(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 691 274 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.01.1996 Bulletin 1996/02

(51) Int. Cl.[6]: **B65B 63/02**, B65B 25/14

(21) Application number: **94202715.2**

(22) Date of filing: **21.09.1994**

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **08.07.1994 IT TO940562**

(71) Applicant: **SCOTT PAPER COMPANY**
Philadelphia, PA 19113 (US)

(72) Inventor: **Sarchi, Giulio**
I-12024 Costigliole Saluzzo (Cuneo) (IT)

(74) Representative: **Robba, Eugenio et al**
I-10129 Turin (IT)

(54) Apparatus and method for packaging compressed paper rolls wound on cores

(57) Apparatus and method for packing or packaging togheter rolls of paper that are wound on a core and compressed. The apparatus comprises a device (32) for carrying out a first continuos and progressive compression of each roll (1-5), and a second compressing device (36) receiving layers of compressed rolls and wherein a bundle is formed, which device subsequently carries out a further compression either of the whole bundle of rolls, or of a layer thereof at a time.

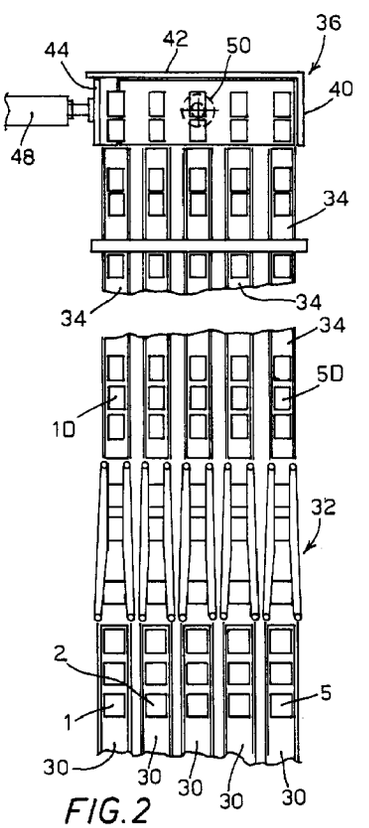


FIG.2

EP 0 691 274 A1

Description

The present invention relates to an apparatus and a method for packing or packaging together a number rolls of papers or paper-like material wound onto a core, which rolls are squashed or laterally compressed in order to reduce their overall bulk.

More particularly, such packaging is accomplished by wrapping with a plastic or paper film the rolls that have been compressed and deformed to reduce their dead space resulting from both the hollow cylindrical cores on which the rolls are wound, and from the voids created when the cylindrically shaped rolls are disposed side by side.

More particularly, the present invention is concerned with packages wherein the rolls are toilet paper rolls or similar articles, and are arranged in two or more layers.

The known packages of a plurality of toilet paper rolls or the like, having a cylindrical (i.e. not deformed) shape, are formed by placing a given number of rolls side by side, in lateral contact and with their axes parallel, to form a so called layer. A layer can comprise a single row of rolls or two or more rows of rolls located one behind the next.

A single layer, for example made up by two rows each comprising 5 rolls, can be encased into a plastic material sheet to form a package containing 10 rolls in total.

Another kind of known package consists of two or more layers of rolls placed one on the top of the other, forming the so called "bundle" which is then wrapped.

It has been long recognized that the hollow space inside the core (of cardboard or other suitable material) on which rolls are wound, as well the substantially circular shape of the core, cause a relevant increase of the package size. Such increase originates directly from the inner hollow space of the cores and indirectly from the unfilled spaces between the adjacent cylindrical rolls.

It has been suggested to radially compress or deform the rolls, thereby permanently deforming their cores also, thus obtaining "rolls" with a substantially elongated oval, or almost parallelepipedal shape that allows for a higher packaging efficiency and a better exploitation of the space. Once the rolls are pulled out from the package, they can be brought back to a reasonably cylindrical configuration before use, partially thanks to their spontaneous elastic recovery, and partially by means of a proper manual action.

As an example, WO 93/04966 discloses an article formed by a paper web wound around a core to form a roll that is then compressed and flattened, and retained in the deformed state by a band or other individual constraint.

EP-A-0 392 581 discloses in particular a packaged product, formed by a plurality of such flattened articles, disposed side by side to form a layer and encased in a sheet or film of plastic material.

Italian Patent N. 1 177 749 discloses a method for deforming individual paper rolls wound on a core, and wrapping them in a heat-shrinkable material sheet which is heated for shrinking around the article.

