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Schermund

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[54] **FOLDING DEVICE FOR PACKAGING MATERIAL**

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[51] **Int. Cl.** **B65b 11/32**

[58] **Field of Search** 53/224, 225, 232, 234, 53/378, 374; 74/29, 31, 89.11, 422

[56] **References Cited**

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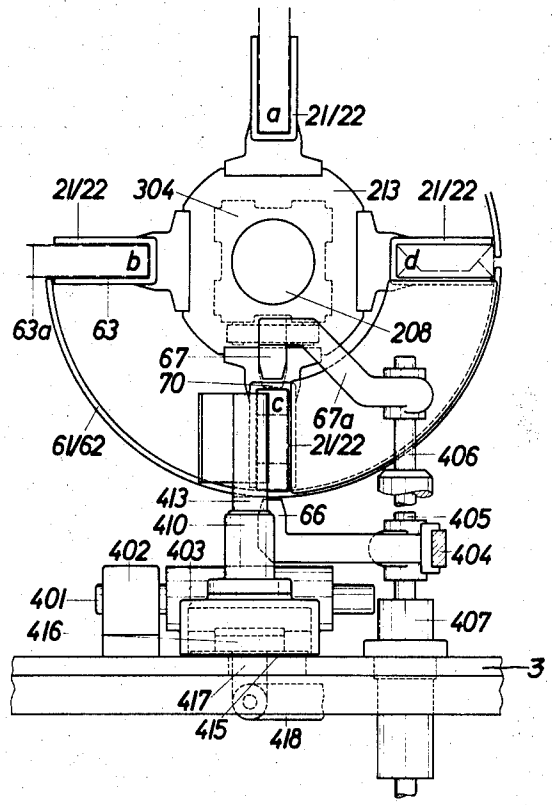
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Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A device for folding a sheet of wrapping material around external surfaces of an article of parallelepipedonal shape is disclosed. The device comprises a revolver provided with wall members defining a plurality of cells, the revolver being so rotatable stepwise that each of the cells comes to rest successively at a first station, a second station, a third station and a fourth station of the device. The cells are constructed so to receive at the first station a sheet of wrapping material and so to receive at the second station an article to be wrapped that such sheet of wrapping material is disposed between the received article and walls of the cell in which that article is received, with lobes of the sheet projecting in a direction parallel to the axis of rotation beyond an end face of the article. The device is provided with folder means disposed at the third station, the folder means comprising a folder member rotatably mounted on carrier means reciprocatably displaceable along guide means to impart such simultaneous rotational and translational motion to the folder member that the latter is moved towards a cell located at the third station when the carrier means is displaced along the guide means in a first direction and the folder member is moved away from the cell when the carrier means is displaced in a direction opposite to the first direction. The arrangement is such that displacement of the carrier means in the first direction causes the folder member to engage one of the projecting lobes and to fold the latter against the end face of an article in a cell at the third station.

