The turret **179** comprises several spokes **184** which extend radially outwardly from the axis of the shaft **183** and each of which carries one of the pockets **178** at its outer end. The pockets **178** may be integral with or separably secured to the respective spokes **184.** The pockets **178** which travel along the path Y advance along one side of a stationary retaining member or flange **186.** This flange extends along an arc of approximately **270** degrees.

Each empty pack **41** which is removed by the transfer unit **175** from the path V advances with the respective pocket **178** from the transfer station B to the pack filling or assembling station C where the empty pack receives a preselected group **8** consisting of 20 cigarettes **22.** Such groups are removed from the chambers **39** of the compacting or condensing turret **36** and each thereof forms a prismatic body which can be readily introduced through the open end of the adjacent empty pack **41.** The pack filling station C accommodates a pack filling device **187** which serves to transfer condensed groups **8** from the chambers **39** of the turret **36** into empty packs **41** arriving along the path Y. It will be seen that the path U along which the groups **8** advance with the cells **9** of the chain **11** is continued as a circular path defined by the chambers **39** of the turret **36** and that this path U approaches the path Y at the

pack filling station C. The transfer unit **175** and the pack filling unit **187** together form an arrangement which can convert empty packs **41** into open-ended filled packs which are thereupon subjected to several treatments during travel along the path Y toward the transfer station A''.

The details of the pack filling unit **187** are illustrated in FIG. **4***c*. This unit comprises a transfer member or pusher **188** mounted on a rod **189** and reciprocable in and counter to the direction indicated by an arrow **193.** The pusher **188** is installed behind the turret **36,** as viewed in FIG. **4***b*, and is movable forwardly toward the registering pocket **178** of the turret **179.** The pusher **188** thus expels a condensed group **8** from a registering chamber **39** and causes the thus expelled group **8** to pass through a mouthpiece **192** (see FIG. **4***c*) which is mounted on a movable link **191.**

The aforementioned treating instrumentalities which are adjacent to the path Y include a tucking device **194** which is located downstream of the pack filling station C and serves to tuck in the two small flaps at the open end of a filled pack advancing in the adjacent pocket **178.** The construction of the tucking device **194** is preferably identical with or similar to that of the aforedescribed tucking device **161.**

The tucking device **194** is followed by a folding member **196** which is pivotable with a shaft **197.** The purpose of the folding member **196** is to fold one of the wide flaps at the open end of the filled pack which advances along the path Y. The remaining or last flap of the pack advancing along the path Y is folded by a stationary folding member **198** which is adjacent to the path of the pockets **178** and is located opposite the flange **186.** The folding member **198** is preferably heated so as to insure that the adhesive which is applied to one of the flaps at the open end of the pack **41** adheres to the other flap. This completes the conversion of an empty pack into a filled pack **201.**

when a pocket **178,** with a filled pack **201** therein, reaches the transfer station A'', it is caused to enter the tax stamp applicator **199** shown in the lower portion of FIG. **4**b. The applicator **199** comprises a magazine **213** for a stack of tax stamps **202.** Once a pack **201** receives a tax stamp **202,** it is transferred onto the upper stretch of an endless take-off conveyor belt **203** which can transport the packs to storage, to a carton filling machine, to the aforementioned second packing machine **13,** or to another destination. A transfer member or pusher **204** is mounted at the transfer station A'' to expel filled packs **201** from successive pockets **178** and to introduce such packs into the pockets of a four-armed tax stamp turret **207.** Each arm of the turret **207** has a pocket **206** dimensioned to receive a filled pack **201** so that one closed end of the pack extends outwardly and is ready to receive a tax stamp **202.**

The applicator **199** further comprises a carrier **209** which is rotatable in the direction indicated by an arrow **208** and is mounted on a shaft **281.** The carrier **209** serves to transfer tax stamps **202** from the magazine **213** onto the filled packs **201** in the pockets **206** of the turret **207.** During travel from the magazine **213** to the adjacent pocket **206,** the tax stamps **202** are caused to move along a paster **217** which coats the exposed sides of tax stamps with a layer of adhesive.

The details of construction of the carrier **209** are shown in FIG. **11.** This carrier supports a ram **211** which is movable radially of the shaft **281** by an electromagnet **212.** The ram **211** has two parallel extensions or tines **210** each of which is provided on its front face with suction ports **214.** The suction ports **214** are connected with a suction generating device when the extensions **210** travel along the open side of the magazine **213** so that the foremost tax stamp **202** of the stack in this magazine is caused to adhere to the exposed surfaces of the extensions and shares their movements along the paster **217** and toward the adjacent pocket **206** in the turret **207.** The ram **211** further comprises a median portion **215** which is disposed between the extensions **210** and is biased to the position shown in FIG. **11** by a helical spring **216.** The median portion **215** can yield against the opposition of the spring **216** when the ram **211** reaches the position shown in FIG. **4**b whereby the extensions **210** cause the tax stamp **202** to be draped about the adjacent end of the finished pack **201.** Thus, the marginal portions of each tax stamp **202** are caused to adhere to the respective major panels of the paper envelope forming part of the pack **201** and the median portion of such tax stamp adheres to the overlapping flaps at the outer end of the pack.

The means for withdrawing or expelling packs **201,** with tax stamps **202** already applied thereto, from the pockets **206** of the turret **207** in the tax stamp applicator **199** comprises a reciprocable piston rod **218** which carries a pivotable motion transmitting or entraining member **219.** The station where the entraining member **219** transfers packs **201** from the pockets **206** of the turret **207** onto the upper stretch of the take-off conveyor belt **203** accommodates an ejector nozzle **221.** The purpose of the nozzle **221** is to remove from the belt **203** groups **8** of cigarettes **22** which reach the belt **203** in unconcealed condition, namely, which are not received in closed and sealed packs.

In order to insure that the packing machine **12** can operate with a minimum of supervision, this machine comprises a plurality of detectors which scan the components of packs **201** during travel along the paths U, V, W, X and/or Y. The signals produced by such detectors are transmitted to various control units which are illustrated in FIGS. **13***a* to **13***c*. FIGS. **4***a* and **4***b* merely show the positions of various detectors with reference to the remaining parts of the packing machine **12.** The details of such detectors will be described later with reference to FIGS. **13***a*, **13***b* and **13***c*. A first detector **222** is adjacent to the endless last portion of the path U, namely, to that portion of this path which is defined by the compacting turret **36.** The detector **222** comprises a photosensitive receiver and a light source. The light source and the receiver are disposed at the opposite sides of the compacting turret **36** and cooperate to produce signals which indicate the presence or absence of groups **8** in successive chambers **39** of the turret **36.** The detector **222** is mounted in such position that the turret **36** must be indexed three times before a group **8** which has been scanned by the detector **222** reaches the pack filling station C. The distance between the detector **222** and the pack filling station C, as considered in the direction of travel groups **8** along the path U, is identical with the distance between the transfer station B and the pack filling station C. Thus, an empty pack **41** which reaches the transfer station B requires the same amount of time to reach the pack filling station C as a group **8** which has been detected by the detector **222.**

The packing machine 12 further comprises detectors 223, 224, 226 and 227 shown in FIGS. 4*a* and 4*b*. These detectors are capable of discriminating between conductive and non-conductive materials, namely, between paper blanks 132 and tinfoil blanks 71. Each of the detectors 223, 224, 226, 227 comprises two electric contacts wwhich are connected with an energy source and are placed adjacent to the path of travel of empty packs 41 or their components. When the two contacts of one of said detectors are engaged by a tinfoil blank 71, the blank completes the circuit and the respective detector produces an electric signal. When the contacts of one of those detectors are engaged by a portion of a paper blank 132, i.e., by a blank which consists of non-conducting material, the respective detector fails to produce a signal. It is clear that tinfoil is but one of the materials which can be employed for the manufacture of blanks 71.

The control system of the packing machine 12 further comprises two additional detectors in the form of inductances 228, 229. The purpose of the detectors 228, 229 is to respectively detect the presence or absence of finished packs 201 in the pockets 206 of the turret 207 and on the upper stretch of the take-off conveyor belt 203.

The detectors 227 and 223 are adjacent to the path V along which empty packs 41 travel with the mandrels 43 of the turret 42. The detectors 224 and 226 are also adjacent to the path V and they respectively serve to detect the presence or absence of tinfoil blanks 71 and paper blanks 132.

FIG. 12 illustrates the drive of the packing machine 12. This drive comprises a primer mover here shown as an electric motor 231 which drives one element of a first clutch 232 and one element of a second clutch 237. The other element of the clutch 367 drives the producing machines 1 and 2 of FIG. 1. The clutch 232 drives a Geneva movement 233 and a belt drive 239.

The Geneva movement 233 comprises an indexible wheel 234 which is provided with four radially extending slots or grooves 236 for the pin 238 of a driver wheel 237 mounted on a shaft 241a which is driven by the driven element of the clutch 232. The wheel 234 rotates while the pin 238 extends into one of the slots 236. Thus, the Geneva movement can impart to a shaft 183 a succession of stepwise angular movements each followed by an interval S of predetermined duration. A step or stage T in the operation of the packing machine 12 includes one stepwise advance during an interval R and a dwell during an interval S.

The parts of the drive shown in FIG. 12 are illustrated in positions they assume after the wheel 234 of the Geneva movement 233 has completed one stepwise advance during an interval R. Thus, the pin 238 of the wheel 237 is about to enter the adjacent radial slot 236 of the wheel 234. As stated above, the driven element of the clutch 232 drives the shaft 241a for the wheel 237 of the Geneva movement 233. This shaft 241*a* carries a pulley 241 for an endless belt 243 of the belt drive 239. The belt 243 is further trained over a second pulley 242 which is mounted at one end of a shaft 244. The belt 243 is preferably provided with teeth which cooperate with teeth on pulleys 241, 242 to prevent slippage. It is clear that the pulleys 241, 242 can be replaced with sprocket wheels and that the belt 243 can be replaced with a link chain. The shaft 244 drives one element of an electromagnetic clutch 246. The other element of the clutch 246 drives a shaft 247 which carries the cam 94. This cam has been mentioned in connection with FIG. 6. The shaft 183 of the wheel 234 in the Geneva movement 233 carries a cam 248 which is provided with four equidistant lobes. The lobes of the cam 248 can actuate the switch 99 of FIG. 6. The shaft 183 further carries a gear 249 which meshes with a pinion 251. The pinion 251 drives an intermediate gear 252 which is mounted on a shaft 253. The shaft 253 drives the compacting turret 36 of FIG. 4*b*. The gear 252 meshes with a further gear 254 mounted on a shaft 256 which drives the sprocket wheel 33 for the chain 11.

The gear 254 meshes with a pinion 257 on a shaft 258. The shaft 258 carries a gear 259 which meshes with a pinion 261 on a shaft 262. The shaft 262 drives one element of an electromagnetic clutch 263. The other element of the clutch 263 drives the shaft 74*a* for the roller 72*a* in the feeding device 72 of the blank forming apparatus 69. The gear 249 on the shaft 183 of the wheel 234 in the Geneva movement 233 further meshes with a gear 264 mounted on a shaft 266 which indexes the turret 42. The gear 264 meshes with a pinion 267 on the shaft 136 of the suction drum 134 in the blank feeding apparatus 131.

The shaft 183 further carries a bevel gear 268 which meshes with a bevel gear 269 on a shaft 271. The shaft 271 carries a gear 272 in mesh with a pinion 272 on a shaft 274. The shaft 274 indexes the turret 207 of the tax stamp applicator 199. A gear 276 on the shaft 274 meshes with a pinion 277 on a shaft 278 which drives one element of an electromagnetic clutch 279. The other element of the clutch 279 drives the shaft 281 which rotates the carrier 209 in the applicator 199 of FIG. 4*b*. After the cam 248 on the shaft 183 of the wheel 234 is indexed to perform a movement during an interval R, it causes the switch 99 to produce a signal for the duration of an interval S.

To summarize: The shaft 183 drives the turret 179, the shaft 266 drives the turret 42, the shaft 253 drives the turret 36, the shaft 256 drives the sprocket wheel 33, the shaft 74*a* drives the roller 72*a*, the shaft 136 drives the suction drum 134, the shaft 274 drives the turret 207, and the shaft 281 drives the carrier 209. It will be noted that the parts shown in FIGS. 4*a* and 4*b* assume the same positions as the corresponding parts of the drive illustrated in FIG. 12. The positions of parts shown in FIG. 4*a* and 4*b* correspond to those which they assume upon completion of a step T including an advance for the interval R and a dwell for the interval S.

FIGS. 13*a* to 13*b* illustrate the control system of the packing machine 12. This control system includes the aforementioned switch 99 and the pulse shaper 101 (both shown in FIG. 13*a*). The control system comprises a number of control units which receive signals from the pulse shaper 101 and from the aforementioned detectors 222, 223, 224, 226, 227, 228, 229. The control units of the system shown in FIGS. 13*a* to 13*c* regulate the operation of the machine in dependency on such signals.