US-A-5 195 300 discloses a method and an apparatus for packaging a plurality of paper rolls that are in a compressed state, and provides for a progressive and continuous compression of the individual rolls, their subsequent 90° rotation about a vertical axis, and then the bunching of the rolls with an additional compression and their introduction into a plastic material tube which is then sealed at its ends.

US-A-4 679 379 relates to an apparatus for packaging a bundle of paper rolls by compressing the whole bundle and wrapping it into a heat-shrinkable material sheet.

The deformed rolls are arranged to form a layer, as defined above, formed by one or more rows with each row comprising two or more deformed rolls.

Thus a significant space saving can be obtained along two directions, however with the increase of the number of the rolls, the known packages tend to become considerably wide.

The known methods and apparatuses for packaging rolls that are in a flattened or compressed state are not capable to produce packs or packages formed by two or more layers, i.e. with rolls stacked one over the other along the "short" dimension resulting from the roll compression. This substantially limits the advantages achieved with the roll deformation since the packages with a parallelepipedal shape with small difference among their three dimensions, that is packages close to a cube, are quite convenient, particularly to big consumers, such as communities, public concerns, etc.

The object of the present invention is to overcome the above described drawbacks and limits of the prior art.

This object is achieved through the present invention that consists of an apparatus for packaging compressed paper rolls wound on cores and arranged to form two or more layers in a plastic or paper material film, characterised in that it comprises:

first conveying means for parallely advancing a plurality of cylindrically-shaped paper rolls;

a first device for continuously and progressively compressing each individual roll;

second conveying means, adjacent to said individual compressing device, for parallely advancing said plurality of compressed rolls, arranging them in layers;

a second compressing device receiving said layers of compressed rolls for forming the bundle therein, and compressing at least one layer of rolls at a time;

means for wrapping the bundle with said plastic or paper film.

The invention further consists of a method for packaging compressed paper rolls wound on cores in a plastic or paper film, wherein said rolls are advanced side by side along parallel paths, with each roll undergoing a first progressive and continuous compression, characterised in that:

said compressed rolls are disposed side by side to form a first layer o a first layer portion;

at least two of said layers or layer portions are stacked to form a bundle;

said bundle is further compressed before being wrapped with said film.

Additional advantageous features are the objects of the dependent claims.

The invention will be now described with reference to the accompanying drawings illustrating preferred but not limiting embodiments of the invention, in which:

Fig. 1 schematically shows the compression and packaging of rolls according to the invention;

Fig. 2 is a schematic plan view showing with more details a packaging apparatus according to the invention;

Fig. 3 is a perspective schematic view of an embodiment of the second compressing device according to the invention;

Figs. 4A to 4H illustrate, as a cyclic sequence, the steps of the the method according to the invention for obtaining a package made up by two layers of compressed rolls, using a modified embodiment of the second compressing device;

Figs. 5A and 5B illustrate, as a cyclc sequence, another embodiment of the method according to the invention for obtaining a package made up by compressed rolls disposed on two layers.

For an easier explanation, equal or similar references will be used for components equal or similar through all the Figures.

First referring to Figs. 1 and 2, a plurality of paper rolls 1, 2, 3, 4, 5, wound on cores 6, are advanced laying on their side i.e. with their longitudinal axis disposed horizontal, on (first) conveying means 30 after being supplied from a roll store (not shown). In the illustrated example, the conveying means comprises a movable belt or carrier 30, provided of suitable lane dividers or separating members, being of course possible to employ a plurality of individual belts or carriers disposed side by side. Moreover, there can be provided more than the five paper rolls illustrated in drawings only as an example, such rolls being typically obtained by cutting a very long cylindrical roll, known as a log.

The rolls are then transferred to a device 32 carrying out a continuous compression of each individual roll. Such compression will be referred to as the first compression. One component of the compressing device 32 is shown with a somewhat greater detail in Fig. 1. The description which follows will generally refer to a single roll, being evident that such disclosure applies to all the other rolls 1 to 5 (or more), since the treatment of each roll is the same.

Referring more particularly to Fig. 1, the rolls are then accumulated along one or two or more rows to form a layer, and two layers 10 and 11 formed in the afore described way are stacked in a wrapping machine to form the bundle in its final configuration. Then the bundle undergoes a further or second compression, immediately before being wrapped with a plastic or paper material film 13. In the example shown in Fig. 1, a layer is formed of three axially aligned rows, each row being formed by five rolls.

Advantageously the continuous compressing device 32 comprises, for each parallel conveyor of an individual roll, a pair of endless conveyor belts 21, 22, horizontally disposed and movable between two pairs of rolls, that is two front rolls 25 and two rear rolls 26, respectively. Additionally, in a first section, the passage width or distance between belts 21 and 22 becomes progressively narrower, with the belts forming a sort of funnel where the roll 1 is progressively compressed while being advanced, so as to impart a substantially elliptical shape to the roll.

