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Schmermund

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[54] **MACHINE FOR PACKAGING ROD-SHAPED ARTICLES**

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[52] **U.S. Cl.** **53/60;** 53/148; 53/234; 53/236

[51] **Int. Cl.²** **B65B 19/30;** B65B 11/28

[58] **Field of Search** 53/60, 137, 148, 173, 183, 53/225, 230, 232, 234, 236

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Assistant Examiner—John Sipos
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A machine for packaging cigarettes is disclosed. The machine includes a plurality of rotatable translator members — preferably three — each having a plurality of compartments — preferably four — for receiving a group of cigarettes. The translator devices are each rotatable about a respective horizontal axis of rotation, the axes of rotation are mutually spaced apart and the translator members are staggered relative to one another in a direction parallel to their axes of rotation. Thus, next adjacent translator members are so disposed relative to one another that a group of cigarettes from a compartment in one of the translator members, or a group of cigarettes which have been wrapped to form a package as the case may be, can be pushed directly and by a simple sliding motion from a compartment of that translator member to a compartment in a next adjacent translator member while the two compartments are aligned end-to-end in the axial direction. The machine also includes means for feeding an inner wrapper into a compartment in a second translator member, and means for feeding an outer wrapper into a compartment of a final translator member.

15 Claims, 5 Drawing Figures

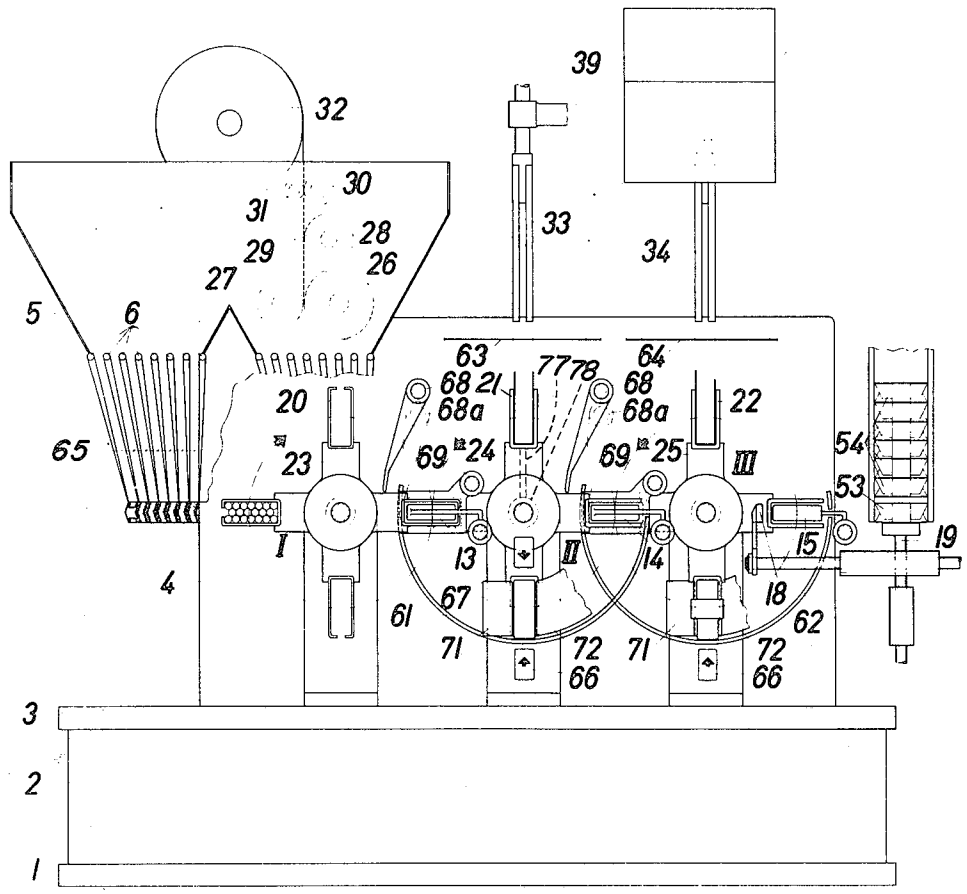
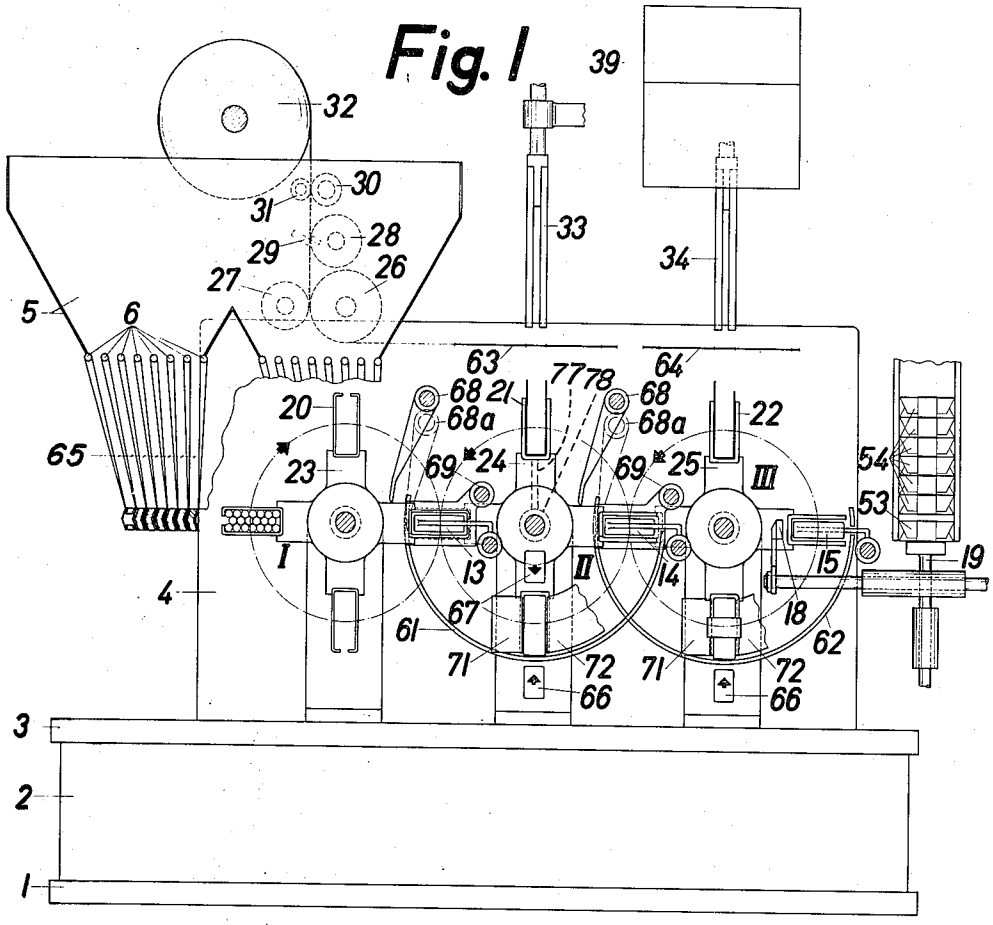