In addition to the control units 107, 112, 118 of FIG. 6, the control system comprises a further control unit 301 (shown in the left-hand part of FIG. 13*a*) which regulates the feed of tinfoil blanks 71 along the path W and to the turret 42 of the converting assembly. The feed of tinfoil blanks 71 is to be interrupted when a

mandrel 43 which reaches the transfer station B' already comprises a tinfoil blank (and more particularly an open-ended envelope wjich is obtained in response to deformation of a tinfoil blank 71). The electromagnetic clutch 263 is shown again in FIG. 13*a;* this clutch can be energized by the control unit 301 to establish a torque-transmitting connection between the shaft 262 and the shaft 74*a* for the roller 72a of the feeding device 72 in the blank forming apparatus 69. The control unit 301 further regulates energization of the electromagnetic clutch 246 which can establish a torque-transmitting connection between the shaft 244 and the shaft 247 for the cam 94 which controls movement of the carrier 83 in the apparatus 69. An interrupter switch 302 is associated with the clutch 246 and serves to insure that the clutch 246 cannot be disengaged excepting when the cam 94 assumes a predetermined angular position, namely, when the carrier 83 assumes a predetermined position with reference to its guides 82. Thus, the switch 302 prevents disengagement of the clutch 246 in immediate response to a signal from the detector 223, excepting if the detector 223 transmits a signal when the carrier 83 assumes a predetermined position. The detector 223 is adjacent to the path V for empty packs 41. The control unit 301 further comprises four logical circuits including a NOT-gate 303, two AND-gates 304, 306 and a flip-flop 307. The outputs of the AND-gates 304, 306 are connected with the inputs of the flip-flop 307, and the latter's output is connected with an amplifier 308 which is in circuit with the clutches 246 and 263.

FIG. 13*a* shows again the elements of the control units 107, 112, 118 which were described in connection with FIG. 6. These control units respectively serve to regulate the movement of the knife 76 of the severing device in the apparatus 69, the electropneumatic valve 111 in the conduit 126 which evacuates air from the ports 79 of the suction plate 81, and the electropneumatic valve 117 in the conduit 124 which serves for evacuation of air from suction ports 89 in the elements 84, 86 of the draping member 93.

A further control unit 309 (FIG. 13*a*) serves to control movements of the folding member 127 of FIG. 4*a*. The folding member 127 serves to perform the step shown in the portion 14*e* of FIG. 14, namely, to deform one flap of the tube formed by a tinfoil blank 71 in response to draping around the respective mandrel 43 on the turret 42. The control unit 309 comprises a rotary electromagnet 311 which is connected with the shaft 128 of the folding member 127, an adjustable time-lag device 312 which includes an R-C link consisting of a capacitor and a variable resistor, a flip-flop 313 one input of which is connected with a time-lag device 312, an amplifier 314 which is connected with the rotary electromagnet 311 and with the output of the flip-flop 313, and a resetting switch 316 which is actuable by the electromagnet 311 and is connected with the other input of the flip-flop 313. The time-lag device 312 insures that the rotary electromagnet 311 is energized with a predetermined delay following reception of a signal from the pulse shaper 101.

A further control unit 317 (shown in the median part of FIG. 13*a*) serves to interrupt the feed of paper blanks 132 and the transfer of such blanks from the path X into the path V by sealing the suction drum 134 of the blank feeding apparatus 131 from the suction generating device. The detector 224 is adjacent to the path V between the stations B' and B'' of FIG. 4a and serves to detect the presence or absence of tinfoil blanks 71. This detector 224 transmits signals to a NOT-gate 318 and an AND-gate 319 of the control unit 317. The output of the NOT-gate 318 is connected with one input of a second AND-gate 321 in the control unit 317. The other inputs of the AND-gates 319, 321 are connected with the output of the pulse shaper 101. The outputs of the AND-gates 319, 321 are connected with the inputs of a flip-flop 322 which is connected with an electropneumatic valve 324 by way of an amplifier 323. The valve 324 is installed in the suction pipe between a suction generating device and the ports of the suction drum 134 in the blank feeding apparatus 131.

Another control unit 326 (shown in FIG. 13a) serves to regulate movements of the piston rod 147 for the draping member 146 of FIG. 4*a*. This draping member is located at the station B'' and serves to convert successively furnished paper blanks 132 into U-shaped bodies which partially surround the tubes formed by the tinfoil blanks 71. The control unit 326 comprises a flip-flop 327 which has one of its inputs connected with the pulse shaper 101 and whose output is connected with an amplifier 328 in circuit with the solenoid of an electropneumatic valve 329. The valve 329 controls the positions of a piston which is rigid with the piston rod 147 of the draping member 146 and is reciprocable in a double-acting pneumatic cylinder 331. The piston in the cylinder 331 controls a resetting switch 332 which is connected with the other input of the flip-flop 327.

A control unit 333 (also shown in FIG. 13*a*) regulates the movements of the shaft 156 for the folding member 153 of FIG. 4*a*. The member 153 performs one step in the conversion of U-shaped paper bodies formed by the draping member 146 into tubes which surround the respective tinfoil tubes. The shaft 156 is connected with or constitutes the armature of a rotary electromagnet 334 which can actuate a resetting switch 339 for a flip-flop 337 of the control unit 333. The latter further includes an amplifier 338 which is connected between the ouput of the flip-flop 337 and the electromagnet 334, and an adjustable time-lag device 336 whose construction is preferably identical with that of the time-lag device 312.

A further control unit 341 (also shown in FIG. 13*a*) comprises a time-lag device 342 which is preferably identical with the device 312, a flip-flop 343, an amplifier 344 and the electromagnet 160 having the aforementioned pin-shaped armature 163. The electromagnet 160 can actuate a resetting switch 347 for the flip-flop 343. The electromagnet 160 serves to arrest the folding member 154 of FIG. 4*a*.

Still another control unit 348 (FIG. 13*a*) includes a flip-flop 349, an amplifier 351 and the electromagnet 352 whose armature 168 can move the fingers 164, 166 of the tucking device 161 (see FIG. 10). The armature 168 of the electromagnet 352 can actuate a resetting switch 353 for the flip-flop 349.

A control unit 354 (shown in the right-hand part of FIG. 13*a*) serves to arrest the producing machines 1 and 2 when several mandrels 43 of the turret 42 fail to receive blanks 71 and/or 132, and/or when the hopper 14 of the magazine 4 shown in FIGS. 2 and 3 is filled to capacity. The control unit 354 receives signals from the pulse shaper 101, from the detector 226 which is

adjacent to the path V (FIG. 4*a*), and from the photoelectric detector **28** in the magazine **4** (see FIGS. **2** and **3**). One branch of the control unit **354** includes the detector **226**, a NOT-gate **356**, an AND-gate **357** and a counter **359** having an erasing signal input **362** connected with the output of the AND-gate **357** and an error signal input **361** connected with a second AND-gate **358** which is in circuit with the detector **226** and pulse shaper **101**. The counter **359** can be designed in such a way that it produces an output signal only when its input **361** receives a predetermined number of successive error signals. Each signal which is received by way of the input **362** erases a signal received by way of the input **361**. Thus, the number of error signals must exceed the number of erasing signals before the counter **359** can transmit a signal which initiates stoppage of the producing machines **1** and **2**.

The other branch of the control unit **354** includes the aforementioned photoelectric detector **28** in the magazine **4**, a manually operated switch **368** which can be actuated to reset a flip-flop **364**, an OR-gate **363** which is connected with the detector **28** and with the output of the counter **359**, and an amplifier **366** which connects the flip-flop **364** with the clutch **367** for the drives of the producing machines **1** and **2**. The closing of the switch **368** initiates energization of the clutch **367** and thus initiates starting of the producing machines **1** and **2**.

A control unit **369** (shown in the left-hand part of FIG. 13*b*) serves to regulate movements of the folding member **173** shown in FIG. 4*a*. The member **173** performs the folding operation shown in FIG. 14*m*. The control unit **369** comprises a flip-flop **371**, an amplifier **372**, a rotary electromagnet **373** whose armature rotates the shaft **174** of the folding member **173**, and a resetting switch **374** for the flip-flop **371**. The resetting switch **374** is actuated by the armature of the electromagnet **373** after the member **173** completes a folding operation.

Another control unit **376** (FIG. 13*b*) serves to regulate movements of the pusher **7** which expels groups **8** of cigarettes **22** from the hopper **14** of the magazine **4**. The control unit **376** includes the aforementioned photoelectric detectors **29** and **31** in the magazine **4** which respectively determine the median and minimum levels of cigarettes in the hopper **14**, a flip-flop **378** whose inputs are connected to the detectors **29**, **31**, an AND-gate **377** connected to the output of the flip-flop **378**, a second flip-flop **379** one input of which is connected with the output of the AND-gate **377**, an amplifier **381** connected to the output of the flip-flop **379**, an electropneumatic valve **382** which controls a double-acting pneumatic cylinder **383**, and a resetting switch **384** for the flip-flop **379**. The piston in the cylinder **383** is connected with the pusher **7** and this pusher also serves to actuate the resetting switch **384**.

A control unit **386** (FIG. 13*b*) is connected with the control unit **376** and with a further control unit **387**. The purpose of the control unit **386** is to control energization of the electromagnetic clutch **232** between the motor **231** and the shaft **241***a* (FIG. 12). Thus, the control unit **386** can disconnect the packing machine **12** from the motor **231**. This control unit comprises two OR-gates **388**, **389** which respectively establish the connection between the unit **386** and the control units **376**, **387**, a manually operated switch **391** which is connected with one input of the OR-gate **388** and can be closed by hand to energize the clutch **232**, a second manually operable switch **392** which is connected with one input of the OR-gate **389** and serves to deenergize the clutch **232**, a flip-flop **393** whose inputs are connected with the outputs of the OR-gates **388**, **389**, and an amplifier **394** which is connected between the output of the flip-flop **393** and the clutch **232**. A switch **396** is associated with the clutch **232** and serves to prevent premature deenergization of the clutch, i.e., to insure that the clutch **232** is deenergized only when the shaft **241** assumes a predetermined angular position corresponding to completion of a step T. Such stoppage of the shaft **241** in a predetermined angular position takes place irrespective of the timing of the signal produced by the manually operated switch **392** or by a counter **407** in the circuit of the control unit **386**.

The control unit **387** regulates movement of the piston rod **62** in the transfer unit **175** (see FIG. 4*d*). As explained above, the transfer unit **175** is installed at the transfer station B and serves to transfer empty packs **41** from the mandrels **43** of the turret **42** into the pockets **178** of the turret **179**. The control unit **387** further includes the photoelectric detector **222** which scans the chambrs **39** of the compacting turret **36** for the presence or absence of groups **8**, and the detector **227** which is adjacent to the path V and scans this path for the presence or absence of empty packs **41** at the station B. Still further, the control unit **387** comprise two NOT-gates **397**, **398** whose inputs are respectively connected with the detectors **222**, **227**, and AND-gate **399** having three inputs two of which are connected with the outputs of the NOT-gates **397**, **398** and the third of which is connected with the pulse shaper **101**, a flip-flop **401** one input of which is connected with the output of the AND-gate **399**, an electropneumatic valve **403** which controls the double-acting pneumatic cylinder **63**, and an amplifier **402** which is connected between the output of the flip-flop **401** and the valve **403**. The piston rod **62** of the tublar body **64** can actuate a resetting switch **405** for the flip-flop **401**.

The detector **222** and NOT-gate **397** are further connected with AND-gates **404**, **406**. The output of the AND-gate **404** is connected with the error signal input **408** of the counter **407** and the output of the AND-gate **406** is connected with a signal erasing input **409** of the counter **407**. The counter **407** counts the number of groups **8** which are transferred into the chambers **39** of the turret **36**. The construction of this counter **407** is analogous to or identical with that of the aforedescribed counter **359**. The input **408** receives a signal in response to detection of the absence of a group **8** in a chamber **39**, and the input **409** transmits a signal in response to detection of the presence of a group **8**.

A further control unit **411** (FIG. 13*b*) serves to regulate movements of the piston rod **38** for the pusher **37** which transfers groups **8** from the cells **9** of the chain **11** into the chambers **39** of the compacting turret **36**. The control unit **411** comprises a flip-flop **412**, an amplifier **413** and an electropneumatic valve **414** which controls the double-acting pneumatic cylinder **416**. The piston of this cylinder is connected with the piston rod **38** and the latter can actuate a resetting switch **415** for the flip-flop **412**.

A further control unit **417** (FIG. 13*b*) serves to regulate movements of the piston rod **189** and mouthpiece **192** in the pack filling unit **187** shown in FIG. 4c. The control unit **417** comprises two branches one of which

includes a flip-flop **418**, an amplifier **419** and an electropneumatic valve **422** which controls a pneumatic cylinder **421**. The piston of the cylinder **421** is connected with the piston rod **189** and this piston rod further serves to actuate a resetting switch **427** for the flip-flop **418**. The other branch of the control unit **417** comprises a flip-flop **423**, an amplifier **424** and an electromagnet **426** for the mouthpiece **192**. The switch **427** serves to reset the aforementioned flip-flop **418** and also the flip-flop **423**.

