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[54] **APPARATUS FOR FORMING GROUPS OF FLAT OBJECTS**

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[52] **U.S. Cl.** ..... **29/211 R;** 29/211 D; 29/211 L

[51] **Int. Cl.²** **B23Q 7/10**

[58] **Field of Search** ..... 29/211 R, 211 D, 211 L, 29/208 R, 208 D

[56] **References Cited**

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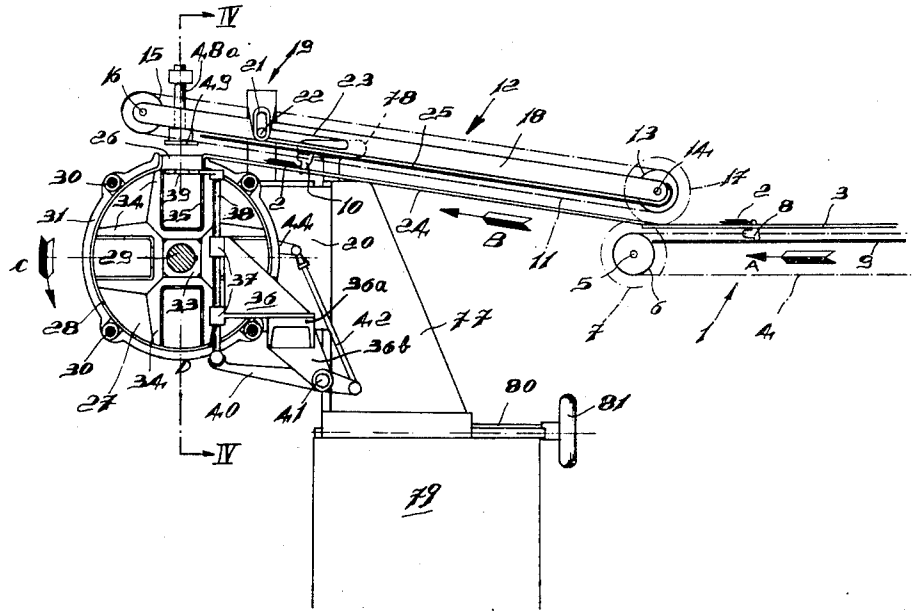
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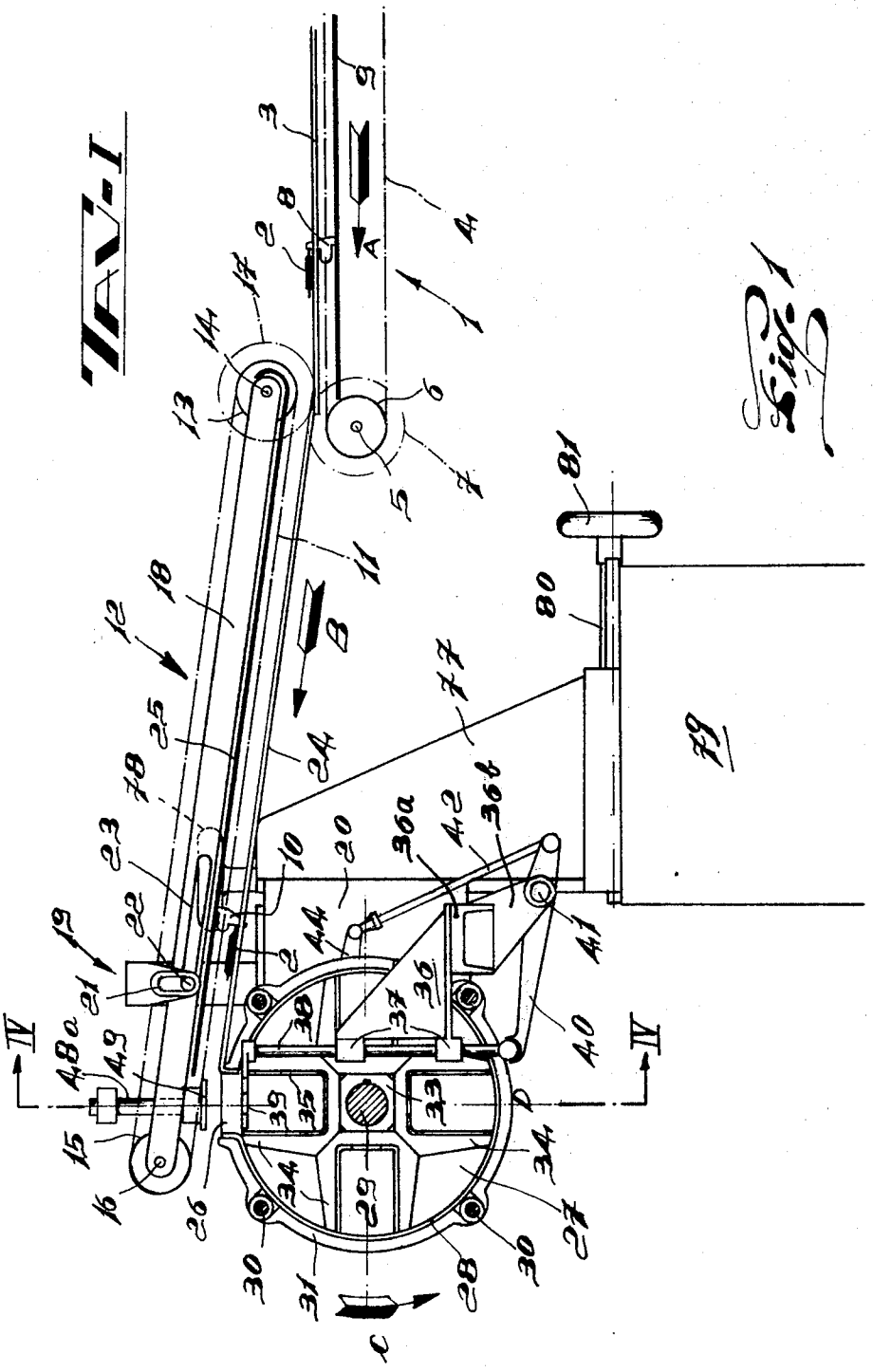
Primary Examiner—Victor A. DiPalma
Attorney, Agent, or Firm—Guido Modiano; Albert Josif

