United States Patent [19]

Kollmar

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[54] **MACHINE FOR FLATTENING CARTONS**

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[52] **U.S. Cl.** ..... **93/53 R**, 93/36 R, 93/49 R

[51] **Int. Cl.** **B31b 1/52**

[58] **Field of Search** . 93/36 R, 36 SQ, 49 R, 49 AC, 93/49 M, 53 R, 53 M, 53 BF, 53 AC, 84 R

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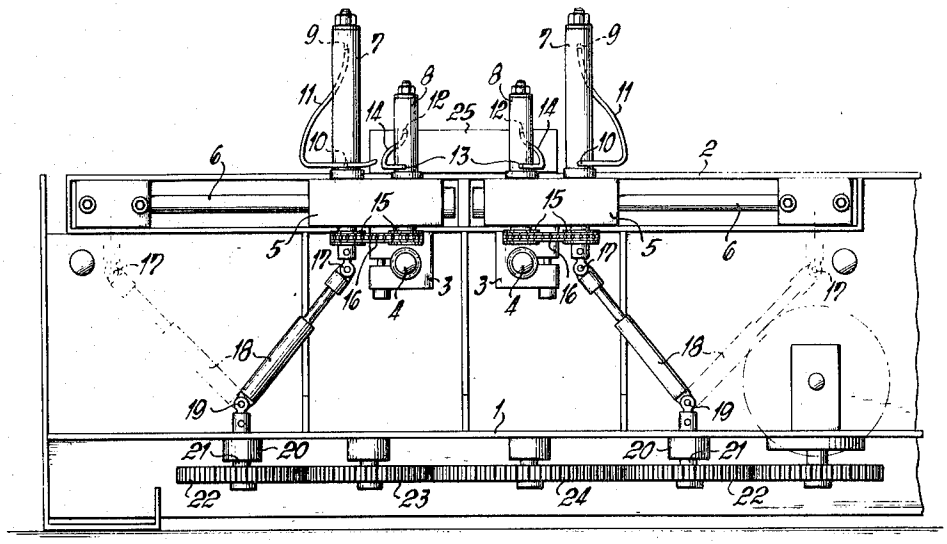
Attorney, Agent, or Firm—Markva and Smith

[57] **ABSTRACT**

A machine for flattening cartons whereby the carton walls are erected about folding creases pre-embossed along their lower edges and whereby end sections provided on one set of mutually parallel walls are folded inwards at right angles about a vertical folding crease and their outsides can be glued to the insides of the walls which are parallel to them and whereby the ends of two mutually opposite walls are provided with folding creases extending from the lower corners of the carton to the upper edges of the walls under an angle of 45°. The machine is provided with folding devices arranged simultaneously to be moved against all four carton walls.

