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2,268,423

PACKAGING APPARATUS

Filed Nov. 7, 1940

3 Sheets-Sheet 1

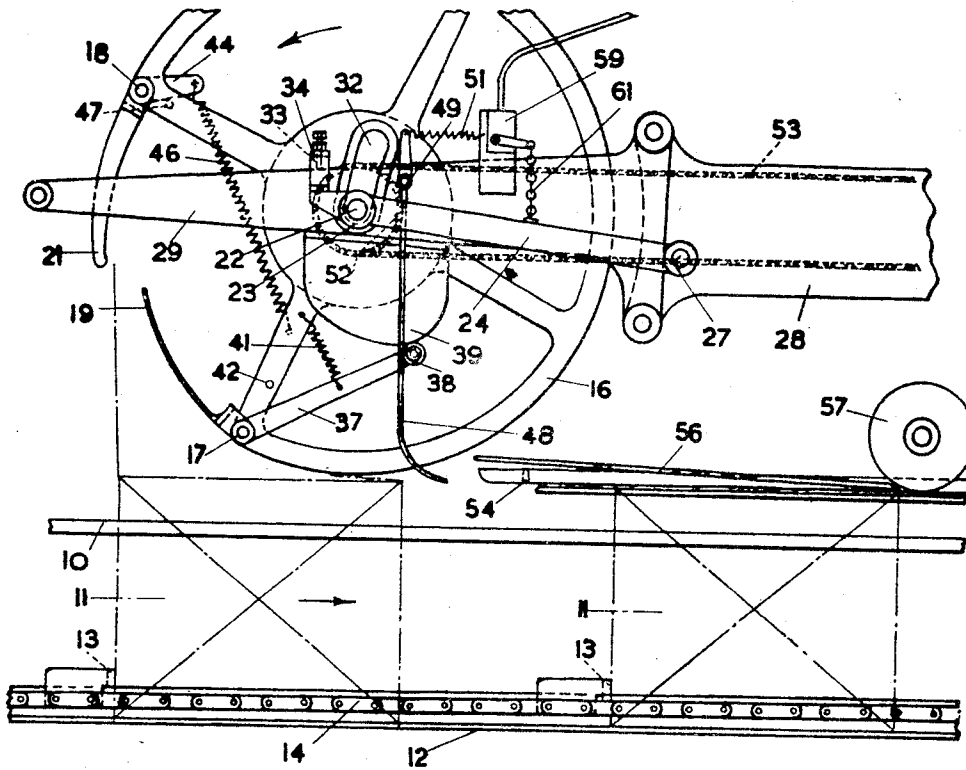


FIG. 1.

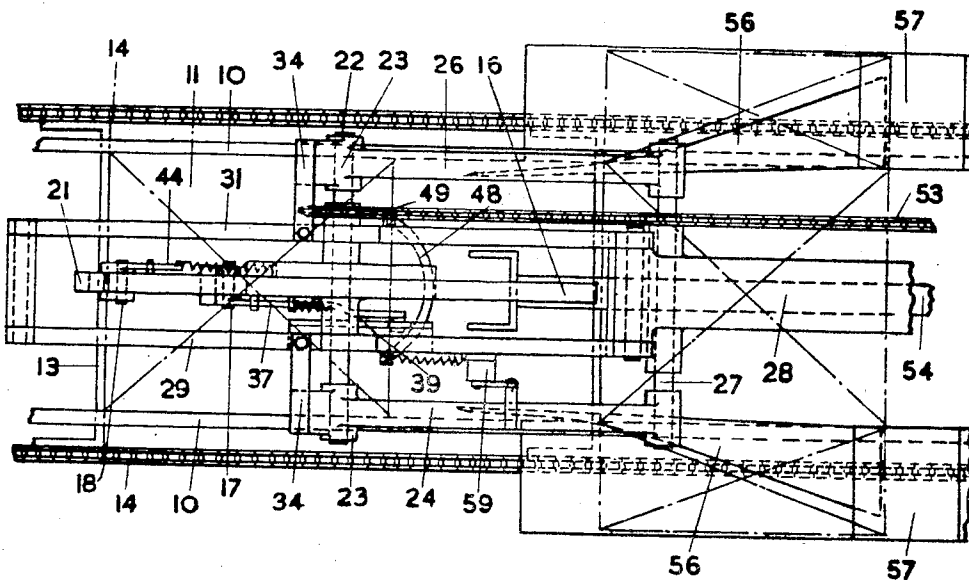


FIG. 2.