The continuously compressing device 32 further provides a second section having a constant width, where the compressed roll is advanced with its longitudinal axis horizontal and the longer axis of the elliptical section vertically disposed. Preferably, the device 32 is not provided with a bottom member (such as a belt or other sustaining surface) where the rolls can rest since belts 21 e 22 ensure the correct advancing thereof.

At least one roll for each belt is motor-driven, and the belts are fitted with a transverse adjusting feasibility.

Shims 27 and 28 are disposed inside the belt paths and preferably each compressing path comprises, as above mentioned, a first section having a progressively decreasing width, followed by a second section of constant width and equal to the minimum spacing of the first section.

After the above first compression, the compressed rolls 1D-5D are moved to a second conveying means, generally indicated with 34, to be subsequently directed to a pneumatic compressing device indicated with 36. Preferably the second conveying means too comprises a single carrier or belt provided with divider members, or alternatively a plurality of adjacent belts. In such device, also referred to as second compressing device, the compression takes place while the rolls are stationary, and the device operates at the same time on a plurality rolls disposed side by side, and a second compression is imparted them such as to remove the remaining dead space within the hollow cores 6. After this second compression, the rolls assume their final flat configuration.

A blade or bar 38 is provided between the first compressing device 32 and the second compressing device 36, and is cyclically operated upwardly and downwardly by conventional means not shown in the drawings. Thus the bar 38 causes the sequential advancing of a predetermined number of rolls over each conveyor. In the embodiment shown in Fig. 2, two rows of rolls are moved into the second compressing device 36 one after the other.

The compressing device 36, better shown in Fig. 3, has a substantially parallelepipedal shape and comprises a board or a baseplate 46, that is vertically moveable by a pneumatic cylinder 50 or similar device, two fixes vertical walls 40 and 42, adjacent and normal to one another, and a vertical wall 44, horizontally movable

along both directions, and actuated by a pneumatic cylinder 48 or similar device. One side of the device 36 is open for receiving the incoming rolls, and the top of the device is open for extracting the formed bundle.

With particular reference to Fig. 3, a layer of rolls comprising two rows of five rolls, is pushed into the device 36 by the conveyors 34. After their deposition on the baseplate, the rolls are further compressed by the side wall 44 moving toward the wall 40 under the action of the cylinder 48. At the end of such compressing step, the cylinder 50 lifts the roll assembly or bundle toward a wrapping device (not shown) that will encase the rolls into a plastic or paper material film 13 (Fig. 1).

Referring now to Figs 4A to 4H, there is illustrated the method (and the related apparatus) according the present invention for obtaining a package of compressed rolls arranged on two layers.

In this embodiment of the invention, the second compressing device (indicated with 36A in Fig. 4A) provides for two parallel and pneumatic cylinders disposed one above the other, respectively 48 and 52, and a movable wall 44A made up by two parallel and adjacent plates 47, 51, each being fixed to the piston rod of the related cylinder. According to this embodiment, a portion of the working plan 54 of the apparatus frame is used as a supporting surface for the outermost roll adjacent to the movable wall. In other words, in the retracted position of cylinders 48, 52, the plates 47 and 51 are sligthly spaced from the edge of the plate 46, and the roll partially rests upon the plane 54.

Still referring to Figs. 4a to 4H, the compressing cyclic operating sequence is as follows.

At the start cylinders 48 and 52 are both completely retracted, cylinder 50 is lowered at a position such that the bottomplate 46 is flush with the level of the frame working surface 54 (Fig. 4A).

Then the partially compressed rolls of a layer are introduced (fig. 4B), and thereafter both cylinders 58 and 62 are extended, with the plate 47 of the lower cylinder 48 further compressing the rolls of the layer (Fig. 4C), up to a position where the layer completely rests on the board 46 only.

The cylinder 50 is then actuated to lift the board 46 and raise the first layer of compressed rolls to the plate 51 level (Fig. 4D).

Now the board 46 is lowered and the row of rolls is retained between the plate 51 and the fixed wall 40. The lower cylinder 48 is retracted (Fig. 4E) to make room to a second already partially compressed layer of rolls, which rolls are delivered at the working surface level, with the outermost roll resting on such surface (Fig. 4F).

Then also the second layer of rolls is compressed by the extraction of the lower cylinder 48 (Fig. 4G) up to a point where all the rolls of the second layer rest on the base board 46 only.