Fig. 1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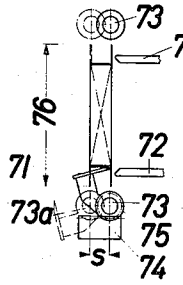
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Fig. 4

Fig. 2

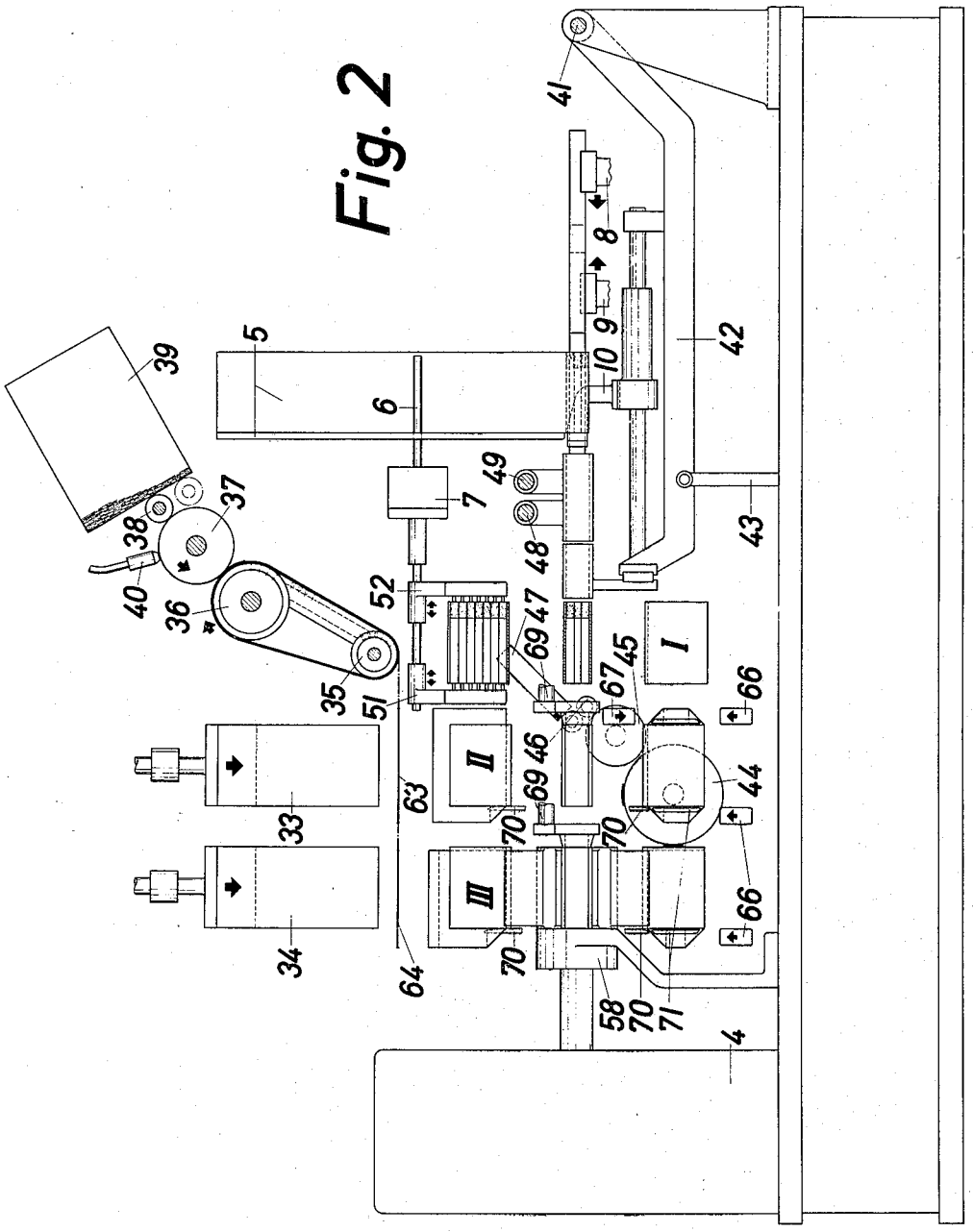
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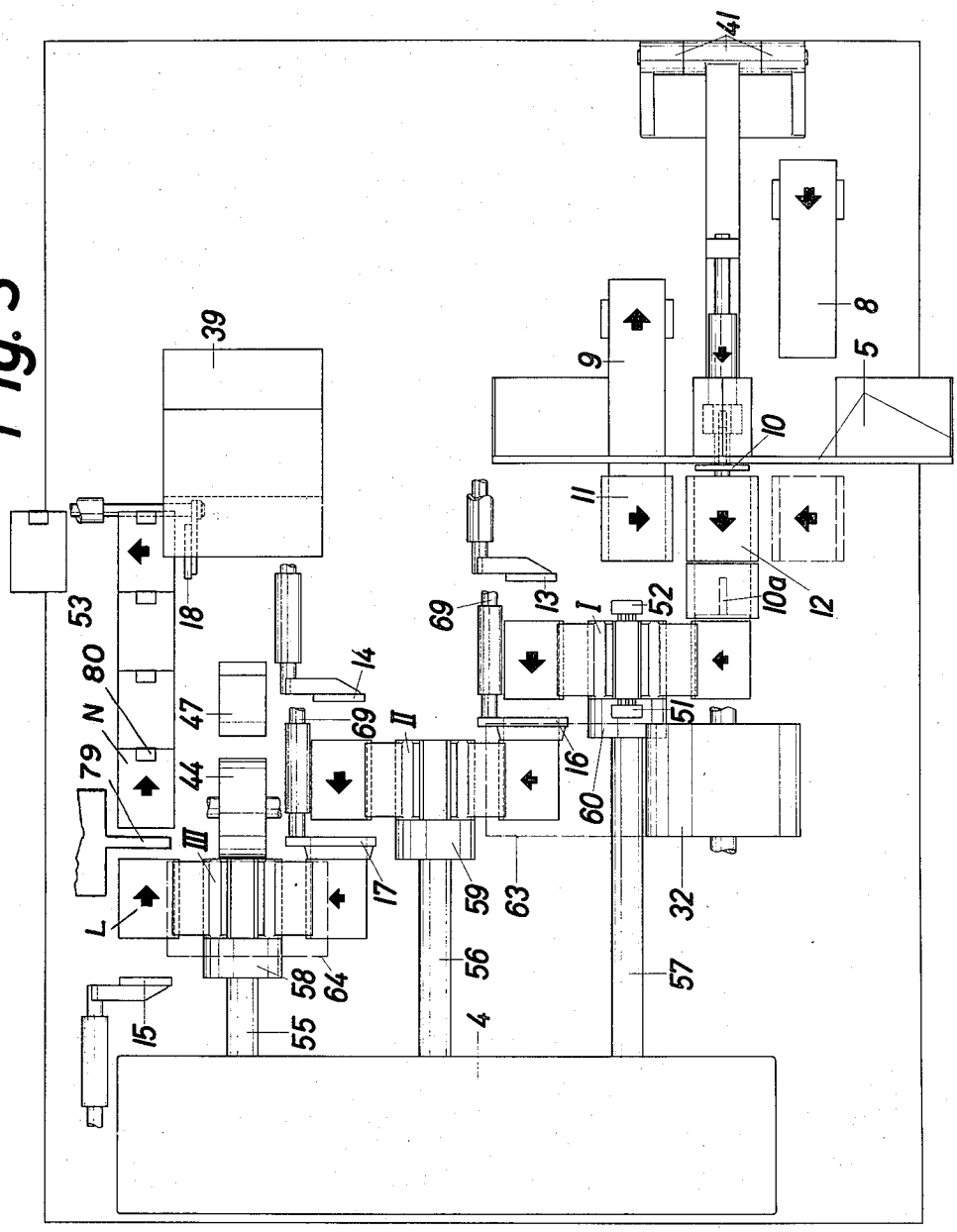
Fig. 3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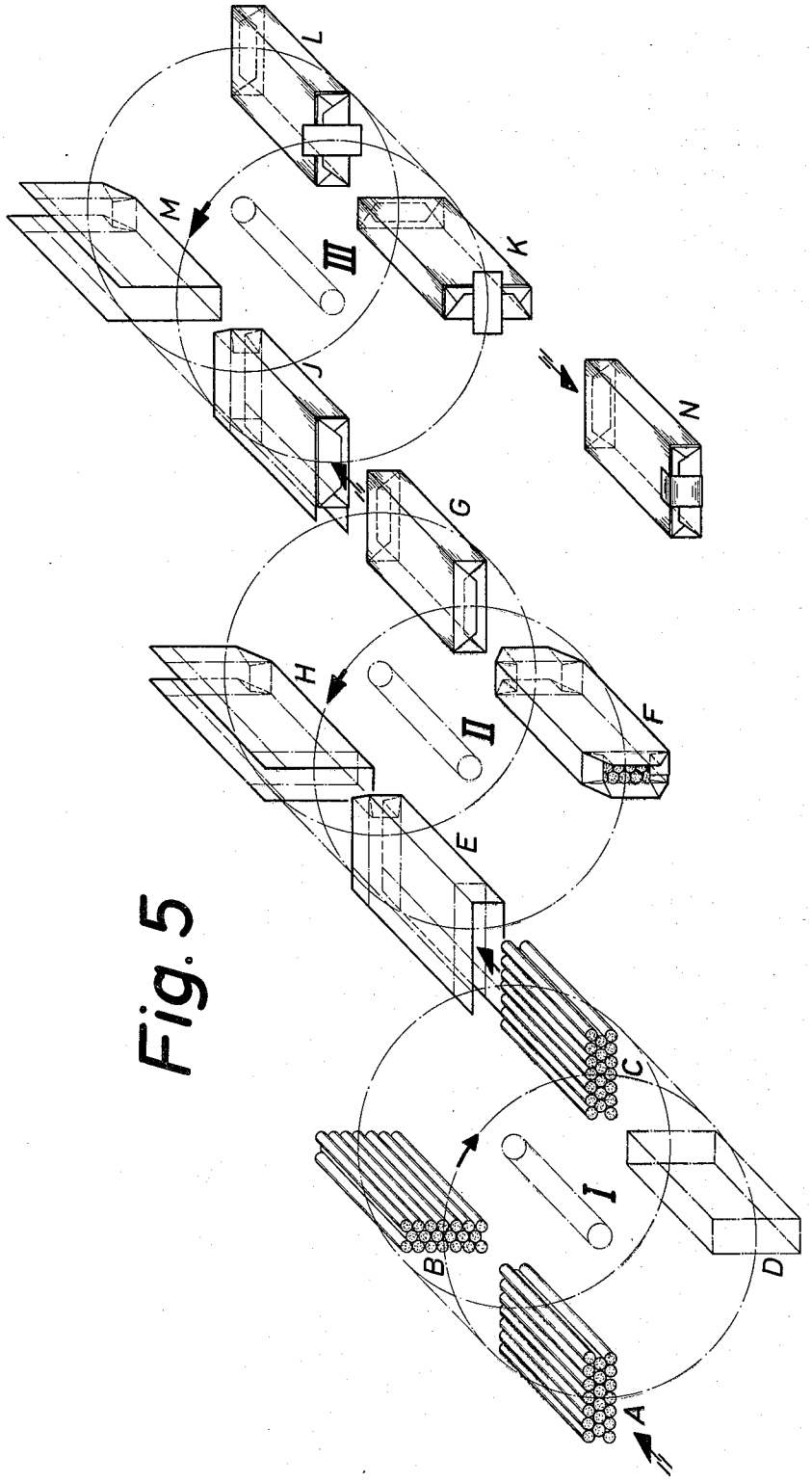

Fig. 5

MACHINE FOR PACKAGING ROD-SHAPED ARTICLES

BACKGROUND OF THE INVENTION

This invention relates to a machine for packaging rod-shaped articles. The machine may be used, for example, in the packaging of cigarettes, and in particular contemplates the wrapping of a block or group of cigarettes so arranged that the block or group has a rectangular outline, in an inner wrapper which may consist for example of thin tissue paper and an outer wrapper which may consist for example of thin tin foil or paper. The wrappers may alternatively consist of synthetic material or any other suitable material, as desired.