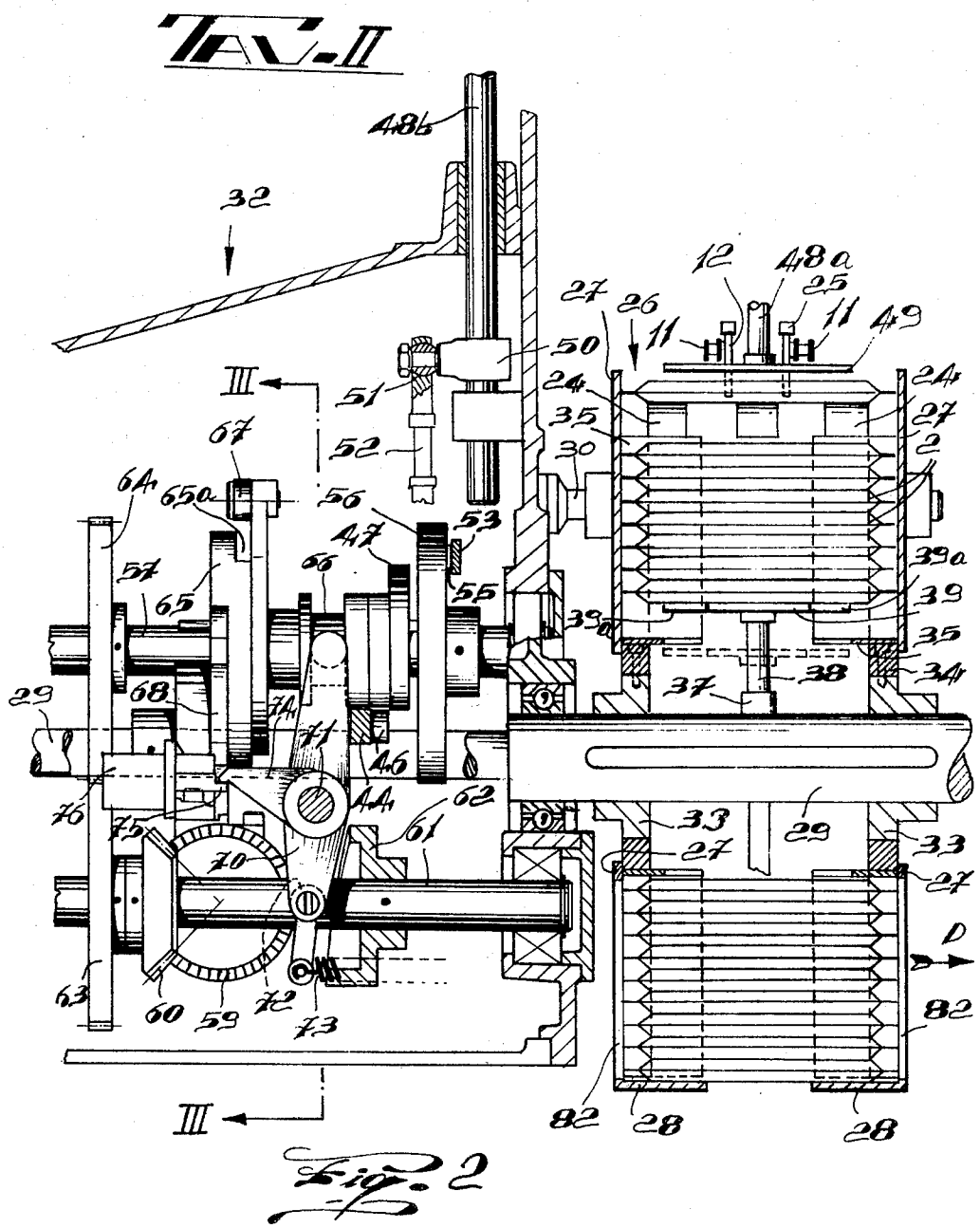
[57] **ABSTRACT**

Apparatus for forming groups of flat objects which are transferred individually from a transfer conveyor comprising an horizontal axis drum. The drum consists of a cylindrical wall having an upper aperture and two parallel plates disposed in diametrical positions to the upper aperture and provided with opposing apertures for the discharge of the objects. The drum is supported on a coaxially shaft and is driven with intermittent motion. Between the plates and angularly distributed on the shaft there are provided seats opening radially outwards in such a manner that at each angular movement of the shaft the seats are accessible through the upper aperture and the opposing apertures of the plates. Through the upper aperture a tray acting as mobil base for the objects is made to descend in steps towards the support shaft while push means driven parallel to the shaft penetrate through the opposing apertures of the plates for expelling the objects. The tray and push means are controlled by a counter which measures the number of objects introduced through the upper aperture.

3 Claims, 4 Drawing Figures




IV-I
Fig. 1
Fig. 2
IV
IV
A
B
C


FIG-II
48b
32
12
48a
25
27
26
11
11
49
50
III
51
24
24
35
27
67
52
30
2
6A
65a
56
53
47
66
55
39a
57
65
39
39a
35
68
37
38
34
29
74
71
46
76
44
62
75
61
33
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70
27
27
D
63
60
59
72
73
82
III
82
28
28
Fig. 2

