Title: SYSTEM FOR PACKAGING CIGARETTES INTO BENT SHEETS EQUIPPED WITH ELECTRONIC CONTROL MOTORS

Abstract: A system (1) for packaging cigarettes (4) into bent sheets is described, comprising at least one first electric motor adapted to operate means for supplying (3) cigarettes (4); at least one second electric motor (35) adapted to operate means for supplying (5) packaging sheets (6); at least one third electric motor (36) adapted to operate rotary collecting means (7) for cigarettes (4), supplied by the means for supplying (3) cigarettes (4), the means for collecting (7) cigarettes (4) being equipped with a plurality of elongated containers (9) adapted to house the cigarettes (4) supplied, the containers (9) being operatively connected to the means for collecting (7) cigarettes (4) so that a longitudinal axis (LL) thereof is parallel to a rotation axis (RR) and perpendicular to a plane of the collecting means (7); at least one fourth electric motor (37) adapted to operate packaging means (11), located downstream of the collecting means (7), and adapted to receive the sheets (6) from the means for supplying (5) sheets (6) and to place the sheets (6) onto containers (9) so that the plane of the sheets (6) is orthogonal to the longitudinal axis of the cigarettes (4); at least one fifth electric motor adapted to operate means for keeping packaging sheets (6) onto containers (9), after the sheets (6) have been placed onto the containers (9); at least one sixth electric motor (39) adapted to the sheets (6) having inside the cigarettes (4), operatively cooperating...
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(b))
SYSTEM FOR PACKAGING CIGARETTES INTO BENT SHEETS
EQUIPPED WITH ELECTRONIC CONTROL MOTORS

The present invention relates to a system for packaging cigarettes into bent sheets equipped with electronic control motors.

Currently, to achieve the packaging of cigarettes, they must be wrapped within packaging sheets of various types, according to a wrapping direction transverse to the motion of the cigarettes, motion which allows placing the cigarettes in proper containers to wrap them in desired numbers for subsequent downstream insertion in boxes of various shapes and sizes.

For example, the technical field has therefore proposed various systems, such as those described in documents US-A-4603534 and IT-A-1854726, which specifically concern the presence of containers transverse to the motion of the cigarettes forming a "U" as the packaging sheet wraps the actual cigarettes. Such systems, however, are composed of a large number of components cooperating with each other making them expensive, bulky and difficult to
be configured in case of variations of packaging characteristics to be made.

In EP0553636, EP0970887, EP1616794, EP1780127, EP1832516, JP50322219, US4887408, US4584816, US4559758 and GB1425009, are described however other systems for packaging cigarettes in bent sheets having in common at least two wheels cooperating to join both cigarettes and the relative packaging sheet. The presence of two or more wheels, contributes to make these systems highly complex and bulky.

In general however, the known packaging systems have means for moving the various component parts which are substantially mechanically operated, such as an oil bath type, which have little flexibility in use and configuration.

Therefore, the purpose of the present invention is to solve the aforesaid problems of prior art by providing a system for packaging cigarettes in bent sheets equipped with electronic control motors, which is flexible and immediately adaptable to different end-use configurations, providing a fully electronic solution for moving the system, thereby allowing to achieve, for example, intermittently moving and advancement solutions
without the use of complex mechanical solutions, but simply providing an electronic movement of various axes, with obvious advantages of immediacy and a wide range of different possible solutions.

In fact, such electronically controlled electric motors allow for high flexibility where special bends in one direction or the other are needed to be made (bending points shifting); and further, when you turn off a motor for various reasons, the others may remain on, which allows clearing of the line in case of stalls. The fact of avoiding mechanical components (for example of the oil bath-type) permits to avoid jamming of the components themselves, which are sensed by the system only too late when overloaded. Instead, the presence of an electric motor that provides torque only when needed allows to directly and immediately detect the jam and the relative overload.

The aforesaid and other purposes and advantages of the invention, as embodied in the following description, are achieved with a system for packaging cigarettes in bent sheets as described in claim 1.
Preferred embodiments and unobvious variations of the present invention form the subject of the dependent claims.