A control unit **428** (FIG. **13***b*) regulates movements of the tucking device **194** shown in FIG. **4***b*. The device **194** performs the operation shown in the portion **14***p* of FIG. **14**. The construction of the control unit **428** is identical to or analogous with that of the control unit **348** of FIG. **13***a*; it comprises a flip-flop **429**, an amplifier **431**, an electromagnet **432** whose armature corresponds to the part **168** shown in FIG. **10**, and a resetting switch **433** for the flip-flop **429**.

A further control unit **434** (shown in the right-hand part of FIG. **13***b*) comprises an adjustable time-lag device **436** (having an R-C link including a capacitor and a variable resistor), a flip-flop **437**, an amplifier **438**, a rotary electromagnet **439** whose armature **197** constitutes the shaft for the pivotable folding member **196**, and a resetting switch **441** for the flip-flop **437**. The switch **441** can be actuated by the armature **197** of the electromagnet **439**. The folding member **196** performs the operation shown in the portion **14***q* of FIG. **14**.

A control unit **442** (FIG. **13***c*) regulates movements of the pusher **204** which transfers packs **201** from the pockets **178** of the turret **179** into the pockets **206** of the turret **207** in the tax stamp applicator **199**. The control unit **442** comprises a flip-flop **443**, an amplifier **444**, an electropneumatic valve **446** which controls a double-acting pneumatic cylinder **447**, and a resetting switch **448** which can be actuated by the pusher **204**. The latter constitutes the piston rod of the cylinder **447**.

A control unit **449** (FIG. **13***c*) serves to interrupt the feed of tax stamps **202** from the magazine **213** to the turret **207** of the tax stamp applicator **199** when the pocket **206** facing the carrier **209** does not contain a pack **201**. The control unit **449** includes the detector **228** (which is an inductance) which responds to detection of deformed tinfoil blanks **71**, a NOT-gate **451**, two AND-gates **452**, **453**, a flip-flop **454**, and an amplifier **456** which is connected between the output of the flip-flop **454** and the electromagnetic clutch **279**. The clutch **279** drives the shaft **281** of the carrier **209**.

A further control unit **457** (FIG. **13***c*) regulates energization of the electromagnetic **212** for the ram **211** in the tax stamp applicator **199** (See FIG. **11**). The control unit **457** further includes a flip-flop **458** one input of which is connected with the pulse shaper **101**, an amplifier **459** which is connected between the output of the flip-flop **458** and the electromagnet **212**, and a resetting switch **461** for the flip-flop **458** which is actuated by the armature of the electromagnet **212**.

A control unit **462** (FIG. **13***c*) serves to regulate movements of the piston rod **218** for the entraining member **219** which can transfer packs **201** (each provided with a tax stamp **202**) from the pockets **206** of the turret **207** onto the upper stretch of the take-off conveyor belt **203**. The control unit **462** comprises a flip-flop **464**, an amplifier **466**, an electropneumatic valve **463** which controls a double-acting pneumatic cylinder **467**, and a resetting switch **468** for the flip-flop **464**. The piston of the cylinder **467** is connected with the piston rod **218** and this piston rod actuates the resetting switch **468**.

Finally, the control system of the packing machine **12** comprises a control unit **469** (shown in the right-hand part of FIG. **13***c*) which regulates the admission of compressed gaseous fluid to the ejector nozzle **221** (FIG. **4***b*). The control unit **469** comprises the detector **229** (this detector is an inductance) which scans the pockets **206** of the turret **207** in the tax stamp applicator **199** for the presence of packs **201**, a flip-flop **473** which can be set by the switch **468** of the control unit **462**, an amplifier **474**, and an electropneumatic valve **476** which is installed in the conduit connecting the ejector nozzle **221** with a compressor (not shown) or another suitable source of compressed gas. The detector **229** serves to reset the flip-flop **473** of the control unit **469**.

The time lag determined by the devices **312**, **336**, **342** and **436** in the control units **309**, **333**, **341** and **434** can be shortened or lengthened by appropriate adjustment of the respective variable resistors.

The operation of the packing machine **12** is as follows:

The plain cigarettes which are produced in the cigarette rod making machine **1** of FIG. **1** are fed into the flutes of the transfer drum **3** which supplies such cigarettes to the filter tipping machine **2**. The filter tipping machine **2** provides each plain cigarette with a filter tip and discharges filter cigarettes **22** into the magazine **4** (see the conveyor belt **23** in FIGS. **2** and **3**). It is assumed that the hopper **14** of the magazine **4** is empty. It is further assumed that the electric motor **231** of the drive shown in FIG. **12** is on. The clutch **267** is engaged so that it drives the moving parts of the producing machines **1** and **2**. The clutch **232** which drives the moving parts of the packing machine **12** is disengaged and the pusher **7** is also held in its retracted position.

When the level of cigarettes **22** which accumulate in the hopper **14** of the magazine **4** rises so that it reaches the photoelectric detector **29**, the detector **29** transmits a signal to the OR-gate **388** of the control unit **386** shown in FIG. **13***b*. The signal which is emitted by the OR-gate **388** changes the condition of the flip-flop **393** wich energizes the clutch **232** by way of the amplifier **394**. Energization of the clutch **232** results in establishment of a torque-transmitting connection between the output shaft of the motor **231** and the shaft **241***a* of the drive shown in FIG. **12**. The motor **231** continues to drive the parts of the packing machine **12** until the flip-flop **393** receives a signal from the OR-gate **389**.

The signal from the photoelectric detector **29** is further transmitted to the flip-flop **378** of the control unit **376** shown in FIG. **13***b*. The output signal from the flip-flop **378** is transmitted to one input of the AND-gate **377**. The Geneva movement **233** of FIG. **12** drives the shaft **183** of the cam **248** in stepwise fashion so that the lobes of the cam **248** intermittently close and open the switch **99** which is in circuit with the pulse shaper **101**. Furthermore, the Geneva movement **233** effects intermittent movements of the turret **42**, turret **179**, turret **207**, carrier **209**, sprocket wheel **33**, turret **36**, rollers **72***a*, **72***b* of the feeding device **72** for the web **73**, and suction drum **134**. The belt drive **239** of FIG. **12** receives motion from the shaft **241***a* and rotates the cam **94** at a constant speed. As shown in FIGS. **13***a* through

13c, the pulse shaper 101 transmits signals to the control units 301, 118, 112, 107, 309, 317, 326, 333, 341, 348, 354, 369, 376, 386, 387, 411, 417, 428, 434, 442, 449, 457, 462 and 469.

As the AND-gate 377 of the control unit 376 in FIG. 13b receives a signal from the pulse shaper 101, it transmits a signal to the corresponding input of the flip-flop 379. The output signal from the flip-flop 379 is transmitted to the solenoid of the electropneumatic valve 382 by way of the amplifier 381. The valve 382 admits pressurized fluid to the upper chamber of the cylinder 383 so that the piston of this cylinder expels the pusher 7 in a downward direction, as viewed in FIG. 13b, whereby the pusher 7 expels a group 8 of 20 cigarettes 22 from the hopper 14 of the magazine 4. The thus expelled group 8 enters the adjacent cell 9 of the chain 11. The chain 11 transports the cell 9 with the group 8 of 20 cigarettes 22 in stepwise fashion along the path U shown in FIG. 4b and toward the transfer station A'. When the pusher 7 reaches its extended position, it actuates the resetting switch 384 which thereby resets the flip-flop 379 to its original condition. Thus, the valve 382 causes the cylinder 383 to retract the pusher 7 so that the latter is ready to perform the following working stroke. The same sequence of steps is repeated when the pulse shaper 101 transmits a fresh signal to the AND-gate 377 of the control unit 376. The cells 9 of the chain 11 advance in stepwise fashion from the transfer station at the hopper 14 of the magazine 4 shown in FIGS. 2 and 3 toward and about the sprocket wheel 33 of FIG. 4b. When the foremost group 8 reaches the transfer station A', the flip-flop 412 of the control unit 411 shown in FIG. 13b actuates the valve 414. The valve 414 controls the flow of compressed gaseous medium into the chambers of the cylinder 416 and enables the piston rod 38 to displace the pusher 37 so that the group 8 which arrives at the transfer station A' is transferred into the registering chamber 39 of the compacting turret 36. When the piston rod 38 reaches its outer end position, it actuates the resetting switch 415 for the flip-flop 412. This causes the valve 414 to reassume its original condition and to retract the piston rod 38 into the cylinder 416. This piston rod 38 is then ready to perform a fresh working stroke in order to expel the next-following group 8 of cigarettes 22 from a registering cell 9 into the aligned chamber 39 of the compacting turret 36. The group 8 which is transferred into the chamber 39 of the turret 36 is subjected to a compressng action which reduces the overall dimensions of the group to such an extent that it can be readily inserted into an empty pack 41.

A complete cycle resulting in the formation of an empty pack 41 is carried out as follows

It is assumed that the turret 42 of the converting assembly is empty, i.e., that each of the mandrels 43 is exposed because it does not carry an empty pack. Consequently, the detector 223 in the control unit 301 of FIG. 13a does not produce any signals because it fails to detect tinfoil blanks 71 on the adjacent turrets 43. The condition of the flip-flop 307 in the control unit 301 remains unchanged and the clutches 246 and 263 of the control unit 301 remain engaged. Thus, the Geneva movement 233 drives the roller 72a of the feeding device 72 in the blank forming apparatus 69 of FIG. 4a. The rollers 72a, 72b of the device 72 advance the web 73 in stepwise fashion toward the trnasfer station B' whereby the web 73 advances lengthwise along the path W. Each stepwise advance of the web 73 is selected in such a way that the length of the web which moves beyond the plane of the knife 76 corresponds to the length of a tinfoil blank 71. When the web 73 advances by a step and thereupon dwells prior to the next-following step, the pulse shaper 101 transmits a signal to the control unit 112 of FIG. 13a, namely, to one input of the flip-flop 103. The output signal from the flip-flop 103 is transmitted to the solenoid of the electropneumatic valve 111 by way of the amplifier 109 whereby the valve 111 connects the suction fan 113 of FIG. 6 with the suction channels 77, 78 and suction ports 79 in the suction plate 81 of the apparatus 69. Thus, the plate 81 attracts the leader of the web 73 preparatory to actuation of the knife 76.

The pulse shaper 101 also transmits a signal to the flip-flop 102 of the control unit 107 shown in FIGS. 6 and 13a. The output signal from the flip-flop 102 is transmitted to the electromagnet 106 by way of the amplifier 104 whereby the electromagnet causes the knife 76 to perform a working stroke and to sever the web 73 so as to form a fresh tinfoil blank 71. The freshly formed tinfoil blank 71 is shown in the portion 14a of FIG. 14. When the knife 76 reaches its foremost position, the armature of the electromagnet 106 actuates the switch 108 which resets the flip-flop 102 whereby the flip-flop deenergizes the electromagnet 106 which retracts the knife 76 to its starting or idle position. The electromagnet 106 preferably comprises a suitable spring (not shown) which automatically retracts the knife 76 when the electromagnet is deenergized.

As stated before, the motor 231 drives the cam 94 at a constant speed, as long as the clutch 232 of FIG. 12 remains engaged. Therefore, the cam 94 transmits motion to the carrier 83 of the blank forming apparatus 69 whereby the carrier 83 moves up and down at a rate determined by the speed of the shaft 247 and the cinfiguration of the groove 97 (see FIG. 7) in the cam 94. The draping member 93 shares the up-and-down movements of the carrier 83. In one of its end positions, the trip 122 on the carrier 83 actuates the limit switch 119 which transmits a resetting signal for the flip-flop 103 in the control unit 112 of FIG. 13a. This changes the condition of the electropneumatic valve 111 which controls the evacuation of air from the ports 79 of the suction plate 81. Thus, the plate 81 ceases to attract the freshly formed tinfoil flank 71. The limit switch 119 also transmits a signal to the flip-flop 114 in the control unit 118 which causes a change in the condition of the electropneumatic valve 117. The valve 117 then connects the suction fan 113 with the suction ports 89 in the elements 84, 86 of the draping member 93. Consequently, the draping member 93 attracts the freshly formed tinfoil blank 71 which leaves the adjacent surface of the plate 81 and adheres to the elements 84, 86.