The board 46 is then lifted by cylinder 50 to a second level, such as to raise both compressed layers above plates 47 and 51. The two layers are kept in a compressed state by a pair of properly spaced fixed plates 52 and 53, during the wrapping with the material 13.

Referring now to Figs 5A and 5B, there is illustrated a second method (and the related apparatus) for stacking two layers of rolls one above the other.

In this embodiment, the conveyor belt device 34 has been modified so as to include three consecutive and adjacent sections. The first section 34A is horizontal and similar to the one provided in Fig. 2 at the end of the first compressing device 32. A second portion 34B is provided adjacent to section 3A and is formed by a pivotable conveyor, hinged at the end 35 proximate to the first section, that can be upwardly inclined with respect to the plane of the fixed section. The section 34B includes a pair of chains 37 driven by two rotating crown gears 39, (only one being shown in the Figures).

A transverse bar 38A is fixed with both ends to the chains 37 and pushes two rows of rolls 41, 43 onto a third horizontal section of the conveyor indicated at 34C.

Referring to Fig. 5A, the pivotable conveyor forming the section 34B is in a horizontal position when the first layer of rolls 41, 43 is pushed and deposited onto the conveyor 34C by the bar 38A.

Subsequently, as shown in Fig. 5B, the pivotable conveyor 34B is rotated upwardly so that the bar 38A pushes the subsequent roll layer 45, 49 to superimpose itself to the previously delivered one (as indicated in broken lines).

The so formed bundle is introduced into a compressing device such as that already shown by Fig. 3, that carries out the second compression of all the layers at the same time, after which the bundle is wrapped by a plastic packaging material.

Although the invention has been described with particular reference to preferred embodiments and to a specific use thereof, the invention is not to be limited to what has been illustrated, but it is extended to cover all the evident variations, changes and applications that will be evident to the skilled in the art.

Claims

1. An apparatus for packaging compressed paper rolls (1-5) wound on cores (6) and arranged to form two or more layers (10, 11) in a plastic or paper material film (13), characterised in that it comprises:

   first conveying means (30) for parallely advancing a plurality of cylindrically-shaped paper rolls (1-5);

   a first device (32) for continuously and progressively compressing each individual roll (1-5);

   second conveying means (34), adjacent to said individual compressing device (32), for parallely advancing said plurality of compressed rolls (1D-5D), arranging them in layers;

   a second compressing device (36) receiving said layers of compressed rolls for forming the bundle therein, and compressing at least one layer of rolls at a time;

means for wrapping the bundle with said plastic or paper film (13).

2. An apparatus according to claim 1, characterised in that said first conveying means (30) comprises at least one carrier or conveyor belt.

3. An apparatus according to claim 1 or 2, characterised in that said first compressing device (32) comprises, for each parallel carrier or conveyor belt (30) of an individual roll, an advancing path having a progressively narrowing width.

4. An apparatus according to claim 1 to 3, characterised in that said advancing path comprises a pair of conveyor belts (21, 22) each belt being arranged vertically and movable between a pair of rolls (25, 26), the distance or spacing between said belts (21, 22) being progressively narrower.

5. An apparatus according to claim 4, characterised in that at least one roll for each belt is motor-driven, and the belts (21, 22) are fitted with a transverse adjusting feasibility.

6. An apparatus according to claim 4 or 5, characterised in that shims (27, 28) are located within the belt paths.

7. An apparatus according to claims 4 to 6, characterised in that said first compressing device (32) further comprises a second section (21, 22, 26, 28) of constant width.

8. An apparatus according to claims 1 to 7, characterised in that said second conveying means (34) comprises at least a conveyor belt or a carrier.

9. An apparatus according to claim 8, characterised in that said second compressing device (36) has a substantially parallelepipedal shape and comprises a board or baseplate (46), vertically movable under the action of a first pneumatic cylinder (50), two fixed vertical walls (40, 42) that are disposed adjacent and normal to each other, and at least one vertical wall (44), horizontally movable along both directions under the action of a second pneumatic cylinder (48).

10. An apparatus according to claim 9, characterised in that said second compressing device (36A) provides for a movable wall (44A) formed by two parallel and adjacent plates (47, 51), independently actuated by two pneumatic cylinders (48, 52) that are parallel and superimposed one another.

11. An apparatus according to claim 9, characterised in that said second conveying means (34) comprises three adjacent and consecutive sections, namely a first section of horizontal conveyor (34A), a second section (34B) formed by a pivotable conveyor that can be inclined upwardly around a pivoted end (35), and a third section formed by a horizontal conveyor (34C).