It will be immediately obvious that countless variations and changes can be made to what is described (for example with respect to shape, size, arrangements and parts with equivalent functionality) without departing from the scope of protection of the invention as appears from the attached claims.

The present invention will be better described by some preferred embodiments, given as an example and without limitation, with reference to the attached drawings in which:

- FIG. 1 shows a front perspective view of a preferred embodiment of the system for packaging cigarettes into bent sheets according to the present invention;
- FIG. 2 shows another front perspective view of the system of FIG. 1;
- FIG. 3 shows a rear perspective view of the system of FIG. 1;
- FIG. 4 shows an enlarged view of other components of the system for packaging cigarettes into bent sheets according to the present invention,
FIG. 5 shows an enlarged view of other system components for packaging cigarettes into bent sheets according to the present invention,

FIG. 6 shows an enlarged view of other system components for packaging cigarettes into bent sheets according to the present invention; and

Figs. 7a to 7f shows a sequence of certain phases of the packaging by way of the system according to the present invention.

In reference to the Figures we can see that a preferred embodiment of system 1 covered by the present invention, system adapted for packaging cigarettes into bent sheets, includes:

- means for supplying 3 cigarettes 4;
- means for supplying 5 packaging sheets 6;
- means for (collecting 7) cigarettes 4, movable in an orthogonal direction to the axis of cigarettes 4 (for example rotating according to the direction indicated by arrow G in FIG. 1) and supplied by the means for supplying 3 cigarettes 4; in particular and advantageously, the means for collecting 7 cigarettes 4 are equipped with a plurality of elongated containers 9, preferably with a truncated pyramid shape, adapted to collect cigarettes 4 supplied by the supplying means 3, such containers
9 being operationally connected to the means for collecting 7 cigarettes 4 so that one of their longitudinal axis (as, for example, illustrated by axis L-L in FIG. 1) is parallel to the rotation axis (as, for example, illustrated by the axis R-R in FIG. 1) of said means for collecting 7 cigarettes 4, and perpendicular to a plane of such means for collecting 7 cigarettes 4;

- packaging means 11, operatively coupled and cooperating with the means for collecting 7 cigarettes 4, and adapted to receive the packaging sheets 6 by the means for supplying 5 packaging sheets 6 and placing such packaging sheets 6 onto the elongated containers 9 so that the plane of the packaging sheets 6 is orthogonal to the longitudinal axis of the cigarettes 4, so that, subsequently, the sheets 6 will be put in contact with the filter or the opposite end of cigarettes 4 inserted inside a respective elongated container 9;

- retaining means (not shown, but preferably achieved by way of mechanical tweezers or by way of forced air intake against the sheets 6) of the packaging sheets 6 onto containers 9, after such sheets 6 have been placed onto the same relative containers by the packaging means 11; and
- means for moving 13 packages 15 constituted by the sheets 6, having inside cigarettes 4, such moving means 13 operatively cooperating with the collecting means 7 for moving the same packages 15 downstream of the system 1 according to the present invention for carrying out further needed elaborations in order to complete the packaging of cigarettes 4: in particular, the moving means 13 are adapted to make an intermittent movement of the packaging 15 (a type of stop-hold progression), for example by at least one conveyor belt 21, to perform the appropriate and necessary bending of packaging sheets 6 by way of appropriate bending means 22 substantially known.

The intermittent motion is made preferably by a chain driven by a cam mechanism or a motor (not shown).

The above mentioned configuration of the inventive system is very flexible, in the sense that the collecting means 7 may be operatively located upstream with respect to the packaging means 11 (as in the preferred embodiment illustrated in the Figures) and the means for keeping the sheets 6, or may also be operatively located downstream with respect to the packaging.
means 11 and the means for keeping the sheets 6 themselves. In this second embodiment, not shown, the packaging sheet 6 is placed in a container 9 by the packaging means 11, and the cigarettes 4 are then inserted into the container 9 and therefore in the relative sheet 6.