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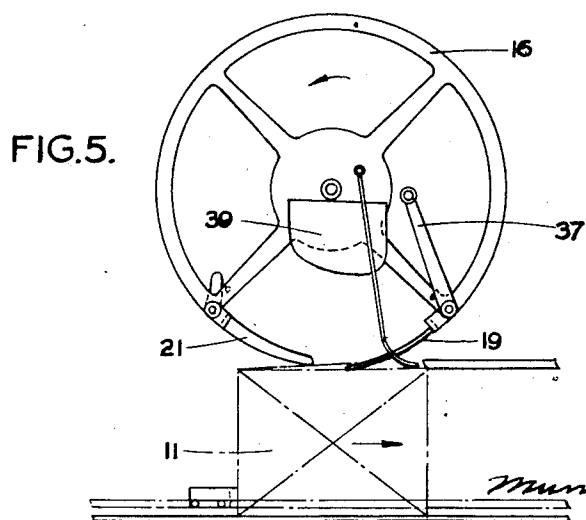
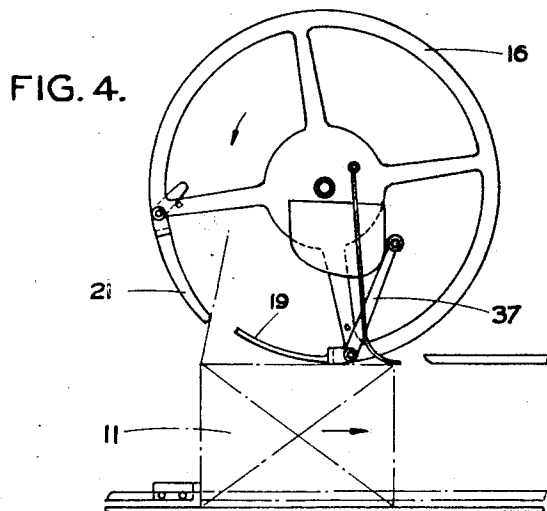
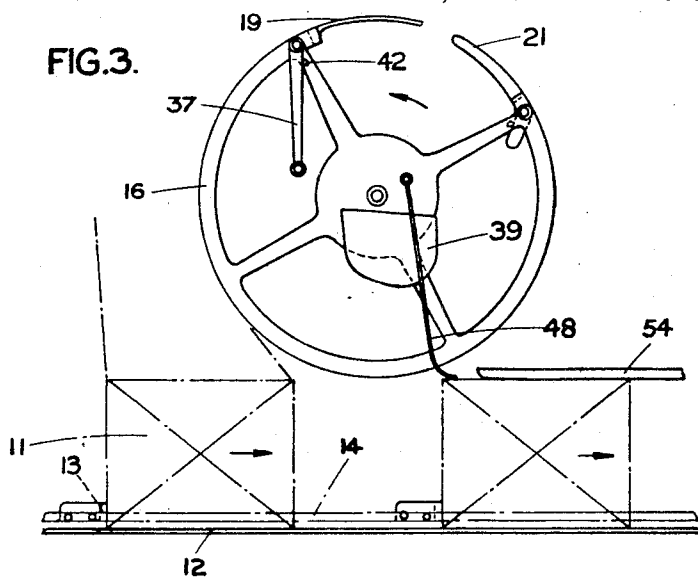
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3 Sheets-Sheet 3

