PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B31B 5/80 — A1

(11) International Publication Number: WO 96/23655

(43) International Publication Date: 8 August 1996 (08.08.96)

(21) International Application Number: PCT/GB96/00223

(22) International Filing Date: 2 February 1996 (02.02.96)

(30) Priority Data:
9502125.9 3 February 1995 (03.02.95) GB

(71) Applicant *(for all designated States except US)*: TETRA LAVAL HOLDINGS & FINANCE S.A. [CH/CH]; Avenue General-Guisan 70, CH-1009 Pully (CH).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: HOUSE, Andrew [GB/GB]; 42 Muschamp Road, London SE15 4EF (GB). MOSSE, Charles, Alexander [GB/GB]; 21 Parliament Hill, London NW3 2TA (GB). MOSSE, Richard, Wolfgang, Emil [GB/GB]; 28 Clifton Hill, London NW8 0QG (GB).

(74) Agent: SMART, Peter, J.; W.H. Beck, Greener & Co., 7 Stone Buildings, Lincoln's Inn, London WC2A 3SZ (GB).

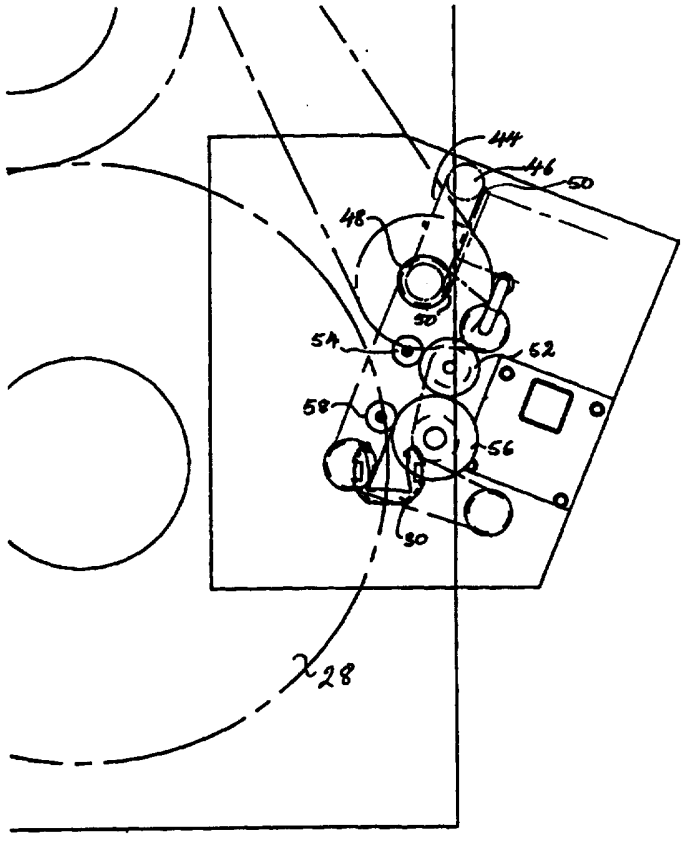
(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHODS AND APPARATUS FOR ERECTING TUBULAR CARTON BLANKS

(57) Abstract

Apparatus for loading carton blanks into a packing machine comprises a magazine (20) containing a stack of flattened, tubular blanks (22), a dog chain (44) driving the blanks out of the magazine into the nip of rollers (52, 54) and then into the nip of overdriven rollers (56, 58) which accelerate the blanks into respective pockets (67) defined in transport holders (30) carried on a wheel conveyor. The blanks are driven at a speed sufficient to carry them into their respective pockets which are moving away from the magazine on the wheel conveyor. A slipping clutch in the drive to roller (56) allows the blanks to decelerate without damage when fully home in their pockets. Arms bearing suction heads travelling with the wheel conveyor open the carton blanks in the pockets and the opened blanks are transferred in their transport holders for bottom closing, filling and top closing operations on respective wheel conveyors.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	**GB**	United Kingdom	**MW**	Malawi
AT	Austria	**GE**	Georgia	**MX**	Mexico
AU	Australia	**GN**	Guinea	**NE**	Niger
BB	Barbados	**GR**	Greece	**NL**	Netherlands
BE	Belgium	**HU**	Hungary	**NO**	Norway
BF	Burkina Faso	**IE**	Ireland	**NZ**	New Zealand
BG	Bulgaria	**IT**	Italy	**PL**	Poland
BJ	Benin	**JP**	Japan	**PT**	Portugal
BR	Brazil	**KE**	Kenya	**RO**	Romania
BY	Belarus	**KG**	Kyrgystan	**RU**	Russian Federation
CA	Canada	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SG**	Singapore
CH	Switzerland	**KZ**	Kazakhstan	**SI**	Slovenia
CI	Côte d'Ivoire	**LI**	Liechtenstein	**SK**	Slovakia
CM	Cameroon	**LK**	Sri Lanka	**SN**	Senegal
CN	China	**LR**	Liberia	**SZ**	Swaziland
CS	Czechoslovakia	**LT**	Lithuania	**TD**	Chad
CZ	Czech Republic	**LU**	Luxembourg	**TG**	Togo
DE	Germany	**LV**	Latvia	**TJ**	Tajikistan
DK	Denmark	**MC**	Monaco	**TT**	Trinidad and Tobago
EE	Estonia	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**UG**	Uganda
FI	Finland	**ML**	Mali	**US**	United States of America
FR	France	**MN**	Mongolia	**UZ**	Uzbekistan
GA	Gabon	**MR**	Mauritania	**VN**	Viet Nam

METHODS AND APPARATUS FOR ERECTING TUBULAR CARTON BLANKS

The present invention relates to methods and apparatus for erecting tubular carton blanks from a flattened configuration to an open tubular configuration.

Machines for packing solid articles or for packing liquids are often designed to be fed with a supply of carton blanks in an open tubular configuration. During the packing operation, a bottom closure is formed, the blank is filled with the appropriate contents and a top closure is formed to produce a filled box. The tubular blanks are generally supplied to the machine in flattened form from a magazine containing a stack of such flattened blanks. The blanks must be removed one by one from the magazine and must be erected into an open tubular configuration for packing as described above. Numerous proposals have been made in the past for carrying out the steps of removing the flattened blanks from the magazine and opening them whilst positioning them in a packing machine for filling and closing. In EP-A-0425226, blanks are removed at the mouth of a magazine by a transfer wheel which has several similar transfer arms. Each arm has a hook to engage the trailing edge of a blank at the magazine mouth and to drive the magazine sideways out of the mouth whilst the face of the blank is engaged by a suction head which grips the blank. After the rotating arm clears the magazine, the hook is rotated round with respect to the suction head forcing the blank to open by hinging movement of panels of the blank with respect to one another about a line joining respective panels which lies between the suction head and the hook. The opened blank is carried round on the transfer arm to a conveyor having a succession of pockets and the opened blank is deposited into a respective pocket on the conveyor.

This effectively restricts the orientation of the openings of the pockets to facing out from their conveyor, but

in some circumstances it is desirable for the cartons to be in pockets in which the openings face forwards or backwards along the direction of movement of the conveyor.

Broadly similar arrangements for extracting blanks from a magazine, opening them and depositing them on a moving conveyor for further handling are described in numerous other specifications such as GB-A-2053133. In all of these previously described arrangements, the carton blanks are delivered into the conveyor pockets in an erected state.