During the next stage of operation of the packing machine 12, the groove 97 of the cam 94 causes the roller follower 96 to shift the carrier 83 and the draping member 93 in a direction counter to that indicated by arrow 95 in FIG. 6. Thus the carrier 83 moves in a direction toward the path V of the turret 42. The carrier 83 then maintains the draping member 93 in the position shown in FIG. 8a. The turret 42 advances one of its mandrels 43 in the direction indicated by arrow 85 shown in FIG. 8a whereby the mandrel 43 passes between the wings or elements 84, 86 of the draping member 93 (see FIG. 8b) and removes the blank 71 from the front surface of

the draping member. At the same time, the thus removed blank **71** is partially draped around the mandrel **43** so as to assume the shape shown in the portion **14***b* of FIG. **14.** Such transfer and simultaneous deformation of the blank **71** take place at the transfer station B' of FIG. **4***a*. As mentioned before, the distance **92** between the edge faces **91** of the elements **84, 86** of the draping member **93** (see FIG. **6**) equal or closely approximates the width **43***a* of a mandrel **43.**

The mandrel **43,** with a partially draped blank **71** thereon, comes to a halt as soon as it moves beyond the space between the edge faces **91.** During the period of dwell following a movement of the turret **43** to the position shown in FIG. **8***b*, the continuously rotating cam **94** causes its groove **97** to again move the roller follower **96** and the carrier **83** counter to the direction indicated by the arrow **95** whereby the draping member **93** moves in the direction indicated in FIG. **8***c* by arrow **90** and its element **84** folds one leg of the U-shaped body of tinfoil. The operation which the draping element **84** performs is shown in FIG. **14***c*. The trip **122** of the carrier **83** actuates the limit switch **121** which causes the flip-flop **114** of the control unit **118** to change the condition of the valve **117.** The valve **117** then seals the suction ports **89** of the draping elements **84, 86** from the fan **113.**

The cam **94** continues to rotate and its groove **97** causes the roller follower **96** to move the carrier **83** and the draping member **93** in the direction of arrow **95** (FIGS. **6** and **8***d*) whereby the draping element **86** completes the conversion of the tinfoil blank **71** into a tube (see the portion **14***d* of FIG. **14**). The apparatus **69** is then ready to make a fresh tinfoil blank **71.**

During the conversion of a blank **71** into a tube, the ports **44** of the respective mandrel **43** are connected to the suction generating device so that the mandrel attracts the adjacent portions of the tube shown in the portion **14***d* of FIG. **14.**

The mandrel **43,** with a tinfoil tube thereon, is thereupon indexed and reaches the pivotable folding member **127** of FIG. **4***a*. When the mandrel **43** comes to a halt, the time-lag device **312** of the control unit **309** causes the flip-flop **313** and amplifier **314** to energize the rotary electromagnet **311,** The latter rotates the shaft **128** whereby the folding member **127** performs the operation shown in the portion **14***e* of FIG. **14.** When the rotation of the shaft **128** is completed, the armature of the electromagnet **311** actuates the switch **316** which resets the flip-flop **313** to deenergize the electromagnet **311** and to effect a return movement of the folding member **127** to its idle position, for example, by means of a suitable return spring (not shown).

During the just described stage of operation of the packing machine **12,** the detector **224** determines whether or not the mandrel **43** carries a tinfoil blank **71.** If the mandrel **43** is provided with such a blank, the detector **224** resets the flip-flop **322** but the condition of the flip-flop **322** remains unchanged so that the valve **324** remains in the condition shown in FIG. **13***a* and connects the ports of the suction drum **134** in the apparatus **131** with a suction generating device.

The turret **42** is thereupon indexed and causes the mandrel **43** to move along the stationary folding member **129** which performs the operation shown in the portion **14***f* of FIG. **14.** When the indexing of the turret **42** is completed, the mandrel **43** is located at the transfer station B''. During the preceding indexing of the turret **42,** the suction drum **134** withdraws a paper blank **132** from the magazine **133** and moves the thus withdrawn paper blank along the coating roller **143** which applies to the adjacent surface of the paper blank two strips of adhesive. The paper blank **132** (but without adhesive strips thereon) is shown in the portion **14***g* of FIG. **14.** Such strips are applied to one longitudinal and to one transverse marginal portion of the blank **132** (see FIG. **25***f*). The adhesive-coated paper blank **132** is then taken over and transported by the suction bands **137***a*, **137***b* so that it arrives at the transfer station B'' and is adjacent to the mandrel **43** which carries a partially deformed tinfoil blank **71.** The blank **132** at the transfer station B'' is then located in the path of movement of the draping member **146.**

When the mandrel **43** comes to a halt at the station B'', the pulse shaper **101** transmits a signal to the flip-flop **327** in the control unit **326** of FIG. **13***a*. This causes the amplifier **328** to energize the solenoid of the valve **329** which admits compressed air to the cylinder **331.** The piston rod **147** is caused to move toward the mandrel **43** at the station B'' and the plate-like prongs of the draping member **146** drape the paper blank **132** about a portion of the partially completed tinfoil envelope of the mandrel **43.** The operation which is performed by the draping member **146** is shown in the portion **14***h* of FIG. **14.**

The plunger **149** (see FIG. **9**) of the draping member **146** bears against the paper blank **132** and presses it against the adjacent portion of the mandrel **43** at the station B'' while the piston rod **147** for the draping member **146** performs a working stroke. This prevents slippage of the paper blank **132** during its conversion into the U-shaped body shown in FIG. **14***h*.

The time-lag device **336** of the control unit **333** transmits a delayed signal to the flip-flop **337** which causes the amplifier **338** to energize the rotary electromagnet **334.** The latter rotates the folding member **153** to the position shown in FIG. **4***a* whereby the member **153** performs the operation shown in portion **14***i* of FIG. **14.**

The time-lag device **342** of the control unit **341** transmits a delayed signal to the flip-flop **343** which causes the amplifier **344** to energize the electromagnet **160** so that the electromagnet **160** retracts its pin-shaped armature **163.** Up to then, the extended armature **163** was holding the folding member **154** in a position in which the torsion spring **158** was caused to store energy. The member **154** was moved to such position during the preceding stage of operation. As soon as the armature **163** is retracted, the spring **158** controls the folding member **154** in a clockwise direction as indicated by arrow **159** (back to the position shown in FIG. **4***a*) whereby the member **154** performs the operation shown in the portion **14***k* of FIG. **14,** i.e., the paper blank **132** is converted into a tube.

The electromagnet **334** thereupon actuates the switch **339** which resets the flip-flop **337** so that the electromagnet **334** is deenergized and the folding member **153** is moved from the position shown in FIG. **4***a* is back to a starting position, preferably under the action of a suitable spring (not shown). The movements of the folding member **153** are synchronized with movements of the folding member **154** in such a way that the folding member **153** begins to move back to its starting position when the folding member **154** begins

to fold the paper blank **132** to complete the formation of the tube shown in the portion **14k** of FIG. **14.**

When the piston rod **147** reaches its end position, it actuates the switch **332** which resets the flip-flop **337** whereby the valve **329** reassumes the condition shown in FIG. **13***a*. The cylinder **331** is caused to retract the piston rod **147** so that the draping member **146** returns to the position shown in FIG. **4***a*.

The turret **42** is thereupon indexed to move the mandrel **43** into registry with the tucking device **171.** This tucking device serves to perform the operation shown in the portion **14L** of FIG. **14.** During such indexing of the mandrel **43** away from the station B'', the permanent magnets **52, 53** (FIG. **5**) attract the ferromagnetic folding member **154** and cause it to pivot in a counterclockwise direction, as viewed in FIG. **4***a*, and to stress the torsion spring **158.** This enables the folding member **154** to bear against the overlapping portions of the paper tube on the moving turret **43** and to thus enhance the setting of adhesive which bonds such overlapping portions to each other. As the folding member **154** pivots in response to indexing of the mandrel **43** away from the station B'', the pin-shaped armature **163** of the electromagnet **160** slides along the inclined surface in the notch **162** of the member **154** and is depressed to thereupon move outwardly and to prevent return movement of the folding member **154** under the action of the torsion spring **158** prior to energization of the electromagnet **160.** The anticlockwise pivotal movement of the folding member **154** is terminated when it abuts against the stationary heating member **177.** Thus, when the mandrel **43** is indexed to move away from registry with the tucking device **161,** the permanent magnets **52, 53** become separated from the folding member **154** because the latter is held by the heating member **177.** However, since the electromagnet **160** is deenergized, the pin **163** is in an extended position and holds the folding member **154** against premature return movement (arrow **159**) under the action of the torson spring **158.**

When the turret **43** reaches the tuking device **161** and comes to a halt, the flip-flop **349** of the control unit **348** receives a signal from the pulse shaper **101** whereby the output signal from the flip-flop **349** causes the amplifier **351** to energize the electromagnet **352.** The electromagnet **352** attracts the armature **168** (which moves upwardly, as viewed in FIG. **10**), whereby the tucking fingers **164, 166** of the device **161** slide along the guide rail **167** toward each other and provide the blanks on the mandrel **43** with the tucks shown in the portion **14L** of FIG. **14.**

The electromagnet **352** thereupon actuates the switch **353** which resets the flip-flop **349** with the result that the electromagnet **352** is deenergized and the tucking fingers **164, 166** move away from the mandrel **43** under the action of a spring, not shown.

The detector **226** determines whether or not the adjacent mandrel **43** carries a paper blank **132.** If the mandrel is provided with a paper blank, the detector **226** does not transmit signals to the gates **356, 358** of the control unit **354** of FIG. **13***a*. However, the gates **356, 358** receive signals if the detector **226** determines that the adjacent mandrel **43** does not carry a paper blank **132.** As mentioned above, the detector **226** may comprise two contacts which are electrically connected with each other if they engage a tinfoil blank, i.e., if the adjacent mandrel **43** does not carry a paper blank **132** overlying that portion of the tinfoil blank which can be scanned by the detector **226.** The purpose of the signal from the detector **226** will be described later.

In response to renewed indexing of the turret **42,** the mandrel with a paper blank **132** and a tinfoil blank **71** thereon reaches the station which accommodates the folding member **173.** When the mandrel **43** comes to a standstill, the flip-flop **371** in the control unit **369** of FIG. **13***b* receives a signal from the pulse shape **101** and energizes the rotary electromagnet **373** which rotates the shaft **174** of the folding member **173.** The folding member **173** then perfoms the operation which is shown in the portion **14m** of FIG. **14.** The armature of the electromagnet **373** then actuates the switch **374** which resets the flip-flop **371** so that the electromagnet **373** is deenergized and permits a spring (not shown) to return the folding member **173** to its starting position.

In response to the next-following indexing of the turret **42,** the mandrel **43** advances along the heated stationary folding member **176** which performs the operation shown in the portion **14n** of FIG. **14.** This completes the closing of one end of the paper blank **132.** The folding member **176** heats the adhesive which was applied by the coating roller **143** of the paster **139** to the adjacent flap of the blank **132** so that the adhesive sets before the mandrel reaches the transfer station B.

The photoelectric detector **222** downstream of the transfer station A' is constructed in such a way that it produces signals only when it fails to detect groups **8** of cigarettes **22** in the chambers **39** of the compacting turret **36.** When the detector **222** fails to produce signals, the NOR-gate **397** in the control unit **387** transmits a signal to the corresponding input of the AND-gate **399.** If the detector **227** at the transfer station A fails to detect a tinfoil blank **71** (i.e., if such tinfoil blank is concealed by the outer envelope consisting of the material of a paper blank **132**), this indicates that a mandrel **43** at the transfer station B carries a properly shaped empty pack **41** or that it is without an empty pack. The detector **227** then fails to produce a signal so that the output of the AND-gate **398** transmits a signal which is received by the corresponding input of the AND-gate **399.** Thus, if the just described conditions are met with the two inputs of the AND-gate **399** receive signals from the gates **397, 398,** the AND-gate **399** transmits a signal to the flip-flop **401** as soon as it receives a signal from the pulse shaper **101.** The flip-flop **401** then transmits a signal to the valve **403** by way of the amplifier **402** whereby the valve **403** causes the cylinder **63** to expel the piston rod **62** which in turn moves the rod **57** and the pack stripping plunger **56** of the adjacent mandrel **43** in the direction indicated by arrow **61** shown in FIG. **5.** The piston rod **62** then bears against the flange **58** at the lower end of the rod **57,** as seen in FIG. **5.** This causes the plunger **56** to strip the empty pack **41** off of the mandrel **43** and to transfer it into the registering pocket **178** of the turret **179.** Thus, the empty pack **41** is transferred from the path V into the path Y. When it reaches the fully extended position, the piston rod **62** closes the switch **405** which resets the flip-flop **401.** The latter changes the condition of the valve **403** which causes the cylinder **63** to retract the piston rod **62** whereby the spring **59** returns the plunger **56** to the position shown in FIG. **5.**

The pocket **178,** with an empty pack **41** therein, thereupon advances by two steps in a direction from the transfer station B toward the pack filling station C.

