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Schmermund

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[54] **DEVICE FOR USE IN FOLDING A SHEET OF PACKAGING MATERIAL**

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[52] **U.S. Cl.** **53/234**

[51] **Int. Cl.**..... **B65b 11/36**

[58] **Field of Search** 53/225, 232, 234, 378

[56] **References Cited**

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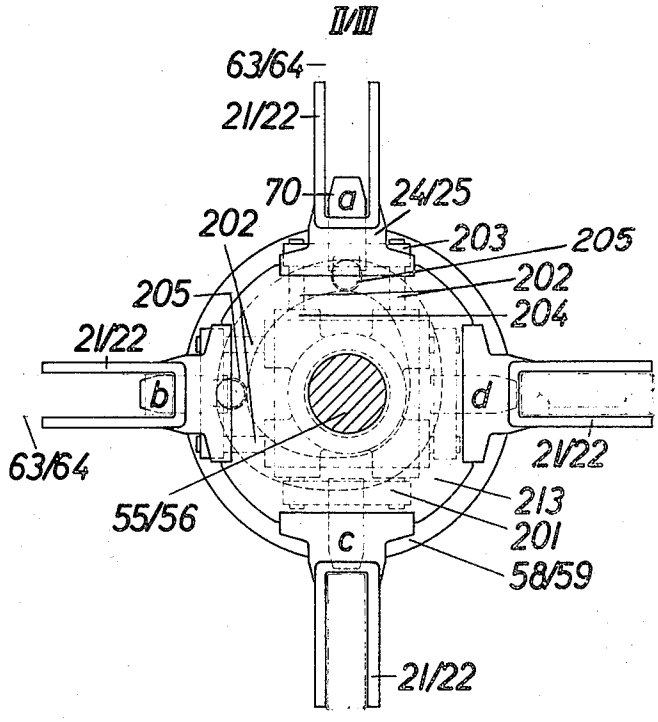
[57] **ABSTRACT**

A device for use in folding a sheet of packaging material is disclosed. The device comprises first support means rotatably mounted on a frame to be rotatable about a predetermined axis of rotation; at least one further support means, the or each said further support means being slidably mounted on the first support means and being rotatable therewith; at least one pair of elongate folder members, the folder members of the or each pair being interconnected by a respective further support means and being supported thereby to project radially in mutually opposite directions with respect of the axis of rotation; stationary cam means connected to the frame to define a camming surface encompassing the axis; cam follower means contacting the camming surface and connected to a respective one of the further support means to impart reciprocatory motion thereto on each rotation of the first support means about the axis, whereby each folder member is displaced between a radially outer operative position and a radially inner inoperative position.

