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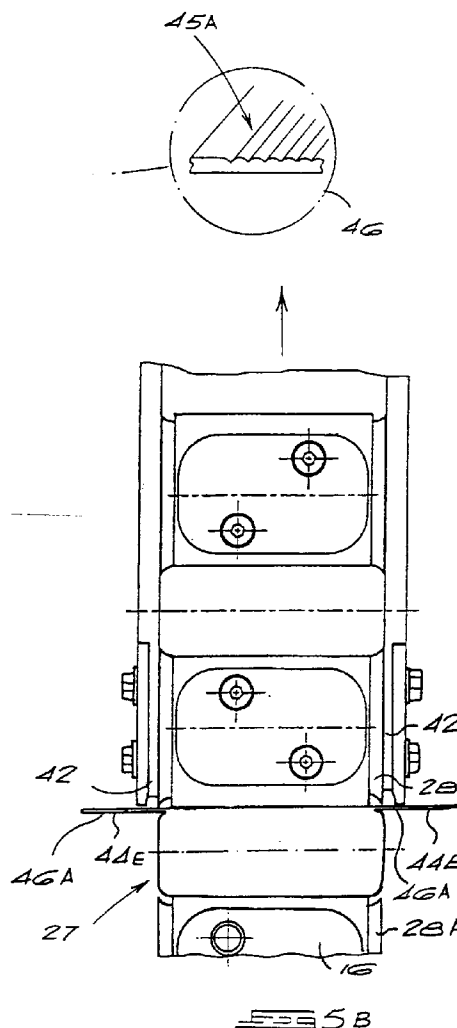
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54 Corner forming apparatus and method.

57 A box corner forming apparatus (10) is disclosed for forming non-rectangular corners on cigarette boxes (27) and the like. A plurality of wedge-shaped spacers (14, 16) defining a plurality of parallel-sided pockets (12) are arranged around a drying drum carousel (10) for receiving opposed walls of a partly formed box having projecting side flaps (44E). A pair of folding plates (42) are provided for folding down the side flaps along corner formations defined by parallel striations (45A) between the opposed walls and the side flaps so as to form corners (44F). Corner support means in the form of a pair of retractable wedge-shaped cheek plates (28, 28A) are mounted slidably on opposite sides of the corresponding wedge-shaped spacers for supporting and maintaining the shape of the corner as it is being formed. The invention extends to a method of forming rounded or chamfered non-rectangular for a box.



BACKGROUND TO THE INVENTION

THIS invention relates to a corner forming apparatus and method, and in particular to a corner forming apparatus and method for the forming of corners in cigarette boxes.

Nowadays, a number of cigarette boxes are manufactured with non-rectangular chamfered or rounded corners. For the sake of a neat and consistent appearance, it is important that no irregularities occur in the forming of such rounded or chamfered corners. Corners of this type are normally formed by applying a number of closely spaced parallel creases or striations to the box blank at the corner forming zone, and subsequently forming the blank into a box. A problem associated with the method is that equi-angular folding along each crease line is not assured, leading to the formation of an uneven and unattractive fold.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a box corner forming apparatus comprising:

- a) plurality of pocket defining elements defining at least one pocket for receiving opposed walls of a partly formed box having at least one projecting side flap;
- b) folding means for folding down the side flap along corner formations defined between at least one of the opposed walls and the side flap so as to form a corner;
- c) corner support means for supporting and maintaining the shape of the corner as it is being formed.

In a preferred form of the invention, the corner formation is defined by a plurality of parallel crease lines or striations for forming a rounded or chamfered corner.

The corner support means typically carries a complementally profiled end face arranged to support an operatively outer surface of the corner formation.

Conveniently, the pocket is defined by a pair of opposed planar wall-contacting faces, and the corner supporting means is movable between an extended support position in which it stands proud of the faces for supporting a corner of the box and a retracted feed position in which it is flush or recessed relative to the faces.

Advantageously, the pocket defining elements comprise a plurality of spacers arranged in a parallel side-by-side relationship so as to define a plurality of pockets, each spacer having opposed planar wall-contacting surface, with the planar surfaces of adjacent spacers defining the pockets.

Preferably, the box corner forming apparatus is supported on a carousel, and the spacers are carried towards the outer periphery of the carousel and are substantially wedge-shaped in form so as to define therebetween a plurality of identical parallel-sided pockets.

