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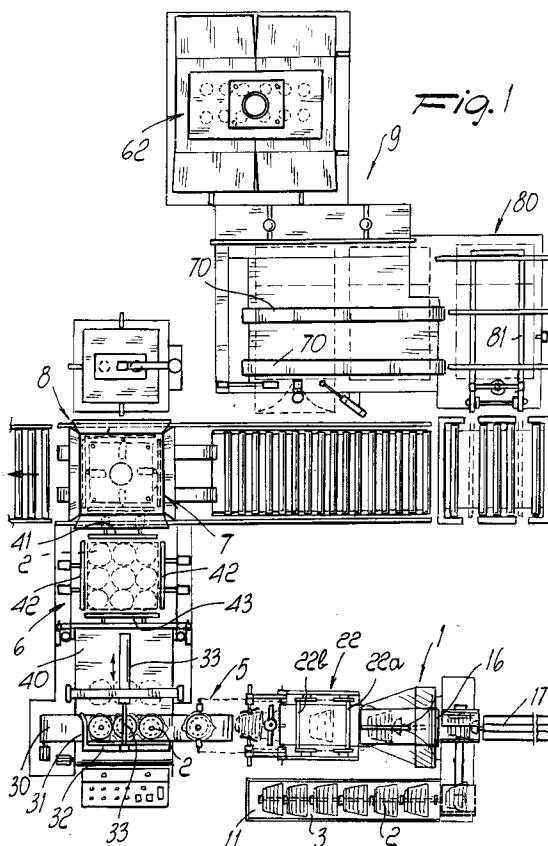
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I-20123 Milano (IT)(54) **Film-wrapping and boxing machine particularly for spools of thread and the like.**

(57) The present invention relates to a film-wrapping and boxing machine particularly for spools of thread and the like, which has the peculiarity of comprising a station (1) for the film-wrapping of spools (2) of thread and the like removed from a spool accumulation region (3), a unit (5) for the advancement and orientation of the film-wrapped spools, a station (6) for the forming of a layer of spools, a unit (7) for removing and transferring the layer of spools, and a station (8) for boxing the preformed layer of spools.

**EP 0 532 785 A1**

The present invention relates to a film-wrapping and boxing machine, particularly for spools of thread and the like.

As is known, a problem which is currently strongly felt, particularly in the thread manufacturing industry, is the one related to the film-wrapping and boxing of spools of thread. Thread spools in fact generally have a truncated-cone shape and must be arranged in boxes or cartons so as to minimize wasted space.

Currently known solutions have various problems which mainly arise from the correct forming of the layer of spools which must be inserted in the cartons, so that considerable problems occur both in correctly placing the spools for each individual layer and in completely automating the cycle for the film-wrapping of the individual spools and for the boxing of the layer of spools.

Another problem is furthermore related to the forming of the cartons, which are generally formed starting from a cutout which is already pasted along one edge, so as to form a tubular element which, when it is to be used, must be opened in order to form the carton: this operation currently requires a considerable contribution of manual labor and is never completely integrated with a film-wrapping and boxing machine.

The aim of the invention is indeed to eliminate the disadvantages described above by providing a film-wrapping and boxing machine, suitable specifically for spools of thread and the like, which allows to perform, with a fully automatic cycle, the boxing of the various spools, forming a layer with a presettable arrangement of the various spools.

Within the scope of the above aim, a particular object of the invention is to provide a film-wrapping and boxing machine which can perform in automatic succession all of the operations, starting from the film-wrapping of the individual spools up to the forming of the cartons, with the boxing of the various layers of formed spools.

Another object of the present invention is to provide a film-wrapping and boxing machine which is particularly versatile and practical in use, since it can easily and rapidly adapt to all the types of spools which are commercially used.

Not least object of the present invention is to provide a film-wrapping and boxing machine, particularly for spools of thread and the like, which can be easily obtained starting from commonly commercially available elements and materials and which is furthermore competitive from a merely economical point of view.

This aim, these objects and others which will become apparent hereinafter are achieved by a film-wrapping and boxing machine, particularly for spools of thread and the like, according to the invention, characterized in that it comprises a sta-

tion for the film-wrapping of spools of thread and the like removed from a spool accumulation region, a unit for the advancement and orientation of the film-wrapped spools, a station for the forming of a layer of spools, a unit for removing and transferring the layer of spools, and a station for boxing the preformed layer of spools.