4 Claims, 4 Drawing Figures



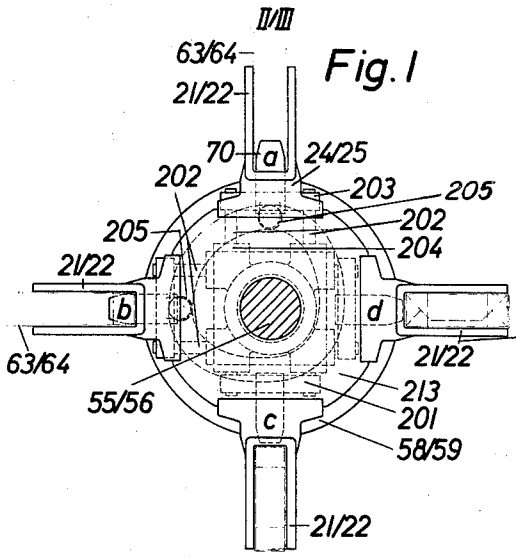


Fig. 1

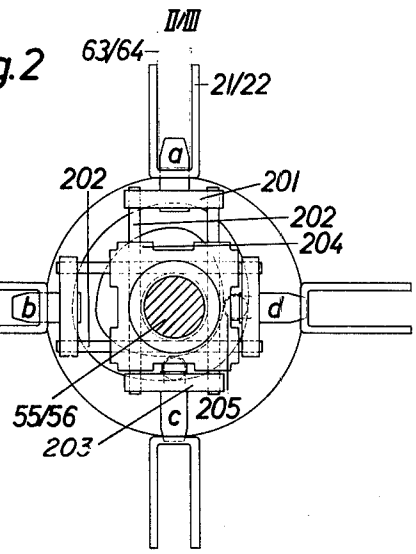


Fig. 2

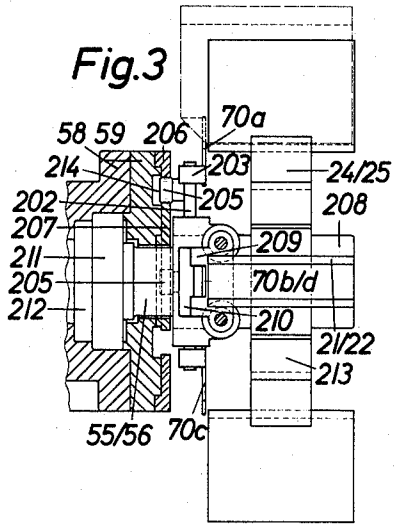


Fig. 3

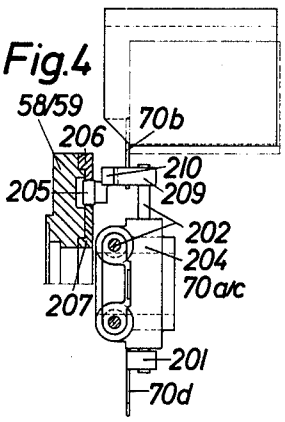


Fig. 4

DEVICE FOR USE IN FOLDING A SHEET OF PACKAGING MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to a device for use in folding a sheet of packaging material.

In copending United Kingdom Patent Application No. 48186/72 there is disclosed a packaging machine for wrapping block-like articles such as cigarette blocks in two wrappers, for example of paper or viscose or cellulose film. This packaging machine includes folder members connected to revolvers each containing four cells to receive cigarette blocks, and the present invention is concernd with the construction and operation of an arrangement of folding members which may be used with that packaging machine. Of course, the present folding arrangement may also be employed with machines other than that disclosed in copending United Kingdom Patent Application No. 48186/72.

SUMMARY OF THE INVENTION

According to the present invention there is provided a device for use in folding a sheet of packaging material comprising first support means rotatably mounted on a frame to be rotatable about a predetermined axis of rotation, at least one further support means, the or each further support means being slidably mounted on the first support means and being rotatable therewith, at least one pair of elongate folder members, the folder members of the or each pair being interconnected by respective further support means and being supported thereby to project radially in mutually opposite directions with respect to the axis of rotation, stationary cam means connected to the frame to define a camming surface encompassing the axis, cam follower means contacting the camming surface and connected to a respective further support means to impart reciprocatory motion thereto on each rotation of the first support means about the axis, the arrangement being such that each folder member is displaced between a radially outer operative position and a radially inner inoperative position.

Preferably, the cam means defines a second camming surface encompassing the axis and located in spaced relationship with the first mentioned camming surface to define a displacement path for the or each cam follower means between the first and the second camming surfaces. Advantageously, the or each cam follower means comprises a roller.

It is in particular envisaged that the device may be used with a revolver of a packaging machine such as that disclosed in the above mentioned co-pending patent application, in which case at any given time when the revolver is stationary each folder member of each pair of mutually opposite folder members is in the opposite condition from the other folder member of the same pair, i.e., directly opposite a folder member in its operative position ready for folding there is a folder member in its inoperative position in which the folder member is retracted out of contact with a web of packaging material when situated in the adjacent cell of the revolver.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention, with indications of small modifications, will now be more particularly described with reference to the accompanying drawing, in which:

FIG. 1 shows a front view, partly in section, of a revolver of a packaging machine, provided with a folding device;

FIG. 2 shows in greater detail the particular arrangement of sliding rods employed;

FIG. 3 shows the revolver in side view, also showing some of the components provided for mounting the revolver for its rotation; and

FIG. 4 shows a similar view to FIG. 3, of a slightly modified arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing, reference numerals **55, 56** denote a shaft on which a revolver of a cigarette packaging machine is mounted so that the revolver can be rotated stepwise 90° at a time, anti-clockwise in FIG. **1**, so that the four cells of the revolver occupy in turn the positions *a*, *b*, *c* and *d* successively. An elongate folder member **70** is provided for each of the four cells, at one axial end of each cell. The folder members of each individual pair of diametrically opposite cells are connected as a pair to respective cam follower means described below. In the condition shown in FIG. **1**, the folder members **70** at the cells *a* and *b* are each in their operative positions, which in the described arrangement are positions in which they project radially outwardly of the revolver to a sufficient extent to fold over the axial end of the central web portion of a U-shaped piece of packaging material **63/64** inserted into each cell when the cell is in position *a*, and the folder members **70** at the cells *c* and *d* are each in their inoperative positions, which in the described arrangement are positions in which they are retracted so as not to be able to contact the web of packaging material.