During the interval following the second step of the turret **179**, the flip-flops **418**, **423** of the control unit **417** shown in FIG. **13**b receive a signal from the pulse shaper **101**. The flip-flop **418** energizes the solenoid of the electropneumatic valve **422** by way of the amplifier **419** whereby the valve **422** causes the cylinder **421** to expel the piston rod **189**. The flip-flop **423** energizes the electromagnet **426** for the mouthpiece **192** by way of the amplifir **424**. The link **191** thereby advances the mouthpiece **192** toward the turret **179** so that the mouthpiece **192** enters the open end of the empty pack **41** in the adjacent pocket **178**. The piston rod **189** of the cylinder **421** causes the pusher **188** to advance toward the turret **179** whereby the pusher **188** expels a group **8** from the registering chambers **39** of the compacting turret **35** and causes the thus expelled group **8** to pass through the mouthpiece **192** so that the group enters the empty pack (FIG. **4***c*). The mouthpiece **192** cooperates with the turret **36** to prevent premature expansion of the compacted group **8**. This completes the transfer of the compacted group **8** from the last portion of the path U into the path Y. The filling of empty packs **41** with groups **8** of cigarettes **22** takes place at the station C. The retaining member or flange **186** which is adjacent to the path Y prevents the empty packs **41** from yielding in response to introduction of groups **8**. When the piston rod **189** of the cylinder **421** in the control unit **417** reaches its outer end position, it closes the switch **427** which resets the flip-flops **418**, **423**. This enables the valve **422** to retract the piston rod **189**, and the electromagnet **426** is deenergized to permit the link **191** to return the mouthpiece **192** to its idle position. The return movement of the mouthpiece **192** to its idle position can take place under the action of a suitable spring, not shown.

When a pocket **178** of the turret **179** moves beyond the pack filling station C, it reaches the tucking device **194** shown in FIG. **4**b. The construction of the tucking device **194** is analogous to that of the tucking device **161**. When the pocket **178** comes to a halt, the flip-flop **429** of the control unit **428** shown in FIG. **13***b* receives a signal from the pulse shaper **101** whereby the flip-flop **429** effects energization of the electromagnet **432** which causs the tucking fingers of the device **194** to move toward each other in a manner as described in connection with the tucking fingers **166**, **164** of the device **161** shown in FIG. **10**. The operation which is performed by the tucking device **194** is shown in the portion **14***p* of FIG. **14**. The portion **14***o* of FIG. **14** illustrates the transfer of a group **8** of 20 cigarettes **22** into an empty pack **41** at the pack filling station C. The electromagnet **432** of the control unit **428** then closes the switch **433** which resets the flip-flop **429** so that the electromagnet **432** is deenergized and a spring (not shown) returns the tucking fingers of the device **194** to their retracted or idle positions. The turret **179** is thereupon indexed again by a step and the pocket **178** with the pack **41** and a group **8** therein reaches the pivotal folding member **196** shown in FIG. **4***b*. When the pocket **178** comes to a stop, the adjustable time-lag device **436** transmits to the flip-flop **437** of the control unit **434** shown in FIG. **13***b* a delayed signal which causes energization of the rotary electromagnet **439** for the shaft **197** of the folding member **196**. The folding member **196** then performs the operation which is illustrated in the portion **14***q* of FIG. **14**. When it reaches its end position, the shaft **197** closes the switch **441** which resets the flip-flop **437**. This deenergizes the electromagnet **439** whereby a spring (not shown) returns the folding member **196** to its idle position.

The pocket **178** of the turret **179** is thereupon advanced by a step to reach the folding and sealing member **198**. This member **198** perfoms the operation which is illustrated in the portion **14***r* of FIG. **14**. Thus, the empty pack **41** with a group **8** of 20 cigarettes **22** therein is converted into a closed pack **201**. The member **198** heats the adhesive between the adjacent flaps of the paper envelope consisting of a blank **132** so that the adhesive sets and cannot open during the next-following stages of treatment of the respective pack **201**.

In response to renewed indexing of the turret **179**, the pocket **178** with a pack **201** therein moves to a position between the front part of the folding member **198** and the transfer station A''. When the turret **179** is indexed again, the pack **201** reaches the station A'' and is located in the range of the pusher **204**. When the turret **179** comes to a halt, the pulse shaper **101** transmits to the flip-flop **443** of the control unit **442** shown in FIG. **13***c* a signal which energizes the solenoid of the valve **446** whereby the valve causes the cylinder **447** to shift the pusher **204** so that the latter expels the pack **201** from the adjacent pocket **178** into the registering pocket **206** of the turret **207** in the tax stamp applicator **199**. When the pusher **204** reaches its extended position, it actuates the switch **448** which resets the flip-flop **443** so that the valve **446** reassumes its original condition and causes the cylinder **447** to retract the pusher **204** to the starting or idle position shown in FIG. **4***b*.

The detector **228** at the transfer station A'' determines whether or not a group **8** which has been transferred by the pusher **204** into the adjacent pocket **206** of the turret **207** is surrounded by a layer of tinfoil. If the detector **228** senses the presence of tinfoil, this indicates that the pack **201** is properly formed and is ready to be provided with a tax stamp **202**. A signal transmitted by the detector **228** in the control unit **449** of FIG. **13***c* reaches the corresponding input of the AND-gate **452** together with a signal from the pulse shaper **101**. The signal which is transmitted by the AND-gate **452** to the corresponding input of the flip-flop **454** does not change the condition of the flip-flop. Therefore, the electromagnetic clutch **279** remains energized and the shaft **281** for the carrier **209** in the applicator **199** can be indexed.

The turret **207** is thereupon indexed by a step so that the freshly received pack **201** is moved in front of the carrier **209** on the shaft **281**. During such indexing of the turret **207**, the carrier **209** performs a full revolution in the direction indicated by arrow **208**. This enables the ram **211** to withdraw the foremost tax stamp **202** from the magazine **213** whereby the thus withdrawn tax stamp adheres to the suction ports **214** in the extensions **210** of the ram **211**. The tax stamp is thereupon caused to move along the paster **217** which coats the exposed side of the tax stamp with a suitable adhesive. When the carrier **209** completes a full revolution, the flip-flop **458** of the control unit **457** receives from the pulse shaper **101** a signal while the turret **207** and the carrier **209** are at a standstill. The output signal from the flip-flop **458** is amplified at **459** and is transmitted to the electromagnet **212** which is energized. The thus energized electromagnet **212** advances the

ram 211 in a direction toward the adjacent pocket 206. The operation of the ram 211 is analogous to that of the draping member 146 shown in FIG. 9. Thus, the median portion 215 of the ram 211 presses the adjacent part of the adhesive-coated tax stamp 202 against the adjacent end face of the pack 201 and the end portions of the stamp are moved against the major surfaces of the pack 201. The operation which is performed by the ram 211 of the carrier 209 in the tax stamp applicator 199 is shown in the portion 14s of FIG. 14. The median portion 215 of the ram 211 prevents lateral shifting of the tax stamp 202 during its deformation of the extensions 210. The electromagnet 212 thereupon closes the switch 461 which resets the flip-flop 458 of the control unit 457. This enables a spring (not shown) to return the ram 211 to a retracted position. The pack 201 is now provided with a properly applied tax stamp 202 and is ready for transfer onto the upper stretch of the take-off conveyor belt 203 in response to renewed indexing of the turret 207. When the pack 201 reaches a position adjacent to the belt 203 and comes to a standstill, the flip-flop 464 of the control unit 462 shown in FIG. 13*c* receives a signal from the pulse shaper 101. This enables the flip-flop 464 to energize the solenoid of the valve 463 which causes the cylinder 467 to expel the piston rod 218 whereby the entraining member 219 of the piston rod 218 withdraws the pack 201 from the adjacent pocket 206 and transfers it onto the upper stretch of the belt 203. Prior to a working stroke of the piston rod 218, the entraining member 219 is located in the space between the four arms of the turret 207. The entraining member 219 pivots in response to engagement with the adjacent pocket 206 while the piston rod 218 performs a return stroke and the member 219 thereupon pivots to assume a vertical position in which it is ready to expel the pack 201. When it reaches its foremost position, the piston rod 218 closes the switch 468 which resets the flip-flop 464 of the control unit 462 and sets the flip-flop 473 in the control unit 469. The flip-flop 473 thereupon transmits a signal to the valve 476 which admits compressed gas (preferably air) to the ejector nozzle 221. The detector 229 is positioned adjacent to the path of movement of packs 201 from the path Y onto the upper stretch of the belt 203. This detector scans the transferred pack for the presence or absence of a tinfoil blank 71. If the detector 229 detects the presence of a tinfoil blank 71, it transmits a signal to the corresponding input of the flip-flop 473 which causes energization of the solenoid in the valve 476 so that the admission of compressed air to the ejector nozzle 221 is interrupted before the pack 201 reaches the orifice of this nozzle. Thus, the nozzle 221 cannot eject a proper pack 201.

If the operation of the producing machines 1 and 2 is interrupted, or if these machines happen to function improperly for whatever reason so that the rate at which the belt 23 of FIGS. 2 and 3 delivers cigarettes 22 to the hopper 14 of the magazine 4 does not suffice for continuous formation of groups 8 and their introduction into the cells 9 of the chain 11, the level of cigarettes 22 in the hopper 14 descends below the lowermost photoelectric detector 31. The detector 31 then produces a signal which causes a change in the condition of the flip-flop 378 in the control unit 376 of FIG. 13b. The signal at the corresponding input of the AND-gate 377 is changed so that the gate 377 begins to block. When the other input of the AND-gate 377 thereupon receives a signal from the pulse shaper 101, the gate 377 does not produce an output signal and the electropneumatic valve 382 cannot initiate a working stroke of the pusher 7 which serves to transfer the groups 8 from the hopper 14 into successive cells 9 of the chain 11. Thus, the pusher 7 remains at a standstill and at least one cell 9 of the chain 11 remains unfilled. It will be seen that the detector 31 prevents the formation of unsatisfactory groups 8, namely, of groups which contain less than twenty cigarettes 22. The empty cell 9 advances toward and around the sprocket wheel 33 of FIG. 4*b* and reaches the transfer station A'. The pusher 37 performs a working stroke but such stroke does not result in the transfer of a group 8 into the adjacent chamber 39 of the compacting turret 36 because the cell 9 which registers with the pusher 37 is empty. This causes the detector 222 which is adjacent to the path U to produce a signal which is transmitted to the NOT-gate 397 of the control unit 387. The NOT-gate 397 transmits a signal to the AND-gate 399 which begins to block. Consequently, the condition of the flip-flop 401 remains unchanged and the valve 403 cannot cause the piston rod 62 to perform a working stroke. The transfer unit 175 remains idle. Consequently, the empty pack 41 which reaches the station B is not transferred into the adjacent pocket 178 of the turret 179. It will be seen that a signal from the detector 222 results in retention of an empty pack 41 in the path V. Furthermore, the signal from the detector 222 is transmitted to the AND-gate 404 which transmits a signal to the error signal input 408 of the counter 407. If the detector 222 determines a certain predetermined number of empty chambers 39, the AND-gate 404 transmits a corresponding number of error signals to the counter 407. When the sum of error signals received by the counter 407 reaches the predetermined number, the counter transmits a signal to the OR-gate 389 of the control unit 386. The output signal from the OR-gate 389 then causes the flip-flop 393 to deenergize the clutch 232 between the motor 231 and the packing machine 12. The packing machine comes to a standstill. The purpose of the switch 396 which is adjacent to the clutch 232 shown in FIG. 13*b* will be described later.

It will be noted that the detector 222 can initiate an automatic stoppage of the packing machine 12 in response to malfunction of the producing machines 1 and 2, namely, in response to such a drop in the level of cigarettes 22 in the hopper 14 that the detector 31 produces a signal. A stoppage of the packing machine 12 under such circumstances is desirable because it insures that the pusher 7 cannot form incomplete groups 8. However, the packing machine 12 will continue to operate when the cigarettes in the hopper 14 extend to a level above the detector 31 even though the turret 39 fails to receive groups 8 of cigarettes 22. If the interruption in the feed of cigarettes 22 to the hopper 14 is of relatively short duration, namely, when the counter 407 fails to store a requisite number of error signals transmitted thereto by way of the input 408, the packing machine 12 preferably continues to run until each of the mandrels 43 carries an empty pack 41. Each signal which is transmitted to the counter 407 by way of the input 409 erases a signal from the input 408 so that the packing machine 12 continues to run as long as the sum of error signals stored in the counter 407 is less than a predetermined number because the clutch 232

between the motor 231 and the driven parts of the packing machine 12 then remains in energized condition. The input 409 transmits to the counter 407 an erasing signal whenever the detector 222 detects the presence of a group 8 in the adjacent chamber 39 of the turret 36. For example, the detector 222 can detect the absence of groups 8 in two, three or four successive chambers 39. The four empty chambers 39 are followed by two filled chambers 39 whereby two of the error signals transmitted to the counter 407 are erased. If the counter 407 is set to deenergize the clutch 232 in response to a total of six stored error signals, the packing machine 12 continues to operate even though the detector 22 has found four empty chambers 39. The detector 222 causes the transfer of an empty pack 41 from the path V into the path Y whenever it detects a filled chamber 39.