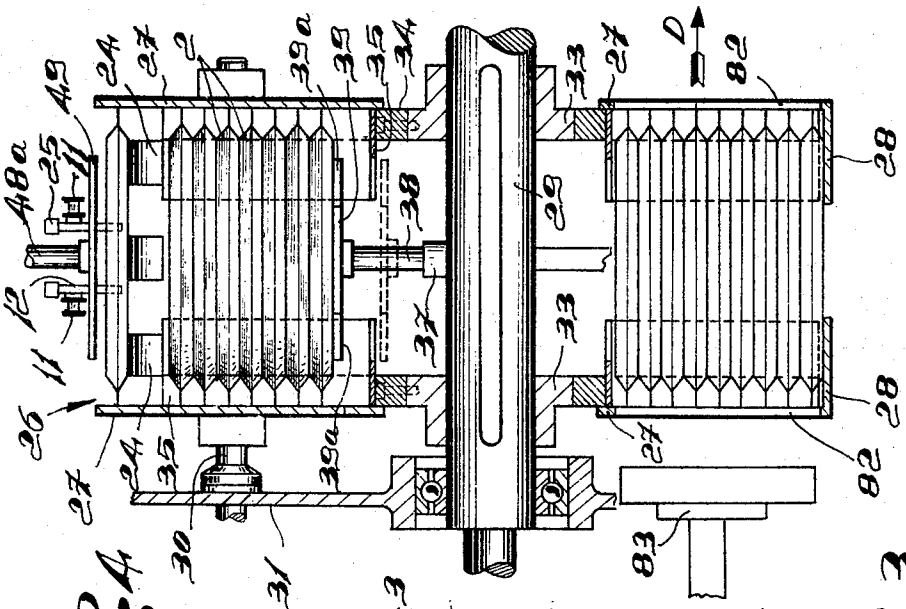


Fig. 4

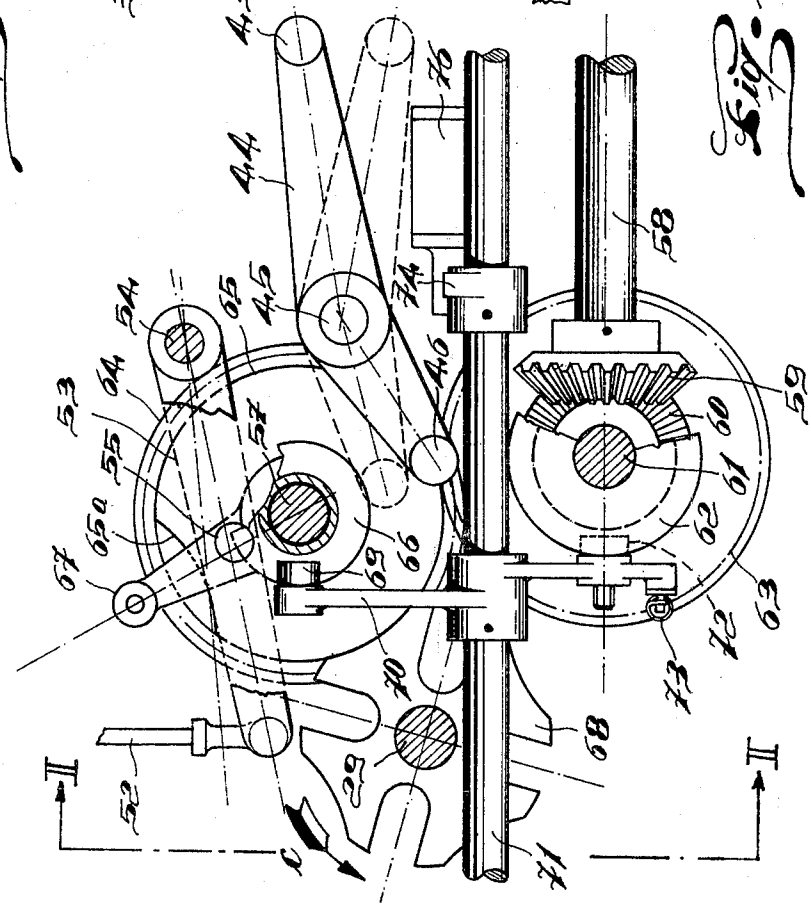


Fig. 3



Fig. III

APPARATUS FOR FORMING GROUPS OF FLAT OBJECTS

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for forming groups of flat objects which are transferred individually from a transfer conveyor. The invention is particularly suitable for forming groups of envelopes to be inserted into a boxing or cartoning machine.