Typically, the corner support means comprises pairs of wedge-shaped cheek plates arranged on opposed sides of the corresponding wedge-shaped spacers, and mounting means for mounting each cheek plate slidably along a radius of the carousel, actuating means for moving the cheek plates outwardly along the radius between an advanced position in which opposed corner supporting edges of the cheek plates are flush or recessed relative to the wall-contacting surfaces and a retracted position in which the corner-supporting edges stand proud of the faces so as to support a corner of the box.

Advantageously, the actuating means comprises at least one cam, at least one follower being carried on each cheek plate for following the cam and biasing means for biasing the followers against a camming surface of the cam, with the cheek plates and spacers being arranged to rotate relative to the cam.

The folding means preferably comprises a folding unit carrying a pair of stationary folding plates, and the pocket defining elements are arranged to be rotated past the folding plates for allowing the at least one side flap to be folded down.

The carousel typically comprises a drying drum for sealing opposed flaps of prismatic hinge lid packs, the drying drum being arranged to receive in series partly formed packs from a pack transfer station.

The pack transfer station may be located adjacent the actuating means, with the partly formed packs being arranged to be transferred into the pockets when the cheek plates are in the advanced position.

The invention extends to a method of forming a non-rectangular corner in a box comprising the steps of:

- a) providing a partly formed box having opposed walls and at least one projecting side flap;
- b) feeding the partly formed box into a pocket defined by a pair of spacers, with opposed walls of the box abutting against planar faces of the spacers;
- c) folding the side flap down along corner formations defined between at least one of the opposed walls and a side flap so as to form a corner, and
- d) supporting and maintaining the shape of the corner as it is being formed.

Preferably, the shape of the corner is maintained by cradling an operatively outer surface of the corner with a complementally profiled concave edge.

The invention still further provides a method of forming a non-rectangular corner in a box comprising the

steps of forming a plurality of striations in a blank of the box between first and second walls of the box, partly folding the first and second walls towards one another so as to define a first corner, and supporting an operatively outer surface of the corner as it is being formed with a complementally profiled concave corner edge.

Typically, the blank includes a third wall adjacent the second wall and divided therefrom by a plurality of striations, the second wall comprising a front wall and first and third walls comprising side flaps, and the method including the steps of folding the side flaps towards one another so as to define first and second corners, and supporting the operatively outer surfaces of the corners as they are being formed with complementally profiled concave corner edges.

Conveniently, the blank includes an end wall extending from the second wall and an opposed rear wall extending from an opposite edge of the end wall, and the method includes the step of folding the front and opposed rear walls towards one another to a position in which they are parallel to one another, so as to partly form a box, and inserting the partly formed box into a pocket-defining formation, with opposed parallel surfaces of the pocket-defining formation abutting the outer surfaces of the front wall and the opposed rear wall.

The blank typically includes an opposed pair of side flaps extending laterally from the opposed side wall, and separated therefrom by a plurality of striations, and the method includes the step of folding the opposed side flaps towards the side wall prior to insertion of the partly formed box into the pocket, so as to define third and fourth corners, and supporting the operatively outer surfaces of the third and fourth corners during or after the formation thereof by means of complementally profiled concave corner edges.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a side view of a corner forming apparatus of the invention incorporated into a drying drum for a hinge-lid pack cigarette box;

Figure 1A shows a detailed side view of a partly formed hinge-lid pack on a slide packet transfer mechanism just prior to insertion into the drying drum;

Figure 2 shows an enlarged detail of the corner forming apparatus of Figure 1;

Figure 3 shows a cross section on the line 3-3 of Figure 2;

Figures 4A to 4C show schematic side views of the corner forming apparatus illustrating various stages in the operation thereof; and

Figure 5A to 5D shows partly schematic front views of the corner forming apparatus illustrating various stages in the operation thereof.

DESCRIPTION OF EMBODIMENTS

Referring first to Figures 1 and 1A, a rotary drying drum 10, which forms one of the final stations in the manufacture of hinge-lid pack (HLP) cigarette boxes, receives partly folded blanks 11A from a conventional Molins slide packet transfer mechanism 11B. The transfer mechanism is mounted adjacent the drying drum, and feeds successive partly folded blanks into successive pockets 12 which are rotated past the mechanism defined between equispaced wedge-shaped spacers 14 and 16. The drying drum 10 is mounted on a central shaft 18 and is rotated stepwise so as to ensure that each successive pocket 12 is correctly aligned with the slide packet transfer.