12 Claims, 6 Drawing Figures



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SHEET 1 OF 3

FIG. 1

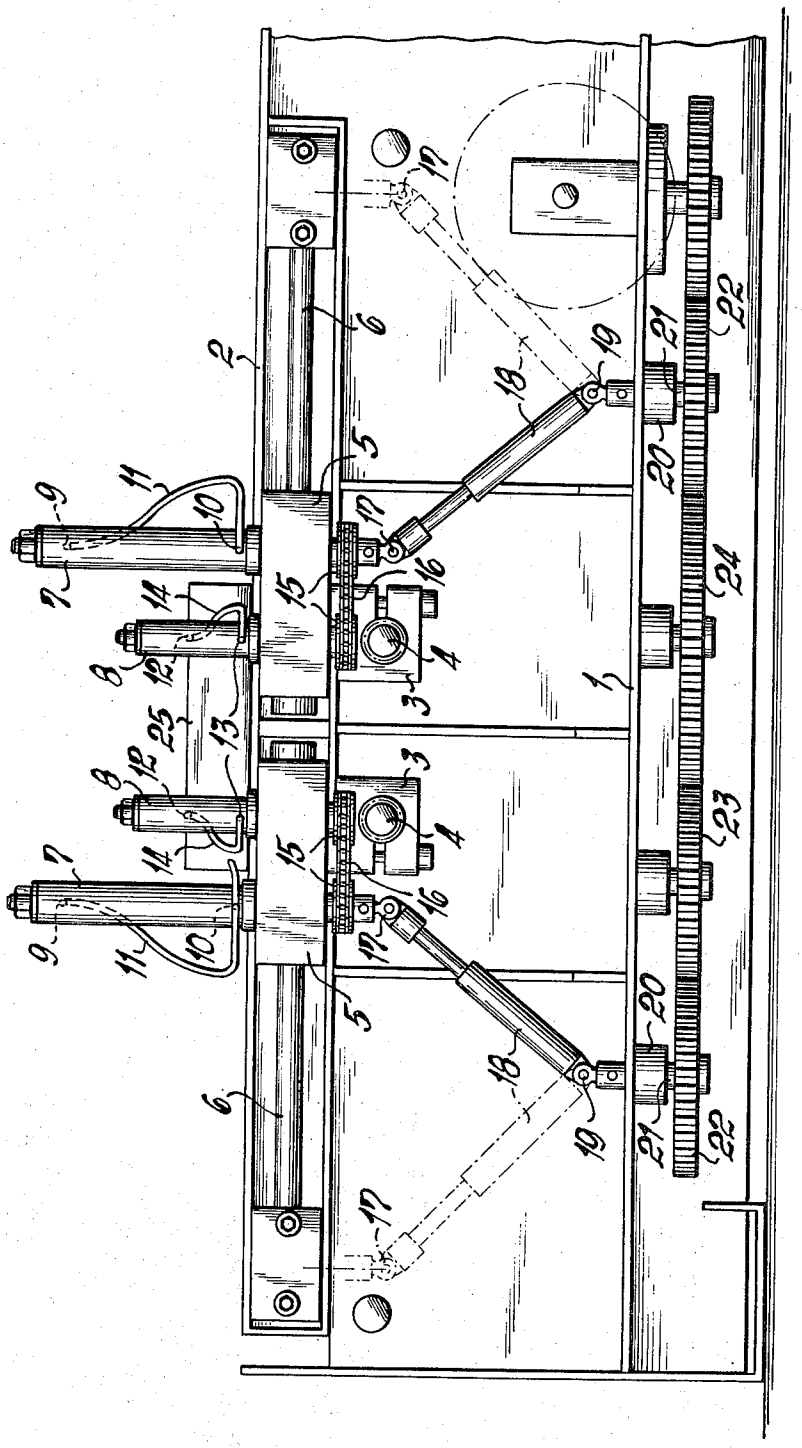


FIG. 3

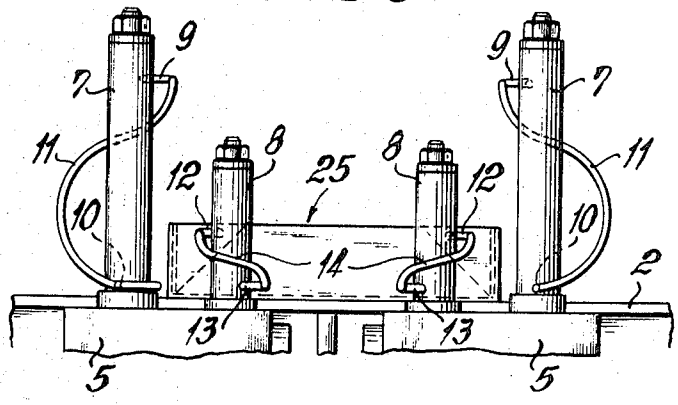
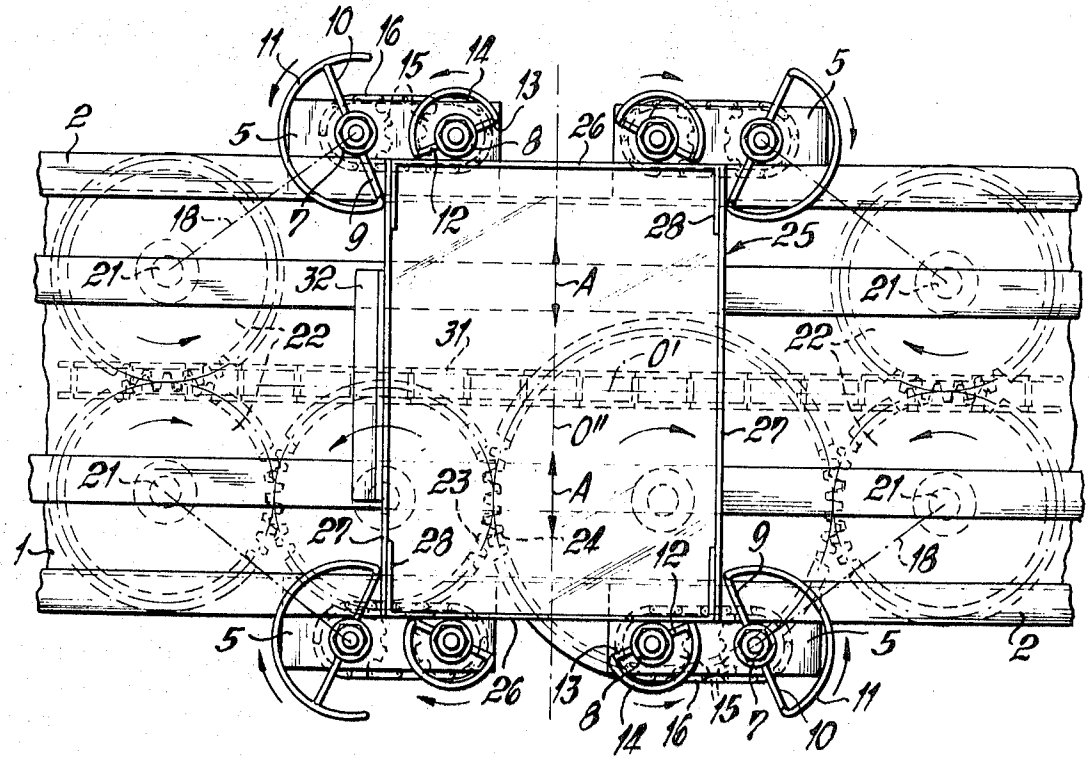