Each folder member **70** is carried by a holder **201**, 203 rigidly carried by two mutually spaced parallel elongate rod members **202** arranged to slide through first support means in the form of a cross-shaped guide member **204.** For example, the vertically extending rods **202** in FIG. **1** have one holder **203** rigidly attached to their upper ends and another holder **201**, similar to the holdr **203**, attached to their lower ends. The vertically extending rods **202** and the holders **201** and **203** constitute further support means. The arrangement of the horizontally extending rods is similar. This is evident from FIG. **2**, which shows the rods in greater detail. The vertically extending rods **202** have their longitudinal axes precisely perpendicular to those of the horizontally extending rods. It is clear from the above that a total of four holders are provided for the one revolver shown in FIG. **1**, each holder carrying an individual folder member **70.** The holder shown at cells *a* and *b* in FIG. **1** each carry a cam follower in the form of a rotatable roller **205** arranged to run between mutually complementary cam surfaces located in spaced relationship and provided respectively on a central eccentric member and on an annular member surrounding the central eccentric member, as shown in FIGS. **1** and **2.** The two rotatable rollers **205** are mutually angularly spaced apart to define an angle of 90° therebetween, as shown in FIG. **1.** As the revolver rotates anticlockwise in FIG. **1** the rollers **205** follow the eccentric path defined between the cam surfaces. In the arrangement shown, the cam surfaces are each endless, to en-

able stepwise rotation of the revolver in the same sense to take place without interruption or reversal. As shown in FIGS. 1 and 2, a first portion of the cam follower displacement path describes an arc of constant radius of first value, a second portion of the path describes an arcuate path of radius progressively decreasing from the first value to a second value, a third portion of the path describes an arc of constant radius of the second value, and a fourth portion of the path describes an arcuate path of a radius progressively increasing from the second value to the first value. The cells of the revolver are shown at **21/22.** A frame in the form of a bearing body **58/59** is provided to mount the cam means in the form of the eccentric and annular members to be maintained stationary during rotation of the revolver.

Regardless of which particular cell of the revolver is in the uppermost position, the arrangement of folder members **70** always has the general appearance shown in FIG. **1,** i.e., the upper most and left-hand cells have their folder members projecting, while the bottom and right-hand cells have their folder members retracted.

In cell *a* shown in FIG. **1** there is indicated a U-shaped web of packaging material **63/64,** the folder member **70** being effective to fold over the above mentioned central web portion of the wrapping material as the web is inserted into the cell by a plunger (not shown). The cross-shaped guide element **204** is securely fixed to the revolver shaft **55/56.** The cells **21/22** are rigidly fixed to mountings **24/25,** which are in turn fixed to the shaft **55/56** by means of a carrier plate **213.** Reference numeral **208** (FIG. **3**) indicates a holding plate for the parts **204, 213** of the revolver secured to the shaft **55/56.**

Referring to FIG. **3,** two complementary cam surfaces are provided respectively on an outer cam part formed by the annular member shown at **206** and an inner cam part formed by the central eccentric member shown at **207,** which are each secured to the bearing body **58/59.** The cam surfaces define between them a cam path, to the left of which in FIG. **3** a groove of enlarged width **214** is situated. FIG. **3** also schematically shows a rolling bearing **211** and a sealing ring **212,** which is employed to provide the necessary sealing for a supply of suction to the cells of the revolver, which are each of double-walled construction. The sealing ring **212** surrounds a central portion of the shaft (not shown in FIG. **3**) and provides a control for the suction.

In FIG. **4,** the reference letters *a, b, c* and *d* do not refer to the orientation of the cells relatively to the remainder of the packaging machine, as is the case in FIG. **1,** but they refer in FIG. **4** to the manner of securing of the folder members **70** to the sliding rods **202.** The holder **203** for the folder member **70***b* in FIG. **4** consists of the parts **209** and **210** shown in FIG. **3. 209** represents the holder for the folder member **70***b* itself in FIG. **3,** while **210** represents a separate mounting portion of the roller **205** shown at the centre of FIG. **3.** With the holder **203** comprising the two parts **209** and **210,** the folder member **70***b* of FIG. **3** can be unscrewed and thus removed. Furthermore, the two parts **209** and **210** can themselves be unscrewed from one another. The same manner of securing of the folder member **70** to the rods **22** is employed at the opposite end of each pair of rods **202,** but of course in this case no roller is provided.