As can be seen in Figure 2, the spacer element 14 has an upper face 24 and the identical spacer element 16 has a lower face 26 which is parallel to the upper face 24 and spaced apart from the upper face 24 by a distance which allows a partly folded HLP box 27 to be retained snugly within the pocket 12, with the major rear and front walls 27A and 27B of the box contacting the respective surfaces 24 and 26, and an end wall 27C contacting a base 27D of the pocket.

Mounted slidably adjacent opposite flanks of each spacer element are pairs of cheek plates 28 and 28A. When in the advanced position, the wedge-shaped cheek plates have a side profile which is identical to that of the spacer element 14 which they cover completely, as is shown at 29.

Referring now to Figure 3, each cheek plate 28 is mounted slidably to the opposite sides of each spacer element by means of a tongue-and-groove arrangement 31, which allows the cheek plates to slide along a radius 32 of the drying drum. A pair of springs 34 housed within each spacer element and acting against sliding blocks 35 biases the cheek plates inwardly against a cam 36 carried on the drying drum, the cam being fixed as the spacer elements 14 and 16 and the cheek plates 28 move past the cam on rotary followers 39 mounted rotatably to the innermost ends of the cheek plates.

A folding unit 40 extends around the spacer elements 14 and 16 and the cheek plates 28, and also remains stationary as the spacer elements rotate past it. A pair of stationary folding plates 42 are carried on the folding unit 40, and the cheek plates 28 are arranged to pass the folding plates 42 with a narrow clearance, thereby

folding the box flaps at right angles to the front and rear walls of the box.

With reference now to Figures 4A to 4C and 5A to 5D, the drying drum 10 works as follows. In the Figure 4A and 5A position, the partly formed hinged lid pack 27 is inserted into the pocket 12, with the pairs of cheek plates 28 and 28A of the respective spacer elements 14 and 16 being in the advanced position, in which they have a wedge-shaped side profile which is identical to that of the spacer elements. It is clear how the outermost flat profile 45 of the stationary cam 36 urges both pairs of cheek plates 28 and 28A into the advanced position. A parallel series of striations 45A are clearly visible from the detail 46A in Figure 5A. The striations are common to all of the side corners of the box.

In this position, as is apparent from the detail at 46 in Figure 5A, curved corner supporting edges 47 of the cheek plates 28 and 28A are retracted and the outermost portion 47A of the corner-supporting edge 47 is coplanar with or slightly retracted relative to the planes of the upper and lower surfaces 24 and 26 of the respective spacer elements 14 and 16.

In this position, the rounded corner 44A between the lower wall 44B and the lower flap 44C of the box is partly formed by the slide packet transfer. The upper flaps 44E extend transversely and have yet to be folded down.

In the Figure 5B position, a more detailed front view of the corner forming apparatus is shown in which the pairs of cheek plates 28 and 28A and the spacer elements 14 and 16 have moved one more step, to a position just before the upper flaps 44E of the box are sequentially folded down by the leading edges 46A and inner faces of the stationary folding plates 42.

In Figures 4B and 5C, the cheek plate 28 has travelled past the cam 36 and is forced into the retarded position by means of the spring 34.

Folding of the side flaps 44E is commenced by the folding plates 42 just before the cheek plates 28 move into the retarded corner forming position.

While moving to the retarded position, the corner supporting edge 47 of the wedge-shaped cheek plate 28 extends beyond the surface 26 of the spacer 16, with the curved profile acting as a support for the rounded upper corner 44F of the hinge lid pack. In this particular embodiment, the corner supporting edge 47 has a curved profile with a radius of 3.5 mm.

In a position indicated in Figures 4C and 5D, the pair of cheek plates 28A have moved past the cam 36 into a retracted or retarded position, with the result that the cheek plates 28A extend over the upper surface 24 of the spacer element 14 so as to provide a corner forming support for the lower rounded corner 44A of the hinge lid pack.

Opposed flaps 44C and 44E of the pack may then be sealed together, with all four corners of the pack having the requisite degree of curvature.

Naturally, the corner forming apparatus of the invention is not confined to the formation of hinge lid cigarette packs, but may be used to assist in the formation of any box corners which are not rectangular.