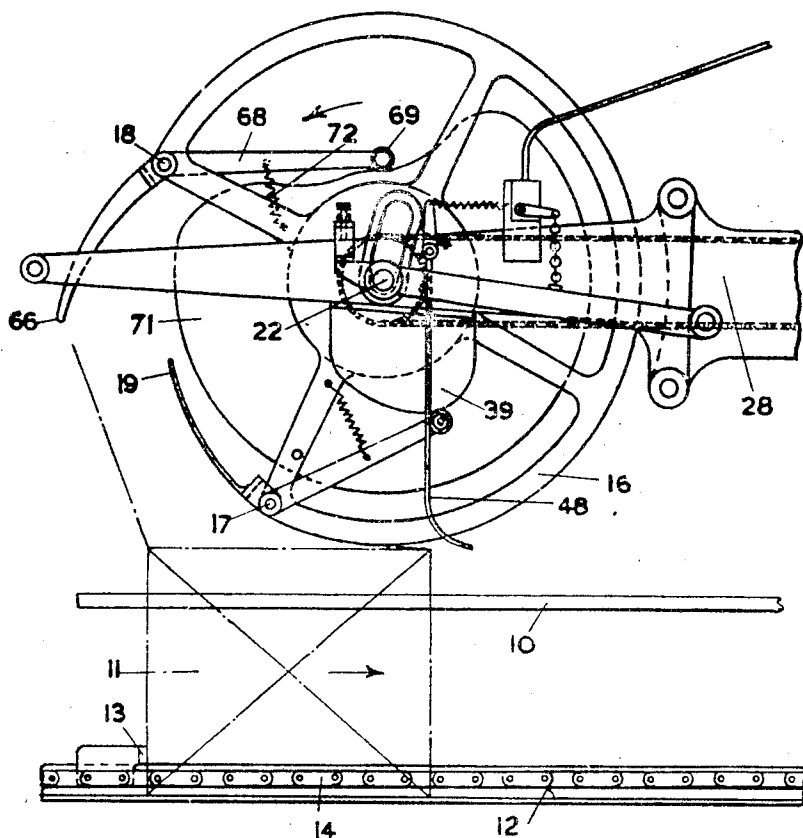


FIG. 6.

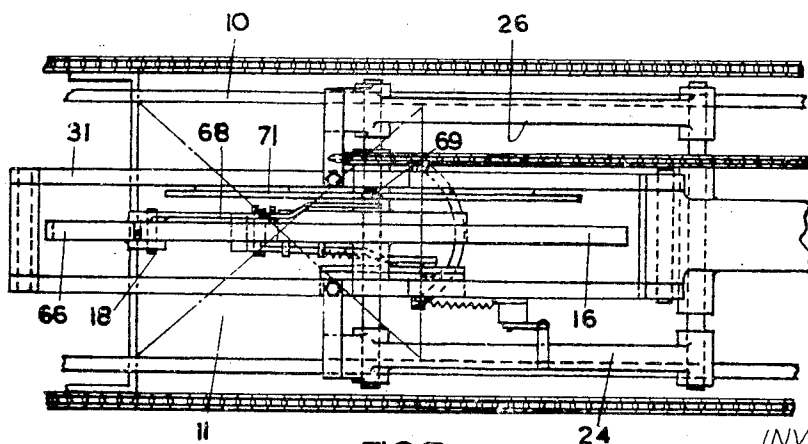


FIG. 7.

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## UNITED STATES PATENT OFFICE

2,268,423

## PACKAGING APPARATUS

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In Great Britain November 15, 1939

13 Claims. (Cl. 93—6)

This invention relates to packaging apparatus, and more particularly to apparatus for closing the two inside flaps of a travelling open-ended fibre or cardboard box or like container (hereinafter referred to as "container"), preparatory to the sealing of the container by closing the outer flaps upon the inner flaps.