Further characteristics and advantages will become apparent from the description of a preferred but not exclusive embodiment of a film-wrapping and boxing machine, particularly for spools of thread and the like, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a schematic plan view of the film-wrapping and boxing machine according to the invention;

figure 2 is an end view of the station for the film-wrapping of the individual spools of thread;

figure 3 is a detail view of the thread spool film-wrapping station and of the spool advancement and orientation unit;

figure 4 is a detail view of the unit for the orientation of the film-wrapped spools;

figure 5 is a view of the unit for the removal and transfer of the spool layer;

figure 6 is a view of the station for the boxing of the formed spools;

figure 7 is a view of a machine for the forming of the cartons, illustrating the unit for the removal of the cutout;

figure 8 is a view of the carton forming machine during the carton forming step;

figure 9 is a view of the unit for the transfer of the formed carton.

With reference to the above figures, and in particular to figures 1 to 6, the film-wrapping and boxing machine, particularly for spools of thread and the like, according to the invention, comprises a station 1 for the film-wrapping of spools 2 which arrive from a spool accumulation region 3; a unit 5 for the advancement and orientation of the spools acts downstream of said station 1 so as to feed said spools into a station 6 for the forming of a layer of spools, where a removal unit 7 acts and transfers said spools to a boxing station, which is generally indicated by 8.

More in detail, the spools 2 are placed in the accumulation region 3 so that they are mutually axially aligned and are all orientated in the same direction, i.e. with the taper of the spool directed in the same direction; the accumulation region 3 in practice has a spool transfer lane 11, at the end of which there acts an articulated arm 12 which supports, at its upper end, a cradle 13 which is available at the lane 11 to remove the spool and arrange it in a guiding cradle 15 arranged on the inlet 16 of the film-wrapping station 1. As illustrated in

figure 3, at said inlet there acts a pusher piston 17 which introduces the spool into a channel 18 outside which a film 19 of polyethylene or similar material is wrapped continuously; said film 19 is unrolled from a feed roll 20 which continuously feeds said film, which is wrapped around the channel 18, mutually overlapping its longitudinal flaps.

Above the channel 18 there is a bar-shaped heat welding unit 21 which, continuously and in discrete segments, associates the overlapping flaps, in practice joining the film in the longitudinal direction, so as to obtain a tubular element.

At the outlet of the channel 18 there is a head 22 for the transverse welding and cutting of the tubular film element formed upstream. Said head, by means of welding units, closes the ends of the wrapping.

The welding head is composed of two sets of welding/cutting clamps 22a and 22b which are articulated on chain links.

The welding/cutting units are forced to follow a straight path in the active portion and a curved one in the idle portion; they are composed of elements which are heated with electric pulses which have the purpose of welding the wrapping and then separating it from the tubular film element.

The spool pushed by the piston 17 (through the channel 18) arranges itself inside the welding head 22; the clamps 22a are in idle position (open), the clamps 22b are closed in the end-of-work position (they have welded the front part of the wrapping).

The rotation of the clamps in the direction indicated by the arrow (the clamps 22a move so as to occupy the position of the clamps 22b) causes the advancement of the spool; during this motion, the clamps 22a:

- a) weld the rear side of the wrapping;
- b) cut the wrapping from the tubular film element;
- c) weld the leading portion of the subsequent wrapping,

whereas the previously closed clamps 22b open and move into the open position previously occupied by the clamps 22a.

Upon each cycle, a wrapping is formed completely and a spool is thus packaged.

At the outlet of the welding head 22 there is the advancement and orientation unit, which comprises a removal unit, more clearly illustrated in figure 4, which is constituted by a pair of L-shaped arms 25 which are pivoted to the fixed structure at one end and support a pair of wing-shaped removal devices 26 which are arranged mutually opposite and are connected to small pusher pistons 27 which allow to couple the wing-shaped removal devices 26 to the lateral surface of the already film-wrapped spool 2.