Claims

1. A box corner forming apparatus (10) characterized in that it comprises:
 - a) a plurality of pocket defining elements (14, 16) defining at least one pocket (12) for receiving opposed walls (27A, 27B) of a partly formed box (11A) having at least one projecting side flap (44E);
 - b) folding means (40) for folding down the side flap along corner formations (45A) defined between at least one of the opposed walls and the side flap so as to form a corner (44F); and
 - c) corner support means (28, 28A) for supporting and maintaining the shape of the corner as it is being formed.
2. A box corner forming apparatus according to claim 1 characterized in that the corner formation is defined by a plurality of parallel crease lines (45A) or striations for forming a rounded or chamfered corner.
3. A box corner forming apparatus according to either one of the preceding claims characterized in that the corner support means (28, 28A) carries a complementally profiled end face (47) arranged to support an operatively outer surface of the corner formation (45A, 44F).
4. A box corner forming apparatus according to claim 3 characterized in that the pocket (12) is defined by a pair of opposed planar wall-contacting faces (24, 26), and the corner support means is movable between an extended support position in which it stands proud of the faces for supporting a corner (44F) of the box and a retracted feed position in which it is flush or recessed relative to the faces.

5. A box corner forming apparatus according to any one of the preceding claims 1 to 3 characterized in that the pocket defining elements comprise a plurality of spacers (14, 16) arranged in a side-by-side relationship so as to define a plurality of pockets (12), each spacer having opposed planar wall-contacting surfaces, with the planar surfaces of adjacent spacers defining the pockets.
6. A box corner forming apparatus according to claim 5 characterized in that the box corner forming apparatus is supported on a carousel (10), and the spacers (14, 16) are carried towards the outer periphery of the carousel and are substantially wedge-shaped in form so as to define therebetween a plurality of identical parallel-sided pockets (12).
7. A box corner forming apparatus according to claim 6 characterized in that the corner support means comprises pairs of wedge-shaped cheek plates (28, 28A) arranged on opposed sides of the corresponding wedge-shaped spacers (14, 16), and mounting means (31) for mounting each cheek plate slidably along a radius (32) of the carousel, actuating means (36, 39) for moving the cheek plates outwardly along the radius between an advanced position in which opposed corner supporting edges of the cheek plates are flush or recessed relative to the wall-contacting surfaces and a retracted position in which the corner-supporting edges stand proud of the faces so as to support a corner (44F) of the box.
8. A box corner forming apparatus according to claim 7 characterized in that the actuating means comprises at least one cam (36), at least one follower (39) being carried on each cheek plate for following the cam and biasing means (34) for biasing the followers against a camming surface of the cam, with the cheek plates and spacers being arranged to rotate relative to the cam.
9. A box corner forming apparatus according to any one of the preceding claims characterized in that the folding means comprises a folding unit (40) carrying a pair of stationary folding plates (42), and the pocket defining elements are arranged to be rotated past the folding plates for allowing the at least one side flap (44E) to be folded down.
10. A box corner forming apparatus according to any one of claims 6 to 8 characterized in that the carousel comprises a drying drum (10) for sealing opposed flaps of prismatic hinge lid packs (11A), the drying drum being arranged to receive in series partly formed packs (11A) from a pack transfer station (11B).
11. A box corner forming apparatus according to claim 10 characterized in that the pack transfer station (11B) is located adjacent the actuating means (36, 39), with the partly formed packs (11A) being arranged to be transferred into the pockets when the cheek plates (28, 28A) are in the advanced position.
12. A method of forming a non-rectangular corner (44F) in a box characterized in that it comprises the steps of:
 - a) providing a partly formed box (11A) having opposed walls (27A, 27B) and at least one projecting side flap (44E);
 - b) feeding the partly formed box into a pocket (12) defined by a pair of spacers (14, 16), with opposed walls of the box abutting against planar faces (24, 26) of the spacers;
 - c) folding the side flap down (44E) along corner formations (45A) defined between at least one of the opposed walls and a side flap so as to form a corner; and
 - d) supporting and maintaining the shape of the corner (44F) as it is being formed.
13. A method of forming a non-rectangular corner in a box according to claim 12 characterized in that the shape of the corner (44F) is maintained by cradling an operatively outer surface of the corner with a complementally profiled concave edge (47).
14. A method of forming a non-rectangular corner in a box characterized in that it comprises the steps of forming a plurality of striations (45A) in a blank of the box between first and second walls (44B, 44E) of the box, partly folding the first and second walls towards one another so as to define a first corner (44F), and supporting an operatively outer surface of the corner as it is being formed with a complementally profiled concave corner edge (47).
15. A method of forming a non-rectangular corner according to claim 14 characterized in that the blank includes a third wall (44E) adjacent the second wall and divided therefrom by a plurality of striations (45A), the second wall comprising a front wall (27B) and the first and third walls comprising side flaps (44E),

and the method including the steps of folding the side flaps towards one another so as to define first and second corners (44F), and supporting the operatively outer surfaces of the corners as they are being formed with complementally profiled concave corner edges (47).