An alternative scheme is shown in US-A-3937458 and used also in US-A-4642975. Here, blanks are withdrawn from the mouth of a magazine by a suction cup which is driven by an epicyclic gear mechanism to move over an approximately triangular path, one apex of which coincides with the magazine and a second apex of which coincides with the path of a pocket conveyor into which articles drawn from the magazine are to be dropped. It is disclosed that by arranging for the blanks withdrawn from the magazine to contact a suitable striker carried by the conveyor mechanism, the blanks may be forced to open as they are deposited into a pocket on the conveyor.

In the arrangement described, it will be difficult to operate at any substantial speed because the blank is removed out of the magazine after attachment to a suction cup which where it contacts the lead blank in the magazine, is undergoing virtually a reciprocating movement. Also, the erection of the blank depends upon contact between the blank and the moving conveyor. The speed of the apparatus is therefore limited by the speed at which one can open a carton blank in this manner without damage.

The present invention relates to a number of modifications and improvements to such previously known systems. In a first aspect, the invention provides, apparatus for loading carton blanks into a packing machine, comprising:

a magazine for the supply of a succession of said carton blanks in a flat state;

a conveyor having at least one blank receiving pocket moveable in a continuous path; and

transfer means for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket of said conveyor as said pocket moves along said path;

wherein said transfer means is adapted and arranged to move each said blank toward its said pocket in generally the direction in which said pocket is moving but at a velocity having a component in said path direction sufficiently greater than the speed at which said pocket moves along said path that said blank enters said pocket.

Preferably, the pocket opening through which the blank is introduced faces away from the direction of pocket movement. The transfer means may comprise means driving said blanks for said movement at said velocity which allows the said blank to be decelerated by engagement in said pocket without damage to the blank. For this purpose said blank driving means may comprise a drive member acting in use on said blanks to drive them into said pocket or pockets, which drive member is driven via means adapted to slip or is itself adapted to slip on said blanks in response to resistance to further movement of said blank at said velocity when said blank is fully home in said pocket.

Having provided means to introduce the blanks into these respective pockets in a flat state, it is now possible to open the blanks as they travel in the pockets. Accordingly, in a second aspect the present invention provides apparatus for erecting tubular carton blanks comprising:

a magazine for the supply of a succession of said carton blanks in a flat state,

a conveyor having at least one blank receiving pocket,

transfer means for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket of said conveyor, and

opening means mounted to travel with the or each said pocket of said conveyor and serving to open a said blank in said pocket into a tubular state.

Preferably, said transfer means comprises a drive member acting in use on said blanks to drive them into said pocket or pockets, which drive member is driven via drive means at a speed in excess of that sufficient to transfer a said blank to said conveyor and said drive means is adapted to slip in response to resistance to further movement of said blank when said blank is fully home in its said conveyor pocket.

Said drive means may be a drive wheel or drive belt and may comprise an easy slipping clutch connecting means urging rotation of said wheel or belt to said wheel or belt.

Said opening means may comprise:

a first suction head for holding a first panel of a said blank and a second suction head for holding a second panel of a said blank,

means mounting said first and second suction heads for movement with their said conveyor pocket, and

means for producing movement of at least said second suction head for movement with respect to said conveyor pocket and away from said first suction head so as to open out a said blank in said pocket held by said first and second suction heads.

The suction heads should engage on panels which are overlying one another so that the carton blank can be opened by pulling these panels away from one another.

Each of said first and second suction heads is preferably connected to a respective cam follower which cooperates with a fixed cam to produce said blank opening movement of said suction heads with respect to their said conveyor pocket.

Each said pocket of the said conveyor is preferably provided in a transport holder which is detachable from the conveyor with an opened blank therein.

Preferably, each said transport holder comprises a magnetically attractable portion and said conveyor comprises

a magnet holding said transport holder on said conveyor by attraction of said magnetically attractable portion.

Each said transport holder preferably comprises a second magnetically attractable portion facing radially outward from said conveyor by which the transport holder may be attracted out of said conveyor.

In an alternative aspect the invention provides apparatus for packing cartons comprising:

a magazine for the supply of a succession of said carton blanks in a flat state,

a conveyor having at least one blank receiving pocket,

transfer means for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket of said conveyor, and

opening means mounted to travel with the or each said pocket of said conveyor and serving to open a said blank in said pocket into a tubular state,

means for forming bottom closures on said carton whilst in said pockets,

means for filling said cartons whilst in said pockets, and

means for forming top closures on said cartons whilst in said pockets.

The invention will be further described and illustrated with reference to the preferred embodiment illustrated in the accompanying drawings in which:-

Figure 1 is a schematic plan view of packing apparatus for filling liquid into cartons and sealing the cartons to form sealed liquid containing packs;

Figure 2 is a similar view showing in greater detail the right hand half of Figure 2, particularly the mechanism for loading blanks from a magazine onto a first conveyor;

Figure 3 is an enlarged view of the carton blank feeding components of Figure 2.

Figure 4 is a side elevation showing an overdriven slipping drive for conveying carton blanks to the first conveyor in the apparatus of Figure 1;

Figure 5 is a side elevation of a portion of the first conveyor of the apparatus of Figure 1;

Figure 6 is a plan view of the conveyor shown in Figure 5;

Figure 7 is a view as in Figure 5, but with parts omitted more clearly to show a first suction head of the illustrated station of the conveyor;

Figure 8 is a view as in Figure 7, but with other parts omitted more clearly to show a second suction head of the illustrated station of the conveyor;

Figure 9 shows progressive stages in the movement of the first and second suction heads shown in Figures 6 to 8 in opening a carton blank;

The apparatus shown in Figure 1 is similar in most respects to that shown in our co-pending PCT Patent Application No. GB94/01511. The apparatus comprises a sequence of wheel conveyors around which a multitude of transport holders are conveyed in a closed cycle. Each transport holder receives a carton blank at the commencement of its cycle of movement around the apparatus and as the transport holder with its carton blank moves through the apparatus the carton blank is subjected to bottom sealing, filling and top sealing operations before being removed from its transport holder and taken out of the apparatus as a filled package. The present invention is concerned with the loading of the carton blanks into the first of the wheel conveyors. Accordingly, the operation of the apparatus shown in Figure 1 will not be described here in detail. The general scheme of operation of the apparatus however is as follows.

Flattened tubular carton blanks 22 are held in a magazine 20 from which they are withdrawn at the mouth 24 of the magazine by a mechanism 26 described in greater detail below with reference to Figures 2 to 4. The flattened carton blanks

are loaded on to a first conveyor wheel 28 having twenty (or sixteen in an alternative embodiment not shown) stations each of which contains a transport holder 30 described in detail below. Each transport holder is held in a recess at its station on the wheel 28 by a respective magnet. During the rotation of the wheel 28, each blank is opened from a flattened to an opened tubular form by a mechanism described in detail hereafter with reference to Figures 6 to 9. Wheel 28 runs tangentially alongside a second wheel 32 also having twenty (or sixteen in the alternative embodiment 20) stations. As each transport holder 30, comes into the nip between the two wheels 28 and 32, it is transferred to the wheel 32. Each station on wheel 32 has a magnet for retaining a transport holder 30 similar in strength to the magnet in the corresponding station of wheel 28. At the desired instant of transfer, the magnet of wheel 28 is retracted by a cam leaving the transport holder held on the magnet of wheel 32. During the passage of the transport holders around wheel 32, the bottom of the carton blank is sealed so as to form a bottom sealed package with an open top. The transport holders are then transferred to a third wheel 34 of thirty stations by a similar magnetic transfer operation to that described above.