Depending upon the format of the envelopes and the number of envelopes scheduled to form each of said groups, it is sometimes convenient for the envelopes of the groups inserted into the cartons to be arranged standing up, i.e., vertically side by side, and at other times convenient for the envelopes to be arranged face down, i.e., one on the other.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an apparatus for forming groups of flat objects and for feeding them face down and/or standing up to a packaging machine.

The said object is attained by an apparatus for forming groups of flat objects which are transferred individually from a transfer conveyor, comprising a drum of horizontal axis consisting of a cylindrical wall provided with an upper aperture, and two parallel plates provided with opposing apertures disposed in diametrical positions at right angles to the upper aperture, a shaft driven with intermittent motion and supported coaxially to said drum, a plurality of seats angularly distributed on said shaft and disposed between said plates, said seats opening radially outwards and axially towards the plates in such a manner that at each angular movement of the shaft, said seats are accessible through the upper aperture of the cylindrical wall and the opposing apertures of the plates, a support tray for the objects acting as a mobile base for the seat accessible through the upper aperture, said tray being made to descend in steps equal to the thickness of the objects from a position close to the upper aperture of the cylindrical wall to a position close to the support shaft for the seats, and puch means driven parallel to said shaft and penetrating through the opposing apertures of the plates for expelling the objects from the seat aligned with said apertures during pauses in the rotation of the drum, said tray and said push means being controlled by a counter which measures the number of objects introduced through the upper aperture.

BRIEF DESCRIPTION OF THE DRAWINGS.

Further particulars of the invention will be more evident from the description of one embodiment illustrated by way of example in the accompanying drawings in which:

FIG. 1 of drawing I is a partially sectional diagrammatic longitudinal elevational view of the apparatus accordinng to the invention;

FIG. 2 of drawing II is a vertical section on the line II—II of FIG. 3 through the control means for said apparatus;

FIG. 3 of drawing III is a vertical view on the line III—III of FIG. 2;