Machines for the packaging of rod-shaped articles such as cigarettes are known, and a part of such a machine is described in German Pat. No. 906,678. There is shown in this specification a rotary wheel having a number of peripheral compartments so arranged that the width direction of a rectangular block of cigarettes received in any of the compartments is substantially tangential to the wheel. A vacuum arrangement is provided in order to retain a wrapper around the inner walls of the compartments.

U.S. Pat. No. 3,628,309 shows a machine for packaging cigarettes, the machine having a number of collinearly arranged rotary devices for carrying out various aspects of the packaging procedure, the principal transverse axis joining the three rotary devices being perpendicular to the axis of rotation of each of them. Transfer of cigarette blocks from one device to another takes place in a direction parallel to the line joining the rotary devices.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a machine for wrapping groups of rod-shaped articles comprising input means to receive a plurality of rod-shaped articles, a plurality of individually rotatable translator members, mounting means supporting the translator members to be each rotatably displaceable about a respective one of mutually parallel axes of rotation, to be mutually spaced apart in a direction parallel to the axes of rotation, and to locate next adjacent ones of the translator members in at least partially mutually overlapping relationship, a plurality of pairs of substantially parallel axially extending side wall members and a plurality of base wall members each interconnecting radially inner portions of a respective pair of the side wall members in each translator member to define therein a corresponding plurality of compartments each extending generally radially to the respective axis of rotation and each being capable of receiving a group of such articles, insertion means to transfer a group of rod-shaped articles from the input means into a compartment in a first translator member, drive means coupled to the translator members to impart angular displacement thereto and thereby to locate any of the compartments in any one of the translator members in selective axial end-to-end relationship with one of the compartments in a further translator member next adjacent the one translator member, at least one pusher means to pushably transfer a group of such articles between said mutually end-to-end aligned compartments of next adjacent translator members, at least one wrapper feeder means synchronised with the angular displacement of a respective one of the translator members to feed a wrapper into an empty compartment in the or each further translator member, at least one wrapper folder means to fold at least one projecting wrapper portion over a group of such articles in a respective compartment, extractor means to extract a wrapped group of such articles from one of the compartments when in operative juxtaposition with the extractor means, and output means to receive the wrapped group of such articles from the extractor means.

Once the rod-shaped articles have been pushed into a compartment in the first translator member, they retain their configuration adopted in that compartment while they continue to pass through all the translator stages of the machine. The rod-shaped articles are discharged from the final translator stage of the machine in the form of finished packages, which may include for example an inner wrapper immediately surrounding the articles and an outer wrapper superposed on the inner wrapper.

The compartments may be so positioned in the rotary translator members as to be radially upright, i.e. the length of the compartment extends in a direction parallel to the axis of rotation of the rotary translator concerned, the depth of the compartment extends in a direction radial of that axis, and the width of the compartment is, of course, perpendicular to the length and depth. The length is, of course, the largest of the three compartment dimensions, and the width the smallest.

The depth dimension of the compartments corresponds to the width of a package of rod-shaped articles, such as cigarettes, whilst the width dimension of the compartments corresponds to the thickness of the package.

The wrappers may be inserted from above into the appropriate compartment of a rotary translator member so that the wrapper is maintained in each case in a generally U-shaped configuration against the walls of the compartment by means of an air suction or vacuum device.

The finished packages may be pushed out of the machine at the final translator stage in a direction generally opposite to that of their initial entry into the first translator stage of the machine.

If desired, provision may be made in the machine for the supply and fixing of a sealing sticker over one end of the outer wrapper, such sticker carrying information concerning tax, duty or other factors as desired. The sticker may be placed flat against the end of the package to be sealed, and folded over in a U-shaped manner after wetting with adhesive.

Where three rotary translator members are provided, the first to locate and monitor the rod-shaped articles, the second to apply the inner wrapper, and the third or final translator member to apply the outer wrapper, it is convenient to cause the first rotary translator member to be angularly displaced in one rotational direction and the second and final rotary translator members each to be angularly displaced in the respective opposite rotational direction. Suitable gearing or other drive transmission means, for example including a Maltese Cross arrangement, may be provided for this purpose.

The arrangement of the individual rotary translator members relatively to one another may conveniently be such, that as the rod-shaped articles or partially wrapped packages are transferred linearly from one rotary translator member to another, they are so orientated that their length and width directions each extend

in a substantially horizontal plane.

A supply path for the inner wrapper and for the outer wrapper may be so defined that the former path extends in a direction perpendicular to the axis of rotation of the second rotary translator member, while the latter path extends in a direction parallel to the axis of rotation of the final rotary translator member.

It is convenient for the axes of rotation of the three rotary translator members to be horizontal and to be mutually spaced apart from one another.

Arrangements are provided in the machine for carrying out the necessary folding of the inner and outer wrappers around the rod-shaped articles, the necessary folds including lateral folds of projecting end portions of the wrappers extending along the width of the articles. Lever members may be provided for carrying out these folding operations, the lever members being arranged to pivot up and down as well as towards and away from the rod-shaped articles, and to place one folded flap over the opposite folded flap.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of this invention will now be more particularly described with reference to the accompanying drawings, in which:

FIG. 1 shows a schematic view of the machine, seen from the front;

FIG. 2 shows a further schematic view of the machine, seen from the lefthand side;

FIG.. 3 shows the machine from above, again in schematic representation;