During their passage around wheel 34, the cartons are filled with contents, suitably liquid contents. By a similar magnetic transfer operation, the transport holders are transferred to a twenty (or sixteen in the alternative embodiment) station wheel 36 and from there to a twenty (or sixteen in the alternative embodiment) station wheel 38. During their passage around wheel 38, a top seal is formed closing the cartons. The transport holders are then transferred by a similar magnetic transfer operation to a twelve (or in the alternative embodiment twenty) station wheel 40. During the passage of the cartons around wheel 40, they are discharged downwardly out of their transport holders on to a suitable conveyor 42 and the transport holders themselves are transferred by a magnetic transfer operation back on to

the first wheel 28 where they are ready to receive a fresh carton blank.

As shown in Figure 2, the mechanism 26 for unloading blanks from the magazine and loading them into the transport holders 30 comprises a dog-chain 44 running around sprockets 46, 48 and having at spaced intervals protruding dogs 50 positioned to catch the rear edge of a folded blank in the magazine mouth and to displace the blank sideways out of the magazine mouth through a metering aperture into the nip of a pair of rollers 52, 54. Roller 52 is a driven roller and roller 54 is an idler. Before the rear edge of each blank passes out of the nip of the rollers 52, 54, the leading edge comes into the nip of the next pair of rollers constituted by a driven roller 56 described in detail hereafter and an idler roller 58. These drive the blank so that its leading edge is driven into the corner of a respective transport holder 30 held on the first wheel 28. As is shown in Figures 5 and 6, each transport holder comprises a generally c-shaped top plate 60 having an opening 62, a similarly shaped bottom plate 64, and front and rear connecting bars 66, 68 which connect the top plates 60 and the bottom plates 64. The connecting bars 66, 68 are made of magnetically attractable material such as steel.

Rollers 56, 58 are shown in detail in Figure 4. Roller 56 is driven by an oversize sprocket 70 which is sized deliberately smaller than the size appropriate to drive the periphery of the roller 56 at just the right speed to bring each blank into each transport holder 30 as the wheel 28 rotates away from the roller 56. Sprocket 70 is splined to a shaft 72 carrying a height adjustable collar 74 which serves to compress a helical coil spring 76 against a thrust washer 78 which bears against a felt pad 80 which in turn rubs against the bottom of a bobbin 82 which is supported on but is free to rotate with respect to the shaft 72. At the other end of the bobbin 82 there is a similar arrangement of a second felt pad 84 backed by a thrust washer 86 held in

vertical position by an adjustable collar 88. The whole assembly constituting the roller 56 is mounted for rotation in bearings 90 held in the framework of the apparatus. Roller 58 is constituted by two roller units 92, 94 each mounted for rotation on a respective stub axle 96, 98 mounted to the framework of the apparatus. In use, when a blank enters the nip between the driven roller 56 and idler roller 58, it is driven, by virtue of the undersize sprocket 70, at a rate which is sufficiently fast to guarantee that its leading edge will enter the cavity 62 of its respective transport holder and make contact with the far corner of the cavity 62. Once such contact is made, the motion of the blank will be slowed to the speed dictated by the speed of rotation of the wheel 28. To accommodate this, the felt pads 80, 84 above and below the bobbin 82 of roller 56 allow the bobbin 82 to commence slipping with respect to the shaft 72. The bobbin 82 has low inertia and therefore rapidly regains the speed of the shaft 72 once the blank has been carried out of the nip of the rollers 56, 58 by rotation of the wheel 28.

The chain 44 is driven in synchrony with the wheel 28 so as to separate each blank from the stack at the exact time appropriate to feeding the blank into the transport holder 30 which receives it. Transfer to the rollers 56, 58 running, at least for a short period before transfer of the blank to the transport holder, at a speed greater than the machine speed, ensures that any minor timing variations are compensated for. The excess speed is compensated for by slipping of the felt pads once the blank is in the transport holder.

In Figure 6 two stations of the wheel 28 are shown and positions of the wheel 28 either side of a central portion joining the two stations are omitted. Each station of the wheel 28 comprises a magnet holding the transport holder 30 and comprises a first suction head 102 and a second suction head 104 connected to controlled vacuum lines. Each of the first and second suction heads 102, 104 is mounted for

movement to produce opening of the blank. First suction head 102 is connected to an arm 106 which is mounted for linear movement by linear bearings 108. This linear movement is guided by a cam follower 110 which is moved to produce the desired movement of the first suction head 102. This movement is controlled by a fixed cam 112 which has a number of generally circular cam tracks 114, 116 and 118 which deviate from a true circular path to produce the required movement of their respective cam followers as described below.

Cam follower 110 is situated in track 114 on the upper surface of the circular plate 112 which remains stationary while the wheel 28 rotates.

The second suction head 104 is mounted on an arm 120 which pivots about an axis defined by a shaft 122 at which it is provided with a gear pinion 124 meshing with a larger pinion 126 which is provided at a pivot axis defined by a shaft 128 of an arm 130 pivoted at one end at the shaft 128 and bearing a cam follower 132 at its opposite free end. Cam follower 132 runs in cam track 118 of the stationary cam plate 112. The cam plate 112 guides the cam follower 132 to produce rotation of the pinion 126 which in turn provides rotation of the pinion 124 and hence rotation through a larger angle of rotation of the arm 120 bearing the second suction head 104. The cam tracks 114 and 118 are so shaped however that before the suction heads are moved apart as described above, they are first in a separated condition to allow a blank to feed in between them. They are then moved together to seat them on opposite sides of the blank and then they are moved apart as described. The cycle is shown in Figure 9.

The linear bearings 108 and the shafts 112 and 128 are all mounted to a top plate 136 of the wheel 28 which rotates above the cam plate 112.

In use, a carton blank is injected into the cavity 62 of the transport holder 30 in flattened form and abuts against the radially inner rear leading corner of the cavity 62 as shown in Figure 9. It is grasped by the first suction head

102. The second suction head 104 is brought in under the influence of its cam follower 132 to grasp the opposite face of the flattened blank. Further rotation of the wheel 28 with respect to the cam plate 112 produces the movements shown in Figure 9 in which the first suction head 102 retreats by a small distance whilst the second suction head 104 makes an anti-clockwise angular movement of much greater extent pulling the blank open to a fully rectangular shape shown in Figure 9 (extreme clockwise position) at which time the outer corner crease of the blank latches under a projection 138 present at the entry into the cavity 62 both in the top plate 60 and in the bottom plate 64 of the transport holder 30 so that the blank is held in its fully opened position.

Many variations and modifications of the apparatus described above with reference to the accompanying drawings are possible within the scope of the invention. Thus, the blank receiving pockets constituted by transport holders 30 of the conveyor constituted by wheel 28 need not be detachable from the wheel 28 but can be fixed parts of the wheel 28 from which the erected carton blanks are removed by other means.