The wing-shaped removal devices can rotate about their own axis so as to rotate the spool, arranging it with its larger base or its smaller base upward, according to the packaging requirements.

As shown in figure 3, the arms 25 are rotated so as to deposit the spool, orientated with its base arranged in the selected manner, onto an advancement conveyor 30 on which a plurality of spools is aligned.

A cross-member 31 is provided transversely to the advancement conveyor 30, is connected to a side wall portion 32 and in practice stops and positions the first spool of the row, so as to produce a row with a required number of spools.

The side wall portion is connected to a traction cylinder 33 which moves said side wall portion in a direction which is perpendicular to the direction of motion of the advancement conveyor 30, so that the formed row of spools is removed from the conveyor 30 and is arranged on a forming conveyor 40 which is also constituted by a continuously advancing belt.

The rows of spools thus formed are caused to advance up to the station for the forming of the layer 8, which has a stop abutment 41 (figure 6) which acts as stop element for the first row of spools which has already been formed.

Lateral containment walls 42, perpendicular to the abutment 41, are furthermore provided and can be actuated by pistons for compacting the layer; there is also a front closing wall 43 which is mounted on an oscillating frame 44, and which is in a raised position during the spool row or line feeding step and is lowered in order to perform the lateral compaction of said layer.

Above the forming station there acts a removal and transfer unit, generally indicated by the reference numeral 7 and more clearly illustrated in figure 5, which is constituted by a spool gripping clamp 46 which has an abutment plane 47, above which grip walls 48 are pivoted; said grip walls can be actuated by pistons 49 to secure them against the lateral region of the formed layer of spools in order to be able to remove said spools.

The clamp is connected to a stem 50 which is associated with a carriage 51 which can move on upper guides 52 for the transfer of the layer of spools.

The abutment plane is furthermore provided with a limited stroke movement which allows to separate the spool layer from the grip walls to release said spools into the carton 55 which is arranged adjacent to the belt 40.

The packaging of the spools furthermore entails the insertion of partitions 56 between the layers; said insertion is performed by means of a sucker-fitted removal device 57 which removes a partition 56 from a stack and inserts it within the

carton immediately after the insertion of each individual layer, or as otherwise provided for by the program-based control means.

The carton 55 is formed by means of a carton forming station or machine, generally indicated by the reference numeral 9; said carton forming station comprises a sucker-fitted removal device 62 which removes a single cutout, arranged in flattened configuration and with its larger face parallel to the ground, contrary to what is observed in the known art, which provides the placement of the cutouts along a vertical arrangement.

The removed cutout is carried to the carton forming station, which has a conveyor belt 64, on which the cutout is placed, as illustrated in figure 8; during the removal step, the carton, by virtue of the deactivation of part of the suckers, undergoes a first opening directly by gravity.

The station furthermore comprises a first arm 65 for folding the bottom side flap which is arranged opposite to a fixed folding device 66 which in practice closes the first two opposite flaps.

There are also an upper folding arm 67, which folds a contiguous flap, and a lower folding arm 68, which folds the opposite contiguous flap, consequently closing all four of the flaps of the bottom and consequently forming the carton perfectly.

Once the bottom flaps have been folded, the carton is caused to advance, by means of an upper traction device 70 and of the lower one 64, against a taping unit, indicated by 71, which closes the median region of the bottom, thus making the performed forming permanent.

The upper traction device 70 and the lower one 64 then place the carton on an unloading unit, indicated by 80, which has a grid-like frame 81 which can be overturned in order to arrange the formed carton, which has its open inlet arranged laterally, so that its bottom rests on the carton conveyance unit for routing to the boxing station and so that the upper inlet is open.

In practical operation, the spools 2, arranged in the accumulation region, are caused to slide toward the removal arm 12, which introduces them at the inlet 16 of the channel 18, where the piston 17 pushes them, encountering the bottom of the polythene film, which is already closed transversely and welded along the longitudinal edge.

Under the thrust of the piston 17, the spool is inserted in the wrapping which has been preformed by the clamp 22b, and said clamp, by rotating, welds the wrapping in its rear part, forms another wrapping with a front welding, and positions the packaged spool so that it is ready to be removed, as shown in figure 4.