FIG. 4 shows a detail schematic view of part of the folding arrangements; and

FIG. 5 shows a schematic flow path diagram which indicates the path taken by cigarettes through the packaging machine and the manner in which the inner and outer wrappers respectively are folded around the cigarettes.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings, FIG. 1 shows a bed of the machine designated with the reference numerals **1, 2** and **3,** and a housing **4** containing drive means, gearing and other transmission arrangements. Input means in the form of a supply hopper **5** is provided above the bed of the machine, for supplying rod-shaped articles such as cigarettes down individual chutes **65** having their beginnings defined between agitating rollers **6** situated within the hopper **5,** and insertion means in the form of a feed table arrangement is provided for transferring the cigarettes from the base of hopper **5** to the lefthand compartment of a first one, designated with reference numeral **23,** of three rotary translator members or devices **23, 24** and **25,** which are respectively provided for monitoring the cigarettes, for folding an inner wrapper around the cigarettes, and for folding an outer wrapper around the inner wrapper. The respective stages of the machine which include the translator members **23, 24** and **25** are indicated generally in the drawings by the references I, II and III. The cigarette feed table arrangement is represented schematically in the drawings and may be of the kind described in detail in my prior U.S. Pat. No. 3,282,443. The axes of rotation of the three rotary translator members or devices **23, 24** and **25** are parallel to one another, are mutually spaced apart, and each extend horizontally. The rotary translator members or devices are each constructed in 90° cross shape, one of four cells or compartments of each rotary device being situated on each one of the four arms of the device. Each of the rotary translator members is provided with four cells or compartments defined by four pairs of substantially parallel axially extending wall members and four base wall members each interconnecting radially inner portions of a respective pair of the side wall members in each translator member. Each compartment, such as those indicated in FIG. **1** by the references **20, 21** and **22** extends generally radially to the respective axis of rotation and each is adapted to receive a group or block of cigarettes. The base wall members extend perpendicularly to the corresponding pair of side wall members and tangentially to a circle concentric with the axis of rotation of the respective translator member. The cells or compartments are selectably connected to air suction means to retain a wrapper therein in substantially U-shaped configuration, the wrappers are retained against the walls of compartments, and such wrappers are shown by heavy lines in the compartments **21** and **22** (FIG. **1**). For this purpose, the compartments are provided with perforate inner wall members spaced apart from corresponding outer wall members to define ducts therebetween. These ducts are selectably connected to suction applicator means, including ducts **77** and **78** which are provided in the body of the respective translator devices and which retain a wrapper against the walls of the respective compartment in the interest of clarity, the ducts **77** and **78** by means of which suction is applied to retain the wrapper against the walls of the respective compartment are indicated schematically only in respect of the upper cell of the translator device II in FIG. **1.** However, such ducts are provided for each cell of both the translator devices II and III. The construction of such cells or compartments and of the suction means is more fully described in the specification of my co-pending U.S. Pat. application Ser. No. 413,995 now U.S. Pat. No. 3,877,354. The orientation of the compartments is such that their length direction extends parallel to the axis of rotation of the respective rotary device, their depth direction extends radially of the axis of rotation, and their width is of course perpendicular to the length and width. The depth dimension of a compartment corresponds to the width of a package of cigarettes and the width dimension of the compartments corresponds to the thickness of a package formed by a wrapped block or group of cigarettes. The length dimension of each compartment is greater than its depth dimension and the latter is greater than the width dimension. A supply reel **32** is provided for the supply of an inner wrapper through the nip between two transport rollers **30** and **31,** and between the two mutually co-operable parts **28** and **29** of a rotating knife arrangement. Lengths thus cut from a continuous web of inner wrapper supplied from the reel **32** pass through the nip between further transport rollers **26** and **27,** of which the roller **26** has a larger diameter than the roller **27,** and then pass around a portion of the circumference of the roller **26** through additional guide rollers to a registration position above the top compartment **21** of the second rotary device **24.** Additional gearing is provided in a box **7.** Feeder members **33** and **34** are provided above the second and third rotary devices respectively. Each of the feeder members **33** and **34** is displaceable into a respective compartment of the corresponding translator member in a direction extending radially of the respective axis of rotation to introduce an inner wrapper and an outer wrap-

per respectively into the uppermost compartments of the respective rotary devices. Thus, these components form wrapper feeder means synchronised with angular displacement of the further rotary translator members 24 and 25 to feed inner and outer wrappers into respective empty compartments of the translator members 24 and 25, when such compartments are located in their uppermost positions with their respective side walls extending vertically.

The insertion means includes tandem-operable cigarette ejectors 8 and 9 (FIG. 3), a pusher member 10, and reciprocatory distribution cells 11 and 12 forming part of the feed table arrangement described in U.S. Pat. Specification 3,282,443. Pusher means in the form of three pushing members 13, 14 and 15 are provided for transferring the cigarettes from the first rotary device to the second, from the second to the third and for ejecting the packages from the third rotary device, respectively. These transfers taking place between mutually end-to-end aligned compartments of next adjacent translator members. The pusher member 15 forms part of extractor means for extracting wrapped blocks of cigarettes from a compartment in the final translator member. The extractor means operates when a compartment in the final translator member is in operative juxtaposition with the pusher member 15. Numerals 16 and 17 denote intake mouthpiece portions, and numeral 18 denotes a transverse pushing member for displacing the finished packages to output means of the machine. These finished packages have both inner and outer wrappers surrounding the cigarettes as well as a sealing sticker shown on the right of the package 53 in FIG. 3. The output means of the machine includes a lifting member 19 (FIG. 1), which is provided to lift the discharged finished packages into a shaft in which the packages accumulate.

FIG. 2 shows the wrapper feed means for the outer wrapper. A magazine 39 is provided to hold individual sheets of outer wrapper of large length, and a suction roller 38 is positioned to draw off individual sheets from the magazine and to supply them to a portion of the circumference of a gripper cylinder 37, at which the sheets follow the course shown by the arrows and heavy lines in FIG. 2. The sheets pass along a belt which circulates around transport rollers 35 and 36, and a nozzle 40 is provided for the application of liquid adhesive material to the surface of the outer wrapper facing the nozzle 40 as the wrapper passes around the roller 37. Numeral 41 denotes a rotary mounting for the lever arrangement belonging to the thruster 10, as described in U.S. Pat. No. 3,282,443, mentioned above.

Reference numeral 42 denotes a lever belonging to the feed table arrangement, and numeral 43 a pull rod for operating the lever.

Referring to FIG. 2, sticker applicator means in the form of a rotary device or roller 44 is provided for the application of the sealing sticker, this roller being cooperable with a supporting roller 45 and a feed or suction roller 46 provided for drawing off individual stickers from a magazine 47. Guide mountings 48 and 49 are provided for controlling the movement of the distribution cells 11 and 12 respectively. Reference numeral 50 denotes a transfer bridge member which may be used in the apparatus according to U.S. Pat. No. 3,282,443.