FIG. 4 of drawing III is a transverse view on the line IV—IV of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Said figures, and in particular FIG. 1, show a first portion 1 of a transfer conveyor which transfers the objects which leave at a regular rate from a known delivery machine, not shown. A delivery machine of this type is a packeting machine, which forms, fills and closes envelopes. At the outlet of the packaging machine, the envelopes 2 fall onto a surface consisting of a series of parallel segments 3 positioned above the upper branches of chains 4, which travel with continuous motion in the direction indicated by the arrow A. The chains 4 pass around respective gear wheels mounted on a pair of shafts supported by the base of the packaging machine. FIG. 1 shows one of such shafts, 5, and the gear wheels 6 keyed on to it. On the same shaft there is also keyed a gear wheel 7 which is driven by the drive system for the packaging machine. To the chains 4 are articulated teeth 8 which, along the upper path of the chains, intersect the segments 3 and are kept in the active position by tracks 9. Each time an envelope 2 leaves the packaging machine, a group of teeth 8 (in FIG. 1 only one of these groups is shown) acts on its rear edge and drags the envelope on the segments 3 to the shaft 5. From here the envelope is removed by the teeth 10 of the chains 11 of the second portion 12 of the transfer conveyor. The chains 11 pass around the gear wheels 13 keyed on the shaft 14, and around the gear wheels 15 of the shaft 16. The shaft 14 is supported by the bed of the packaging machine above the shaft 5 and it receives its continuous rotation from this latter by way of the gear 17 which intermeshes with the gear 7. The supports of the shaft 14 carry in an oscillating manner one of the ends of the side walls 18 of the second portion 12 of the transfer conveyor. The other end of the side walls idly support said shaft 16. The angular position of the side walls 18 about the axis of the shaft 14, and therefore the level of discharge of the envelopes 2 form the chains 11, is determined by a bridge support 19, which is mounted on a bracket 20 which will be described hereinafter. Pins 22 are engaged in vertical elongated slots 21 in the arms of the support 19, and these pins also engage in longitudinal elongated slots 23 in the side walls 18, so forming a link engagement between the side walls and the support. The teeth 10 of the lower branches of the chains 11 advance in the direction indicated by the arrow B, and drag the envelopes along the underlying segments 24 which are aligned with the segments 3. The teeth 10 intersect the segments 24 and are kept in the active position by the tracks 25. The segments 24 and tracks 25 are supported parallel to the lower branches of the chains 11 by the side walls 18 and terminate at the upper aperture 26 of a drum 27–28, so that the envelopes 2 enter the same aperture flatly one after the other. The drum consists of two annular vertical plates 27, with each of which is rigid a cylindrical wall 28 having an horizontal axis transverse to the transfer conveyor 1, 12. The two cylindrical walls 28 which have the same radius and project against one another from the plates 27 are preferably transparent. The plates 27 are centrally traversed by the shaft 29 and their position along this shaft can be adjusted by four pins 30 which are parallel to the shaft 29 and project from a part 31 (FIG. 4), of a casing 32 (FIG. 2) which is rigid with said bracket 20.

On that portion of the shaft **29** which is external to the casing **32** and traverses the plates **27,** there are rigidly mounted two corresponding hubs **33** with a square flange. To each of the sides of the flanges are fixed by screws the bases of respective stirrups **34** of U-shape, the arms of which have their ends approximately tangential to the cylindrical walls **28.** U-elements **35,** each comprising two parallel flat portions or arms and a base, are fixed on the inner edge of the stirrups **34** and project inwards the drum. The arms and base of opposite elements **35** and in alignment with one another and define a space between them. The elements **35** and stirrups **34** thus form about the shaft **29** four seats which are open towards the walls **28** and the plates **27,** and are arranged to contain a pile of a predetermined number of envelopes **2.**

A plate **36,** provided laterally to the bracket **20** and supported in a cantilever manner by the arm **36a**, comprises at its front vertical sleeves **37** in which the rod **38** is slidably guided, by way of bushes of friction material. The plate **36** and rod **38** are located between the opposite plates **27.** At its summit the rod **38** supports the tray **39** in a cantilever manner, located under the inlet aperture **26** of the drum **27–28** and forming a mobile base for the seat formed by the pair of stirrups **34,** and which when at rest is immediately under the aperture **26.** As shown in FIG. **4,** the ends **39***a* of the tray **39** are restricted so that they can pass through corresponding openings in the bases of the elements **35.** In this manner, as shown by the dashed lines in FIG. **4,** the tray can descend slightly under these bases.

One suitably shaped end of a rocker arm **40** acts against the lower end of the rod **38** for raising the tray **39** as far as the aperture **26.** The rocker arm **40** is pivoted at **41** to an appendix of the bracket **20,** and its other end is linked to a tie rod **42** which is linked at **43** to the rocker arm **44** (FIGS. **2** and **3**). The rocker arm **44** is pivoted at **45** to the inside of the casing **32,** and at its free end carries the roller **46** which, as explained hereinafter, engages with the shaped edge of the cam **47.** Normally rocker arm **44** is kept resting, by a spring not shown, against an abutment which is also not shown.