The spool is removed by the removal device, is possibly inverted, if required, and is then arranged on the advancement belt 30 which moves it

forward by one step according to the program.

These operations are repeated until a complete row of spools is formed against the cross-member 31 and the wall section 32.

When a row is completely formed, the wall 32 is moved, moving the row of spools onto the forming conveyor 40, which causes the advancement of the formed rows until the layer is defined in the layer forming region.

When the layer is completely formed, it is compacted by means of the bars which act on the periphery of the set of spools.

The clamp 46 descends onto the layer and the abutment plane upwardly compresses the spool layer, then the lateral walls of the clamp are closed in order to retain the spool layer and the clamp is moved initially upward and then in a horizontal direction to arrange itself above the carton in which the spools are to be inserted.

The clamp is moved down until it reaches the bottom of the carton and is opened slightly so that the abutment plane, by means of a slight movement, can release the formed spool layer.

The clamp is then retracted above the boxing section, and the sucker-fitted removal device inserts a partition, or whatever else is required by the production cycle, into the carton.

The carton forming unit entails the complete opening of the carton, after the initial step of removal by means of the suckers and a partial opening directly by gravity, the folding of a flap by the arm 65 until the flap is closed completely, then the closure of the opposite flap by means of the opposite arm and the closure of the other flaps of the carton by means of the upper and lower arms, thus completing the closure of the carton.

The upper and lower traction devices pull the carton along the taping unit, which fixes adhesive paper to the seam of the flaps, so as to close the carton downward.

The carton thus formed is then conveyed to the grid-like frame, which moves the carton from the horizontal position to the vertical one, i.e. with the loading opening arranged upward, onto the conveyor which introduces the carton into the boxing station.

To the above it should be furthermore added that the taping unit is provided with adjustable levels so as to position the adhesive tape at the required level.

From what has been described above it can thus be seen that the invention achieves the proposed aim and objects, and in particular the fact is stressed that an apparatus is provided which allows to perform, in a fully automatic manner, the packaging cycle of spools, comprising the film-wrapping and boxing of the spools and the forming of the cartons, which are removed from a stack of hori-

zontally arranged cutouts.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, as well the dimensions and contingent shapes, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