- 5 **16.** A method according to claim 15 characterized in that the blank includes an end wall (27C) extending from the second wall and an opposed rear wall (27A) extending from an opposite edge of the end wall, and the method includes the step of folding the front and opposed rear walls towards one another to a position in which they are parallel to one another, so as to partly form a box, and inserting the partly formed box into a pocket-defining formation (12), with opposed parallel surfaces (24, 26) of the pocket-defining formation abutting the outer surfaces of the front wall and the opposed rear wall.
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- 17.** A method according to claim 16 characterized in that the blank includes an opposed pair of side flaps (44C) extending laterally from the opposed rear wall, and separated therefrom by a plurality of striations (45A), and the method includes the step of folding the opposed side flaps towards the front wall prior to insertion of the partly formed box into the pocket, so as to define third and fourth corners (44A), and supporting the operatively outer surfaces of the third and fourth corners during or after the formation thereof by means of complementally profiled concave corner edges (47).
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- 18.** A box (27) characterized in that it is formed in accordance with any of the method claims 12 to 17 of the invention.
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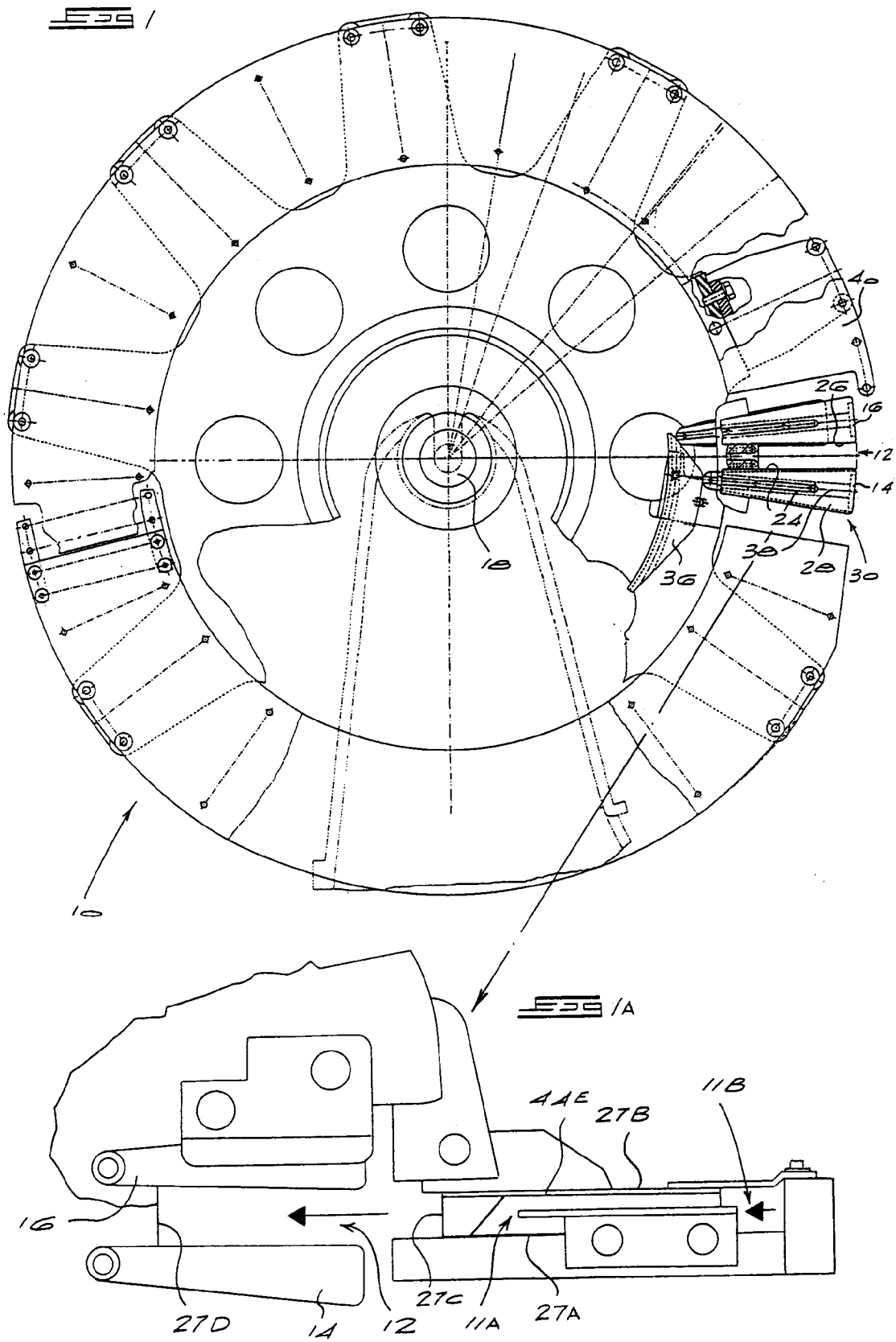
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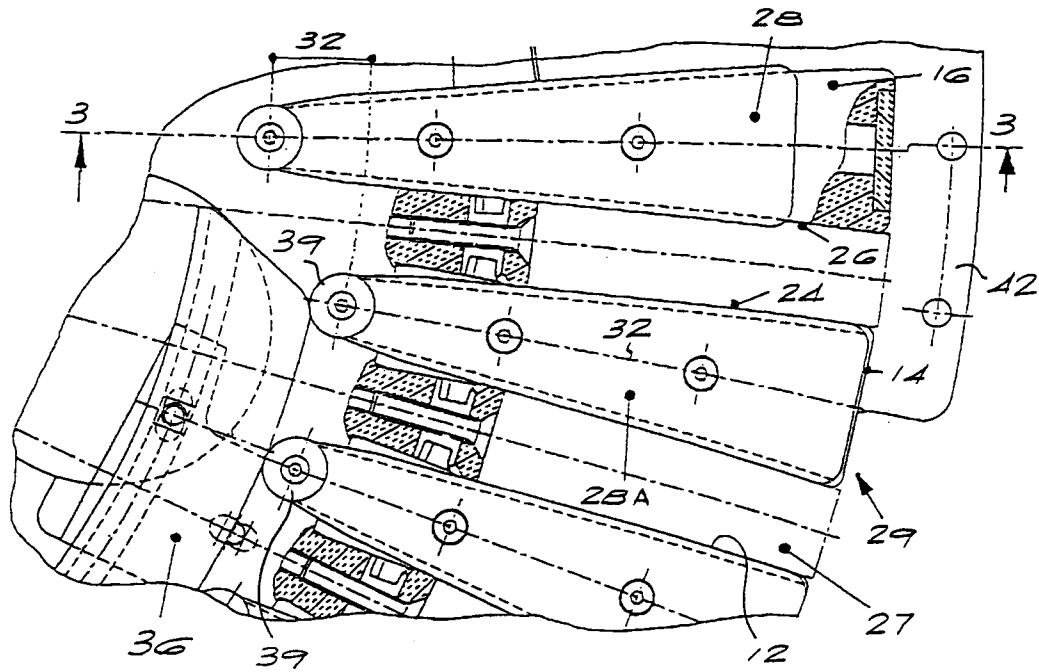