9
7
11
10
8
12
25
14
13
2
5

FIG. 2


11
10
16
15
14
13
8
5
2
26
18
7
9
12
28
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21
32
A
22
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11

FIG. 4

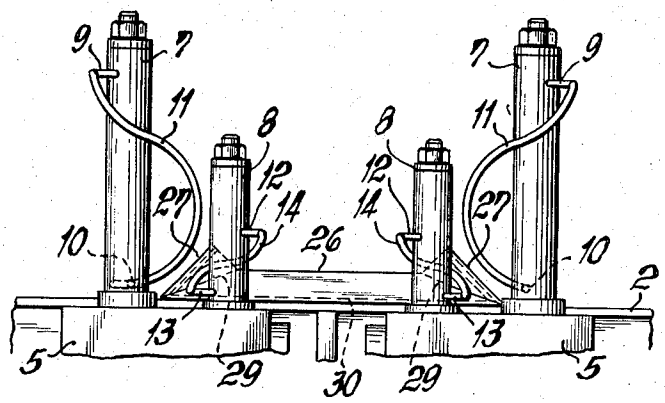


FIG. 6

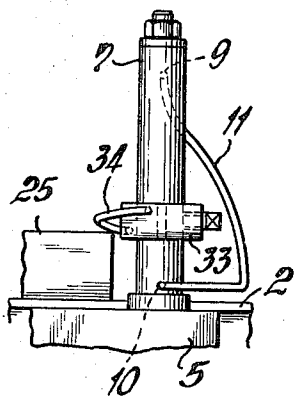
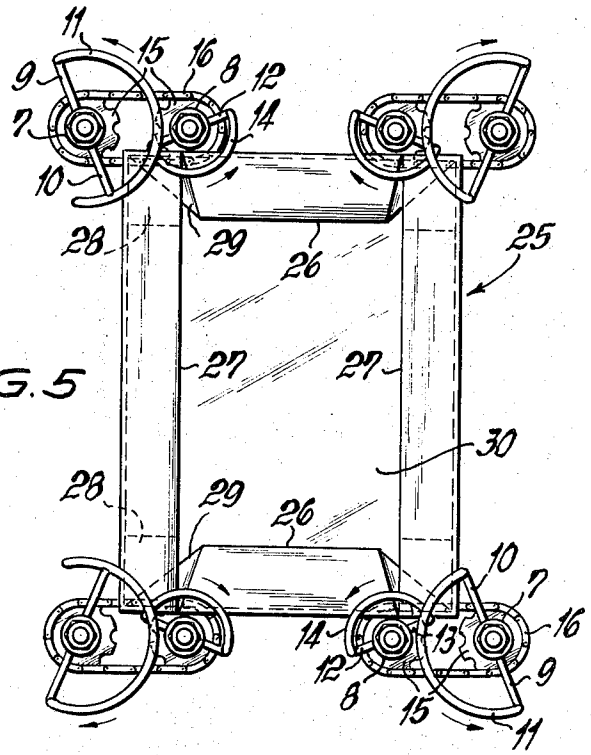


FIG. 5



MACHINE FOR FLATTENING CARTONS

BACKGROUND OF THE INVENTION

This invention relates to a machine for flattening cartons.