The invention is particularly applicable to the type of apparatus in which containers are fed with their end flaps open at one end of the container, by conveyor means, to a folding and gluing device, which folds outwardly the outer flaps in preparation for the application of glue, and closes the inner flaps preparatory to the final sealing of the container by the subsequent inward folding of the outer glued flaps upon the inner flaps.

In folding apparatus of this type, it has been usual to employ a stationary folder to fold the forward inner flap of the container, the folder being so shaped and disposed relative to the end of the container that, as the container passes beneath the folder, the flap presses against the nose of the folder and is caused to fold, and pass beneath the folder. The usual method of folding the rear inner flap on this type of apparatus is by a rotatable member, which is so timed in relation to the container feeding mechanism as to move into position behind the advancing container, and fold down the rear inner flap as the container passes the folding apparatus.

With this type of apparatus, the stationary forward flap folder is made adjustable towards or away from the rotatable rear flap folder for the purpose of adjusting the apparatus to operate on containers of various lengths. When such adjustment is made, it is usually necessary to re-time the rotatable rear flap folder also.

Apart from the necessity for making these adjustments, it has now been found that in some cases, for example, when using a short container with a long rear flap, the necessary adjustment of the stationary folder to ensure proper folding of the forward flap is such, that the rear flap, during folding, is apt to be trapped on to the top of the stationary folder; and when the rotatable rear flap folder is advanced in an attempt to avoid such trapping, it sometimes happens that the necessary extent of the advancement is sufficient to cause the folder to pass in advance of the rear flap and thus fail to fold it.

It is an object of the present invention to avoid the above difficulties by providing an apparatus capable of operating on containers of various dimensions without the need for adjust-

ment of the flap folding elements relative to each other.

In accordance with the present invention, apparatus for the folding of the inside flaps of travelling open-ended containers, comprises means for feeding a container with its end flaps in open position at one end of the container, a rotatable forward flap-folding member (hereinafter referred to as the "front folder") arranged to engage the forward flap of the travelling container and fold it into closed position, and a rotatable rear flap folding member (hereinafter referred to as the "rear folder"), arranged to engage the rear flap of the travelling container and fold it into closed position, said folders being so arranged that upon the approach of the rear flap there is a relative movement between the folders away from each other to allow the rear flap to pass between the folders so that its free extremity passes within the path of movement of the rear folder.

In order to bring about the relative movement between the front and rear folders, the front folder may be pivotally mounted on a rotatable support about an axis parallel to the axis of rotation of the rotatable support and provided with a roller arranged to follow a stationary cam so shaped as to cause the folder to move towards the centre of rotation of the rotatable support upon the approach of the rear flap. The front folder is preferably arranged so as to exert a resilient pressure on the forward flap during folding.

The rear folder also is preferably arranged so as to exert a resilient pressure on the rear flap during folding, and may be pivotally mounted on a rotatable support and urged by a spring device away from the centre of rotation of the rotatable support, a stop being provided for limiting the movement of the rear folder under the action of the spring.

Alternatively, the rear folder, like the front folder, may be pivotally mounted on a rotatable support about an axis parallel to the axis of rotation of the rotatable support and provided with a roller arranged to follow a stationary cam so shaped as to cause the folder to move away from the centre of rotation as it approaches the rear flap, so as to ensure proper engagement with the flap, and towards the centre of rotation during the folding of the flap. With this arrangement, also, the rear folder may be arranged to exert a resilient pressure upon the flap during the folding operation.

The front and rear folders are conveniently

mounted at different points on a common rotatable support. It will be clear, of course, that two or more sets of folders, each comprising a front and rear folder, may be mounted on a single rotatable support, the rate of rotation of the support being determined by the number of sets of folders employed. Thus, if one set of folders is used, the rotatable support will make one revolution for every container passing through the apparatus; if two sets are used, the rotatable member will make only half a revolution for each container; if three sets are used, only a third of a revolution will be necessary for each container, and so on.

Preferably, the apparatus is also provided with a fold-retaining member arranged to hold the flaps in the folded position during the passage of the container from the folding apparatus to the flap-glueing device. Conveniently, this fold-retaining member is in the form of a pivoted spring loaded shoe arranged to exert a resilient pressure on the folded flaps as the container passes the shoe.