Furthermore, referring in particular to the Figures, it can be seen that the collecting means 7 may be made of at least one wheel 8, defining the aforesaid plane, rotating around the rotation axis RR: peripherally and radially around the wheel 8 are preferably connected the elongated containers 9, each of which, cyclically rotating jointly with the wheel 8, is filled with the appropriate number of cigarettes 4 by the supplying means 3 and is covered with the relative packaging sheet 6 by the packaging means 11: in correspondence to the moving means 13, the package 15 is therefore removed from the container 9 which therefore may return towards the means for supplying 3 cigarettes 4 to begin a new cycle of packaging: as can be seen particularly from FIG. 3, to allow the removal of each package 15 from the respective container 9, once the latter has reached in correspondence to the moving means 13, the wheel 8, and in particular the container 9,
is preferably supplied with steps 17 to withdraw the packages 15 by way of pushing elements 19 placed, preferably upon at least one chain (not shown).

The means for collecting 7 cigarettes 4 could obviously be achieved in many equivalent ways, such as using a catenary wire (not shown) in the roto-translational motion of collecting and moving containers of cigarettes 4.

The collecting means 7 are made in such a way that, by means of the containers 9, only a part of or all the operations of collecting, tips control and possible rejection of cigarettes 4 can be performed. For example, in the second embodiment described above in which the packaging means 11 and the means for keeping the sheets 6 are located upstream of the collecting means 7, the tips control and rejection operation is done before inserting the cigarettes 4 into containers 9 with sheets 6.

Referring in particular to Figures 5 and 7a to 7f it can be noted that the packaging means 11 of the system 1 according to the present invention include:
- means for moving 23 at least one packaging sheet
6 arriving from the supplying means 5, the latter
preferably composed of at least one spool 25 of at
least one web 27 of such packaging sheets 6 and,
possibly, by cutting means for said web 27 into
individual packaging sheets 6 for feeding to the
means for moving 23 the packaging means 11; in
particular, the moving means 23 are realized as at
least one conveyor belt composed of two parallel
and mutually sliding belts 24 mutually parallel and
with synchronized and compliant movement, upon
which is placed the packaging sheet 6, between
which at least one free space is included;
- at least a first pushing means 29 adapted to move
the packaging sheet 6 from the moving means 23 to
the container 9; and
- at least a second pushing means 31, equipped as
necessary with at least one shaped presser element
33 adapted to press the packaging sheet 6 onto the
container 9 to give the sheet itself 6, the
external shape of the container 9.

Referring in particular to Figures 7a to 7f,
it is possible then to note that a possible
sequence of steps of operation of the packaging
means 11 is as follows:
- means for collecting 7 cigarettes 4, turning, carry cyclically the individual containers 9, previously filled with cigarettes 4 by the supplying means 3, in correspondence to the packaging means 11, and the moving means 23 carry at least a packaging sheet in correspondence to the container 9 (Fig. 7a);
- subsequently, the first pushing means 29, passing for example within the free space interposed between the sliding belts 24, remove the packaging sheet 6 from the moving means 23 keeping it in contact with the container 9 (Fig. 7b);
- subsequently, the second pushing means 31, possibly by way of the shaped presser element 33, presses the packaging sheet 6 upon the container 9, bending the same sheet 6 and shaping it on the external shape of same container 9 (Figs. 7c and 7d);
- subsequently, the second pushing means 31 (FIG. 7E) and the first pushing means 29 (FIG. 7f) are withdrawn, freeing the container 9 covered by its packaging sheet 6 appropriately bent and shaped. The means for collecting 7 cigarettes 4, turning once again, carry therefore the container 9 covered by its packaging sheet 6 towards the moving means.
13 and a new container 9 in correspondence with the packaging means 11, repeating the sequence of above described steps.