A testing arrangement is provided for monitoring the quality and number of the cigarettes supplied to each compartment, the testing arrangement consisting of monitoring elements 51 and 52, which are in the form of sensors to be applied to the cigarette blocks and the position of which is shown in FIG. 3. A pile of finished packages is shown at 54 in FIG. 1, situated in the hollow vertical shaft mentioned above. Mounting means supporting the translator members include three rotatable shafts 55, 56 and 57, and rotary bearings 58, 59 and 60 support the rotary devices on the shafts. As shown best in FIG. 3, the mounting means locates next adjacent ones of the translator members in at least partially mutually overlapping relationship in which the translator members are mutually spaced apart in a direction parallel to their respective and mutually parallel axes of rotation. Also, in the preferred embodiment, the axes of rotation of the respective translator members are mutually spaced apart in a direction perpendicular to these axes of rotation. However, in accordance with another embodiment, the axes of rotation of the respective translator members are disposed in mutually axial alignment. In these circumstances, the translator members are disposed in line with one another and next adjacent ones of the translator members are disposed in substantially complete overlapping relationship. A substantially semi-circular casing 61, 62 is provided around part of the periphery of each of the second and third rotary translator members, to assist in the support of the cigarette blocks and to prevent the blocks from falling out of the bottom compartments of these rotary devices. The inner wrapper, in this case of paper, is shown at 63, and the outer wrapper, in this case also of paper, is shown at 64. Individual chutes 65 are provided within the hopper 5, to assist in the metering of the flow of the cigarettes towards the feed table arrangement. The radial folding-over of projecting wrapper portions is carried out by wrapper folder means in the form of lower folding members 66 and upper folding members 67 respectively, the positions of which are shown in FIGS. 1 and 2. As indicated previously, each of the compartments in the second and final rotary translator members is of such a construction as to facilitate the holding of the wrappers in the compartments by means of air suction or vacuum means. The air suction means is selectably connected to ducts in the wall members of the compartments to maintain a wrapper introduced therein in generally U-shaped configuration against such wall members, thereby means is operatively connected to such ducts only on the compartment being disposed opposite the respective wrapper feeder member 33 or 34. If desired, the compartments of the first rotary translator member may also be made of such a construction.

Wrapper folder means in the form of two folding elements 68 are shown in FIG. 1, to co-operate with the second and final rotary translator members respectively, each of the folding elements 68 comprising a lever device which is movable up and down as well as pivotable about an axis which moves up and down with the lever arrangement. The function of the folding lever members 68 is initially to allow to pass the edges of the inner and outer paper respectively and then to fold down the upper projecting edge portions of the respective wrappers. Thus each wrapper folder means may comprise a plurality of pivotably mounted lever members, each lever member being both pivotably displaceable and rectilinearly displaceable in a common plane, the plane of the drawing in FIG. 1, to carry out a wrapper folding step in which one foldable projecting

wrapper portion is folded over the cigarette block. The full scheme of the folding operations will be described later with reference to FIG. **5.**

FIG. **1** also shows at **68***a* the lower extreme positions occupied by the respective folding lever members **68.** The upper extreme position is shown in solid lines and the lower extreme position in chain-dotted lines. Actuating rods **69** are provided for the mouthpiece portions **16** and **17** respectively.

Further wrapper folder means in the form of folding elements **70** are provided at the radially inner end portion of each of the compartments of the second and final rotary devices respectively, the purpose of the folding elements **70** being to carry out the radially outwardly directed fold of a narrow strip of inner or outer wrapper which projects in a direction parallel to the axis of rotation of the rotary translator members beyond the radially inner edge portion of the cigarette block. The folding elements **70** are arranged to circulate with the rotary devices and are cam-operated. As desired, the folding elements **70** may be provided at one axial end only, or at both axial ends, of the rotary translator members. Yet further wrapper means in the form of lateral folders **71** are provided to carry out the "lower fold" of the lateral end portions of the wrapper projecting axially beyond the cigarette block, prior to the carrying out of the "upper fold" by stationary side walls **72.** The folders **71** are movable in a direction parallel to the thickness of the cigarette block, as well as being pivotable about axles which are mounted in carriages carried on pinions such as **75** (FIG. **4**). The pinions roll along toothed rack members such as **74** (FIG. **4**), and thereby turn the lateral folders **71.** The numeral **76** denotes the range, in a direction parallel to the axis of rotation of each of the rotary devices, which must be capable of being kept clear from the influence of the folders **71** for the desired period, to avoid interference by these folders with the desired folding procedure. S denotes the path along which sliding carriages supporting the folders **71** are moved to and fro. The distance S is measured in a direction parallel to the line which joins the axes of the rotary devices and which is perpendicular to those axes. The sliding carriages are not shown in FIG. **4,** and the same components **71** to **73** are provided at each axial end of the cigarette block.

The representation of FIG. **4** is a downward view, on to the cigarette block accommodated in the bottom compartment of the second rotary device. The stages of the machine including first, second and third rotary devices are indicated generally by the reference numerals I, II and III respectively. FIG. **4** clearly shows four projecting strips of inner wrapper, which during the folding procedure are to be folded over by the folders **71** and the side walls **72.** In the arrangement shown in FIG. **4,** the folders **71** fold over, in a rightward direction, the left-hand projecting strips of wrapper, and the right-hand projecting strips of wrapper are folded over in a leftward direction as a result of the movement of the cigarette block itself during the rotation of the second rotary translator member from the position to which the shown cigarette block is in the bottom compartment to that in which it is in the right-hand compartment as shown in FIG. **1,** of the same rotary device.

The manner in which the cigarettes are fed into the left-hand compartment of the first rotary device shown in FIG. **1** is clear from the foregoing description. The manner in which the various folding operations takes place will now, however, be described with particular reference to FIG. **5,** which shows schematically a flow diagram through the part of the machine which carries out the folding steps.

In FIG. **5,** the three stages of the machine including the translator members **23, 24** and **25,** respectively, are indicated generally by the references I, II and III. As indicated by the arrows on the circles indicating the rotational path of each translator member, the translator member in the stage I is angularly dislaced in a clockwise direction, whilst the translator members in stages II and III are each angularly displaced in an anti-clockwise direction.

When the cigarettes are in the left-hand compartment of the first rotary translator member or device, in the arrangement shown in FIG. **1,** they occupy the position designated A in FIG. **5.** FIG. **5** is a perspective view, from which it will be seen that the lengths of the cigarettes are all parallel to the axes of rotation of the rotary translator members in the machine stages I, II and III. In the particular case shown, each cigarette block contains twenty cigarettes. After a quarter of a revolution of the first rotary translator device in the clockwise sense of FIG. **5,** position B is reached, in which monitoring of the number and quality of the cigarettes takes place by means of the monitoring elements **51** and **52** shown in FIG. **3.**