12. An apparatus according to claim 11, characterised in that said second section (34B) comprises a pair of chains (37) driven by two rotating crown gears (39).

13. An apparatus according to claim 10, characterised in that a bar (38) is located between the first compressing device (32) and the second compressing device (36), said bar being cyclically operated upwardly and downwardly for allowing the sequential passage of a predetermined number of rolls on each belt or carrier.

14. An apparatus according to claim 12, characterised in that is comprises a transverse bar (38A) having its ends fixed to the chains (37) of said pair, for pushing two or more rows of rolls (41, 43) onto said third conveyor section (34C).

15. A method for packaging compressed paper rolls (1-5) wound on cores (6) in a plastic or paper film (13), wherein said rolls (1-5) are advanced side by side along parallel paths, with each roll undergoing a first progressive and continuous compression, characterised in that:

said compressed rolls (1D-5D) are disposed side by side to form a first layer o a first layer portion (10);

at least two of said layers (10) or layer portions are stacked to form a bundle;

said bundle is further compressed before being wrapped with said film.

16. A method according to claim 15, characterised in that said second compression of the bundle is carried out for a layer at a time.

17. A method according to claim 15, characterised in that said compression of the whole bundle is accomplished as a single operation.

18. A method according to claim 16, characterised in that said bundle is formed by lifting a layer that has been compressed to its final state, thus creating an underneath space for receiving a next layer of rolls.

19. A method according to claim 17, characterised in that said bundle is formed by stacking layers of rolls that have been subjected to said first compression.

20. A package of paper rolls wound on cores and compressed, arranged on two or more layers, obtained

through the method according any one of claims 15 to 19.

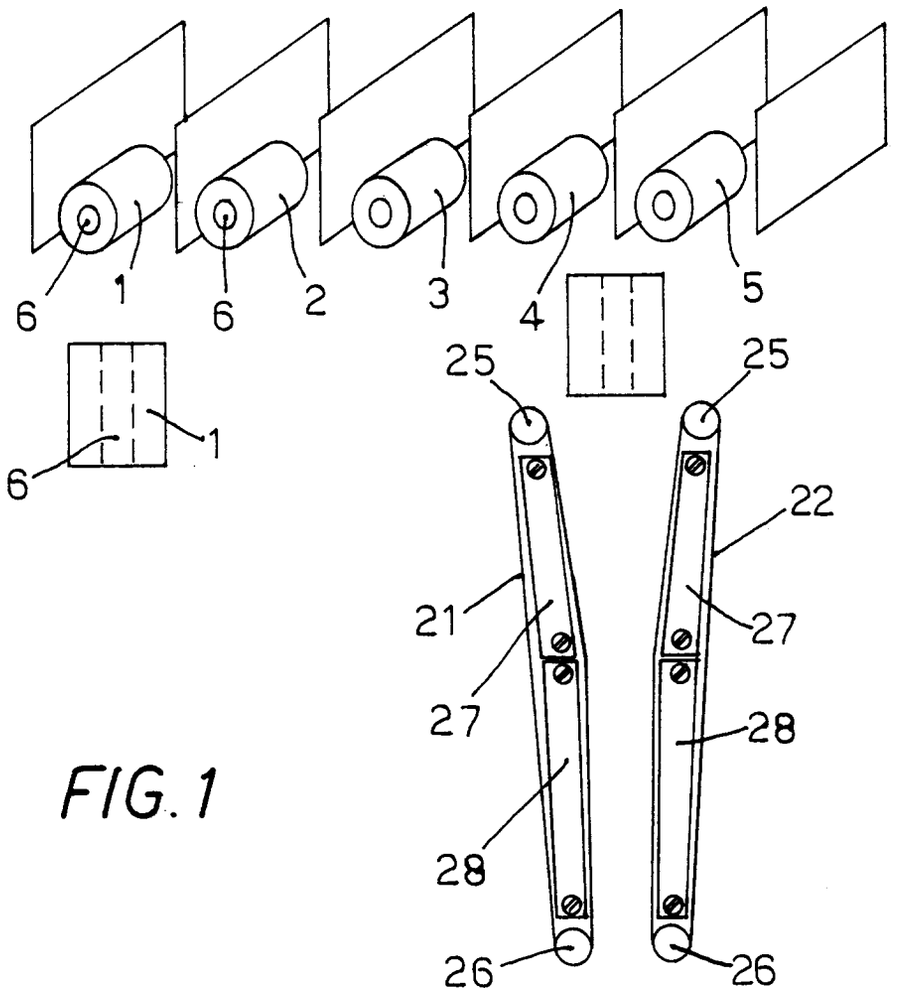
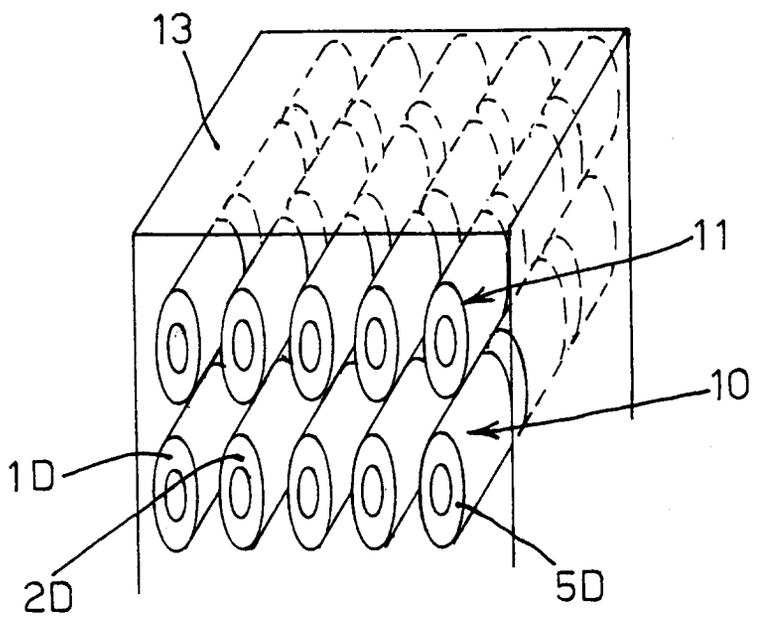