A part, or the whole, of the folding apparatus may be supported in such a manner in relation to the container feeding mechanism as to be capable of moving into engagement with a stop mechanism in the event of an obstruction occurring during the folding operation. For similar reasons, the rotatable support may be provided with a slipping clutch mechanism which will allow the rotatable support to stop during the movement of the folding apparatus into engagement with the stop mechanism.

By way of example the invention will now be described in greater detail with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is an elevation of part of a packaging machine employing flap-folding apparatus according to the invention,

Figure 2 is a plan view of the apparatus shown in Figure 1,

Figures 3, 4 and 5 are three views similar to Figure 1 showing the position of the folders at three successive stages in the folding operations, only the essential elements being shown,

Figure 6 is an elevation similar to Figure 1 showing a modified form of rear folder, and

Figure 7 is a plan view of the apparatus shown in Figure 6.

Referring to Figures 1 and 2, containers 11 are fed from a packing station (not shown) to a platform 12 with their upper flaps open, i. e., upstanding from the body portion of the container, and are moved along the platform 12 between guide rails 10 by pusher bars 13 extending transversely of the platform 12 and connected to a pair of conveyor chains 14 supported on pairs of sprockets (not shown) at each end of the machine.

Disposed above the conveyor chains 14 is a flap-folding apparatus comprising a rotatable folder support 16 on which is pivotally mounted, at points 17 and 18 respectively, a front folder 19 and a rear folder 21. The folder support 16 is carried by a shaft 22 mounted for rotation in bearings 23 in a pair of arms 24 and 26 pivotally connected at 27 to the main framework 28 of the machine. Embracing the folder support 16 is a pair of brackets 29 and 31 provided with registering slots 32 extending along an arc struck from the pivot point 27, the shaft 22 passing through the slots 32. The shaft 22 with the folder support 16 is thus free to rock (for a

purpose later described) about the pivot 27 by an amount determined by the length of the slots 32, and two adjustable stops 33 are provided to prevent the shaft 22 from bearing on the base of the slots 32. The stops 33 are carried in brackets 34 attached to the arms 24 and 26 and are arranged to bear on the top of the brackets 29 and 31.

The front folder 19 is provided with an arm 37 carrying a cam roller 38 arranged to bear against the face of a stationary cam 39 attached to the bracket 29. A spring 41 attached at one end to the arm 37 and at the other to the support 16 is provided for urging the cam roller 38 into engagement with the cam 39. A stop 42 is provided against which the arm 37 is urged by the spring 41 when the cam roller 38 has moved out of range of the cam 39.

The rear folder 21 is provided with an arm 44 to which is attached one end of a spring 46 the other end of which is attached to the support 16, the spring urging the arm 44 into contact with a stop 47 on the support 16 which prevents the rear folder 21 from moving outwards beyond its normal setting.

A fold-retaining member 48 is pivotally mounted at 49 on the brackets 29 and 31 and is urged by a spring 51 towards the top of the container for a purpose to be described later. A stop 52 is provided in the frame 29 to limit the movement of the fold-retaining member 48 under the action of the spring 51.

The folder support 16 is driven by means of chain and sprocket gearing 53 from any convenient part of the machine in timed relation with the conveyor chains 14 so that the folder support 16 makes one complete revolution for the passage of each container and the apparatus is set up in such a manner that the upstanding rear flap of the travelling container just clears the tip of the rear folder 21, as shown in Figure 1. The profile of the cam 39 is such that the front folder 19 at this position of the support 16 is in its innermost position, that is to say, there is a maximum gap between the extremities of the front and rear folders 19 and 21 as the free extremity of the rear flap passes within the path of movement of the rear folder 21. The diameter of the folder support 16 is such that it moves at a greater peripheral speed than the speed of the container.