5 Claims, 5 Drawing Figures



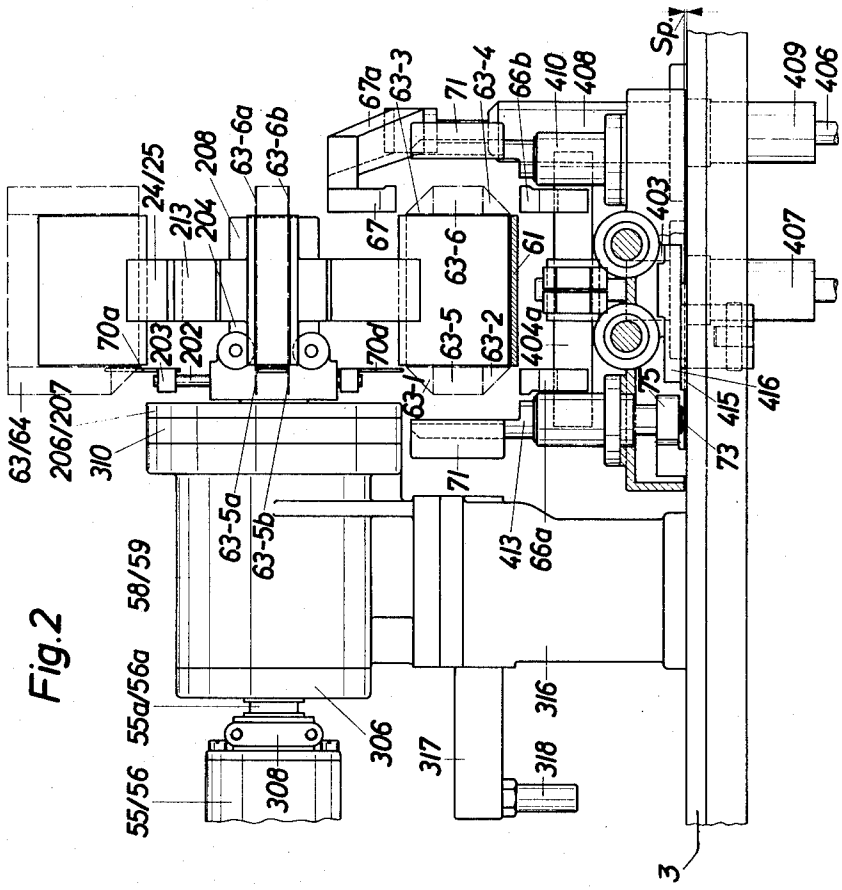

Sp
67a
63-3
71
63-4
66b
410
408
409
406
24/25
208
63-6a
63-6b
213
204
67
63-6
61
403
407
70a
203
202
70d
63-5
63-2
404a
63/64
206/207
310
63-1
75
415
416
73
71
63-5a
63-5b
413
66a
58/59
55a/56a
306
316
55/56
308
317
318
3

Fig.2

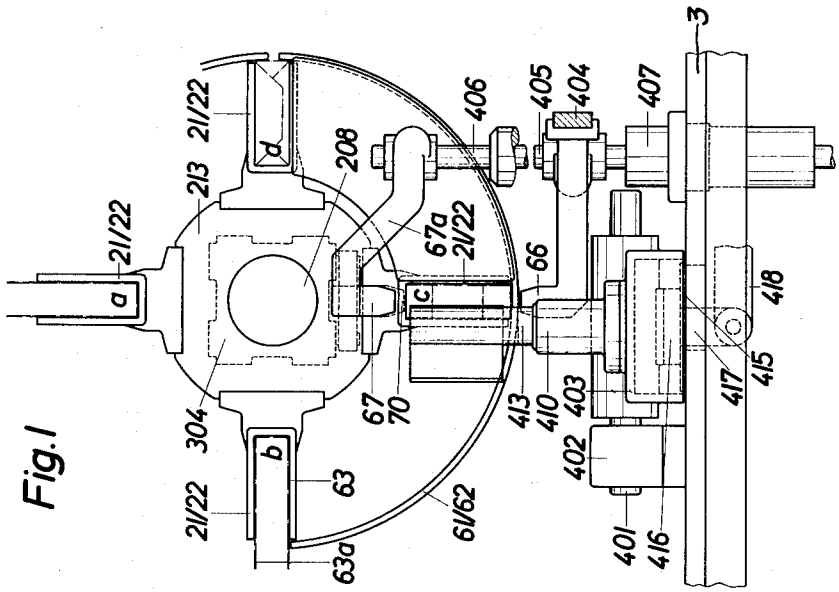

3
406
405
404
407
21/22
213
208
67a
21/22
66
418
a
c
d
b
304
67
70
413
410
403
415
417
402
63
61/62
401
416
63a