The arm **48***a* of a rod bent in the form of an inverted U descends towards the aperture **26.** The arm **48***a* carries lowerly the pushing plate **49** which penetrates into the aperture **26.** The other vertical arm **48***b* (FIG. **2**) of said rod is slidably guided in casing **32.** Inside the casing the a clamp **50** is fastened on the arm **48***b* and is articulatedly coupled at **51** to the tie rod **52,** which is articulatedly coupled to the lever **53.** This lever is pivoted at **54** to the casing **32** and supports the roller **55** which is always in engagement with the frontal shaped groove of the cam **56** keyed on to the shaft **57.** The shaft **57,** parallel to the shaft **29** and rotatably supported by the casing **32,** is rotated continuously. Under the action of the cam **56,** the pushing plate **49** makes an ascent-descent stroke with the same frequency as the packaging machine. In this manner as soon as an envelope **2** arrives at the aperture **26,** the pushing plate **49** descends, engages the envelope and drags it downwards for a distance practically equal to the thickness of the envelope.

The envelope penetrates into the underlying seat formed by a pair of stirrups **34** and elements **35** and lies on the pile of other envelopes already there. Correspondingly the tray **39** supporting the pile of envelopes descends through a distance equal to the thickness of one envenope as the friction between the rod **38** and its guides is overcome by the thrust exerted on the envelopes by the pushing plate **49.** As soon as the pushing plate **49** has carried out its descending stroke, it rises again so as not to interfere with the new arriving envelope.

The control means in the casing **32** receive their motion from the shaft **58** which is driven with continuous rotation by the motor of the packaging machine and is idly supported by the casing itself. Inside the casing, the shaft **58** ends with the bevel gear **59** which is keyed on to it, and which engages with the bevel gear **60** keyed on to the shaft **61.** The shaft **61** is parallel to the shafts **29** and **57** and is rotatably supported by the casing **32.** The same shaft has keyed on to it an axial cam **62** and a gear **63** which engages with the gear **64** keyed on to the shaft **57.** The disc **65** is rotatably rigid with the shaft **57** but can slide axially on it. The disc **65** is rigid with the cam **47** by means of an intermediate bush comprising an annular groove **66.** A radial arm is fixed to the disc **65** and carries at the end external to the disc a roller **67** which engages and drives the Maltese cross **68** keyed on the shaft **29,** when the disc **65** is at the end of the working stroke in which the cam **47** is engaged by the roller **46.** At the other end of the stroke, in which the roller **67** and cam **47** are inactive although rotating, the Maltese cross cannot rotate because it is engaged by the periphery of the disc **65.** In the periphery of the disc **65** there is a cavity in the form of a sector **65***a*, which enables the Maltese cross to rotate when it is engaged by the roller **67.**

The groove **66** is engaged by the pin **69** coupled to one end of the lever **70,** which is fixed to the shaft **71** supported in an oscillating manner by the casing **32.** At the other end of the lever there is a roller **72** which engages with the cam **62** under the action of the traction spring **73,** the ends of which are fixed to an appendix of the lever and to the casing **32.** The lever **74** is also rigid with the shaft **71,** and normally rests on a tooth **75** which can assume a withdrawn position by the action of an electric magnet **76.** The energizing of the electric magnet is controlled by a counter, not shown, which receives the impulses fed by a device sensitive to the envelopes which arrive at the aperture **26** dragged by the chains **11.** When the counter ascertains that the number of envelopes which have reached the aperture **26** is sufficient to fill the seat **34, 35** located under it, the counter energises the electric magnet **76** so causing the tooth **75** to withdraw. In this manner the lever **70** passes under the control of the cam **62** which brings the disc **65** to said end of the working stroke. The Maltese cross **68** and the shaft **29** thus make one-quarter of a turn in the direction indicated by the arrow C, and a new seat to be filled is brought under the aperture **26.** The cam **47** immediately causes the support tray **39** to rise for supporting the new pile of envelopes. The lever **74** is returned upwards by the cam **62** and can thus again hook on to the tooth **75** which, as the electric magnet **76** becomes de-energized, reassumes the extracted position under the action of a not shown return spring.