The container shown in the drawings is of the type having a long rear flap and a short forward flap and it is found that, with the above setting of the apparatus on this type of container, a large range of sizes of containers can be dealt with without any adjustment or retiming of the front and rear folders relative to each other.

In order to accommodate containers of different height, the framework 28 is made adjustable in a vertical direction, and for any given height of container the setting is such that the periphery of the folder support 16 runs just clear of the top of the container.

In operation, containers 11 move along the platform 12 under the influence of the pusher bars 13 with their upper flaps upstanding from the body portion of the container, and as a container comes into contact with the folder support 16 the forward flap commences to fold over as shown in Figure 3. It should be observed that for some lengths of container such, for example, as that shown in the drawings, the folding operation of the forward flap is started by the folder support 16 so that the front folder 19 actually

only completes the folding of the forward flap (see Figure 4). As the container approaches the position shown in Figure 1, the front folder 19 is caused to pivot by the action of the roller 38 on the cam 39 so that it moves towards the centre of rotation of the support 16 and increases the gap between the extremities of the folders 19 and 21. This allows the free extremity of the rear flap to pass between the folders and within the path of movement of the tip of the rear folder 21. Further movement of the folder support 16 then causes the rear folder 21 to make contact with the rear flap and fold it on to the top of the front folder (see Figures 4 and 5) which, due to the fact that it travels at a greater peripheral speed than the container, is drawn out from between the forward and rear flaps during the final folding of the rear flap by the rear folder.

During further movement of the container, the folded flaps move into contact with the fold-retaining member 48 which applies a resilient pressure to the folded flaps as the container passes beyond the folding apparatus, and maintains the flaps in their folded position until they pass under a guide 54 which maintains the flaps folded during the passage of the container under ploughs 56 which fold the side flaps of the container outwardly for the application of gum by a gumming roller 57. The containers then pass to further apparatus which closes the gummed side flaps upon the folded forward and rear flaps and finally seals the top of the container.

In order to prevent any jamming of the apparatus, in case a container does not pass smoothly through the apparatus for any reason, for example, if a container of a greater height than that for which the apparatus is set is accidentally placed on the platform 12, the folder support 16, as described above, is capable of pivoting about the point 27 to raise the folding apparatus as a whole and stop the machine by releasing a spring-loaded switch 59, controlling the main drive to the machine, which is connected to the arm 24 by means of a chain 61.

When dealing with containers having flaps of a weak nature or with containers which have been previously used, the rear flap is apt to sag rearwardly, and in such a case it may happen that the free extremity of the rear flap does not pass into the gap between the front and rear folders. In such a case, the modified form of apparatus shown in Figures 6 and 7 may be used with advantage. In this apparatus, a cam-operated rear folder 66 is employed, the folder being pivoted as before at 18 to the folder support 16 and provided with an arm 68 carrying a cam roller 69 arranged to bear against the face of a stationary cam 71 attached to the frame 31. A spring 72 maintains contact between the roller 69 and the cam 71. The cam 71 is so shaped and set in relation to the cam 39 that, as the front folder 19 moves inwardly upon the approach of the rear flap, the rear folder 66 moves outwardly to ensure that the free extremity of the rear flap passes between the folders.

I claim:

1. Apparatus for the folding of the inside flaps of travelling open-ended containers, comprising means for feeding a container with its end flaps in open position at one end of the container, a rotatable front folder arranged to engage the forward flap of the travelling container and fold it into closed position, and a rotatable rear folder arranged to engage the rear flap of the

travelling container and fold it into closed position, said folders being so arranged that upon the approach of the rear flap there is a relative movement between the folders away from each other to allow the rear flap to pass between the folders so that its free extremity passes within the path of movement of the rear folder.

2. Apparatus according to claim 1 wherein the front folder is pivotally mounted on a rotatable support about an axis parallel to the axis of rotation of the rotatable support and provided with cam mechanism arranged to cause the folder to move towards the centre of rotation of the rotatable support upon the approach of the rear flap.