Referring to the Figures, it can be noted that the system 1 for packaging cigarettes into bent sheets described above includes, for achieving the aims according to the invention:

- at least one first electric motor (not shown) adapted to operate the means for supplying 3 cigarettes 4;
- at least one second electric motor 35 adapted to operate the means for supplying 5 packaging sheets 6;
- at least one third electric motor 36 adapted to operate the means for collecting 7 cigarettes 4 supplied by the means for supplying 5 cigarettes 4;
- at least one fourth electric motor 37 adapted to operate the packaging means 11;
- at least one fifth electric motor (not shown) adapted to operate the means for keeping the packaging sheets onto containers 9 after the same sheets 6 have been placed onto the same containers 9;
- at least one sixth electric motor 39 adapted to operate the means for moving 13 the packages 15;
- at least one seventh electric motor 41 adapted to operate the means for bending 22 the packages 15;
- at least one eighth electric motor 43 adapted to operate further means 44 bending 44 the packages 15;
- at least one ninth electric motor 45 adapted to lift the packages 15 for the last bend; and
- electronic control means adapted to control said first, second, third, fourth, fifth, sixth, seventh, eighth and ninth electric motor for electronically moving related motor axes.

And finally it is obvious that variations could be adopted of the aforesaid arrangement, in which some of the electric motors mentioned above can be merged into a single motor that performs the functions of the individual motors listed: while on one hand these variants would simplify the final realization of the system, reducing the number of included motors, on the other, they would reduce correspondingly the complete flexibility which is the key characteristic of the invention system.

For example, but without limiting the invention to what above described, the fourth electric motor 37 and the fifth electric motor could be built-in into a single motor to control
both the packaging and keeping means; or else the seventh 41, the eighth 43 and the ninth electric
motor 45 could be built-in into a single motor to operate the various means for bending 22, 44
packages 15.
CLAIMS

1. System (1) for packaging cigarettes (4) into bent sheets, characterised in that it comprises:
   - at least one first electric motor adapted to operate means for supplying (3) cigarettes (4);
   - at least one second electric motor (35) adapted to operate means for supplying (5) packaging sheets (6);
   - at least one third electric motor (36) adapted to operate rotary collecting means (7) for said cigarettes (4), supplied by said means for supplying (3) cigarettes (4), said means for collecting (7) cigarettes (4) being equipped with a plurality of elongated containers (9) adapted to house said cigarettes (4) supplied by said supplying means (3), said containers (9) being operatively connected to said means for collecting (7) cigarettes (4) so that a longitudinal axis (L-L) thereof is parallel to a rotation axis (R-R) of said means for collecting (7) cigarettes (4), and perpendicular to said plane of said means for collecting (7) cigarettes (4);
   - at least one fourth electric motor (37) adapted to operate packaging means (11) operatively coupled and cooperating with said means for
collecting (7) cigarettes (4), and adapted to receive said packaging sheets (6) from said means for supplying (5) packaging sheets (6) and to place said packaging sheets (6) onto said elongated containers (9) so that the plane of the packaging sheets (6) is orthogonal to the longitudinal axis of the cigarettes (4);
- at least one fifth electric motor adapted to operate means for keeping said packaging sheets (6) onto said containers (9), after said sheets have been placed onto said containers (9);
- at least one sixth electric motor (39) adapted to operate means for moving (13) packages (15) composed of said sheets (6) having inside said cigarettes (4), operatively cooperating with said rotary collecting means (7) for moving said packages (15) downstream;
- at least one seventh electric motor (41) adapted to operate means for bending (22) said packages (15);
- at least one eighth electric motor (43) adapted to operate further means for bending (44) said packages (15);
- at least one ninth electric motor (45) adapted to lift said packages (15) for their last bending;
and

- electronic control means adapted to control
said first, second, third, fourth, fifth, sixth,
seventh, eighth and ninth electric motor for
electronically moving related motor axes.

2. System according to claim 1, characterised in
that said fourth electric motor (37) and said
fifth electric motor are built-in in a single
motor for handling said packaging means (11) and
said sheet-keeping means (6).

3. System according to claim 1, characterised in
that said seventh (41), eighth (43) and ninth
electric motor (45) are built-in in a single
motor for moving said means for bending (22, 44)
said packages (15).
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B19/24 B65B65/00

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

ADD.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65B

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No</th>
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D Further documents are listed in the continuation of Box C

\( \text{X} \) See patent family annex

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Date of the actual completion of the international search

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