The slipping provided by the felt pads 80, 84 could alternatively be provided between the drive member (driven roller 56) and the blank, e.g. by arranging for the drive member to contact the blank only lightly. Alternatively, instead of providing slippage, the blanks could be driven by a variable speed drive such as a stepper motor time to slow to the appropriate extent as each blank reaches its fully home position in its respective pocket.

CLAIMS

1. Apparatus for loading carton blanks into a packing machine, comprising:

a magazine (20) for the supply of a succession of said carton blanks (22) in a flat state;

a conveyor (28) having at least one blank receiving pocket (30, 62) moveable in a continuous path; and

transfer means (44, 50, 52, 54, 56, 58) for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket (30) of said conveyor as said pocket moves along said path;

characterised in that said transfer means is adapted and arranged to move each said blank toward its said pocket in generally the direction in which said pocket is moving but at a velocity having a component in said path direction sufficiently greater than the speed at which said pocket moves along said path that said blank enters said pocket.

2. Apparatus as claimed in Claim 1, wherein the transfer means comprises means (56, 58) driving said blanks for said movement at said velocity which means allows the said blank to be decelerated by engagement in said pocket without damage to the blank.

3. Apparatus as claimed in Claim 2, wherein said blank driving means comprises a drive member (56) acting in use on said blanks to drive them into said pocket or pockets, which drive member is driven via means (76, 78, 80, 82) adapted to slip or is itself adapted to slip on said blanks in response to resistance to further movement of said blank at said velocity when said blank is fully home in said pocket.

4. Apparatus for erecting tubular carton blanks comprising:

a magazine (20) for the supply of a succession of said carton blanks (22) in a flat state,

a conveyor (28) having at least one blank receiving pocket (30, 62), and

transfer means (44, 50, 52, 54, 56, 58) for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket of said conveyor, characterised in that said apparatus further comprises:

opening means (102, 104) mounted to travel with the or each said pocket of said conveyor and serving to open a said blank in said pocket into a tubular state.

5. Apparatus as claimed in Claim 4, wherein said transfer means comprises a drive member (56) acting in use on said blanks to drive them into said pocket or pockets, which drive member is driven via drive means (76, 78, 80, 82) at a speed in excess of that sufficient to transfer a said blank to said conveyor and said drive means is adapted to slip in response to resistance to further movement of said blank when said blank is fully home in its said conveyor pocket.

6. Apparatus as claimed in Claim 5, wherein said drive means is a drive wheel (56) or drive belt and wherein said drive means comprises an easy slipping clutch (80, 82) connecting means urging rotation of said wheel or belt to said wheel or belt.

7. Apparatus as claimed in any one of Claims 4 to 6, wherein said opening means comprises:

a first suction head (102) for holding a first panel of a said blank and a second suction head (104) for holding a second panel of a said blank,

means (106, 108, 120, 122) mounting said first and second suction heads for movement with their said conveyor pocket, and

means (110, 112, 132, 118) for producing movement of at least said second suction head for movement with respect to said conveyor pocket and away from said first suction head so as to open out a said blank in said pocket held by said first and second suction heads.

8. Apparatus as claimed in Claim 7, wherein each of said first and second suction heads (102, 104) is connected to a respective cam follower (110, 132) which cooperates with a fixed cam to produce said blank opening movement of said suction heads with respect to their said conveyor pocket.

9. Apparatus as claimed in any one of Claims 4 to 8, wherein each said pocket (62) of the said conveyor is provided in a transport holder (30) which is detachable from the conveyor with an opened blank therein.

10. Apparatus as claimed in Claim 9, wherein each said transport holder comprises a magnetically attractable portion and said conveyor comprises a magnet holding said transport holder on said conveyor by attraction of said magnetically attractable portion.

11. Apparatus as claimed in Claim 10, wherein each said transport holder comprises a second magnetically attractable portion facing radially outward from said conveyor by which the transport holder may be attracted out of said conveyor.

12. Apparatus for packing cartons comprising:

a magazine (20) for the supply of a succession of said carton blanks (22) in a flat state,

a conveyor having at least one blank receiving pocket (30, 62),

transfer means (44, 50, 52, 54, 56, 58) for withdrawing blanks from said magazine and transferring each blank in a flat state to the or a respective pocket of said conveyor, and

opening means (102, 104) mounted to travel with the or each said pocket of said conveyor and serving to open a said blank in said pocket into a tubular state,

means (32) for forming bottom closures on said carton whilst in said pockets,

means (34) for filling said cartons whilst in said pockets, and

means (38) for forming top closures on said cartons whilst in said pockets.