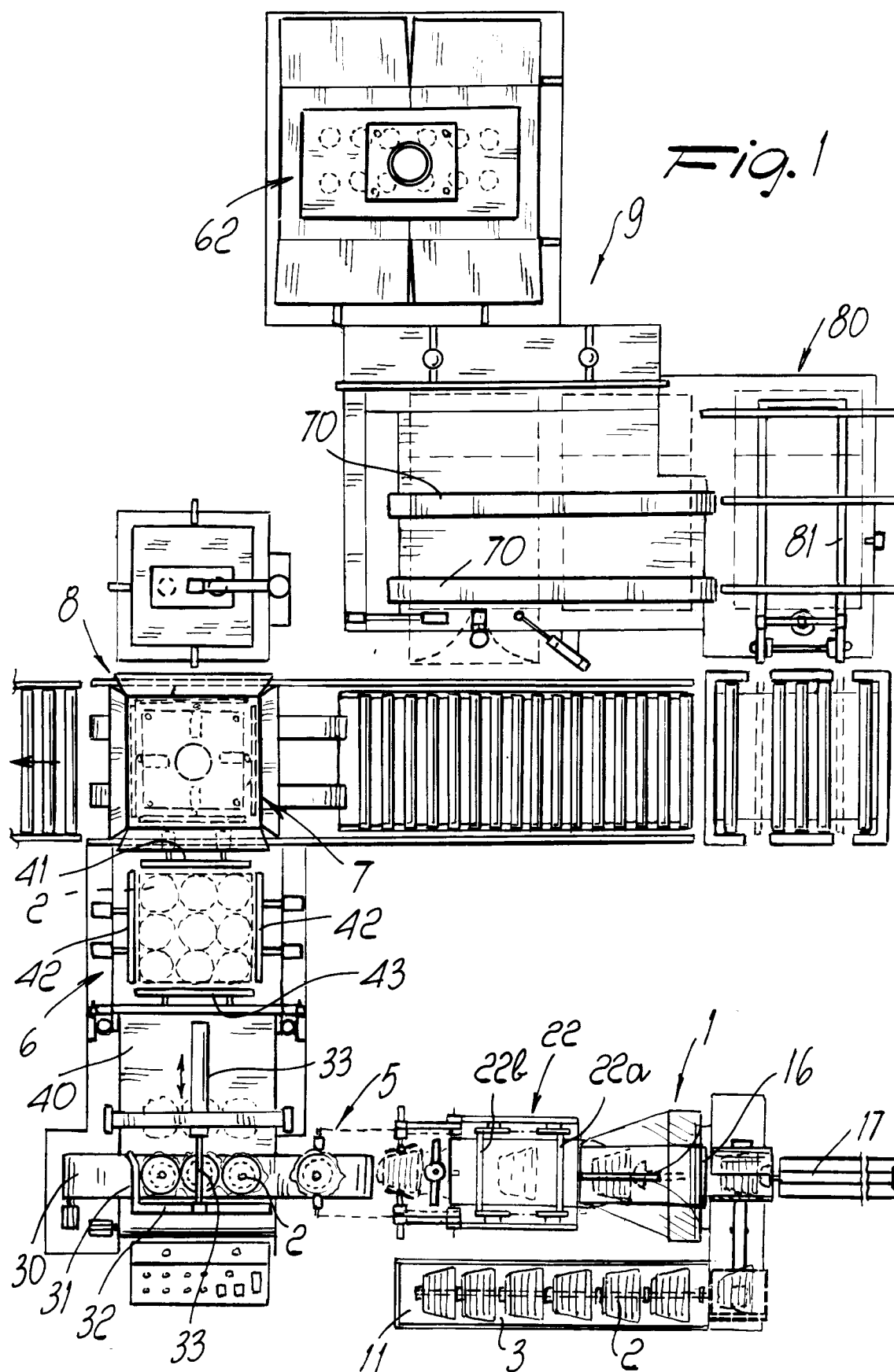
Claims

1. Film-wrapping and boxing machine, particularly for spools of thread and the like, characterized in that it comprises a station (1) for the film-wrapping of spools (2) of thread and the like removed from a spool accumulation region (3), a unit (5) for the advancement and orientation of the film-wrapped spools, a station (6) for the forming of a layer of spools, a unit (7) for removing and transferring the layer of spools, and a station (8) for boxing the preformed layer of spools. 5
2. Film-wrapping and boxing machine, according to claim 1, characterized in that said spool accumulation region (3) comprises a lane (11) at the end of which there is an articulated arm (12) which upwardly supports a cradle (13) which is provided at said lane (11) in order to remove the spool (2) and arrange it in a guiding cradle (15) arranged at the inlet (16) of said film-wrapping station (1). 10
3. Film-wrapping and boxing machine according to the preceding claims, characterized in that said film-wrapping station (1) has a channel (18) which defines said inlet (16) and outside which it is possible to continuously wrap a film (19) arriving from a feeder roll (20), said film (19) wrapping around said channel (18) with overlap of its longitudinal flaps. 15
4. Film-wrapping and boxing machine according to one or more of the preceding claims, characterized in that it comprises a heat welding unit (21) which acts above said channel (18) for the mutual joining of said longitudinal flaps. 20
5. Film-wrapping and boxing machine, according to one or more of the preceding claims, characterized in that it comprises, downstream of said channel (18), a welding and cutting clamp (22a,22b) which acts transversely on the tubular film formed by said channel (18). 25
6. Film-wrapping and boxing machine, according to one or more of the preceding claims, characterized in that it comprises a pusher piston (17) which acts on the spool (2) which is arranged in said channel (18) in order to push it against the bottom of the tubular film (19) which has previously been pulled and welded by the welding clamps (22a,22b). 30
7. Film-wrapping and boxing machine, according to one or more of the preceding claims, characterized in that said advancement and orientation unit (5) comprises a removal device which is constituted by a pair of L-shaped arms (25) which are pivoted to the fixed structure at one end and support a pair of wing-shaped removal devices (26) which are arranged mutually opposite and can move longitudinally in order to engage the surface of the film-wrapped spool (2), means being furthermore provided for rotating said wing-shaped removal devices about their own axes for the possible overturning of said film-wrapped spool (2). 35
8. Film-wrapping and boxing machine according to one or more of the preceding claims, characterized in that it comprises an advancement conveyor (30) which is arranged downstream of said removal arms (25), a cross-member (31) being provided transversely to said advancement conveyor (30) and being connected to a wall section (32) which is suitable for forming a row of film-wrapped spools. 40
9. Film-wrapping and boxing machine according to one or more of the preceding claims, characterized in that said wall section (32) is connected to a traction cylinder (33) in order to move the row of film-wrapped spools (2) perpendicularly to the direction of motion of said advancement conveyor (30), with the transfer of said row onto a forming conveyor (40) which advances continuously substantially perpendicularly to said advancement conveyor (30). 45
10. Film-wrapping and boxing machine, according to one or more of the preceding claims, characterized in that said spool layer forming station (6) comprises a stop abutment (41) which is arranged on said forming conveyor (40) and 50