In order to enable cartons or their parts to be stored and shipped in a space-saving manner it is necessary to fold them flat.

The carbon elements are prepared as plane, pre-stamped cut-outs with pre-embossed folding creases for folding together. To begin with, the carton walls are erected about folding creases pre-embossed along their lower edges, and end sections provided with one set of mutually parallel walls are folded inward at right angles about a vertical folding crease, their outside being glued to the inside of the other pair of walls which are parallel to them.

In the course of a second operation following setting of the bonding points the carton walls are laid over their lower folding creases against the inside of the carbon base. For this to be possible, folding creases leading from the lower corners of the carton to the upper edges of the walls are provided at an angle of 45° at the ends of two mutually opposite walls, and the external, triangular wall sections are folded inward about the said folding creases between the ends of the walls forming an angle with one another.

SUMMARY OF THE INVENTION

This method of flattening is very complicated and, with cartons consisting of relatively thick cardboard, also very difficult and strenuous. In order to avoid strains and distortions in the carbon walls it is also necessary for all four carton walls to be flattened at the same time and for two operators to be working simultaneously at opposite sides of the carton. In view of the costs involved cheap labor has to be found for this task, but this is not easy. Hence there is a need for a process enabling flattening of such cartons by means of mechanical, automatic devices. An advantageous solution of this problem is offered by the present invention.

The present invention provides a machine for flattening cartons whereby the carton walls are erected about folding creases pre-embossed along their lower edges and whereby end sections provided on one set of mutually parallel walls are folded inwards at right angles about a vertical folding crease and their outsides can be glued to the insides of the walls which are parallel to them and whereby the ends of two mutually opposite walls are provided with folding creases extending from the lower corners of the carton to the upper edges of the walls under an angle of 45°, the machine being provided with folding devices arranged simultaneously to be moved against all four carbon walls.

In a preferred embodiment of the machine folding devices are provided in the shape of helical bodies rotatable on vertical spindles and furnished with a partial screw thread. In their initial position the said helical bodies with the upper ends of their screw thread elements abut the carbon walls in their direction of rotation, their screw thread element descending thereafter in a rear and downward direction.

When these helical bodies are rotated, their screw thread elements initially contact the walls of the carton laterally, and then progressively to an increasing extent the walls of the carton, thus simultaneously folding the latter and finally flattening them.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics of the machine forming the subject of the present invention and in particular the folding devices as well as their adjustment to different carton sizes and their drive, will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a side view of a machine for flattening cartons according to the invention;

FIG. 2 is a plan view of the machine in its initial position;

FIG. 3 is a side view of the machine elements acting direct on the carton, in their initial positions;

FIG. 4 is a similar view of the same machine elements after partial forward movement;

FIG. 5 is a plan view of FIG. 4 showing the machine elements in the same positions as in FIG. 4, and

FIG. 6 is a side view of an additional part of the machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIGS. 1 and 2, within a machine frame 1 there is a pair of longitudinal guide rails 2 which are symmetrically adjustable in respect of the vertical longitudinal centre plane 0′ of the machine frame 1 in the direction of arrows A. For this purpose, the two guide rails 2 are each provided at the bottom near the centre of their length with a bearing 3 having a female thread, the hand of which is in each case opposite both as regards the two bearings 3 of each rail 2 and the two rails 2. Within the female threads of the bearings 3 there are spindles 4 with appropriately handed male threads, whereby the centre sections of the said spindles 4 below the longitudinal centre plane 0′ are prevented from axial movement so that their rotation causes the nut-type bearings 3 and, as a result, the guide rails 2 to be moved symmetrically in respect of the longitudinal centre plane 0′ between the rails and according to their direction of rotation from or towards the same.