In operation, a web **63/64** of packaging material is pressed into the cell *a* by the displacement of a plunger (not shown), during which the plunger, as it descends into the cell *a*, is arranged to pass by the projecting folder members **70,** during which the member **70** as a result of being in its projecting position, folds over the central portion of the U-shaped web. The web is shown in FIG. **1** after this fold has been made. The web is retained in the cell by suction applied through a perforated inner one of two walls constituting the cell, and the revolver executes a 90° anti-clockwise rotation in the sense of FIG. **1.** While the cell is in position *b* of FIG. **1** a cigarette block is inserted in a direction parallel to the axis of the axle **55/56,** during which the folder member **70** acts as an end stop to prevent the cigarette block from over-shooting its desired position. Thus, the cigarette block is accurately located in the cell. The remaining folds are carried out for example during passage of the cell from position *b* to position *c* and in position *c* itself, and this arrangement is more fully described in co-pending United Kingdom Patent Application No. 48186/72. It is necessary that by the time when the cell reaches position *c* the folder member **70** should be fully retracted into its retracted position, so as not to interfere with any folding operations taking place at position *c*. This retraction is achieved by the roller **205** rotatably mounted on the holder **203** following the path determined for it by the two cam surfaces between which the roller **205** runs.

As the cell passes from position *b* to position *c*, the roller **205** is forced to travel along a path having a component directed radially inwardly towards the centre of the axle **55/56,** so that the roller **205** forces the rods **202** to execute a displacement through the guide element **204.** Thus after a 180° rotation from position *a* to position *c*, the cell is inverted and also has its folder member **70** brought from its projecting position to its retracted position. However, the retracting of the folder member **70** only occurs during the 90° stretch of the rotation from position *b* to position *c*, since at all points along the path of the roller between position *a* and position *b* the roller is constrained to remain at the same radial distance from the centre of the shaft **55/56** This is also true of the 90° stretch of the path from position *c* to position *d*. When the cell reaches position *d*, the wrapped cigarette block is ejected in a direction parallel to the axis of rotation of the revolver, so that the cell arrives emtpy, after a further 90° anti-clockwise rotation, at position *a* again. During the travel of the cell from position *d* to position *a*, the roller is constrained to move further away from the axis of the shaft **55/56,** so that the rods **202** are forced to move linearly in the opposite sense relative to the revolver from their movement in passing from position *b* to position *c*. Having reached position *a*, the cell is again ready to receive a web of wrapping material **63/64,** and the folder member **70** is in its projecting position.

One advantage given by the described arrangement is that only one cam arrangement, which in the described case consists of the members **206** and **207,** is necessary to control the movement of the four folder members **70** of the respective cells of the revolver. Two factors are particularly important in giving this result; namely, the provision of one roller **205** only on each of the two sets of rods, each set controlling two folder members, and the construction of the cam parts defined by the members **206** and **207** in four parts,

namely a 90° upper and lower part (shown at top left and bottom right in FIG. 1) of constant radial distance from the axis of rotation of the revolver, acting as dwell portions between a rising cam surface portion and a falling cam surface portion (shown at top right and bottom left in FIG. 1 respectively).

I claim:

1. A device for use in folding a sheet of packaging material comprising, in combination:

a frame,

first support means rotatably mounted on said frame to be rotatable about a predetermined axis of rotation;

two further support means extending substantially perpendicularly of one another, each said further support means being slidably mounted on said first support means and being rotatable therewith;

two pairs of elongate folder members, said folder members of each said pair being interconnected by a respective one of said further support means and being supported thereby to project radially in mutually opposite directions with respect to said axis of rotation;

stationary cam means connected to said frame to define a first camming surface encompassing said axis and a second camming surface encompassing said axis and located in spaced relationship with said first camming surface;

two roller followers, said roller followers being angularly spaced apart to define an angle of 90° therebetween at said axis of rotation, each roller follower contacting said first and second camming surfaces to follow a displacement path defined therebetween and being rotatably mounted on a respective one of said further support means to impart reciprocatory motion thereto on each rotation of said first support means about said axis, a first portion of said roller follower displacement path describing an arc of constant radius of a first value, a second portion of said path describing an arcuate path of a radius progressively decreasing from said first value to a second value, a third portion of said path describing an arc of constant radius of said second value, and a fourth portion of said path describing an arcuate path of a radius progressively increasing from said second value to said first value, whereby each said folder member is displaced between a radially outer operative position and a radially inner inoperative position on each rotation of said first support means about said axis.

2. A device as defined in claim 1, wherein each said further support means comprises two mutually spaced parallel elongate rod members and two holder members, each holder member interconnecting mutually next adjacent end portions of said parallel rod members and supporting a respective one of said folder members.

3. A device as defined in claim 2, wherein each said first support means is provided with at least one pair of guide means, each said pair of guide means slidably supporting said two parallel rod members of a respective one of said further support means.

4. A device as defined in claim 2, wherein each said folder member is detachably connected to a respective one of said holder members, whereby any one said folder member may readily be exchanged for another said folder member.

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