13. Apparatus for erecting tubular cartons substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

14. Apparatus for packing cartons substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

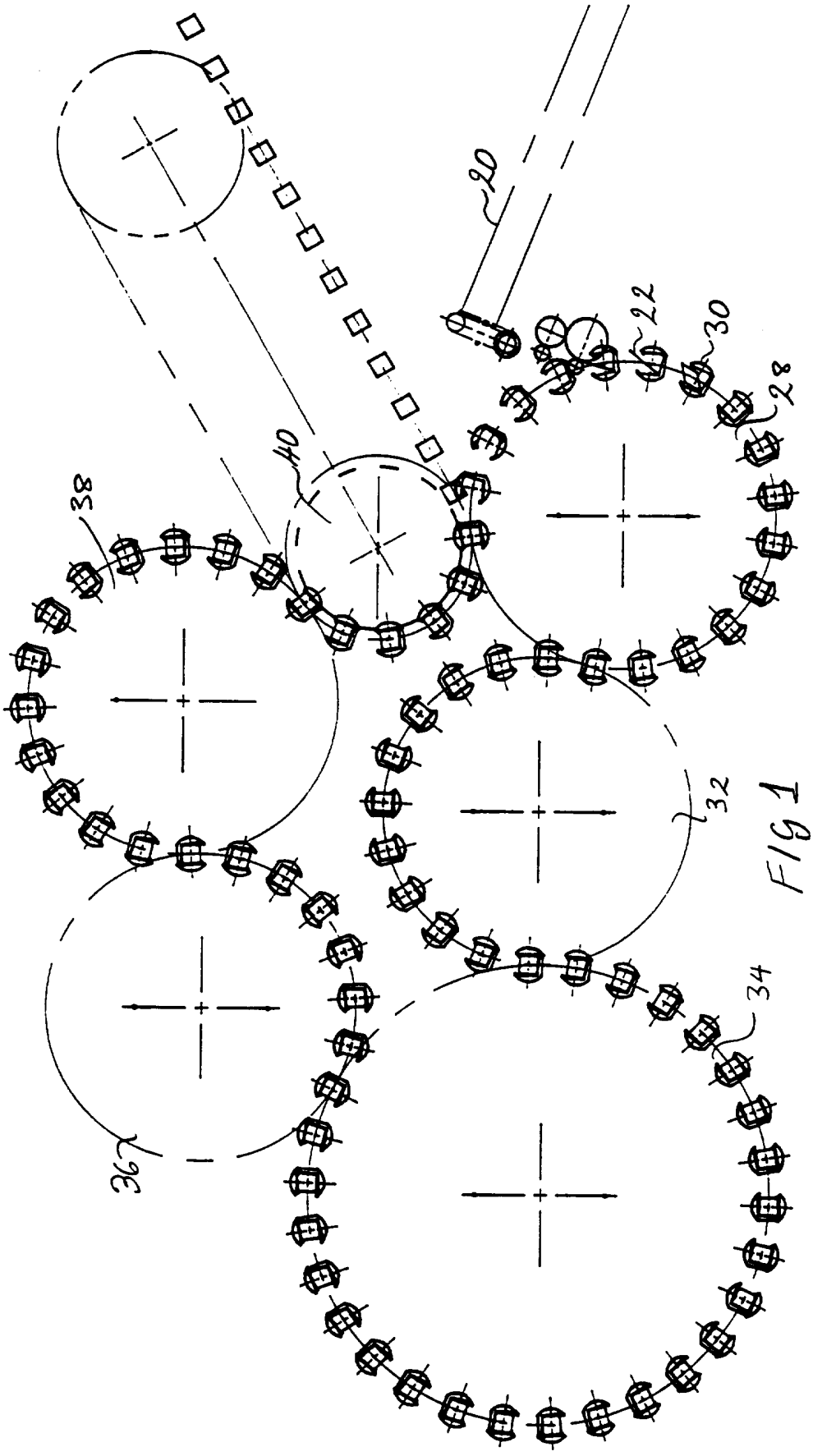


FIG 1

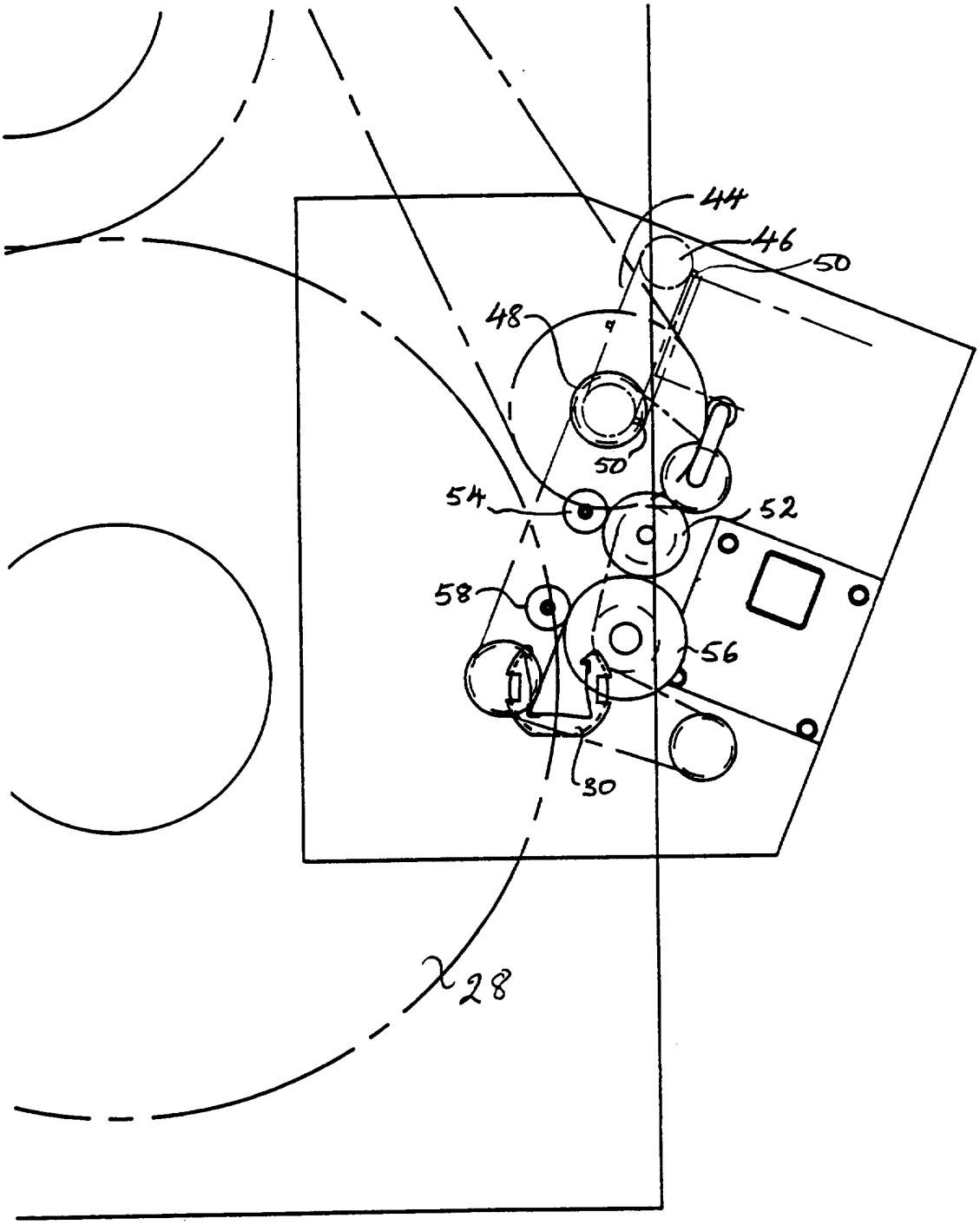


FIG 2

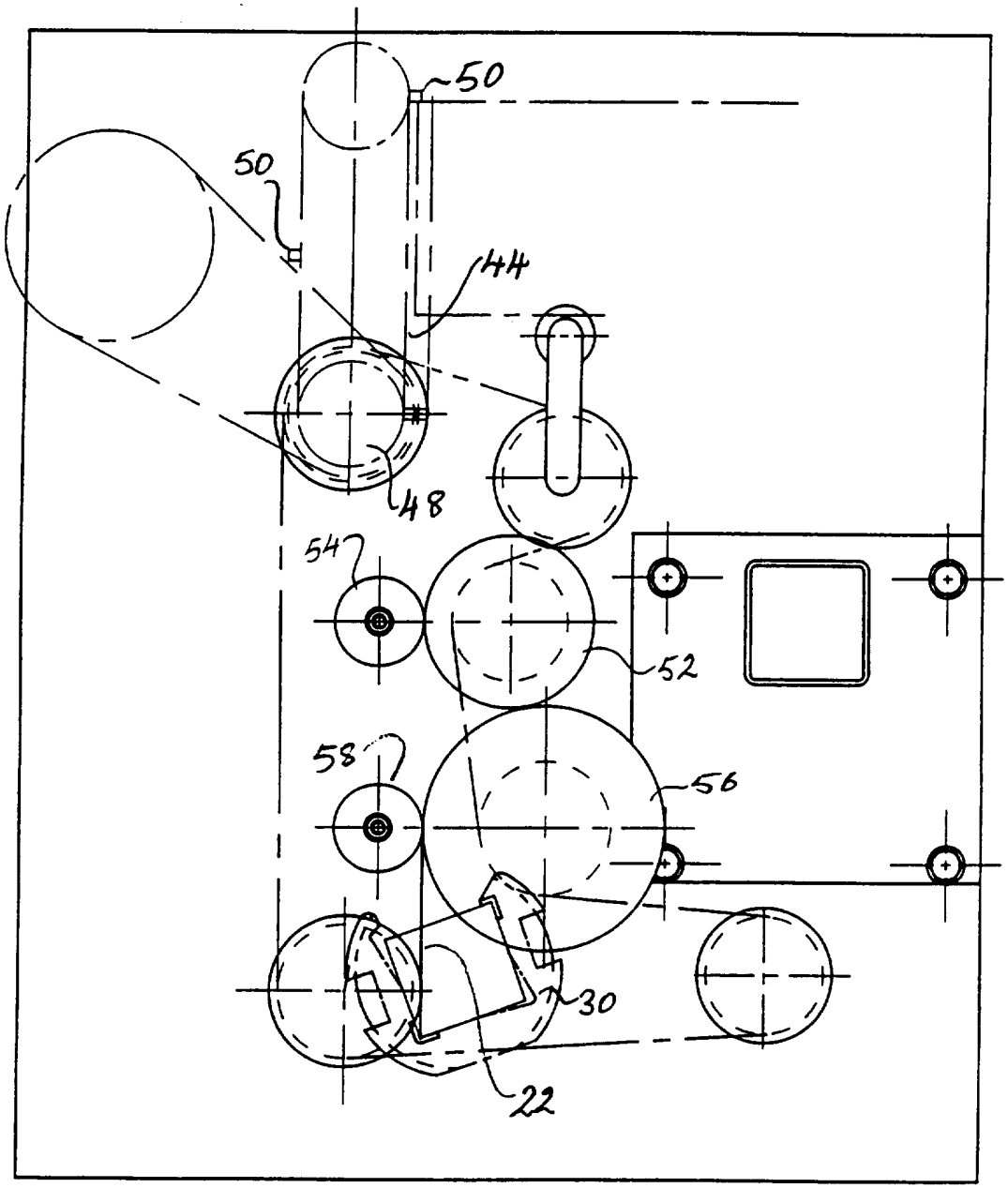


FIG 3

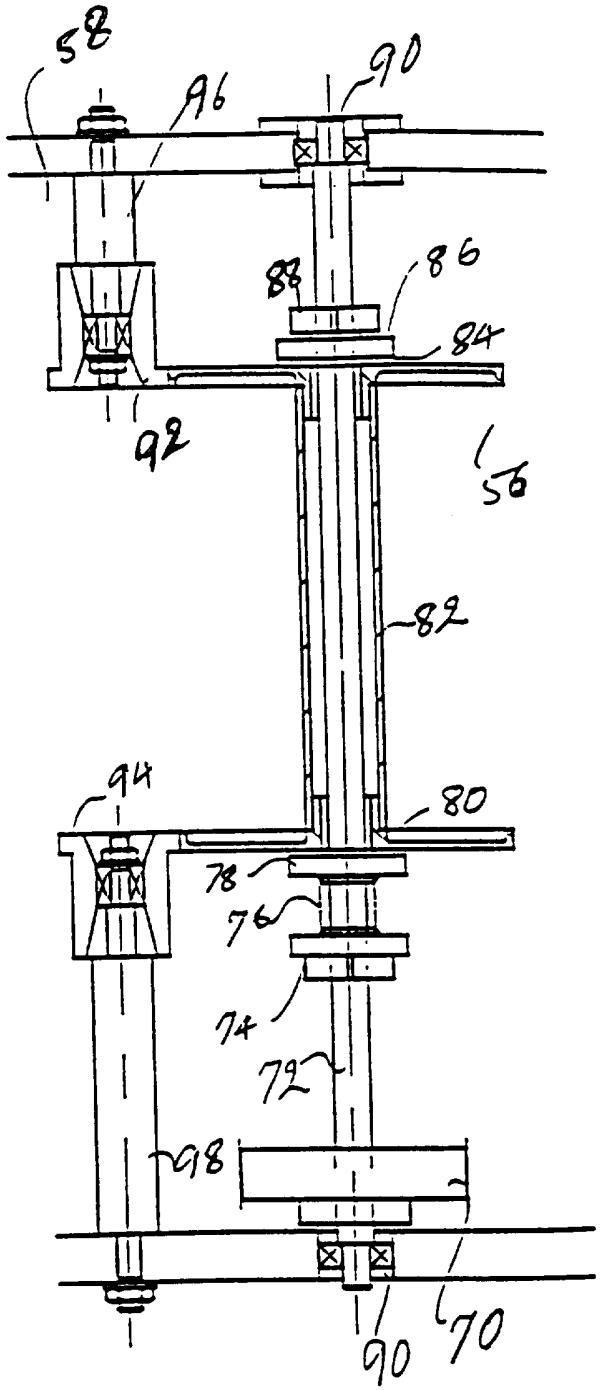


FIG 4

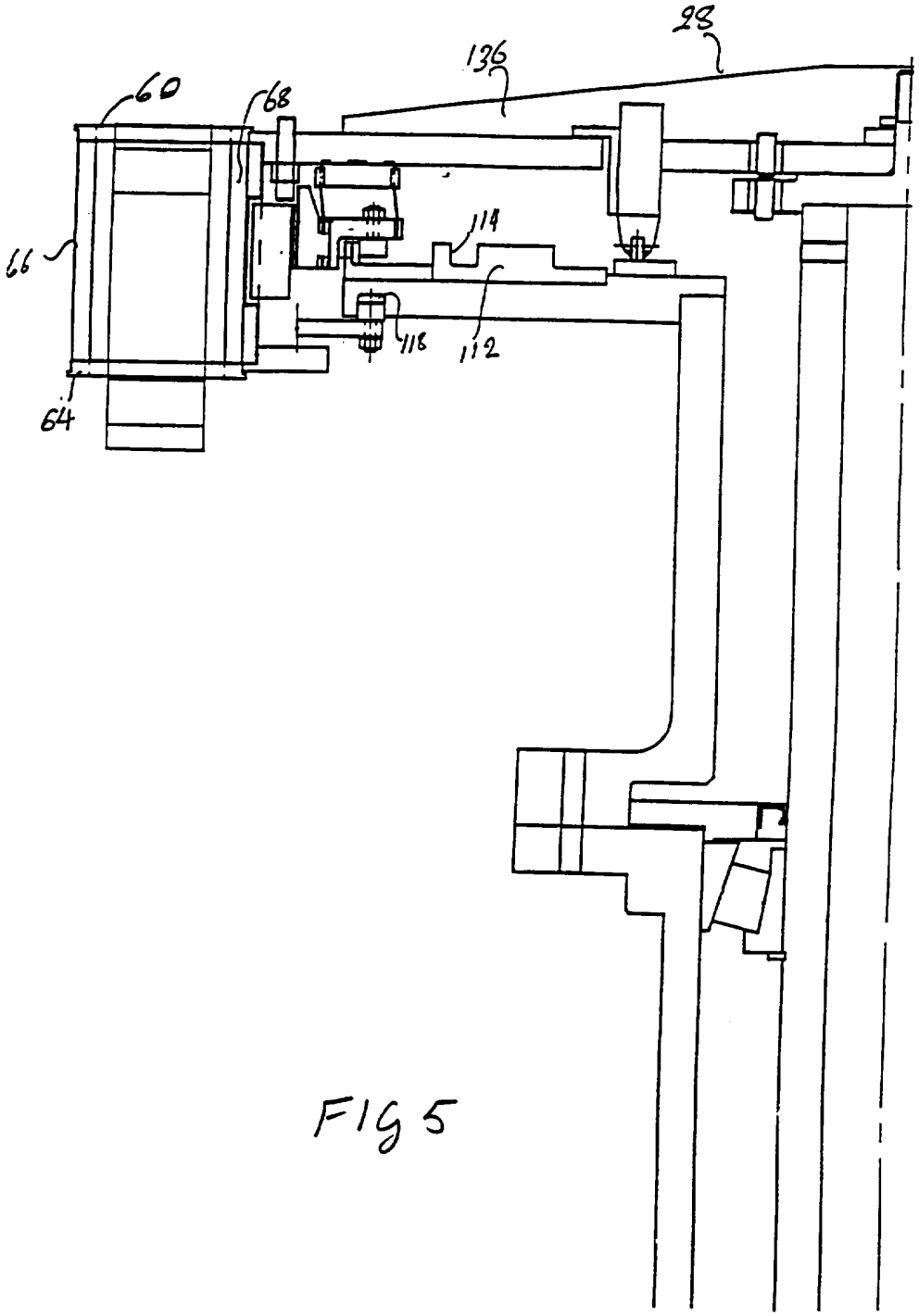


FIG 5

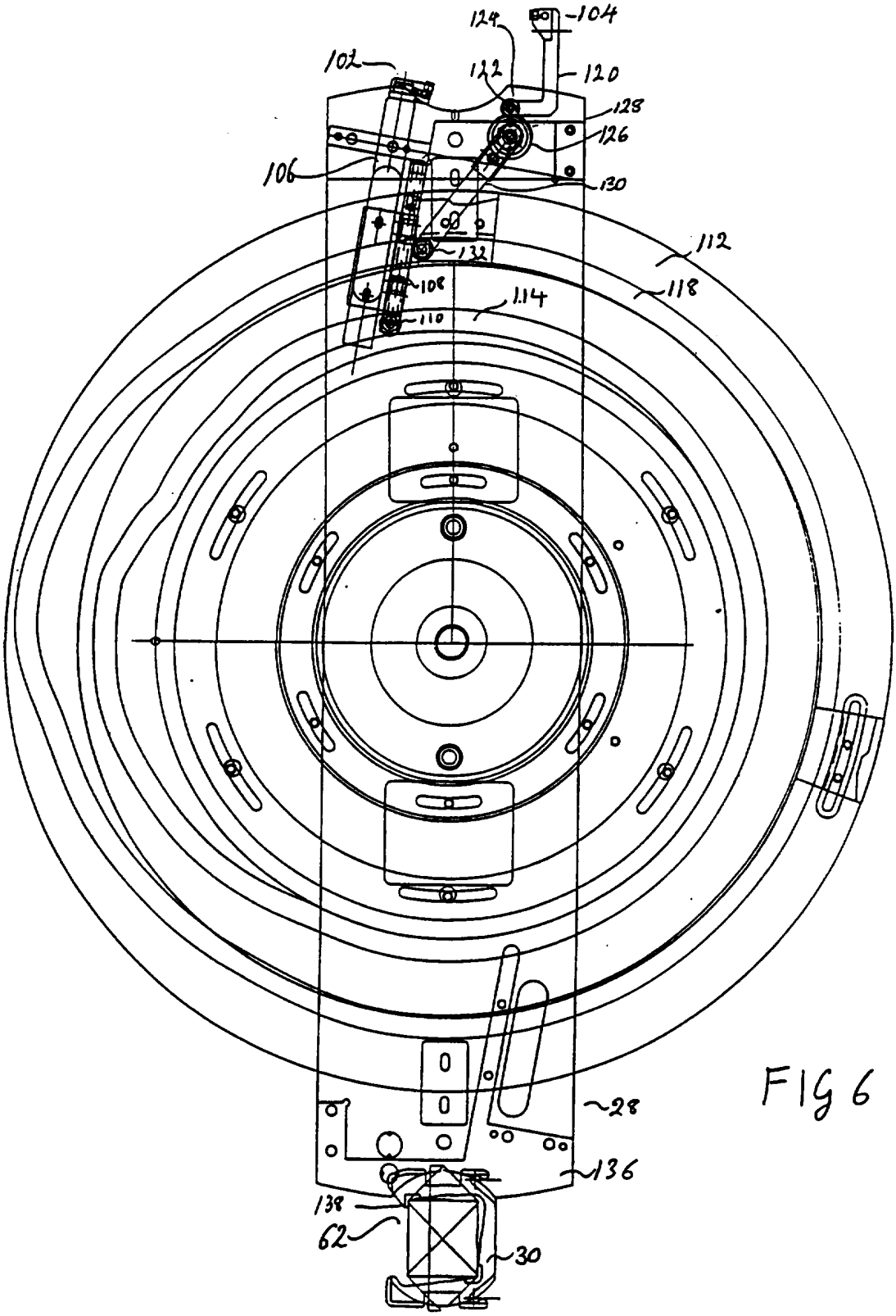

124
104
102
122