is flanked by a pair of lateral containment walls (42) which are perpendicular to said stop abutment (41), a front closure wall (43) being furthermore provided, said wall being mounted on an oscillating frame (44) and being arrangeable opposite to said stop abutment (41), said lateral walls (42) being movable perpendicularly to the direction of motion of said forming conveyor (40) for the compaction of the formed layer.

of the formed cartons, which is constituted by a grid-like frame (81) which can be overturned in order to arrange the formed carton with its open inlet upward.

11. Film-wrapping and boxing machine according to one or more of the preceding claims, characterized in that said removal and transfer unit (7) comprises a spool grip clamp (46) which is constituted by an abutment plane (47) above which grip walls (48) are pivoted, said grip walls (48) being arranged perimetrically and being securable against the lateral region of the formed spool layer, said clamp (46) being connected to a stem (50) which is associated with a carriage (51) which can move along upper guides (52) for the transfer of the spool layer removed by said clamp (46).
12. Film-wrapping and boxing machine, according to one or more of the preceding claims, characterized in that it comprises a unit for the application of a partition (56) between one layer of spools and the other, said unit comprising a sucker-fitted partition removal unit (57) which can move on supporting guides for insertion into the carton (55) in which the spool layers are introduced.
13. Carton forming machine, characterized in that it comprises a sucker-fitted removal unit (62) which acts above a stack of cutouts which are arranged on a horizontal plane, at least part of said suckers being deactivatable for the gravity opening of the cutout, there being also a first arm (65) for the folding of a first lateral flap and a fixed folding arm (66), arranged opposite to said first folding arm (65), for the closure of the opposite flap, there being also an upper folding arm (67) and a lower folding arm (68) for the folding of the other bottom flaps.
14. Carton forming machine, characterized in that it comprises an upper traction unit (70) which acts on the formed carton in order to move it into a taping unit (71) which is suitable for applying an adhesive tape which is suitable for making the forming of the carton permanent.
15. Carton forming machine, according to one or more of the preceding claims, characterized in that it comprises a unit (80) for the unloading