A further 90° clockwise rotation of the first rotary device brings the cigarette block into the position indicated with C in FIG. **5,** in which the cigarette block is inverted in relation to its orientation in position A. When the cigarette block is in position C, it lies axially opposite a compartment, shown at E in FIG. **5,** of the second rotary device, in which a sheet of inner wrapper is held by vacuum, the sheet having been fed into that compartment by means of the pushing member **33** when the compartment was in position H shown in FIG. **5;** i.e., the compartment executes a 90° anti-clockwise rotation from position H to position E to be ready to receive the cigarette block situated in position C in the first rotary device. The pusher member **13** is now actuated to push the cigarette block from position C to position E in FIG. **5,** in which the cigarette block is partially enveloped by the U-shaped sheet of inner wrapper. Thus, the displacement of the pusher member **13** is co-ordinated with the rotational movement of the second translator member to push the block of cigarettes from the position C into the compartment of the second translator member into which the inner wrapper feeder means has introduced the inner wrapper **63.** The folding of the wrapper now takes place during subsequent rotation of the second rotary device. Initially, the second rotary device executes a 90° anti-clockwise rotation to bring the cigarette block into position F in FIG. **5,** after the left-hand folding device **68** (FIG. **1**) has been brought to its position **68***a* to fold down the upper left-hand projecting strip shown at position E in FIG. **5,** i.e. the strip extending along the radially outer upper length edge of the cigarette block. During this rotation, the casing **61** is employed to fold the lower left-hand length edge of the cigarette block wrapper, over the first mentioned length edge. When the cigarette block has reached position F, the folding members **66** and **67** (FIG. **1**) are moved upwardly and downwardly respectively, to fold over the short strips having a length equal only to the thickness of the cigarette block to form the upper and lower folds shown at position F in FIG. **5.** These folding operations are, of course, conducted in a similar manner at each opposite

axial end of the cigarette block. In position F also, the components 71 and 72 are now employed to make the last two folds on the inner wrapper, i.e. to fold the left-hand vertical strip to the right (see FIG. 5, position F) and the right-hand vertical strip to the left. After a further 90° anti-clockwise rotation, the cigarette block reaches position G, with all folds of the inner wrapper completed. The pusher member 14 (FIG. 3) is now employed to push the cigarette block axially into position J of the third or final rotary translator member, in which a U-shaped sheet of outer wrapper material is located in an empty compartment by suction. This outer wrapper sheet had been inserted into the compartment when the compartment was in position M shown in FIG. 5, and the compartment executes a 90° anti-clockwise angular displacement to bring it from position M to position J. After the insertion of the cigarette block into the outer wrapper at position J, there are no projecting strips of outer wrapper at the axial end of the block facing the reader in FIG. 5 at position J, but otherwise the configuration of the outer wrapper around the inner wrapper in position J is the same as was that of the inner wrapper around the cigarette block at position E.

In position J, the right-hand folding member 68 (FIG. 1) is now employed to fold down the upper left-hand edge strip portion of outer wrapper, and the casing 62 is employed to fold the lower edge strip portion over the upper edge strip portion. This takes place during a 90° anti-clockwise angular displacement from position J to position K. At position K, the folder 66 is employed to make the bottom small fold at the far axial end of the block in FIG. 5, and the remaining folds are completed by the folders 71 and 72 which are provided in corresponding locations as was the case in respect of the second rotary translator member.

While the cigarette block is in position K there takes place also the application of the sealing sticker shown in FIG. 5 at position K. This sticker is supplied from the magazine 47 via sticker applicator means in the form of the rollers 46, 45 and 44, and receives adhesive from the nozzle provided against the roller 45. The feed of the sealing stickers is synchronized with the operation of the final rotary translator member. The sticker, which is one of a number of serially fed stickers, adopts the position shown in FIG. 5, i.e. across the axial end of the wrapped block facing the reader, and projects to the left and right as shown.

In the schematic flow diagram of FIG. 5, position D always remains empty.

After a 90° anti-clockwise rotation from position k, the wrapped cigarette block reaches position L, in which the wrapped block is again horizontally disposed, and the pusher member 15 is then employed to eject the block from the third rotary device in an axial direction in FIG. 5 towards the reader, so that the block reaches position N on a conveying path to the output means of the machine in which the blocks are stacked at 54. During the passage of the wrapped package from position L to position N in FIG. 5, the package cooperates with suitable abutments disposed next adjacent its path. Such abutments form sticker folder means arranged to fold projecting end portions of the sticker against the side surfaces of the package. The displacement path followed by the wrapped package from position L to position N in FIG. 5 is also shown in FIG. 3 (at the top of the drawing), in which the sticker folder means are represented schematically and indicated by the reference numeral 79. In FIG. 3, the wrapped package is displaced from positions L to N in the direction indicated by the arrows and the folded sticker is indicated by the reference numeral 80. Thus, the sealing sticker is bent around the end of the outer wrapper to be sealed, so that the central portion of the sticker is held fast against the end folds of the inner wrapped and the edges of the outer wrapper, and the end portions of the sticker are stuck to the upper and lower main surfaces of the wrapped cigarette block, as shown in FIG. 5 at position N.

Thus, from the description relating to FIG. 5, it is clear that the insertion means including the pusher member 10, the pusher means including the pusher members 13 and 14, and the extractor means including the pusher member 15 are each adapted to displace a block of cigarettes into or from a compartment which is loaded in operative juxtaposition with the respective pusher member. As has been described with reference to FIG. 5, the compartments — when located in operative juxtaposition with the respective pusher member — are so disposed that their side wall members are substantially horizontal.

It is also clear from FIG. 5 that the insetion means including the pusher member 10 feeds groups or blocks of cigarettes to the receiving compartment in the first translator member in stage I in a direction indicated in FIG. 5 by a double-tailed arrow on the extreme left-hand side of the drawing. However, the extractor means including the pusher member 15 extracts and feeds the wrapped groups or blocks of cigarettes in a direction, indicated by a double-tailed arrow on the right of FIG. 5, which extends parallel to but which is oppositely directed with respect to the insertion direction indicated by the first mentioned double-tailed arrow. Thus, the insertion and extraction of cigarettes occurs in mutually opposite directions.

The embodiment described above has three rotary devices. However, if desired, fewer than three or more than three rotary devices may be employed, in dependence upon the number of wrapper layers or other materials desired to be fitted around the cigarette blocks.

The finished packages may, as desired, be piled up in the hollow vertical shaft shown in FIG. 1, stored in some other storage means, or fed directly to further processing machines, for example machines to wrap the finished package in viscose or cellulose film material.

If desired, individual gearings may be provided for the drive of each of the rotary devices, for example Maltese Cross arrangements, in which case all such gearings are conveniently situated in a common housing, which may be filled with oil.

As shown in FIG. 1, the supply of inner wrapper 63 is fed along a feed path having a portion, next adjacent the second translator member, which extends substantially perpendicularly to the axis of rotation of the respective translator member. Thus, as shown in FIG. 1, the axis of rotation of the second translator member extends perpendicularly to the plane of the drawing, whereas the latter portion of the feed path of the inner wrapper extends to the plane of the drawing. However, the outer wraper 64 is fed along a feed path of which at least that portion next adjacent the final translator member extends perpendicularly to the plane of the drawing. Thus, the latter portion of the feed path of the outer wrapper 64 extends substantially parallel to the axis of rotation of the final translator member. If de-

sired, however, such supply could take place at a different orientation.