If an empty pack 41 is caused to move beyond the transfer station B without being transferred into the path Y, it reaches the detector 223 which is adjacent to the path V downstream of the transfer station B. The detector 223 determines whether or not a mandrel 43 which is adjacent thereto carries a tinfoil blank 71. This detector 223 can readily scan the adjacent tinfoil blank even though the latter is partially surrounded by a deformed paper blank 132 because the open end of the envelope formed by the tinfoil blank extends beyond the paper envelope. This is shown in the portions 14*h* to 14*o* of FIG. 14. When the detector 223 detects a tinfoil blank 71, it transmits a signal to the corresponding input of the AND-gate 304 in the control unit 301. When the AND-gate 304 receives a signal from the detector 223 simultaneously with a signal from the pulse shaper 101, it produces an output signal which is transmitted to the flip-flop 307. The flip-flop 307 transmits a signal to the clutch 263 by way of the amplifier 308, and such signal is also transmitted to the clutch 246. These signals disengage the clutches so that the shafts 74*a* and 247 are arrested. The conductor between the amplifier 308 and clutch 246 contains the aforementioned switch 302 which insures that the clutch 246 can be disengaged only when the turrets of the packing machine 12 complete a step including an indexing movement and the next-following period of dwell. Thus, the clutch 246 can be disengaged only when the carrier 83 of the blank forming apparatus 69 reaches an end position after it has travelled in the direction indicated by arrow 95 shown in FIG. 6. When the clutches 263 and 246 are disengaged, the apparatus 69 ceases to deliver tinfoil blanks 71 to the path V and the web 73 of tinfoil is not transported lengthwise through distances necessary to form a succession of blanks 71. Thus, the detector 223 prevents the formation of blanks 71 when it detects the presence of an empty pack 41 on a turret 43 which has advanced beyond the transfer station B.

When a mandrel 43 which carries an empty pack 41 reaches the detector 224 which is adjacent to the path V and is close to the movable folding member 127, the detector 224 does not produce a signal because it is positioned in such a way that it cannot detect the tinfoil blank 71 if the latter is covered by a paper blank 132. Consequently, the NOT-gate 318 of the control unit 317 transmits a signal to the corresponding input of the AND-gate 321. When the AND-gate 321 thereupon receives a signal from the pulse shaper 101, it transmits a signal to the corresponding input of the flip-flop 322 which deenergizes the solenoid of the valve 324. Therefore, the suction drum 134 of the blank feeding apparatus 131 is sealed from the suction generating device. Consequently, the drum 134 cannot withdraw a fresh paper blank 132 from the magazine 133. A mandrel 43, with an empty pack 41 thereon, can travel past the transfer station B'' without receiving a paper blank 132.

It will be noted that the making of fresh empty packs 41 is controlled by empty packs which circulate along the path V. Otherwise stated, fresh tinfoil blanks 71 and paper blanks 132 can be fed into the path V only when the approaching mandrels 43 do not carry empty packs 41. The detector 223 detects the presence of tinfoil blanks 71 and the detector 224 detects the presence of paper blanks 132. These detectors insure that a turret 43 which already carries an empty pack 41 cannot receive additional blanks. The empty packs 41, each on a turret 43, continue to circulat along the path V until the detector 222 produces a signal which causes them to be transferred into the path Y AND TO BE UNITED WITH GROUPS * TO FORM THEREWITH FILLED PACKS)-. Each group 8 causes the detector 222 to initiate the transfer of an empty pack 41 from the path V into the path Y. packs 41, each on a turret 43, continue to circulate along the path V until the detector 222 produces a signal which causes them to be transferred into the path Y and to be united with groups 8 to form therewith filled packs 201. Each group 8 causes the detector 222 to initiate the transfer of an empty pack 41 from the path V into the path Y.

In an extreme condition of operation of the packing machine 12, the turret 42 can constitute a magazine or storing device for empty packs 41 which are carried by the corresponding mandrels 43. It can happen that each of the mandrels 43 carries an empty pack 41. Such situation can arise if the chain 11 fails to deliver groups 8 to the transfer station A'. The turret 42 continues to rotate intermittently as long as the clutch 232 in the drive shown in FIG. 12 continues to establish a torque-transmitting connection between the output shaft of the electromotor 231 and the shaft 241*a*. It will further be noted that, once an empty pack 41 on a turret 43 moves beyond the transfer station B, it can be transferred from the path V into the path Y only after it completes a full revolution about the axis of the turret 42. In other words, an empty pack 41 can be transferred from a predetermined portion of the path V, namely, at the transfer station B.

The detector 227 produces a certain signal regardless of whether it detects an incomplete empty pack 41 or an empty mandrel 43. This is due to the fact that the detector 27 simply responds to the presence of a current-conducting body, such as a tinfoil blank 71 on an adjacent mandrel 43 or the permanent magnet 52 or 53 on such mandrel. It can happen that, due to malfunctioning of the apparatus 69 and/or 131, or due to exhaustion of the supply of web 73 and/or blanks 132, a mandrel 43 which reaches the transfer station B fails to carry an empty pack 41. If this is the case, and if the detector 222 detects a group 8, the transfer unit 187 transfers such group from the adjacent chamber 39 of the turret 36 into the registering pocket 178 of the turret 179. The thus transferred group 8 is indexed with the turret 179 and reaches the transfer station A''. The detector 228 at the station A'' then fails to produce a signal because it responds only to the presence of a tinfoil blank 71. Consequently, the flip-flop 454 in the

control unit 449 does not receive a signal from the AND-gate 452. This causes the flip-flop 454 to deenergize the clutch 279 which thereby arrests the shaft 281. The carrier 209 in the tax stamp applicator 199 is brought to a halt and cannot withdraw tax stamps 202 from the magazine 213. When the group 8, without a pack 41 therearound, is expelled from the pocket 206 in the corresponding arm of the turet 207, the detector 229 detects the absence of a tinfoil blank and does not produce an output signal. Therefore, the flip-flop 473 in the control unit 469 does not receive a resetting signal and maintains the solenoid of the valve 476 in an energized condition so that the valve 476 connects the ejector nozzle 221 with the source of compressed air. Thus, the nozzle 221 ejects or expels the block 8 from the upper stretch of the take-off conveyor belt 203. This belt transfers satisfactory packs 201 to the packing machine 13 of FIG. 1. The group 8 which is expelled by the nozzle 221 is caused to descend into a suitable collecting receptacle, not shown. The main purpose of the nozzle 221 is to prevent contamination of the second packing machine 13 and interruptions in the operation of such packing machine. Furthermore, tabacco from unpacked cigarettes 22 which are removed from the upper stretch of the belt 203 can be recovered for reintroduction into the cigarette rod making machine 1.

If the detector 227 at the station B detects a tinfoil blank 71, this indicates that the blank feeding apparatus 131 failed to deliver a paper blank 132 to the corresponding mandrel 43. The detector 227 then produces a signal which is transmitted to the input of the NOT-gate 398 in the control unit 387. The gate 398 causes the AND-gate 399 to block so that the flip-flop 401 cannot receive a signal and cannot initiate an operation of the transfer unit 175. The detector 223, which also responds to the presence of tinfoil, prevents the delivery of fresh blanks 71 by the apparatus 69 when it detects a tinfoil blank on the mandrel 43 which has advanced beyond the station B.

As described above, the detector 224 can initiate admission of fresh paper blanks 132 by the blank feeding apparatus 131. If the apparatus 131 has failed to operate only once, namely, during one stage of operation of the packing machine 12, the empty pack on the corresponding mandrel 43 is thereupon completed. However, if the detector 226 detects that the mandrel 43 did not receive a paper blank 132, or that the mandrel does not carry any blanks, the counter 359 of the control unit 354 begins to store error signals which are transmitted thereto by the input 361. When the counter 359 stores a predetermined number of error signals, each produced in response to detection of the absence of a blank, it transmits a signal to the OR-gate 363 which causes the flip-flop 364 to disengage the clutch 367. Such disengagement of the clutch 367 is necessary because the delivery of groups 8 should be interrupted if the turret 42 fails to deliver satisfactory empty packs 41. If desired, the flip-flop 364 can actuate an alarm device (not shown) which indicates to the attendant that the operation of the converting assembly in the packing machine 12 is improper. The input 362 transmits to the counter 359 an erasing signal whenever the detector 226 fails to deliver a signal whereby the counter 359 is automatically reset to zero.

The just described monitoring of tinfoil blanks 71 and paper blanks 132 and the disengagement of the clutch 367 in response to accumulation of a predetermined number of error signals insure that the producing machines 1 and 2 cannot be arrested excepting when the sum of blanks which were not delivered by the apparatus 69 and/or 131 reaches a perdetermined number.

If the level of cigarettes 22 in the hopper 14 of the magazine 4 reaches the uppermost detector 28, the latter transmits a signal to the OR-gate 363 of the control unit 354. This causes the flip-flop 364 to disengage the clutch 367 and to thus arrest the producing machines 1 and 2. The clutch 367 can be reengaged by closing the manually operated switch 368 in the control unit 354. Closing of the switch 368 results in resetting of the flip-flop 364. The packing machine 12 can be started by the manually operated switch 391 in the control unit 386. This switch can reset the flip-flop 393 which controls the clutch 232 between the output shaft of the motor 231 and the shaft 241*a*. The switch 392 of the control unit 386 is opened by hand when the operator wishes to arrest the packing machine 12.

When the packing machine 12 performs operations which involve movements of folding and/or tucking members, or which involve transfer of groups 8 from one turret to another turret, it is undesirable to interrupt such operations before the respective movable parts reach their starting or idle positions. Stoppage of moving parts of the packing machine 12 at inopportune times can result in damage to packs 41, groups 8 and/or movable parts when the packing machine is restarted. Consequently, it is desirable that each stage of operation of the packing machine 12 be completed before the packing machine is arrested. The same holds true for the application of adhesive and for the transfer of blanks 71 and/or 132. To this end, the driven element of the clutch 232 in the control unit 386 is operatively connected with the switch 396. The driven element of the clutch 232 is provided with a lobe or an analogous projection (not shown) which actuates the switch 396 upon completion of a step. In other words, the switch 396 insures that the flip-flop 393 can deenergize the clutch 232 only upon completion of an indexing step and movements of various movable parts in the packing machine 12.

An important advantage of the illustrated packing machine is that it is less prone to malfunction than the presently known packing machines. This is particularly important in connection with packing machines which are directly coupled to one or more producing machines. In the absence of a substantial magazine between the producing and packing machines, it is necessary to insure that the packing machine be arrested simultaneously or substantially simultaneously with the producing machine or machines and that the two groups of machines be started at the same time. Such stoppage and starting of the packing machine must often take place in response to frequent and short-lasting interruptions in operation of the producing machines. Furthermore, the previously described controls of the packing machine 12 insure that the stoppage and starting of the packing machine can take place in automatic response to stoppage and starting of the producing machine or machines so that the operator who is in charge of the producing machine or machines need not be concerned with operation of the packing machine. As a rule, the producing machine or machines are much more sensitive than the packing machines so that

the operator or operators are occupied with supervision of the producing machines and can spend little time for supervision of the packing machines.

Another important advantage of the improved packing machine is that it produces empty packs **41** independently of the rate of delivery of groups **8.** Therefore, the packing machine can accumulate a reasonable supply of empty packs which can be transferred from the path V into the path Y whenever necessary, namely, whenever the detector **222** detects the presence of a group **8** in the adjacent chamber **39** of the turret **36.** The packing machine automatically continues to make empty packs **41** even if the producing machine or machines are arrested until each of the mandrels **43** carries an empty pack **41.** In other words, the packing machine **12** is arrested in automatic response to stoppage of the producing machine or machines but only after the elapse of an interval which is necessary to produce such a number of empty packs **41** that each mandrel **43** carries an empty pack.

FIGS. **15***a*–**15***d* illustrate a second packing machine **2012** whose control system is shown in FIGS. **16***a*–**16***c*. All such parts of the second packing machine which are identical with or clearly analogous to the corresponding parts of the packing machine **12** are denoted by similar reference characters plus **2000.** Also, the paths for various components of filled packs **2201** and for such filled packs are denoted by reference characters employed in FIGS. **4***a*–**4***b* followed by the digit "2".