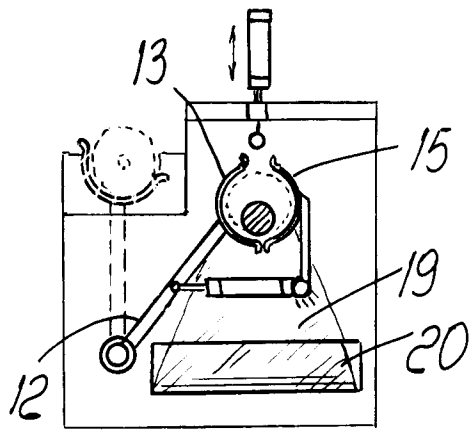


Fig. 2

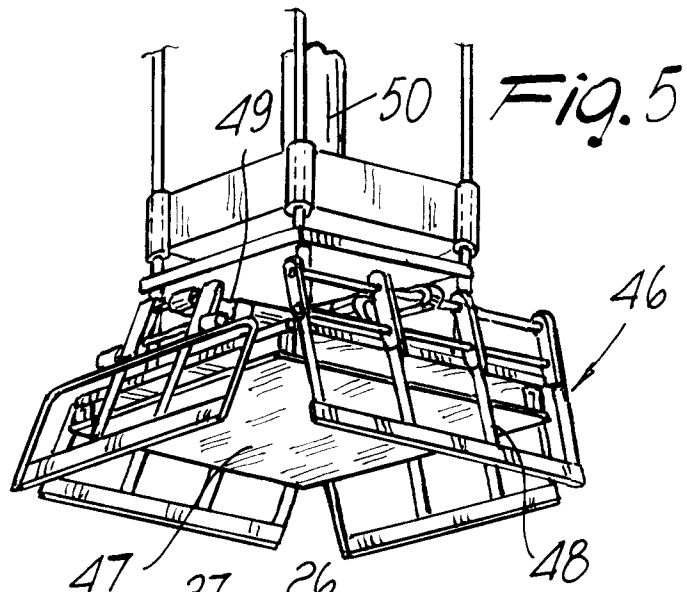


Fig. 5