120
128
126
106
130
112
132
118
108
114
110
28
136
138
62
30

FIG 6

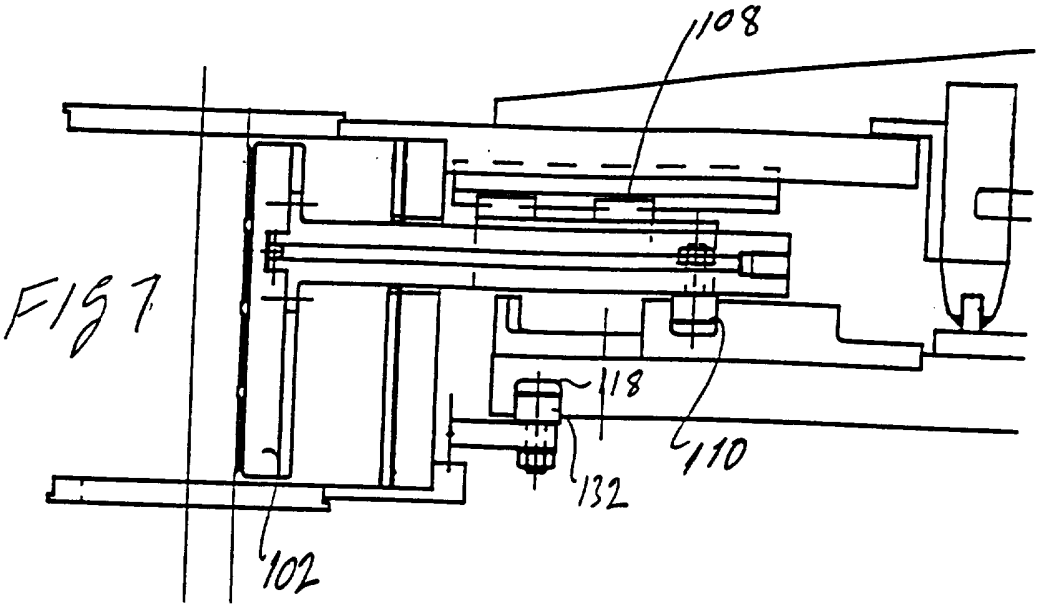


FIG 7

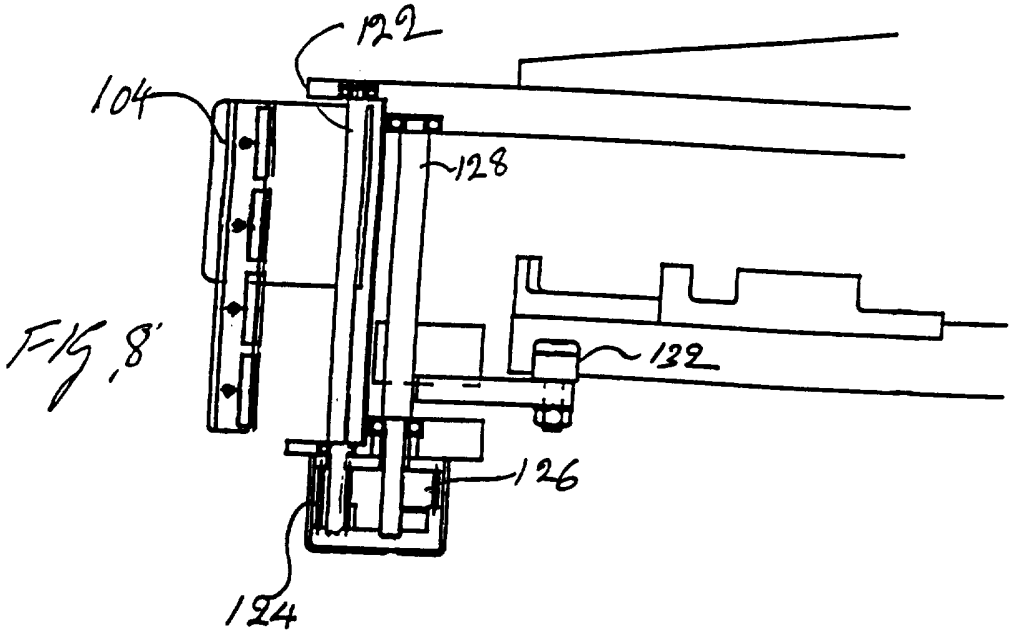


FIG 8

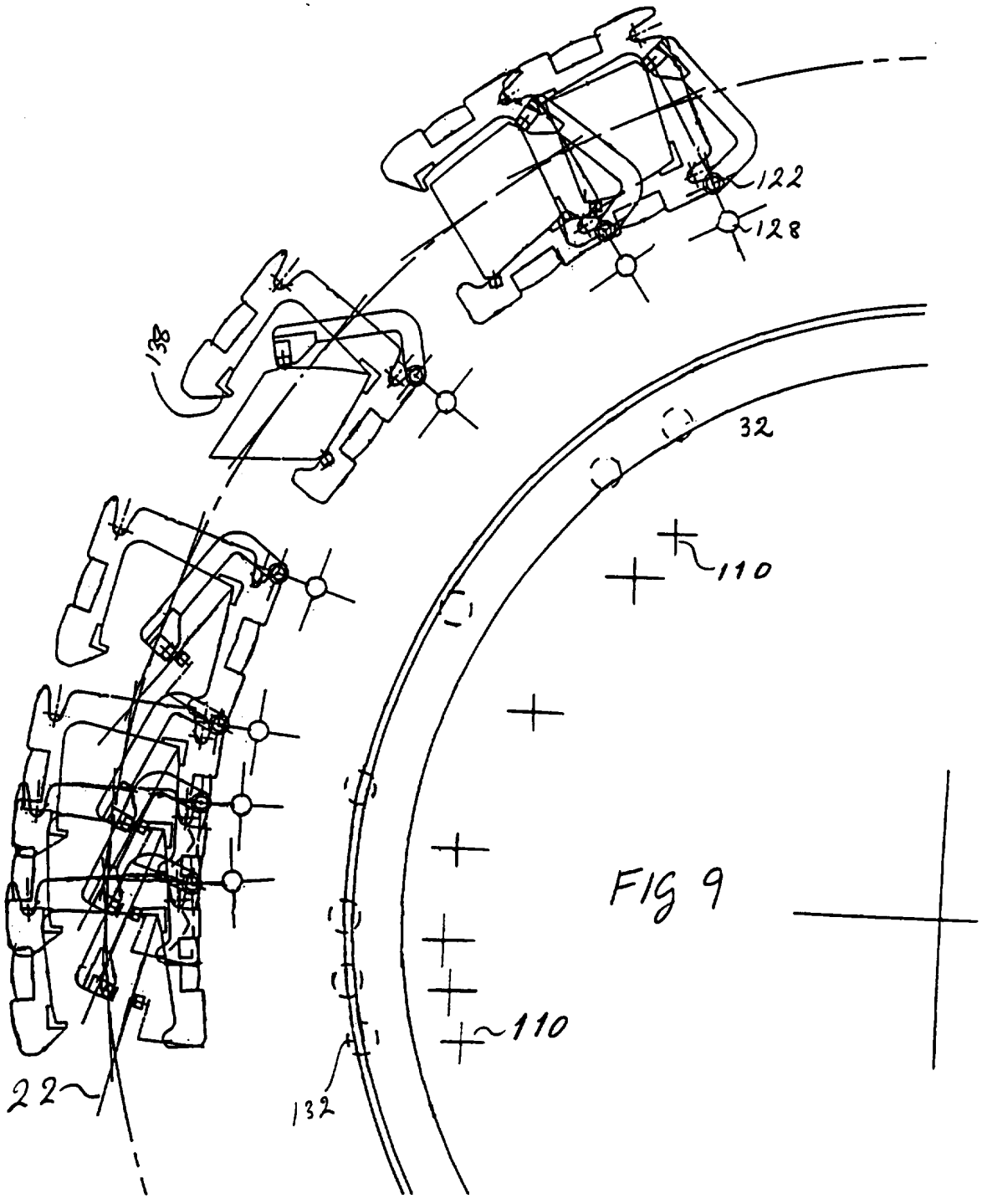


FIG 9

INTERNATIONAL SEARCH REPORT

Ir. ıtional Application No
PCT/GB 96/00223

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B31B5/80

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B31B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,3 937 131 (KELLOGG ROBERT C) 10 February 1976 see column 3, line 16 - line 54; figure 3 see abstract	1-8, 12-14
A	US,A,4 994 011 (REIL WILHELM) 19 February 1991 see column 6, line 56-57	1-3,5,6
A	US,A,2 984 162 (GORDON JAMES H) 16 May 1961 see figure 3	4,7,8
A	WO,A,95 02539 (PAKCENTRE LIMITED ;MOSSE RICHARD WOLFGANG EMIL (GB)) 26 January 1995 cited in the application see abstract; figures	9-11

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
22 May 1996	31.05.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Pipping, L

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 96/00223

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-3937131	10-02-76	NONE	
US-A-4994011	19-02-91	DE-A- 3804791	24-08-89
		AU-B- 2767789	17-08-89
		CA-A- 1301518	26-05-92
		DE-D- 58905862	18-11-93
		EP-A,B 0328876	23-08-89
		ES-T- 2045198	16-01-94
		JP-A- 1254517	11-10-89
		NO-B- 174188	20-12-93
		SU-A- 1807947	07-04-93
US-A-2984162	16-05-61	NONE	
WO-A-9502539	26-01-95	AU-B- 7130494	13-02-95
		CA-A- 2167285	26-01-95
		EP-A- 0707550	24-04-96