FIG. 1



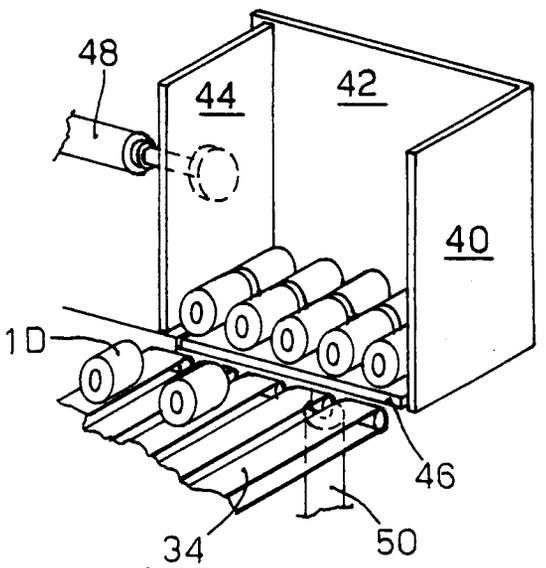

48
44
42
40
1D
46
34
50

FIG. 3

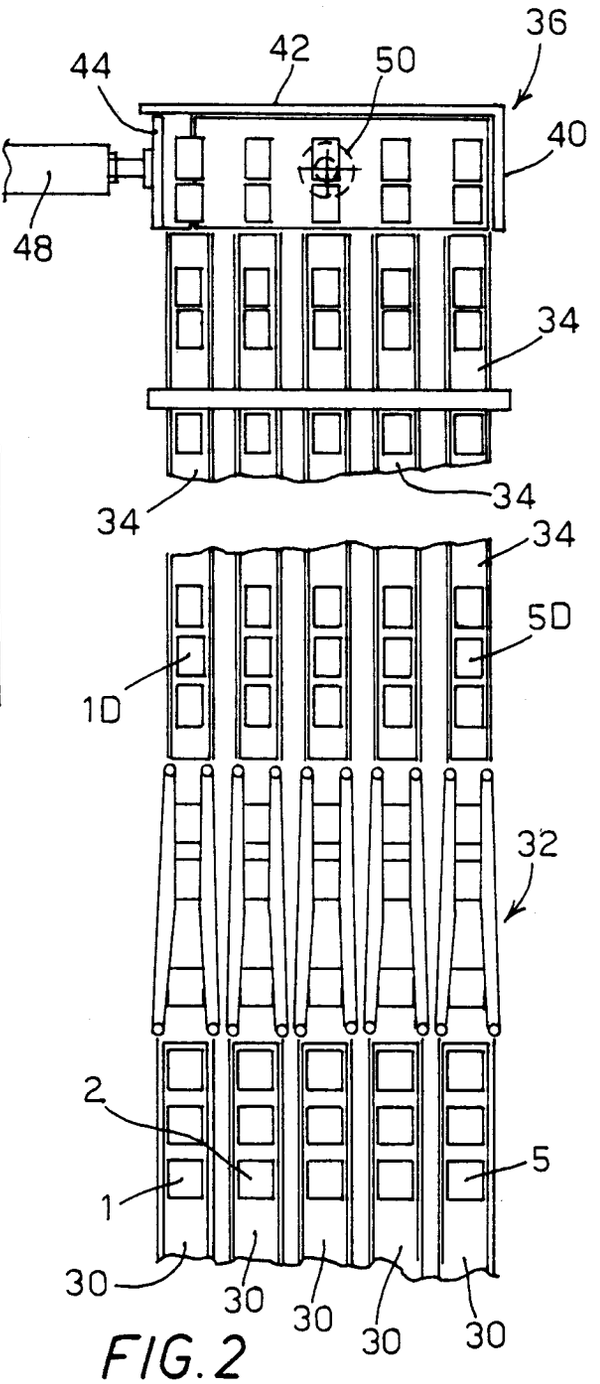

36
42
44
50
40
48
34
34
34
34
5D
1D
32
2
5
1
30
30
30
30
30

FIG. 2

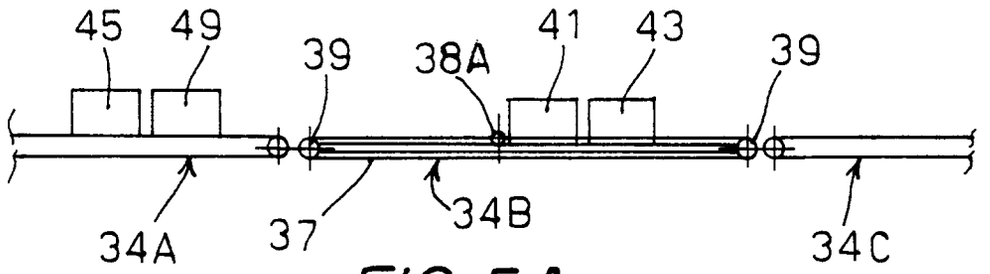


FIG. 5A

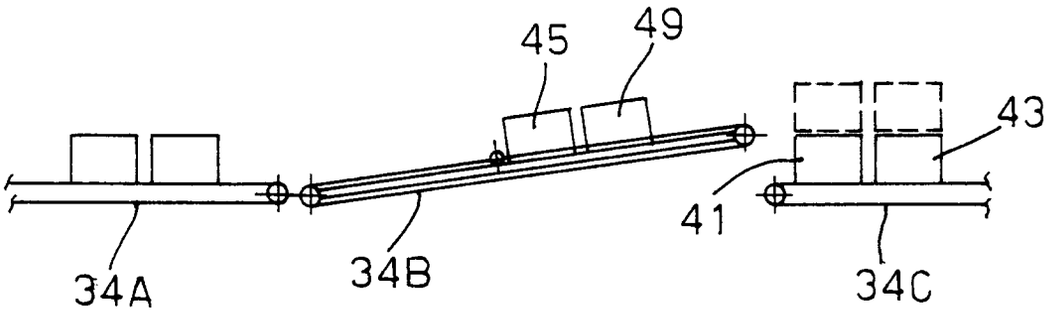


FIG. 5B

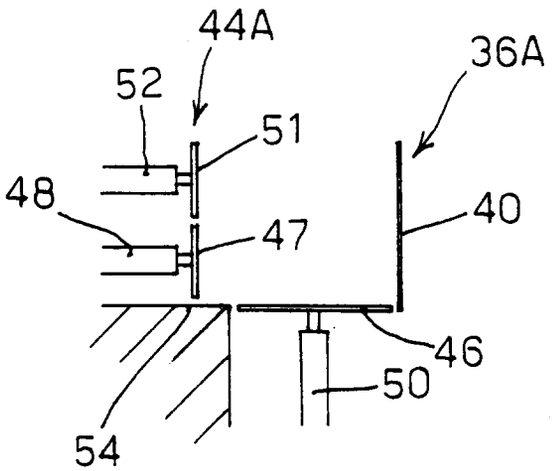


FIG. 4A

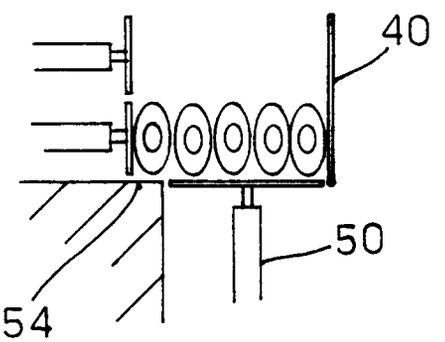


FIG. 4B

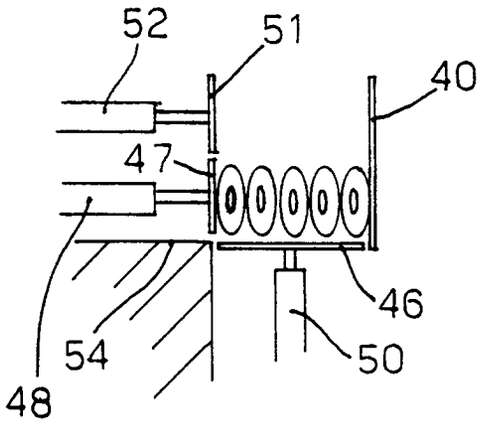


