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METHOD AND MEANS FOR PACKING ROPES IN FOLDED FORM INTO CARTONS, CRATES OR LIKE CONTAINERS

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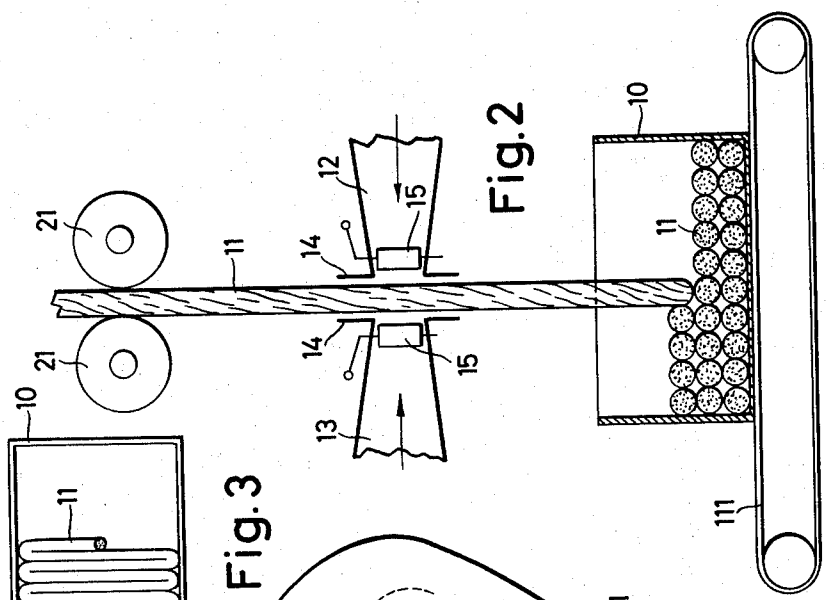


Fig. 2

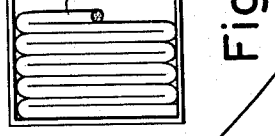


Fig. 3

Fig. 1

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METHOD AND MEANS FOR PACKING ROPES IN FOLDED FORM INTO CARTONS, CRATES OR LIKE CONTAINERS

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The present invention relates to an improved method and means for packing ropes in folded form into cartons, crates or like containers.

Known folding devices for this purpose have the disadvantage that only low working speeds are possible if crinkling or unwanted intermediate folding is to be avoided. The invention is intended to permit the use of very high speeds in operations of the above-indicated type. More particularly, the invention provides a folding device which enables textile-fibre ropes to be folded neatly into containers at relatively high speed.

According to the invention there is provided a method of packing a rope into a container comprising the steps of guiding a rope downwardly in an approximately vertical plane and in the general direction of its own length, oscillating the rope in the vertical plane allowing the rope to fall into a container, and reciprocating the container in a direction substantially normal to the plane of oscillation of the rope.

According to a further feature of the invention there is provided apparatus for packing a rope into a container, said apparatus comprising means for moving the rope downwardly in the general direction of its own length, means for directing an air blast transversely against the rope as it moves, means for substantially reversing the direction of the blast periodically so that it blows against opposite sides of, and thus oscillates, the rope, a container into which the rope can fall and means for reciprocating the container in a direction normal to the plane of oscillation of the rope.

Preferably a pair of oppositely situated nozzles are provided between which a gap is left free for passage of the rope. The nozzles are spaced by a distance equal at least to the width of the container, and their mouths are provided with deflector flaps, which are adapted to pivot transversely to the direction of movement of the rope and which deflect the blast air in opposite directions by pivoting. The pivoting and changeover of the air flaps is always effected when the rope is in the reversal position.

In order to change the direction of movement of the rope, there is used a mechanical or electro-optical reversal control system for the air deflector flaps when the rope is in the required end position or just before reaching the reversal point, either by interrupting an electro-optically controlling beam of light or by operating a fine sensing element. It is possible to use a hydraulic or pneumatic control system for this purpose. The two nozzles may receive the air from a common blower, or a separate blower may be provided for each nozzle.

A preferred form of the invention will now be described with reference to the accompanying diagrammatic drawing, in which:

FIGURE 1 is a horizontal section through a device according to the invention,

FIGURE 2 is a partial vertical section through the device, and

FIGURE 3 shows a container with a textile-fibre rope partially inserted, in folded state, in a container.

An object of the invention is to pack a textile-fibre rope **11** into a container **10** at high speed in such a manner that it is folded in serpentine-fashion as shown in FIGURE 3. To this end, the rope is passed between two rollers **21**, as shown in FIGURE 2, downwardly in an approximately vertical plane towards the container **10**. The rope moves at high speed in the general direction of its own length. The container is disposed on a conveyor belt **111** which performs a relatively high speed reciprocating movement over its length. The rope must now be given a reciprocating movement over the length of the container. To this end, an oppositely situated pair of nozzles **12**, **13** is disposed between rollers **21** and the container **10**, and between the said pair of nozzles is left free a gap for the passage of the rope, the said pair of nozzles having a dimension in a direction perpendicular to the reciprocation of the container, at least equal to that required for the deposition of the rope in the container. The mouths of the nozzles carry walls **14** which serve as guides for the rope and between which the rope oscillates. The nozzles also direct the air transversely against the rope from a common blower **18**, by way of pipes **121** and **131**.