The group of envelopes formed in the filled seat must now be discharged. According to requirements, the group has to be discharged either with the envelopes face downwards or upright. The discharge position must always be the same as the inlet position of the

known cartoning machine, in which the envelopes are introduced in boxes and which is disposed beside the drum **27–28** on the side opposite the casing **32.** This position is indicated by D. When the envelopes are to be discharged face downwards, as shown in FIG. **1,** the expulsion of the envelopes from the seat takes place when the seat is at rest in a position at **180°** to the position in which it was filled. When the envelopes are to be discharged upright, expulsion takes place when the seat has reached a position at **90°** to the filling position. In this latter case, to obtain the discharge position at D, the bracket **20** is lowered and laterally displaced towards the first portion **1** of the transfer conveyor. The bracket **20** is in fact slidably guided vertically in the upright **77,** and its position can be adjusted by a screw the handwheel of which is indicated by **78.** The upright **77** is guided on the bed **79** and is slidable with respect to it in the horizontal direction parallel to the transfer conveyor **1, 12.** The position of the upright **77** in respect to the bed **79** can be adjusted by the screw **80,** using the operating handwheel **81.** Because of the two positions which the bracket **20** can assume, the shaft **58** is driven from the drive system of the packaging machine by means of a transmission system comprising at least one chain. In the drum plates **27,** in positions corresponding with the angular position in which the group of envelopes is discharged, there are two opposing passages **82** into which the expulsion pusher **83** penetrates. This pusher, which is usually supplied with the cartoning machines, is driven with reciprocating motion in a direction parallel to the shaft **29,** and is controlled by said envelope counter, which also controls the start of each cycle of the cartoning machine.

We claim:

1. Apparatus for forming groups of flat objects which are transferred individually from a transfer conveyor, comprising a drum of horizontal axis consisting of a cylindrical wall provided with an upper aperture, and two parallel plates provided with opposing apertures disposed in diametrical positions at right angles to the upper aperture, a shaft driven with intermittent motion and supported coaxially to said drum, a plurality of seats angularly distributed on said shaft and disposed between said plates, said seats opening radially outwards and axially towards the plates in such a manner that at each angular movement of the shaft, said seats are accessible through the upper aperture of the cylindrical wall and the opposing apertures of the plates, a support tray for the objects acting as a mobile base for the seat accessible through the upper aperture, said tray being made to descend in steps equal to the thickness of the objects from a position close to the upper aperture of the cylindrical wall to a position close to the support shaft for the seats, and push means driven parallel to said shaft and penetrating through the opposing apertures of the plates for expelling the objects from the seat aligned with said apertures during pauses in the rotation of the drum, said tray and said push means being controlled by a counter which measures the number of objects introduced through the upper aperture.

2. Apparatus as claimed in claim **1,** in which the drum and the shaft comprising the seats are supported by a bracket guided vertically in an upright which is guided horizontally in a bed, means being provided for the vertical and horizontal adjustment of said bracket and said upright respectively.

3. Apparatus as claimed in claim **1,** comprising a rod slidable vertically in a guide by way of friction means and supporting at its upper end the support tray for the objects, said rod being disposed between the plates of the drum, and a pusher driven with reciprocating motion and arranged to penetrate through the upper aperture into the seat aligned with said aperture, the descent stroke of the pusher being controlled by a counter in such a manner as to increase the descent of the tray by the thickness of one object for each object introduced into the seat and to positively control the descent of the tray, each of said seats comprising a pair of stirrup elements fixed to said shaft and having parallel arms lying in planes perpendicular to said shaft, and a pair of U-shaped elements each formed by two parallel flat portions and one flat base fixed in the inside of said stirrup elements, the portions and base of the U-shaped element associated with one stirrup element being in alignment with those associated with the other stirrup element and spaced apart from one another to form a passage for the rod which carries the tray.

* * * * *