Fig.1

Fig.5

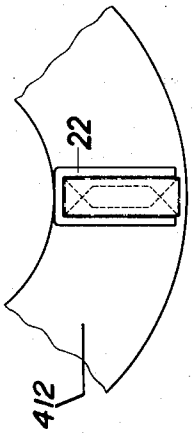


Fig.4

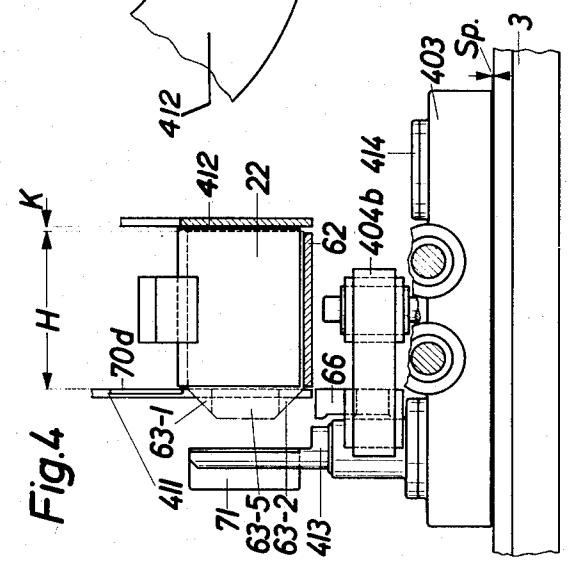
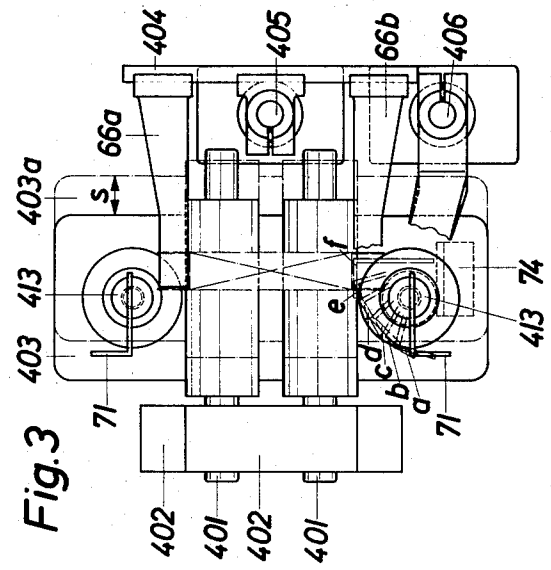


Fig.3



FOLDING DEVICE FOR PACKAGING MATERIAL

BACKGROUND OF THE INVENTION

The present invention relates to a device for folding individual sheets of wrapping material around the external surfaces of successive articles of parallelepipedonal shape.

In co-pending United Kingdom Patent application No. 48186/72 there is disclosed a packaging machine for wrapping block-like articles, such as cigarette blocks, successively in two layers of wrapping material, the two layers being applied in respective revolvers following one on the other in a flow path through the machine. The present invention concerns an improvement in, or modification of, the invention disclosed in that co-pending United Kingdom Patent application, and relates to a folding device which may be employed to form part of such a machine.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a device for folding a sheet of wrapping material around external surfaces of an article of parallelepipedonal shape, the device comprising a revolver provided with wall members defining a plurality of cells, the revolver being so rotatable stepwise that each of the cells comes to rest successively at a first station, a second station, a third station and a fourth station of the device, the cells being constructed so to receive at the first station a sheet of wrapping material and so to receive at the second station an article to be wrapped that such sheet of wrapping material is disposed between the received article and walls of the cell in which that article is received, with lobes of the sheet projecting in a direction parallel to the axis of rotation beyond an end face of the article, and folder means disposed at the third station, the folder means comprising a folder member rotatably mounted on carrier means reciprocatably displaceable along guide means to impart such simultaneous rotational and translational motion to the folder member that the latter is moved towards and along the axial end face of a cell located at the third station when the carrier means is displaced along the guide means in a first direction and the folder member is moved away from the cell when the carrier means is displaced in a direction opposite to the first direction, the arrangement being such that — when the device is in use — displacement of the carrier means in the first direction causes the folder member to engage one of the projecting lobes and to fold the latter against the end face of an article in a cell at the third station.

Four is the most convenient number of cells to provide in a revolver forming part of the device of the invention, but if desired, in principle any multiple of four cells may be provided on the revolver. In practice, however, a revolver having 12 or more cells may well be found to be too unwieldy and cumbersome to operate efficiently. However, a revolver having eight cells may be constructed within the principle of the invention.

A folding means incorporating a folding member which executes both rotary and translational motion is provided at the third station of the folding device, such a folding means being employed to fold the "trailing" projecting lobe of packaging material, i.e. the lobe which is at the rear of the package as far as the direction of motion of the package about the axis of rotation is concerned. With such an arrangement, the folding,

in the opposite sense, of the "leading" lobe of packaging material may conveniently take place by means of a stationary folding element, while the cell executes its step of rotation from the third station to the fourth station. The folding means may thus include the end surface of a stationary folding element, for example of sheet metal, past which a cell moves just after commencing its motion from the position at the third station in which the cell comes to rest. The folding member which executes both rotary and translational motion preferably acts on the trailing lobe when the revolver is stationary.