FIG 2

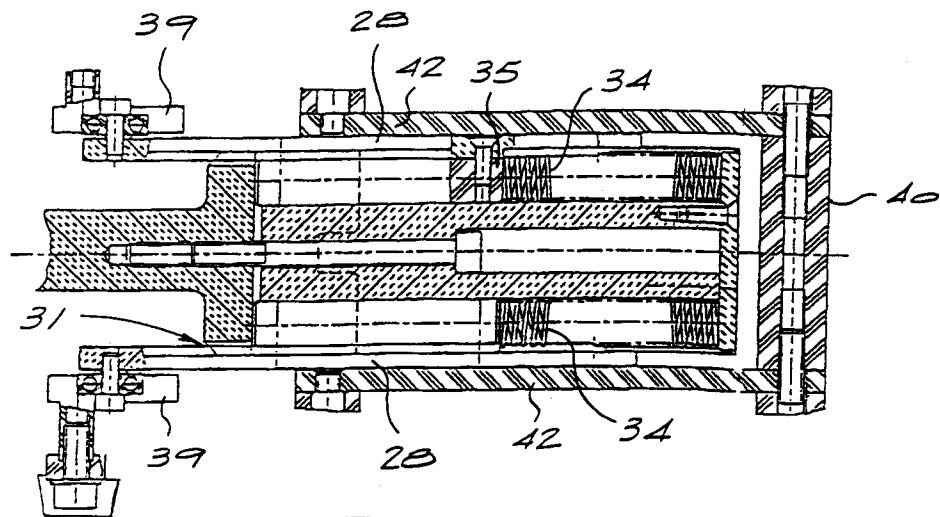
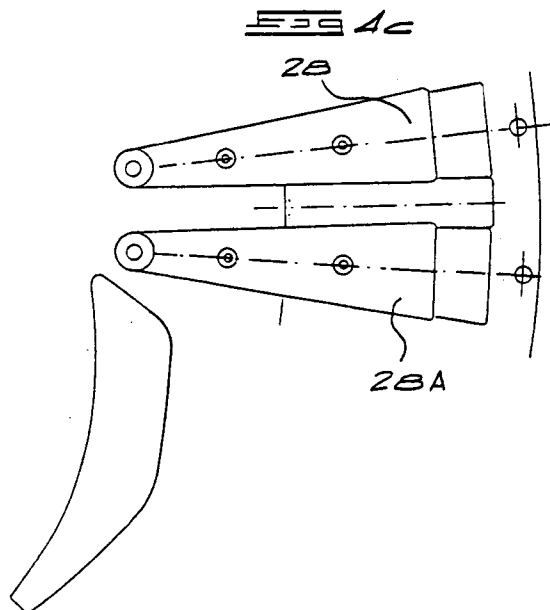
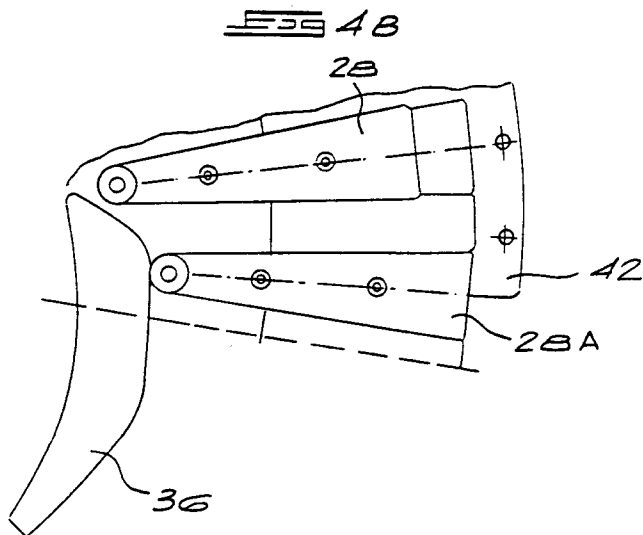
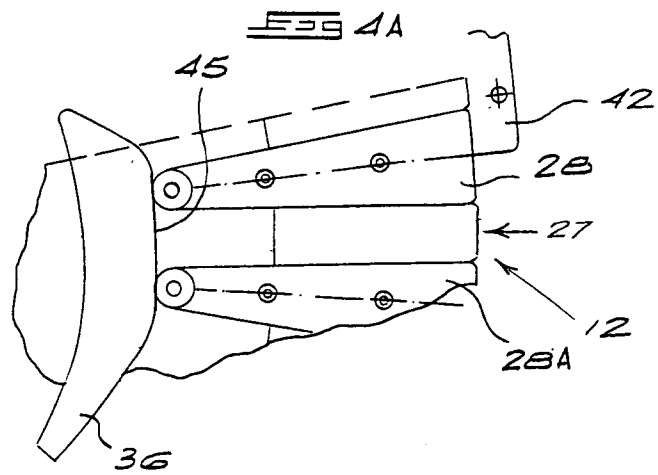
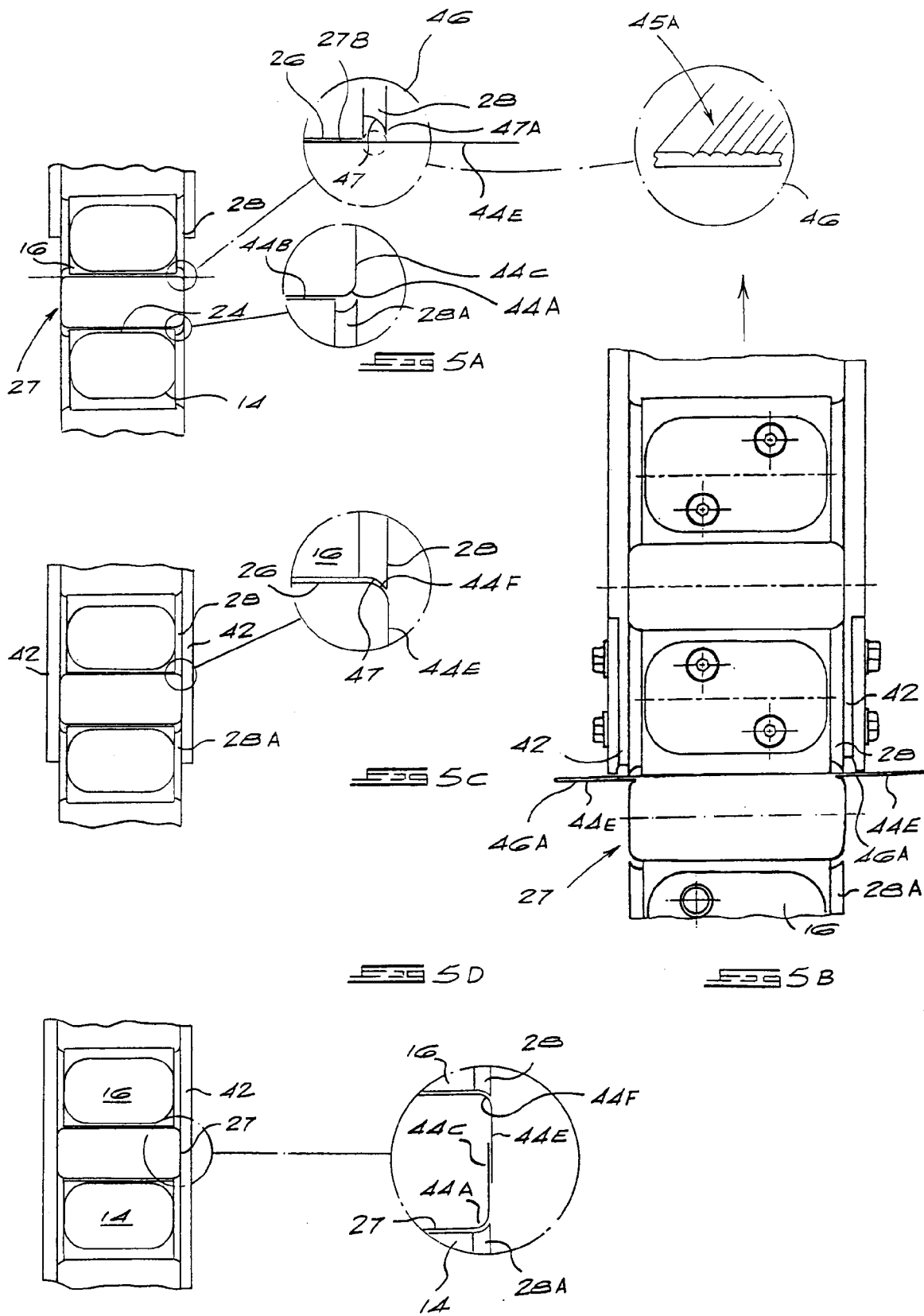


FIG 3







European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 8153

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 205 894 (FÖCKE & CO) 30 December 1986	1-5, 12-18	B31B3/00 B65D85/10
A	* abstract; figures * ---	8-10	
A	GB-A-2 091 162 (WILKINSON SWORD LTD) 28 July 1982 * figures 15,16 *	1,12,18	

A	EP-A-0 414 532 (TOBACCO RESEARCH & DEVELOPMENT INSTITUTE LTD) 27 February 1991 * figures 6-9 *	1,12,18	

A	DE-A-36 24 345 (B.A.T. CIGARETTENFABRIKEN GMBH) 28 January 1988 * figures * -----	18	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B31B B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 February 1995	Examiner Pipping, L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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