Flaps **15** are provided in the oppositely situated nozzle mouths, and according to the arrangement of FIGURE 1 they can be pivoted out of the position shown in solid lines into the position shown in broken lines to deflect air passing through the nozzles. To this end, the flaps **15** are connected by links to a common rod **16** which is in turn operated by an adjusting mechanism **17**. When the flaps **15** are in the position shown in solid lines in the drawing, the air is blown or deflected upwards in the drawing (or, in other words, obliquely against the vertical plane of symmetry of the nozzles) and thus moves obliquely against the rope **11** so that the rope **11** passing between the nozzles, which follows the current of air, is moved to one side of the nozzles. When the rope is in an extreme position in relation to the nozzles, the adjusting mechanism **17** is shifted over so that the air flaps **15** are swung into the position shown in broken lines. As a result, the current of air is directed downward in the drawing, the rope again following the air movement, that is to say reversing its transverse movement.

The changeover of the air deflector flaps or current of air by operation of the adjusting mechanism **17** may be effected mechanically, electro-optically, hydraulically or pneumatically. To effect the changeover, a very fine sensing means is provided as diagrammatically indicated at **20** (FIGURE 1) to operate an electrical change-over switch for a reciprocable electro-magnet. Alternatively a beam of light from a light source **19** may be provided at **20**, which is interrupted by the rope in the reversal position and operates the adjusting mechanism **17**, electro-optically, in manner known per se.

If required, the pair of nozzles **12**, **13** may be considerably longer (in the north-south direction of FIGURE 1) than the container to be filled. In that case the air deflector flaps **15** at the margins of the nozzles may be set to complete shut-off, that is to say into a middle position, so that only a part of the length of the nozzles is operative. The changeover system can be arranged correspondingly. For example, a number of adjusting mechanisms **17** may be provided, which are controlled automatically so that at any given time only some flaps **15** become operative for the conveyance of the rope into the required position while other flaps **15** remain closed in order to avoid the use of excessive air power.

When longer nozzles are used, it is possible to dispose a number of cartons, crates, or containers next to one another and fill them jointly by one or more ropes per container.

If desired, the air blast and flaps on one side of the device (for example those on the right-hand side of FIGURE 1) may be omitted. The right-hand nozzle

may then be used merely as a guide against which the rope slides, or a simpler form of guide may be used.

The blast from the left-hand nozzle then serves to oscillate the rope while forcing it gently against the right-hand guide. In these circumstances more energy may be required to oscillate the rope. To reduce the amount of energy required to as low a value as possible, the rollers **21** above the container may be shifted a little to one side. In the example under consideration they would be moved to the left with resepct to FIGURE 2 and to an extent such that, preferably, the rope oscillates free of both nozzles or guides, or oscillates in light contact with only one of the guides.

For the construction of a device according to the invention it is therefore sufficient, if required, to provide at least one nozzle, one blower and one container, into which at least one rope can be packed. Only one adjusting mechanism is also required in these conditions to control the direction of feed. By provision of appropriately larger units, the capacity of the device can be greatly increased. The device operates very rapidly and it is possible, for example, to pack the rope, perfectly folded into a container, at rope speeds of up to 600 metres per minute or more.

The invention may be used to fold and pack any flexible elongated member, such as a ribbon or light cable.

What is claimed is:

1. A method of packing a rope into a container, said method comprising feeding the rope axially and downwardly towards said container, causing said rope to reciprocate in a vertical plane by directing a pneumatic medium horizontally against the rope and obliquely to said vertical plane while confining movement of the rope to said plane, sensing the movement of the rope to a determinable position in said vertical plane and changing the direction of the pneumatic medium to reverse the movement of the rope when the rope reaches said determinable position, and moving said container transversely of said vertical plane to enable the rope to be deposited in serpentine manner in said container.

2. A method as claimed in claim 1 comprising confining the movement of said rope to the vertical plane by mechanically restricting the latter said movement.

3. A method as claimed in claim 1 directing a pneumatic medium against the rope from the side of said plane which is opposite that of the first said pneumatic medium.

4. Apparatus for packing a rope into a container, said apparatus comprising container supporting means for supporting said container, rope guiding means for guiding the rope axially and downwardly into said container, and rope moving means between the two first said means for oscillating the rope through a vertical plane; said rope moving means comprising means for confining movement of the rope to said vertical plane, means to direct a pneumatic medium horizontally against said rope and in a direction oblique to said vertical plane, and control means to vary the direction of the pneumatic medium to reverse the direction of movement of rope in said vertical plane; said container supporting means being adapted to move said container transversely of said plane to enable the rope to be deposited in serpentine fashion therein, said rope moving means including spaced and facing nozzles on opposite sides of said plane, and pivotal, vertically disposed flaps in said nozzles to control the direction of flow of pneumatic medium therefrom.

5. Apparatus as claimed in claim 4, said means for confining movement of the rope comprising guides spaced on opposite sides of said plane to restrict movement of said rope.

6. Apparatus as claimed in claim 4, wherein said control means includes means to sense the movement of said rope to opposite extreme positions in said plane, said control means being coupled to said flaps to pivot the same.

7. Apparatus as claimed in claim 6, wherein said nozzles are horizontally disposed, flat diverging nozzles adapted to move the rope through a reciprocal path of determinable length and having a horizontal extent along and at least as large as said determinable length.

8. Apparatus as claimed in claim 7, said means for confining movement of the rope comprising vertical guides on said nozzles and parallel to said vertical plane.

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