The folding means preferably includes a pair of folding members disposed to execute simply linear reciprocating motion in a direction substantially radial of the revolver to make respective folds directed radially inwardly of the revolver. This arrangement is preferably employed in the case of a revolver intended to apply an inner layer of wrapping material, for example of paper or viscose or cellulose film, to a block-like article such as a cigarette block, a sheet of the wrapping material being pushed into a cell at the first station of the folding device in such a manner that oppositely directed lobes project from opposite axial ends of the cell in each case. In the case of a revolver for use in the application of an outer wrapper sheet to a block-like article such as a cigarette block, the arrangement may be such that after insertion of a sheet of wrapping material into a cell at the first station of the folding device, lobes project only at one axial end of the cell beyond the appropriate end face of the cigarette block. The reason for this is that it may be desired to stop the end of the outer wrapper short of the end of the cigarette block, so as to leave a "collar" of tin foil (where the inner wrapper is of this material) exposed, a sealing sticker being applied over the open end portion of the outer wrapper to prevent the outer wrapper from sliding off, or accidentally being pulled off, from the inner wrapper.

The folding means may comprise four folding members mounted on the revolver itself to rotate therewith, one folding member being associated with each cell, these particular folding members being controlled in the manner disclosed in co-pending United Kingdom Patent application No. 53141/72.

If desired, each of the cells of the revolver may be of double-walled construction as disclosed in co-pending United Kingdom Patent application No. 55334/72.

A particularly convenient packaging machine is one which includes two revolvers for applying respectively an inner wrapper and an outer wrapper to a cigarette block, a further revolver being provided for feeding successive blocks to the revolver which applies the inner wrapper. Full details of such a machine are given in co-pending United Kingdom Patent application No. 48186/72.

Conveniently, the or each folding member which executes both rotary and translational motion may be carried on mounting means comprising a pinion rollable along a linear rack member maintained stationary relative to a frame of the folding device, the pinion being mounted on a shaft passing through the wall of a casing drivable to execute linear reciprocating motion to cause the pinion to rotate and to roll along the rack member.

A system of guide rods may be provided for guiding the casing along its path of travel.

Sealing means, for example in the form of a sealing plate of synthetic plastics material, may be provided to seal an opening in a base plate for an arm connected to the casing and arranged to receive drive from drive means located below the base plate, the drive means being arranged to effect the reciprocating motion of the casing.

A small gap may be provided between the bottom surface of the casing and the top surface of the base plate, wiper strips or other sealing elements being provided to seal the gap against penetration by dust and dirt.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be more particularly described with reference to the accompanying drawing, in which:

FIG. 1 shows a front elevational view of a revolver for applying an inner wrapper to a parallelepipedonal block-like article, the actuating arrangement for the different parts of the folding means also being shown;

FIG. 2 shows a side elevational view, partly in section, of the embodiment shown in FIG. 1;

FIG. 3 shows a plan view, partly in section, showing in greater detail the construction of the folding member which executes both rotary and translational motion;

FIG. 4 shows a detail view in side elevation of an embodiment of folding device for applying an outer wrapper to a parallelepipedonal block-like article; and

FIG. 5 shows a detail view of a lateral guide for use in either of the embodiments shown in FIGS. 1 to 3 and FIG. 4 respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the embodiment shown in FIGS. 1 to 3, a revolver has four cells 21/22, which in the drawing occupy positions *a*, *b*, *c* and *d*, respectively. The revolver includes article receiving means rotatably mounted on a support. The cells are defined by wall members of the article receiving means and are spaced at angular intervals about the axis of rotation and extend in a generally radial direction relative to the axis. Reference numeral **63** denotes a sheet of inner wrapper material, and reference numeral **64** a sheet of outer wrapper material. The revolver has a mounting plate **213**, a guide arrangement **304** and four folding members **70** of construction fully disclosed in co-pending United Kingdom Patent application No. 53141/72. The folding members **70** do, of course, rotate with the revolver during its stepwise motion. This motion is more fully described in co-pending United Kingdom Patent application No. 48186/72.