Within each guide rail 2, a pusher 5 is provided on either side of a transverse centre plane 0″ of the machine, the said pusher 5 being symmetrically movable. For this purpose, the pushers 5 are provided with oppositely handed female threads in which in each case one half of a spindle 6 with an appropriately handed male thread is movably located, axial movement of the said spindle 6 being prevented at the transverse centre plane 0″.

Each pusher 5 contains near its end facing the end of the corresponding guide rail 2 a vertical spindle 7 and near its other end a second vertical spindle 8, the said spindles being rotatably located. The spindles 7 and 8 may be of equal height. In the preferred embodiment, the spindle 7 is higher, and the spindle 8 is lower. A track 11 corresponding to half a screw thread is in each case connected by means of an upper and a lower, oppositely radially oriented arm 9, 10 to the higher spindle 7, the said track 11 having a correspondingly greater height. Similarly, a track 14 of lesser height corresponding to half a screw thread is connected by means of, in each case, an upper and a lower arm 12, 13 with the lower spindle 8. At the same time, the higher track 11 has a longer radius, and the lower track 14 has a shorter one. The tracks 11 and 14 may also correspond to a screw thread section of smaller angular

range if the angular position of their arms **9, 10** or **12, 13**, respectively, are appropriately selected.

The vertical spindles **7** and **8** project downward beyond the pushers **5**, the said projections being provided with, in each case, a sprocket **15** of identical diameter, an endless chain **16** being laid around the said sprockets so that the two spindles **7** and **8** are compelled to rotate in the same direction.

The lower ends of the tall spindles **7** are connected via a universal joint **17** with a universal shaft **18** and the latter via a further universal joint **19** with a shaft **21** rotatably located within a vertical bearing **20** in the lower part of the machine frame **1**, the said shaft **21** being provided with a gearwheel **22** at its lower end. Owing to the universal shaft **18** and the universal joints **17** and **19** interposed within this section of the gearing, the longitudinal guide rails **2** and the pushers **5** guided within them can be adjusted within wide limits both towards and away from one another (dash-dotted position in FIG. 1). As a result the machine with its screw thread tracks **11** and **14** can be adjusted to and used for cartons of very different sizes.

The two gearwheels **22** which are transversely opposite one another in respect of the longitudinal centre plane **0'** of the machine frame **1** (FIG. 2) are in direct mutual engagement so as to rotate each other and the tracks **11** and **14** in opposite directions. The rotation which takes place in accordance with the arrows drawn in FIGS. **2** and **5** is at the same time so arranged that the high starting section of all the tracks **11** and **14** are first rotated against the peripheral walls of a carton. For this purpose, the two gearwheels **22**, which according to FIG. **2** are on this side of the longitudinal centre plane **0'** of the machine frame **1**, are in geared engagement via two mutually meshing gearwheels **23** and **24** as a result of which the pairs of gearwheels **22** and **22** respectively located along the longitudinal direction of the machine frame likewise rotate in mutually opposite directions thus bringing about the above-described effect of rotating the tracks **11** and **14**. A drive engages at a suitable point of the gear system **22, 23, 24** described above.

The machine is preferably used for cartons **25** provided at the ends of their walls **26** located along the longitudinal edges of the guide rails **2** with the sections **28** glued to the insides of the transverse walls **27**, and directly behind the said sections **28** with folding creases **29** ascending from the lower corners of the carton to the upper edges of the longitudinally erect walls **26** under an angle of 45°.

The machine, and in particular the tracks **11** and **14** in the manner of screw threads, fold, when they are rotated, all four walls **26** and **27** of the carton **25** about their lower folding creases against the carton base **30**. During this process, the small tracks **14** pass below the triangles of walls **27** which are separated by means of the oblique folding creases **29** and cause the said triangles to be folded inward between the ends of the walls **26** and **27** abutting the carton base **30** while being at right angles in respect of one another. As a result the cartons **25** are flattened on all four sides simultaneously and can now be packed and shipped in a space-saving manner. For this purpose, they are pushed from the zone of the flattening system by a bar **32** moved in stages by an endless chain **31**.