One of the differences between the packing machines **12** and **2012** is that the turret **2042** of the converting assembly defines a portion of the path **Y2.** The turret **2042** does not constitute a magazine for empty packs **2041** but merely serves for the making of empty packs whenever warranted by the detection of a satisfactory group **2008.** Thus, the blanks **2071, 2132** are supplied by the respective apparatus **2069, 2131** to the turret **2042** only when the detector **2222** (which is placed adjacent to the path U2) detects a satisfactory group **2008.** In other words, empty packs **2041** cannot circulate along an endless path but only along that portion of the path defined by the mandrels **2043** of the turret **2042** wherein the blanks **2071, 2132** are subjected to deforming operations to be converted into the envelopes of empty packs **2041.** The paths along which the blanks **2071, 2132** are supplied into the path **Y2** are respectively shown at **W2** and **X2.** The transfer stations where the blanks **2071, 2132** enter the path **Y2** are respectively shown at **B2'** and **B2''.**

Another difference between the packing machines **12** and **2012** is that the turret **2042** does not serve for the making of empty packs **2041** independently of the rate of delivery of satisfactory groups **2008** to the pack filling station **C2.** Each empty pack **2041** which is formed during travel of blanks **2071, 2132** along the path **Y2** is transferred into a pocket **2178** of the turret **2179.** Such transfer takes place at the station **B2.** The transfer of blanks **2071, 2132** from the paths **W2, X2** into the path **Y2** depends on the detection of satisfactory groups **2008** by the detector **2222.**

Still another difference between the packing machines **12** and **2012** is that the machine **2012** comprises a paster **2291** which is located downstream of the pivotable folding member **2173** and serves to apply a wet adhesive to that flap **2041***a* of the partially completed empty pack **2041** which is to be folded by the stationary folding member **2176.** The paster **2291** comprises a forked carrier **2292** for a coating roll **2293** and a nozzle **2294** which is connected with a source of adhesive and applies a film of adhesive to the periphery of the roll **2293.** The carrier **2292** is reciprocable in directions indicated by a double-headed arrow **2297.** The means for reciprocating the carrier **2292** comprises an electromagnet **2296** shown in FIG. **16***a*.

As mentioned above, the photoelectric detector **2222** is placed adjacent to the upper stretch of the chain **2011,** as viewed in FIG. **15***b*, so that it is remote from the transfer station **A2'.** This detector scans the cells **2009** for the presence or absence of gropus **2008** and is located at such a distance from the pack filling station **C2** that the sprocket wheel **2033** and compacting turret **2036** must be indexed ten times before a scanned group **2008** advances from the testing station (detector **2222**) to the filling station **C2.** The same number of indexing movements (by the turrets **2042** and **2179**) is necessary to advance a tinfoil blank **2071** from the transfer station **B2'** to the filling station **C2.**

The control system of FIGS. **16***a*–**16***c* differs from the control system of FIGS. **13***a* –**13***c* in that it does not include the control units **301** (because the clutch **246** is omitted from the drive means of the packing machine **2012**), **317, 354** and **449.** Furthermore, the detector **227,** the NOT-gate **398** and the AND-gate **399** of the control unit **387** are also omitted. The amplifiers and certain other parts (including the clutch **263,** the electropneumatic valve **324** and the clutch **279**) are controlled by a shift register **2484** of the control system in the packing machine **2012.**

Furthermore, the control system of FIGS. **16***a*–**16***c* comprises certain parts which are not used in the control system of FIGS. **13***a*–**13***c*. Such parts include a control unit **2481** (shown in FIG. **16***a*) which includes the electromagnet **2296** for moving the carrier **2292** of the paster **2291.** The control unit **2481** further comprises a pulse shaper **2483** which is connected with the switch **2099,** a flip-flop **2485,** an amplifier **2482** and a switch **2489** which is actuated by the armature of the electromagnet **2296** and can reset the flip-flop **2485.** The pulse shaper **2483** produces a signal of predetermined duration in response to opening of the switch **2099,** i.e., the pulse shaper **2483** responds to the downwardly sloping flank of the signal produced by the switch **2099.**

The shift register **2484** is connected with the switch **2099** and pulse shaper **2101** and comprises 14 stages. The exact construction of the shift register **2484** forms no part of the present invention; its stages are denoted by the characters *a* to *o* and the number of such stages equals the number of steps which a blank **2071** must perform in order to advance from the rollers **2072***a*, **2072***b* of the feeding device **2072** to the turret **2207** of the tax stamp applicaton **2199.** A conductor **2486** connects the stages of the register **2484** with the output of the pulse shaper **2101** and serves to transmit to such stages shifting pulses. A further conductor **2487** connects the photoelectric **2222** wit the input of the first stage *a* by way of an AND-gate **2488** in such a way that, when the detector **2222** detects the absence of groups **2008** in the path **U2,** the first stage *a* receives a signal in response to detection of the absence of each group. Such signals are thereupon transported through successive stages of the register **2484** in synchronism with operation of the packing machine **2012.**

The output of the first stage *a* is connected with the clutch **2263** by way of an amplifier **2308.** The clutch

2263 can drive the shaft 2274*a* of the roller 2072*a* in the feeding device 2072. The output of the fourth stage *d* is connected with the solenoid of the electropneumatic valve 2324 by way of an amplifier 2323. The valve 2324 controls the connection between the suction generating device (not shown) and the suction drum 2134 in the apparatus 2131.

The output of the last stage *o* is connected with the clutch 2279 by way of an amplifier 2456. The clutch 2279 can drive the shaft 2281 of the carrier 2209 in the tax stamp applicator 2199.

The operation of the packing machine 2012 is as follows

The cells 2009 of the chain 2011 transport blocks or groups 2008 of 20 cigarettes each along the path U2. The cells 2009 receive groups 2008 from a magazine which preferably corresponds to the magazine 4 of FIG. 2. At the transfer station A2', the groups 2008 are transferred into successive chambers 2039 of the compacting turret 2036 and are moved stepwise to the pack filling station C2. When the detector 2222 detects the presence of a group 2008, it does not produce a signal. Therefore, the NOT-gate 2397 (FIG. 16*b*) transmits a signal to one input of the AND-gate 2406. When the other input of the AND-gate 2406 receives a signal from the pulse shaper 2101 (which is in series with the switch 2099), the gate 2406 transmits a signal to the signal erasing input 2409 of the counter 2407. Since the AND-gate 2488 (FIG. 16*c*) which is connected to the detector 2222 by the conductor 2487 does not receive a signal when the detector 2222 detects the presence of a group 2008, the shift register 2484 does not receive a control signal. Therefore, the first stage *a* cannot disengage the clutch 2263 by way of the amplifier 2308 and the feeding device 2072 is caused to advance the tinfoil web 2073 through a distance corresponding to the length of a blank 2071. Thus, the apparatus 2069 delivers a blank 2071 from the path W2 to the path Y2, namely, to the transfer station B2'. The thus delivered tinfoil blank 2071 is then converted into a tube in a manner as described in connection with FIGS. 4 to 8 and 12 to 14, particularly in connection with FIGS. 6, 7 and 8.

Since the register 2484 did not receive a control signal, the next following timing signals from the pulse shaper 2101 (such timing signals cause a signal which is stored in the register 2484 to move from stage to stage) cannot cause the stage *d*to produce an output signal so that the valve 2324 continues to connect the suction drum 2134 of the apparatus 2131 with the suction generating device. Consequently, the suction drum 2134 can withdraw a paper blank 2132 from the magazine 2133 and delivers such blank along the path X2 to the transfer station B2''. The draping member 2146 thereupon drapes the blank 2132 about the adjacent mandrel 2043 in the same way as described in connection with FIGS. 4*a* and 4*b*. The thus draped paper blank 2132 partially surrounds the tinfoil tube on such mandrel. Prior to the draping of a paper blank 2132, the tinfoil tube on the mandrel 2043 which moves from the station B2' to the station B2'' is treated by the folding members 2127 and 2129 which perform the operations corresponding to those shown in the portions 14*e* and 14*f* of FIG. 14. It will be seen that the detector 2222 controls the admission of blanks 2071, 2132 into the path Y2 in response to detection of groups 2008 in the adjacent cells 2009 of the chain 2011.

The partially deformed blanks 2071, 2132 are thereupon treated substantially in the same way as described in connection with FIGS. 1 to 14 so that they form an empty pack 2041 when the corresponding mandrel 2043 reaches the station B2. Thus, such blanks are treated by the folding members 2153, 2154 (see the portions 14*i* and 14*k* of FIG. 14), by the tucking device 2161 which performs the operation shown in portion 14L of FIG. 14, and by the folding member 2173 (portion 14*m* of FIG. 14). However, the adhesive which is needed to close one end of the paper envelope on the corresponding mandrel 2043 is applied by the paster 2291 whose coating roll 2293 applies paste to the inner side of the flap 2041*a* (FIG. 15*a*). The paster 2291 is operated during an interval which follows a stepwise indexing movement of the turret 2042, namely, when the switch 2099 is open. As stated above, the pulse shaper 2483 (FIG. 16*a*) produces a signal in response to opening of the switch 2099, and such signal causes the flip-flop 2485 of the control unit 2481 to energize the electromagnet 2296 by way of the amplifier 2482. The energized electromagnet 2296 moves the carrier 2292 of the paster 2291 upwardly, as viewed in FIG. 15*a*, so that the coating roll 2293 rolls along and coats with adhesive the inner side of the flap 2041*a*. When the carrier 2292 reaches its upper end position, the armature of the electromagnet 2296 closes the switch 2489 so that the condition of the flip-flop 2485 changes with the result tha the electromagnet 2296 is deenergized. This enables a suitable spring (not shown) to return the carrier 2292 of the paster 2291 to the retracted or idle position shown in FIG. 15*a*. The flap 2041*a* is thereupon caused to adhere to the flap which was formed by the member 2173 while the respective mandrel 2043 moves along the stationary folding member 2176 (see the portion 14*n* of FIG. 14).

When the thus obtained empty pack 2041 reaches the transfer station B2, it is automatically removed from its mandrel 2043 by the transfer unit 2175 and is introduced into the registering pocket 2178 of the turret 2179. The transfer unit 2175 receives signals from a detector which scans the compacted groups 2008 in the chamber 2039 of the turret 2036.

The empty pack 2041 then shares the movements of the turret 2179 and reaches the filling station C2 simultaneously with that group 2008 whose scanning by the detector 2222 triggered the admission of corresponding blanks 2071 and 2132 into the path Y2. The group 2008 is transferred into the empty pack 2041 in the same way as described in connection with FIGS. 1–14 (see also FIG. 15*c*). The thus obtained filled pack is advanced beyond the filling station C2 and the open ends of its tinfoil and paper envelopes are closed by the members 2194, 2196 and 2198 (see the portions 14*p*, 14*q* and 14*r* of FIG. 14). The pack 2201 is thereupon transferred into the adjacent pocket 2206 of the turret 2207 in the tax stamp applicator 2199. The transfer into the pocket 2206 takes place at the station A2'' and is carried out by the pusher 2204.

Since the group 2208 whose travel along the paths U2 and Y2 was described in the preceding paragraphs did not cause the detector 2222 to transmit control signal to the shift register 2484, the last stage *o* of the register does not transmit a signal to the clutch 2279 (FIG. 16*c*) by way of the amplifier 2456. Therefore, the clutch 2279 remains engaged and the applicator 2199 provides the pack 2201 with a tax stamp 2202. The ap-

plication of the stamp **2202** takes place in the same way as described in connection with FIG. **4***b*. The entraining element **2219** thereupon transfers the finished pack **2201**, with a tax stamp **2202** applied thereto, onto the upper stretch of the take off belt **2203**.

If the detector **2222** detects the absence of a group **2208**, namely, that the adjacent cell **2009** of the chain **2011** is empty, the detector **2222** transmits a signal to the corresponding input of the AND-gate **2404** (FIG. 16b). The other input of the AND-gate **2404** thereupon receives a timing signal from the pulse shaper **2101**. Consequently, the AND-gate **2404** transmits an output signal to the error signal input **2408** of the counter **2407**. At the same time, the detector **2222** transmits a signal to the corresponding input of the AND-gate **2488** (by way of the conductor **2487**). When the other input of the AND-gate **2488** receives a signal from the pulse shaper **2101**, its output transmits a control signal to the first stage *a* of the shift register **2484**. Since the register simultaneously receives a timing signal from the pulse shaper **2101**, the first stage *a* transmits an output signal to the amplifier **2308** which disengages the clutch **2263**. Thus, the driving connection between the shafts **2262** and **2074***a* (FIG. **16***c*) is terminated and the feeding device **2072** cannot advance the tinfoil web **2073** toward the transfer station B2'. It will be seen that a signal from the detector **2222** causes the shift register **2484** to interrupt the delivery of tinfoil blanks **2071** into the path Y2. The corresponding mandrel **2043** does not receive a tinfoil blank **2071** and is indexed stepwise to advance toward the transfer station B2''. The control signal travels through the stages of the shift register **2484** and reaches the stage *d* at the time when the contemplated mandrel **2043** (without a tinfoil blank) reaches the station B2''. The stage *d* then transmits a signal to the amplifier **2323** which causes the valve **2324** to seal the suction generating device from the ports of the suction drum **2134**. Consequently, the drum **2134** cannot withdraw a paper blank **2132** from the magazine **2133** and the empty mandrel **2043** is thereupon indexed to advance toward the station B2.