It is not essential that the outer wrapper be supplied from a magazine of pre-cut sheets, and if desired, a reel and a cutting device may be employed in place of the magazine.

A suitable cutting device for this purpose, which may also be employed as the cutting device **28, 29** shown in FIG. **1** for the inner wrapper material, is shown in my prior U.S. Pat. No. 3,203,292.

I claim:

1. A high speed multi-stage machine for monitoring and wrapping blocks of rod-shaped articles, the machine comprising, in combination:

input means to receive a plurality of rod-shaped articles;

a first rotatable translator member;

at least one further rotatable translator member;

mounting means supporting said first and said further translator members to be each rotatably displaceable about a respective one of substantially horizontal and mutually parallel axes of rotation, to be mutually spaced apart in a direction parallel to said axes of rotation, and to locate next adjacent ones of said translator members in at least partially mutually overlapping relationship;

a plurality of pairs of substantially parallel axially extending side wall members and an equal plurality of base wall members each interconnecting radially lower portions of a respective pair of said side wall members in each translator member to define therein a corresponding plurality of compartments each extending generally radially to said respective axis of rotation and each being adapted to receive a block of said articles;

insertion means to transfer a block of rod-shaped articles from said input means into a compartment in said first translator member on said compartment being disposed with said side walls thereof substantially horizontal;

drive means coupled to each said translator member to angularly displace said first translator member stepwise in a first direction of rotation to cause each said compartment thereof to pass through an uppermost position with said side walls thereof substantially vertical before said compartment passes through a lowermost position with said side walls thereof substantially vertical, to angularly displace said at least one further translator member stepwise in a direction of rotation opposite to said first direction, and to locate any of said compartments in any one of said translator members in a selective axial end-to-end relationship with one of said compartments in a translator member next adjacent said one translator member;

monitoring means to monitor said block of articles in said compartment in said first translator member on said compartment being disposed in said uppermost position;

at least one reciprocatable pusher means coordinated with said drive means to pushably transfer a block of said articles between said mutually end-to-end aligned compartments of next adjacent said translator members during a forward stroke displacement of said pusher means when said aligned compartments are each disposed with said side walls thereof substantially horizontal;

at least one wrapper feeder means synchronized with said angular displacement of a respective one of said translator members to feed a wrapper into an empty compartment in said at least one further translator member on said empty compartment being disposed in an uppermost position with said side walls thereof substantially vertical;

at least one wrapper folder means to fold a projecting wrapper portion over said block of said articles in one said compartment;

extractor means to extract a wrapped block of said articles from one of said compartments when said compartment is in operative juxtaposition with said extractor means and when said side walls of said compartment are substantially horizontal; and

output means to receive said wrapped block of said articles from said extractor means.

2. A machine as defined in claim **1**, wherein said respective axes of rotation of said translator members are mutually spaced apart.

3. A machine as defined in claim **1**, wherein each said side wall member has a length dimension extending substantially parallel to the axis of rotation of the respective one of said translator members and a depth dimension extending substantially perpendicularly to said length dimension and substantially radially to said respective axis of rotation, said base wall member interconnecting each said pair of side wall members defining a width dimension extending perpendicularly to said pair of said side wall members and tangentially to a circle concentric with said respective axis of rotation, said length dimension being greater than said depth dimension and said width dimension being less than said depth dimension.

4. A machine as defined in claim **1**, wherein said wrapper feeder means comprises a feeder member displaceable into said compartment in a direction extending radially of the respective one of said axes to introduce said wrapper therein.

5. A machine as defined in claim **4**, wherein said wrapper feeder means is co-ordinated with rotational movement of said translator member to introduce said wrapper into said compartment on the latter being disposed in an uppermost position with said side walls thereof substantially vertical.

6. A machine as defined in claim **1**, comprising air suction application means selectably connected to ducts in said wall members of said compartments to maintain said wrapper in generally U-shaped configuration against said walls, thereby to cause said wrapper to form a lining in said compartment.

7. A machine as defined in claim **1**, wherein said insertion means feeds said groups of rod-shaped articles to said compartment in said first translator member in a first direction, and said extractor means extracts said groups of rod-shaped articles from said compartment in operative juxtaposition with said extractor means in a direction opposite to said first direction.

8. A machine as defined in claim **1**, wherein said plurality of translator members comprises three translator members, said first translator member being located next adjacent a second said translator member, a final said translator member being located next adjacent said second translator member, said drive means being adapted to angularly displace said second translator member and said final translator member in one direction of rotation and to angularly displace said first

translator member in a direction opposite to said one direction of rotation.

9. A machine as defined in claim **8,** comprising inner wrapper feeder means co-ordinated with rotational movement of said second translator member to feed an inner wrapper into an empty compartment in said second translator member along a feed path extending substantially perpendicularly to said axis of rotation of said second translator member, and outer wrapper feeder means coordinated with rotational movement of said final translator member to feed an outer wrapper into an empty compartment in said first translator member along a feed path extending substantially parallel to said axis of rotation of said final translator member.

10. A machine as defined in claim **9,** comprising applicator means for applying a sticker to one end surface of a package comprising a group of said articles wrapped in said outer wrapper, said sticker being placed flat against said end surface and having sticker end portions projecting from said package.

11. A machine as defined in claim **10,** comprising sticker folder means mounted in juxtaposition with a feed path extending between said at least one further translator member and said output means to fold said projecting sticker and portions against the sides of said package on displacement of the latter along said feed path and towards said output means.

12. A machine as defined in claim **1,** wherein each said wrapper folder means comprises a pluraity of pivotably mounted lever members, each said lever member being both pivotably displaceable and rectilinearly displaceable in a common plane to carry out a wrapper folding step.

13. A machine as defined in claim **1,** wherein said at least one pusher member is co-ordinated with rotational movement of at least one further said translator member to push said group of articles into a compartment thereof into which said wrapper feeder means has introduced said wrapper.

14. A machine as defined in claim **3,** wherein the spacing between next adjacent ones of said side wall members of any two said compartments as measured around the circumference of said circle is at least twice said width dimension.

15. A machine as defined in claim **14,** wherein said plurality of compartments is equal to four, said four compartments being equidistantly spaced apart around the circumference of said circle.

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