It may happen that the carton cutouts become warped as a result of atmospheric conditions so that the carton base is not flat on the work track and irregularities occur during the process of folding inward. In order to overcome this condition each of the tall spindles **7** is provided with an adjusting ring **33** (FIG. **6**) with a low track **34** shaped in the manner of a screw thread and so arranged that it precedes the track **11**. The adjusting ring **33** is provided with a perforation **35** enabling it to be slid from above past the upper arm **9** of the track **11** unto the spindle **7** and can then be adjusted by means of its track **34** at the corners of the carton walls at a lower height above the upper edge of the said walls, thus pressing the base **30** of the carton **25** flat onto the work surface when the spindle **7** is rotated.

Various modifications of the machine are feasible. The tracks **11** and **14** may be replaced by solid helical bodies consisting of a plastic material, the periphery of the said body being shaped in the manner of a screw thread in accordance with its path along the carton. The gearing **22** and **24** may be replaced by a chain gear. Such modifications are claimed as forming part of the invention.

What is claimed is:

1. A machine for flattening cartons having a base and two pairs of mutually opposite walls erected about preembossed folding creases provided between said base and said walls, said walls being connected to each other by means of end sections and one of the pairs of mutually opposite walls of said cartons being provided, for flattening purposes, with folding creases extending from the lower corners of the carton to the upper edges of said one of the pair of mutually opposite walls at an angle of about 45°, said machine comprising

a. first and second rotatable folding devices positioned adjacent each corner of the carton, each device being constructed in the form of cam means, said devices being arranged at two adjacent walls of a carton in the vicinity of each corner thereof to act simultaneously on the erected carton walls,

b. first spindles carrying said first folding devices,

c. second spindles carrying said second folding devices, and

d. means for rotating said first and second spindles,

e. said first folding devices having a greater axial height and a larger diameter than the second folding devices and said second folding devices being positioned closer to said one of the pairs of mutually opposite walls than said first folding devices.

2. A machine in accordance with claim **1**, wherein the folding devices in the manner of screw threads consist of solid bodies, e.g. of plastic material.

3. A machine in accordance with claim **1**, wherein adjusting rings open on one side and provided with helical tracks of short axial length are arranged on said first spindles so as to be adjustable above the upper edges of the corners of the carton walls and to precede the folding devices.

4. A machine according to claim **1** further comprising a pusher for commonly holding the two spindles of the first and second folding devices disposed at each corner of the carton.

5. A machine in accordance with claim **4**, wherein the pushers are arranged to be displaced in longitudinal guide rails in the longitudinal direction of the track while the longitudinal guide rails are arranged to be displaced at right angles to the longitudinal direction of

the track, in each case symmetrically in respect of the given centre plane of the machine.

6. A machine in accordance with claim **5,** wherein in each case oppositely handed female threads are provided in bearings attached to the two longitudinal guide rails and in the pushers which are opposite one another in the longitudinal direction of the track, and spindles with appropriate male threads and prevented from axial movement at their centre are rotatably located within the said female threads.

7. A machine in accordance with claim **4,** wherein the two rotatable spindles located within a pusher are at their lower ends provided with fixed sprockets of identical diameter, an endless chain being placed about the said sprockets.

8. A machine in accordance with claim **7,** wherein the lower ends of the long rotatable spindle are connected via a universal joint with a universal shaft and the latter via a further universal joint with a vertical shaft which carries a gearwheel.

9. A machine in accordance with claim **8,** wherein the two gearwheels which are arranged opposite one another transversely to the longitudinal direction of the track are in direct engagement with one another.

10. A machine in accordance with claim **8,** wherein the two gearwheels are provided below one longitudinal half of the machine and are maintained in driving engagement by two mutually meshing gearwheels, whereby a drive engages at a suitable point.

11. A machine in accordance with claim **8,** wherein the shafts are connected by sprocket gearing.

12. A machine for flattening cartons having a polygon shaped base and a plurality of side walls erected about pre-embossed folding creases between said base and side walls, the ends of adjacent side walls being joined at each corner, at least a portion of said plurality of side walls including folding creases extending at an angle of about 45° from lower corners of the carton to the upper edges thereof, said machine comprising

a. a pair of rotatably driven cam means positioned adjacent each corner of the carton to simultaneously fold the erected carton walls,

b. one of each pair of cam means having a greater axial length and diameter than the second of each pair of cam means, and

c. said second of each pair of cam means being positioned closer to one of said side walls adjacent each corner than said one of each pair of cam means.

* * * * *