An additional folding member, which does not rotate with the revolver, is shown at **67** and is connected to an arm **67***a* which is in turn mounted on a shaft **406** passing through bearings **408** and **409** to be vertically reciprocable. The shaft **406** is driven for reciprocation by drive means (not shown) situated below a base plate **3**. The drive means may take the form of cams. Further folding members are shown at **66***a* and **66***b*, and these folding members are also mounted to execute simply up and down reciprocating linear motion. This motion is accomplished by the linkage **404, 404***a* as well as a shaft and bearing arrangement **407**. The folding members **66***a* and **66***b* thus reciprocate in phase with one another.

Components which correspond to those shown in the above mentioned copending patent applications are given corresponding reference numerals in the drawing accompanying the present application, so that full description of such components is not necessary. These components have reference numerals not exceeding **400**. Folding members which execute both rotary and translational motion are shown at **71** (for example see FIG. 2). These members are each connected via an individual member **413** to a pin **73** carrying a pinion **75** rollable along a linear rack member **74** (FIG. 3). The motion of the pinion **75** along the rack member **74** takes place steplessly, i.e. continuously from end to end. **403** denotes a casing which acts as a mounting for the assembly comprising the two folding members **71** and their individual mounting arrangements, the casing **403** carrying a pair of depending elements of a bifurcate arm **417** articulated to a drive rod **418** connected to reciprocable drive means (not shown) situated below the base plate **3**. Around the arm **417** is disposed a sealing plate **415** of plastics material which seals the opening in the base plate **3** for the arm **417** both in the stationary condition of the casing and also during its reciprocation. The casing **403** is guided for its reciprocating motion guide rods **401** passing through pillars **402**. The symbol S′ in FIG. 3 indicates the displacement of the casing **403** during its reciprocation, the left-hand position (FIG. 3) of the casing **403** being shown mainly in solid lines in FIG. 3, and the right-hand position being shown at **403***a* in chain-dotted lines. The symbol Sp (FIG. 2) indicates the height of a small gap between the bottom of the casing **403** and the top of the base plate **3**. This gap is sealed by wiper strips or other suitable sealing devices.

FIG. 4 shows part of a revolver intended for the application of an outer wrapper, in this case no folding at all being required to take place at the right-hand (FIG. 4) axial end of the cells, as the axial length of the outer wrapper extends only the distance H from the left-hand end of the cell, to leave a short gap K of inner wrapper exposed on the product ejected from the cell. Subsequently, a sealing sticker is applied and secured over the open end of the outer wrapper.

The embodiment shown in FIG. 4 is of basically the same construction as that shown in FIGS. 1 to 3, but with the simplification resulting from the omission of all folding elements on the right-hand side in FIG. 4. Referring to FIG. 2, all the projecting lobes of wrapping material are shown and identified individually by reference numerals in connection with the cell shown at the bottom position in FIG. 2, i.e. that is position *c* shown in FIG. 1. At the left-hand axial end of the wrapped cigarette block shown in cell *c* in FIG. 2 there is an upper, narrow lobe **63 – 1**, a lower, narrow lobe **63 – 2**, and a trailing trapezoidal lobe **63 – 5**. Similarly, at the right-hand end of the package there is an upper, narrow lobe **63 – 3**, a lower, narrow lobe **63 – 4**, and a trailing trapezoidal lobe **63 – 6**. In cell *b* in FIG. 2, the leading trapezoidal lobes are shown at **63 – 5***b* and **63 – 6***b*, and the trailing trapezoidal lobes at **63 – 5***a* and **63 – 6***a*.

FIG. 5 shows a detail of one of a pair of arcuate lateral guide plate members **411** and **412**, which are employed in the described embodiments to fold over rearwardly the "leading" trapezoidal lobes **63 – 5***b* and **63 – 6***b* shown in FIG. 2.