3. Apparatus for the folding of the inside flaps of travelling open-ended containers, comprising means for feeding a container with its end flaps in open position at one end of the container, a rotatable front folder arranged resiliently to engage the forward flap of the travelling container and fold it into closed position, and a rotatable rear folder arranged to engage the rear flap of the travelling container and fold it into closed position, said folders being so arranged that upon the approach of the rear flap there is a relative movement between the folders away from each other to allow the rear flap to pass between the folders so that its free extremity passes within the path of movement of the rear folder.

4. Apparatus according to claim 1, wherein the rear folder is pivotally mounted on a rotatable support and urged by a spring device away from the centre of rotation of the rotatable support, a stop being provided for limiting the movement of the rear folder under the action of the spring.

5. Apparatus for the folding of the inside flaps of travelling open-ended containers, comprising means for feeding a container with its end flaps in open position at one end of the container, a front folder pivotally mounted on a rotatable support about an axis parallel to the axis of rotation of the rotatable support and arranged resiliently to engage the forward flap of the travelling container and fold it into closed position, a rear folder pivotally mounted on a rotatable support and arranged to engage the rear flap of the travelling container and fold it into closed position, a spring device adapted to urge the rear folder away from the centre of rotation of the rotatable support so that the rear folder is capable of exerting a resilient pressure on the rear flap of the container, and a stop adapted to limit the movement of the rear folder under the action of the spring, said folders being so arranged that upon the approach of the rear folder there is a relative movement between the folders away from each other to allow the rear flap to pass between the folders so that its free extremity passes within the path of movement of the rear folder.

6. Apparatus according to claim 1, wherein the rear folder is pivotally mounted on a rotatable support about an axis parallel to the axis of rotation of the rotatable support and provided with cam mechanism arranged to cause the folder to move away from the centre of rotation of the rotatable support as it approaches the rear flap and towards centre of rotation during the folding of the flap.

7. Apparatus for the folding of the inside flaps of travelling open-ended containers, comprising means for feeding a container with its end flaps in open position at one end of the container, a front folder pivotally mounted on a rotatable

support about an axis parallel to the axis of rotation of the rotatable support and arranged resiliently to engage the forward flap of the travelling container and fold it into closed position, a rear folder similarly mounted on the rotatable support and arranged resiliently to engage the rear flap of the travelling container and fold it into closed position, cam means adapted to cause the front folder to move towards the centre of rotation of the rotatable support upon the approach of the rear flap, and further cam means adapted to cause the rear folder to move away from the centre of rotation of the rotatable support as it approaches the rear flap and towards the centre of rotation during the folding of the flap, the movement of the folders with respect to the centre of rotation of the rotatable support allowing the rear flap to pass between the folders so that its free extremity passes within the path of movement of the rear folder.

8. Apparatus according to claim 1, comprising a fold-retaining member arranged to hold the flaps in the folded position during the passage of the container from the folding apparatus to an apparatus for performing a subsequent operation on the container.

9. Apparatus according to claim 7, comprising a pivoted spring-loaded shoe arranged to exert a

resilient pressure on the folded flaps so as to hold the flaps in the folded position during the passage of the container from the apparatus to an apparatus for performing a subsequent operation on the container.

10. Apparatus according to claim 5, wherein the rotatable support is movably mounted and there is provided a stop mechanism controlling the operation of the apparatus, said rotatable support being adapted, upon obstruction occurring during the folding operation, to move into engagement with the stop mechanism to cause cessation of operation of the apparatus.

11. Apparatus according to claim 7, wherein the rotatable support is movably mounted and there is provided a stop mechanism controlling the operation of the apparatus, said rotatable support being adapted, upon obstruction occurring during the folding operation, to move into engagement with the stop mechanism to cause cessation of operation of the apparatus.

12. Apparatus according to claim 5, wherein the rotatable support is provided with a slipping clutch mechanism.

13. Apparatus according to claim 7, wherein the rotatable support is provided with a slipping clutch mechanism.

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