FIG. 4C

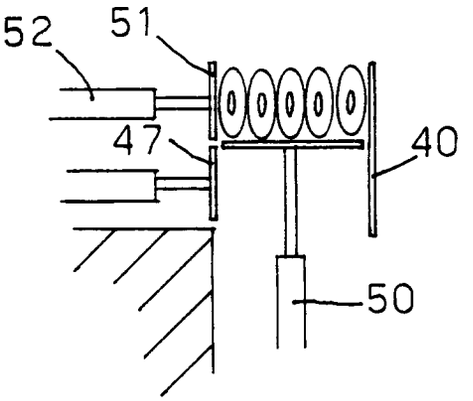


FIG. 4D

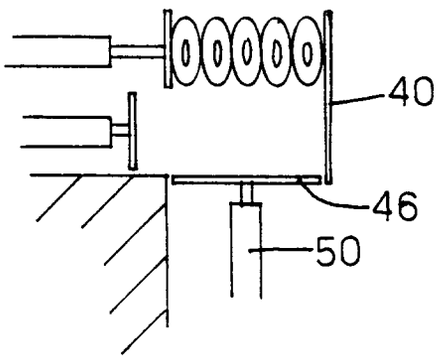


FIG. 4E

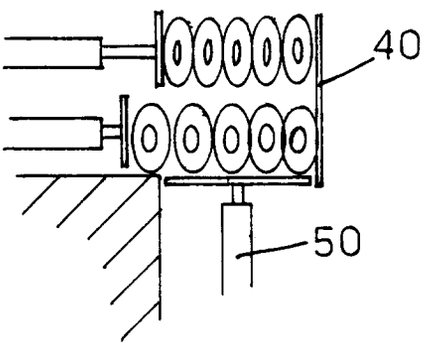


FIG. 4F

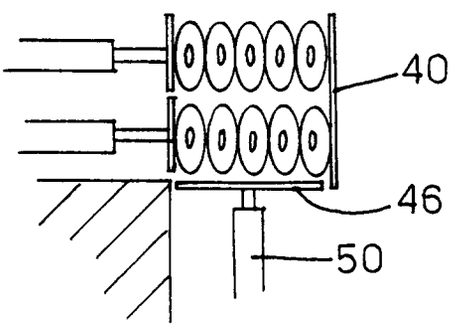


FIG. 4G

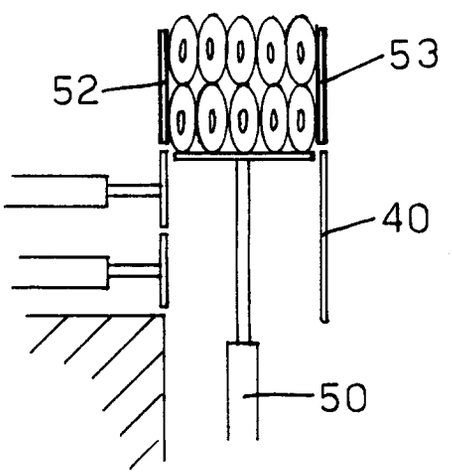


FIG. 4H

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 20 2715

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)
Y	FR-A-1 370 450 (INTERNATIONAL MACHINERY)	1,3,4, 15,17-20	B65B63/02 B65B25/14
A	* page 2, column 1, line 52 - page 3, column 2, line 6; figures 1-8 *	9	
D,Y	US-A-5 195 300 (HAYSSEN)	1,3,4, 15,17-20	
	* column 3, line 35 - line 54; figure 1 *		
Y	US-A-2 962 848 (WILSON) * the whole document *	3,4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 November 1995	Claeys, H

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

EPO FORM 1503 03.82 (P04C01)