The operation of the embodiment shown in FIGS. 1 to 3 will now be described. A U-shaped web of inner

packaging material is inserted into cell *a* by a pushing member (not shown) while the revolver is stationary. During the insertion of the web of packaging material into the cell in position *a*, the folding member **70***a*, which is carried by the revolver itself and is associated with the cell *a*, is in its projecting position, so that the lower, narrow lobe of packaging material projecting in a direction parallel to the axis of rotation of the revolver and towards the "rear" of the folding device as a whole, i.e. the direction towards the left in FIG. **2**, is folded over upwardly by the folding member **70***a*. This fold is indicated in chain-dotted lines at the left-hand end of the uppermost cell in FIG. **2**.

During a 90° anti-clockwise (FIG. **1**) step of rotation, cell *a* moves to position *b*. In position *b*, a cigarette block is inserted in a direction parallel to the axis of rotation, to lie between the upper and lower longer web portions of the U-shaped web of packaging material shown in cell *b*. The upper lobe **63***a* is folded downwardly by folding means (not shown), and the cell *b* now executes a further 90° anti-clockwise step of rotation, during which the lower (leading) lobe **63***a* is folded over rearwardly by the stationary channel section arcuate guide member **61**, more fully described in co-pending United Kingdom Patent application No. 48186/72. The cell now reaches position *c*, where the revolver again stops. It is clear from the drawings that a total of seven folds remain to be carried out, four at one axial end of the package and three at the other, once a cell has left position *b*. The number would have been eight, were it not for the previous action of the folding member **70***a*.

Upon arrival at position *c* in FIG. **1**, the rod passing through the bearing **407** is moved upwardly, and thereby drives the folding members **66***a* and **66***b* (FIG. **2**) upwardly, to fold the lobes indicated at **63 – 2** and **63 – 4**, respectively, in FIG. **2**. The folding members **66***a* and **66***b* are then retracted again downwardly. The rod **406** passing through bearing **409** is driven downwardly, to bring with it the folding member **67** to fold the lobe indicated at **63 – 3**, and the rod **406** is then retracted upwardly. After these folds have been completed, the two trapezoidal lobes projecting at each axial end of the package are the only lobes remaining to be folded. The "trailing" trapezoidal lobes **63 – 5***a* and **63 – 6***a*, i.e. the ones which are rearmost in the direction of travel of the package through the station *c*, are now folded over against their adjacent axial end faces of the package (i.e. against the already folded short lobes **63 – 1, 63 – 2, 63 – 3, 63 – 4** as the case may be, by means of the folding members **71**. The folding members **71** are actuated to follow the course shown in detail in FIG. **3**. Thus the members **71** start in the solid line position of FIG. **3**, and arrive at the positions shown at *a*, *b*, *c*, *d* and *e* successively while the pinion **75** rolls along the rack member **74**, so that the longitudinal axis of the pinion **75** translates linearly. In the position *e* in FIG. **3**, the folding member **71** retains the adjacent trapezoidal lobe against the adjacent end face of the package. After this fold has been completed, the folding member **71** in each case is retracted from its operative position *e* to the withdrawn position shown in solid lines, in which the member **71** is spaced from the nearest part of the cell at station *c*, in a direction parallel to the longitudinal axis of the revolver. In this withdrawn position, the member **71** cannot interfere with the free passage of the lobes projecting from a package of a cell arriving from station *b*.

All the folds made by the folding members **66***a*, **66***b*, **67** and **71** are carried out while the appropriate cell is stationary at station *c* of the folding device. The cell is now ready to proceed to station *d*. This occurs during a further 90° anti-clockwise step of rotation of the revolver, and during the step of rotation the "leading" trapezoidal lobes projecting from the respective axial ends of the package are folded over rearwardly against the end portions of the package, i.e. against the previously folded lobes as required, by the respective stationary arcuate lateral guides **411** and **412**.

When all the above described folds have been completed, which is the case long before the package in question reaches cell *d*, the package is tightly and completely wrapped in an inner wrapper. As is clear from FIG. **1**, the leading edges of the arcuate lateral guides **411, 412** are situated at station *c* and form part of the total arrangement of folding means provided on the folding device.