The mandrel **2043**, without an empty pack thereon, advances stepwise beyond the station B2'' and reaches the transfer station B2. The unit **2175** cannot transfer a pack into the adjacent pocket **2178** of the turret **2179** and such pocket does not receive a group **2008**. It will be recalled that the absence of a group caused the detector **2222** to prevent the admission of blanks to the turret **2042**. The empty pocket **2178** advances toward the transfer station A2'' and reaches such station at the time when the control signal reaches the last stage *o* of the register **2484**. The output signal from the stage *o* is amplified at **2456** and causes disengagement of the clutch **2279** so that the shaft **2281** for the carrier **2209** in the tax stamp applicator **2199** remains at a standstill and the ram **2211** cannot withdraw a tax stamp from the magazine **2213**.

If the detector **2222** detects several successive empty cells **2009**, the error signal input **2408** of the counter **2407** receives a corresponding number of signals. When the sum of error signals in the counter **2407** reaches a predetermined number, the counter **2407** emits a signal which results in disengagement of the clutch **2232** and in stoppage of the packing machine **2012** in a manner as described in connection with FIGS. **1** to **14**.

If the packing machine **2012** is stopped, for example, in response to actuation of the switch **2392** shown in FIG. **16***b*, the possibility exists that such stoppage will take place at a time which is inopportune insofar as certain operations which result in the formation of blanks **2041** are concerned. For example, it would be undesirable to stop the packing machine while the coating roll **2293** of the paster **2291** is in the process of coating the adjacent flap **2041***a*, while a folding or tucking device is in the process of deforming the respective blank or blanks, or while a blank, a pack and/or a group **2008** is being transferred. It could also happen that the packing machine is stopped when a paper blank **2132** is already coated with adhesive but the adhesive-coated portion or portions of the paper blank do not as yet overlap and adhere to uncoated portions of such paper blank. The adhesive is then likely to dry while the packing machine is at a standstill and does not provide a satisfactory bond when the machine is started again. Also, such unsatisfactory paper blank can be caught in the moving parts of the packing machine to cause damage or at least an extended interruption of the operation. Detection of unsatisfactory envelopes would necessitate the provision of additional detectors and would complicate the control system of the packing machine. Therefore, the clutch **2232** is provided with a projection or analogous actuating means (not shown) which actuates the switch **2396** of FIG. **16***b* only when a stage T in operation of the machine is completed whereby the switch **2396** permits or effects disengagement of the clutch **2232**. Thus, the switch **2396** insures that, irrespective of the actual timing of generation of a signal for stoppage of the packing machine, such stoppage can occur only and alone when a stage T in operation is completed.

In the packing machine **12**, the adhesive which is applied by the paster **139** remains exposed during several stages of operation of the packing machine. This could result in drying of such adhesive before the corresponding paper blank **132** is converted into an envelope. Therefore, the packing machine **2012** comprises the additional paster **2291** which applies paste immediately before the flap **2041**a is folded so that the adhesive is exposed for a period less than that required to complete a stage T in the operation of the packing machine. The adhesive which is applied by the paster **2139** merely serves to prevent opening of the paper tube whose formation is completed by the member **2154** (see the portion **14**k of FIG. **14**).

An advantage of the packing machine **2012** is that its control system is simpler than the control system of FIGS. **13***a*–**13***c*. This is due to the fact that the control system of FIGS. **16***a*–**16***c* need not utilize detectors which scan the path defined by the turret **2042** for the mandrels **2043**. Thus, the detectors **223**, **224**, **226**, **227**, **228** of the control system shown in FIGS. **13***a*–**13***c* can be dispensed with.

Another advantage of the packing machine **2012** is that empty packs **2041** cannot be wasted because they are produced only when they are certain to meet groups **2008** of cigarettes at the filling station C2. This is due to the fact that the admission of blanks **2071**, **2132** for the making of an empty pack **2041** in the path Y2 is initiated only when the detector **2222** detects the presence of a group **2008**. The thus detected group is thereupon introduced into that pack which has been produced in response to such detection.

The main difference between the packing machines **12** and **2012** is that the control system of FIGS. **13***a*–**13***c* permits the formation of empty packs **41** even if the detector **222** detects the absence of a group **8**, whereas the control system of FIGS. **16***a*–**16***c* prevents the formation of a pack **2041** when the detector **2222** detects the absence of a group **2008**. However, the two packing machines share the feature that the delivery of at least one component of an empty pack into the path Y or Y2 is prevented when the detector **222** or **2222** detects the absence of a group **8** or **2008**. Thus, in the machine **12** of FIGS. **1-14**, the detector **222** can prevent the transfer of all components (**71** and **132**) of a finished empty pack **41** into the path Y whereas the detector **2222** can prevent the delivery of the component **2071** and/or **2132** from the path W2 and/or X2 into the path Y2 (depending upon whether the empty packs **2041** contain one or more envelopes).

The packing machines **12, 2012** can be designed to make containers each of which consists of a single envelope, e.g., an envelope made of paper, cardboard, plastic, or paper coated with a liner of tinfoil or the like. In the manufacture of cigarette packs, the customary procedure is to form an inner envelope of tinfoil which prevents changes in moisture content of tobacco-containing articles and an outer envelope of paper or cardboard which enhances the appearance of the product and is better suited for reception of imprints, particularly trade marks, warnings, manufacturer's name and/or the like. The control systems of FIGs. **13***a*–**13***c* and **16***a*–**16***c* insure that the withdrawal of blanks **132** or **2132** from the respective sources takes place with a necessary delay following the withdrawal of blanks **71** or **2071** so that the conversion of blanks into containers **41** or **2041** can be carried out in a manner as shown in FIG. **14**. Such staggered withdrawal of blanks from the respective sources takes place irrespective of whether the containers (**41**) are produced independently of the presence or absence of commodities (**8**) in the path (U) defined by the transporting means (**11, 36**) which moves the commodities toward the filling station (C), or whether the blanks (**2071, 2132**) are withdrawn from the respective sources (reel for the web **2173** and the magazine **2133**) in response to detection of the presence of a commodity (**2008**) by the detector means (**2222**).

Direct coupling of one or more producing machines (such as the machines **1** and **2** of FIG. **1**) with the improved packing machine insures that the condition of articles which are to be assembled into groups **8** or **2008** cannot be unduly influenced by surrounding air and also that the introduction of such articles into the packing machine can be carried out with minimal outlays for conveyors, trays, storage space and other auxiliary equipment. The necessary number of articles can be stored in the magazine **4**, and the necessary number of groups **8** or **2008** can be temporarily stored in the cells of the chain **11** or **2011**.

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 our 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. A method of making, filling and treating containers, particularly packs for the reception of groups of rod-shaped tobacco-containing articles or analogous commodities, comprising the steps of conveying commodities along a first path; scanning said first path for the presence and absence of commodities; establishing at least one source of deformable bodies each of which constitutes at least a portion of a container; withdrawing a body from said source only in response to detection of a commodity in said first path and conveying the thus withdrawn body along at least one second path into a third path; transporting the thus conveyed body and the corresponding commodity to an assembling station; assembling the commodity with the body at said assembling station; and thereupon subjecting the resulting assembly to at least one treatment.

2. A method as defined in claim **1**, wherein the containers consist of a plurality of components each of which is withdrawable from a discrete source along a separate second path, said withdrawing step comprising withdrawing components from each of said discrete sources and conveying the thus withdrawn components along the respective second paths into said third path, and further comprising the step of converting such components into an empty container at least during conveying of components along said third path so that the body which reaches said assembling station constitutes an empty container.

3. A method as defined in claim **2**, wherein said withdrawing step comprises withdrawing one of said components from the respective discrete source prior to withdrawal of another component.

4. A method as defined in claim **1**, further comprising the step of regulating the speed of transport of said body and the corresponding commodity so that the body reaches the assembling station simultaneously with the corresponding commodity.

5. A method as defined in claim **1**, wherein said bodies constitute empty containers and further comprising the steps of establishing at least one source of deformable sheet-like blanks, withdrawing blanks from said last mentioned source and converting the thus withdrawn blanks into empty containers, and storing such empty containers in said first mentioned source.

6. A method as defined in claim **5**, wherein a withdrawal of blanks from said last mentioned source takes place only in response to detection of a commodity in said first path.

7. A method as defined in claim **5**, wherein said steps of withdrawing blanks from said last mentioned source and converting such blanks into empty containers take place independently of the detection of the presence or absence of commodities in said first path.

8. A method as defined in claim **7**, wherein said assembling step comprises introducing a detected commodity into that container which is withdrawn from the first mentioned source in response to detection of said detected commodity.

9. A method as defined in claim **1**, wherein said commodities and said bodies are conveyed in stepwise fashion.

10. A method as defined in claim **1**, wherein said commodities and said bodies are conveyed stepwise, always for a first predetermined interval of time, followed by a second predetermined interval of dwell.

11. A method as defined in claim 10, further comprising the steps of subjecting said bodies to at least one treatment during transport from said source to said assembling station, such treatment being terminated during a period including one of said first and one of said second intervals.

12. A method as defined in claim 11, further comprising the step of producing a signal to effect an interruption of said last mentioned treatment and of said conveying steps, and delaying such interruption until after the elapse of said period.

13. A method as defined in claim 12, wherein said last mentioned treatment comprises the application of adhesive to at least one selected portion of a body and placing of such selected portion into contact with another portion of the respective body prior to elapse of said period.

14. A method as defined in claim 12, wherein selected portions of said bodies are provided with layers of heat-activatable adhesive and said last mentioned treatment comprises the steps of placing such selected portion of a body into contact with another portion of the respective body and heating the selected portion prior to elapse of said period.

15. A method as defined in claim 1, wherein said treatment and said conveying steps are carried out in stages and wherein, once started, each such stage is invariably completed.

16. A method as defined in claim 1, further comprising the step of producing said commodities and immediately introducing the thus produced commodities into said first path.

17. A method as defined in claim 1, wherein said commodities consist of arrays of parallel rod-shaped tobacco-containing articles.

18. A machine for the making, filling and treatment of containers, particularly packs for groups of rod-shaped tobacco-containing articles or analogous commodities, comprising first transporting means for moving commodities along a first path toward an assembling station; detector means for determining the presence and absence of commodities in said first path; a supply including at least one source of deformable bodies each of which constitutes at least a portion of a container; second transporting means for moving the bodies along a second path toward said assembling station; transfer means operative to transfer from said source a body along a third path into said second path only in response to detection of a commodity by said detector means; means for assembling the thus transferred body at said assembling station with that commodity whose detection caused the operation of said transfer means; and means for subjecting the resulting assembly to at least one treatment.

19. A machine as defined in claim 18, wherein said supply includes several sources of deformable blanks each of which is convertible into a portion of a container and said transfer means comprises discrete apparatus each arranged to supply to said second transporting means a blank in response to detection of a commodity by said detector means.

20. A machine for the making, filling and treatment of containers, particularly packs for groups of rod-shaped tobacco-containing articles or analogous commodities, comprising first transporting means for moving commodities along a first path toward a filling station; detector means for determining the presence and absence of commodities in said first path; a supply including several sources of deformable blanks each of which is convertible into a portion of a container; second transporting means for moving the blanks along a second path toward said filling station; transfer means operative to transfer from said sources bodies along a third path and into said second path, said transfer means comprising discrete apparatus each arranged to supply to said second transporting means a blank in response to detection of a commodity by said detector means; means for converting said blanks into a container at least while such blanks are moved by said second transporting means; means for assembling the converted blanks at said filling station with that commodity whose detection caused the operation of said transfer means; and means for subjecting the resulting assembly to at least one treatment.

21. A machine as defined in claim 18, wherein said assembling means comprises transfer means for transferring containers from said second path to said assembling station and filling means for introducing the corresponding commodities into the containers at said station.

22. A machine as defined in claim 19, wherein each of said apparatus comprises means for moving blanks from the respective source into said second path.

23. A machine as defined in claim 18, wherein said bodies are open empty containers and further comprising means for converting blanks into such containers independently of the detection of commodities in said first path.

24. A machine as defined in claim 18, further comprising drive means for intermittently operating said transporting means and said assembling means.

25. A machine as defined in claim 24, wherein said drive means comprises means for operating said transporting means for first predetermined intervals of time and for maintaining the transporting means at a standstill for second predetermined intervals of time which alternate with said first intervals.

26. A machine as defined in claim 25, further comprising means for stopping said drive means and means for preventing stoppage of said drive means prior to completion of a period including one of said first and one of said second intervals.

27. A machine as defined in claim 26, further comprising paster means operative to coat with an adhesive selected portions of said bodies in said second path and deforming means for placing the thus coated selected portions into contact with other portions of the respective bodies, said drive means comprising means for operating said paster means and said deforming means during each of said periods.

28. A machine as defined in claim 27, further comprising means for preventing the interruption of operation of said paster means and said deforming means prior to elapse of the respective period.

29. A machine as defined in claim 18, further comprising at least one producing machine arranged to produce said commodities and to supply the thus produced commodities directly to said first transporting means.

30. A machine as defined in claim 18, wherein each of said commodities consists of an array of parallel rod-shaped tobacco-containing articles.

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