At station *d* the package is ejected from the revolver, and where it is desired to apply an outer wrapper over the inner wrapper, the package is passed directly from the cell *d* of the described and illustrated revolver to an input cell of a further revolver, which may be of similar construction and operation. However, for the following revolver it is convenient to use a folding arrangement of the kind shown in FIG. **4**, in which no folding members are present on the right-hand axial end (FIG. **4**) of the revolver, since the U-shaped web of outer wrapper material is inserted into the cells of the following revolver in such a manner that it projects at one axial end (i.e. the left-hand axial end in FIG. **4**) only. The operation of the arrangement shown in FIG. **4** is exactly the same as that of the embodiment of FIGS. **1** to **3**, but with the omission of the folding member **67** and the arrangement for driving it for its reciprocating motion, and with the omission also of the folding member **66***b*. Since the member **66***b* is omitted, the folding member **66***a* alone is operated by the shaft passing through the bearing **407**.

The precise timing of the advancing and retraction of the various folding members may be varied to a certain extent, provided that the folding action of the folding members in each case takes place at station *c* when the revolver is stationary. It must of course be ensured that no folding member remains in its advanced or projecting position for too long a time, since if that were the case it might well interfere with the free passage of lobes of a folded sheet or of an arriving unfolded sheet of wrapping material.

The inner or outer wrapper may consist of viscose or cellulose film, or of paper. In some cases, the inner wrapper consists of tin foil or aluminium foil.

It is convenient for the U-shaped web of packaging material to be inserted in the cell (in position *a* of the revolver) with the two limbs of the U of equal length. However, this is not essential. If desired, the material of the outer wrapper may be printed material.

With the outer wrapper not extending the full length of the inner wrapper folded around the cigarette block, the "collar" indicated in FIG. **4** at K gives rise to a better appearance of a finally wrapped package, in view of the attractive appearance of the tin foil or aluminium foil, where either of these materials is employed to form the inner wrapper.

I claim:

1. A device for folding a sheet of wrapping material around external surfaces of an article of parallelepipedonal shape, said device comprising, in combination:

a support;

article receiving means rotatably mounted on said support to be rotatable about an axis;

cell defining means provided by wall members of said article receiving means to define a plurality of cells spaced at angular intervals about said axis and extending in a generally radial direction relative thereto, each cell being adapted to receive one said article;

means to rotate said article receiving means stepwise about said axis to cause each said cell to be arrested successively at a first station, a second station, a third station and a fourth station of said device;

means to introduce a sheet of wrapping material into one said cell when the latter is located at said first station;

means to introduce said article into said cell when the latter is located at said second station, whereby said sheet of wrapping material is disposed between said article and walls of said cell in which said article is received, with lobes of said sheet projecting beyond an end face of said article and in a direction parallel to said axis;

carrier means disposed at said third station;

guide means co-operating with said carrier means;

a folder member rotatably supported on said carrier means;

a roller member connected to said folder member to rotate therewith and rollably engaging said guide means; and

means to reciprocatably displace said carrier means along said guide means, thereby to impart simultaneous rotational and translational motion to said folder member, whereby the latter is moved towards and along the axial end face of said cell located at said third station when said carrier means is displaced along said guide means in a first direction and said folder member is moved away from said cell when said carrier means is displaced in a direction opposite to said first direction, said displacement of said carrier means in said first direction causing said folder member to engage one of said projecting lobes and to fold the latter against said face of said article in said cell at said third station.

2. A device as defined in claim 1, wherein said guide means comprises a racked member and said roller member is provided with teeth disposed around the periphery of said roller member to engage said racked member.

3. A device as defined in claim 1, wherein said folder member comprises an angle member having two mutually perpendicular arms; whereby when said carrier means is displaced along said guide means in said first direction from one end of its stroke to the other, one of said arms is moved from a first position — in which said one arm is spaced apart from said cell at said third station — to a second position — in which said one arm is located next adjacent said axial end face and extends substantially perpendicularly to said axis of rotation.

4. A device as defined in claim 1, additionally comprising a stationary further folder member located next adjacent the path of displacement of said cell; whereby on said article receiving means being rotated to displace said cell from said third station to said fourth station, a further said lobe is folded by interaction with said stationary folder member to overlie said axial end face of said article.

5. A device as defined in claim 1, further comprising at least one further folder member mounted to be reciprocatably displaceable in a direction radial to said axis to fold a respective other said lobe over said end face of said article in said cell located at said third station.

* * * * *