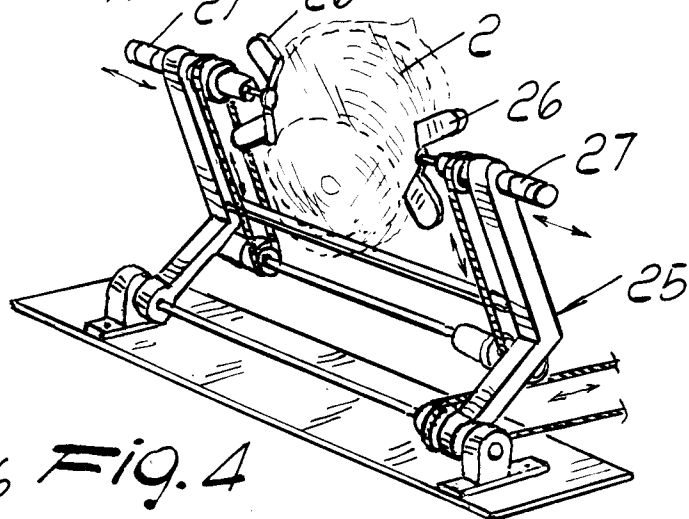


Fig. 4

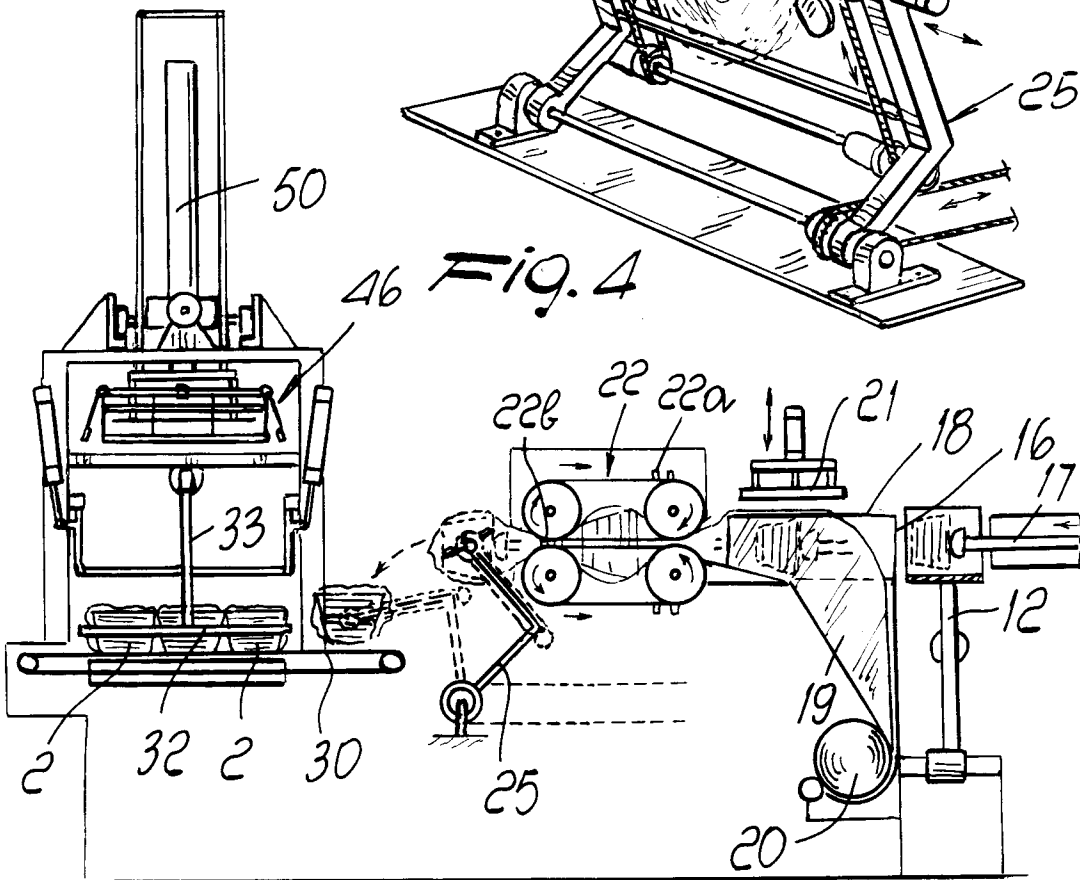
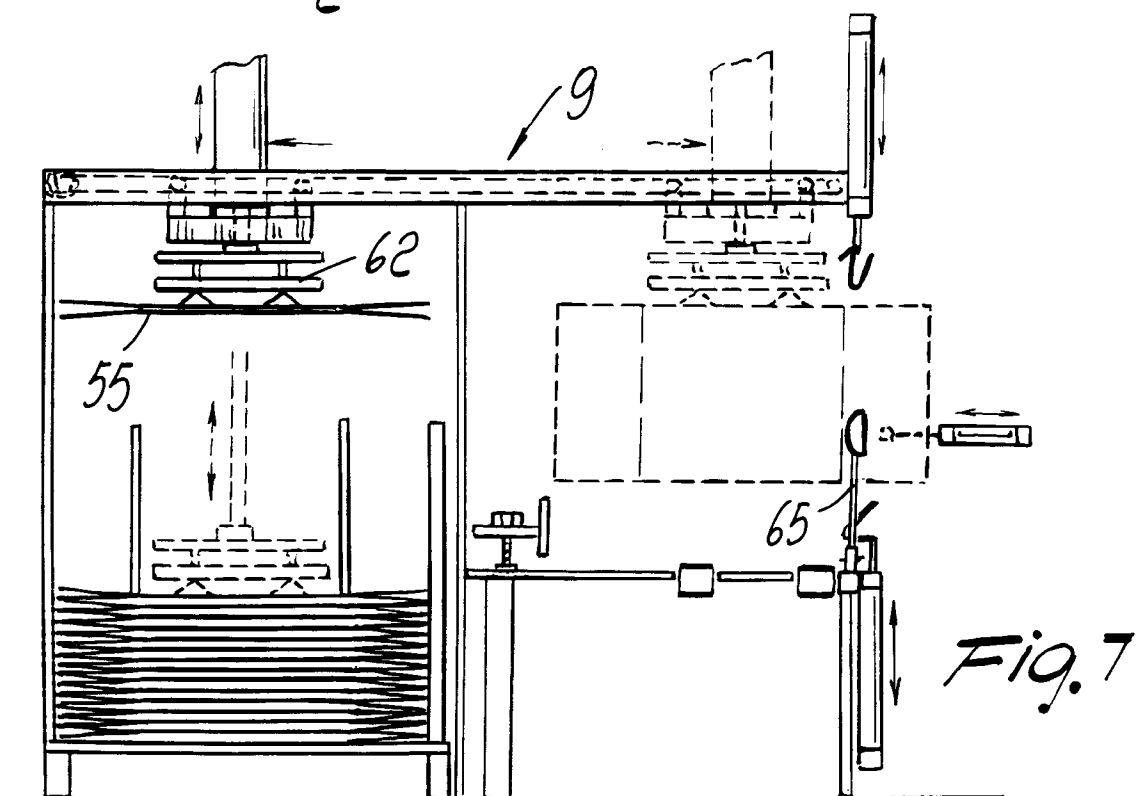
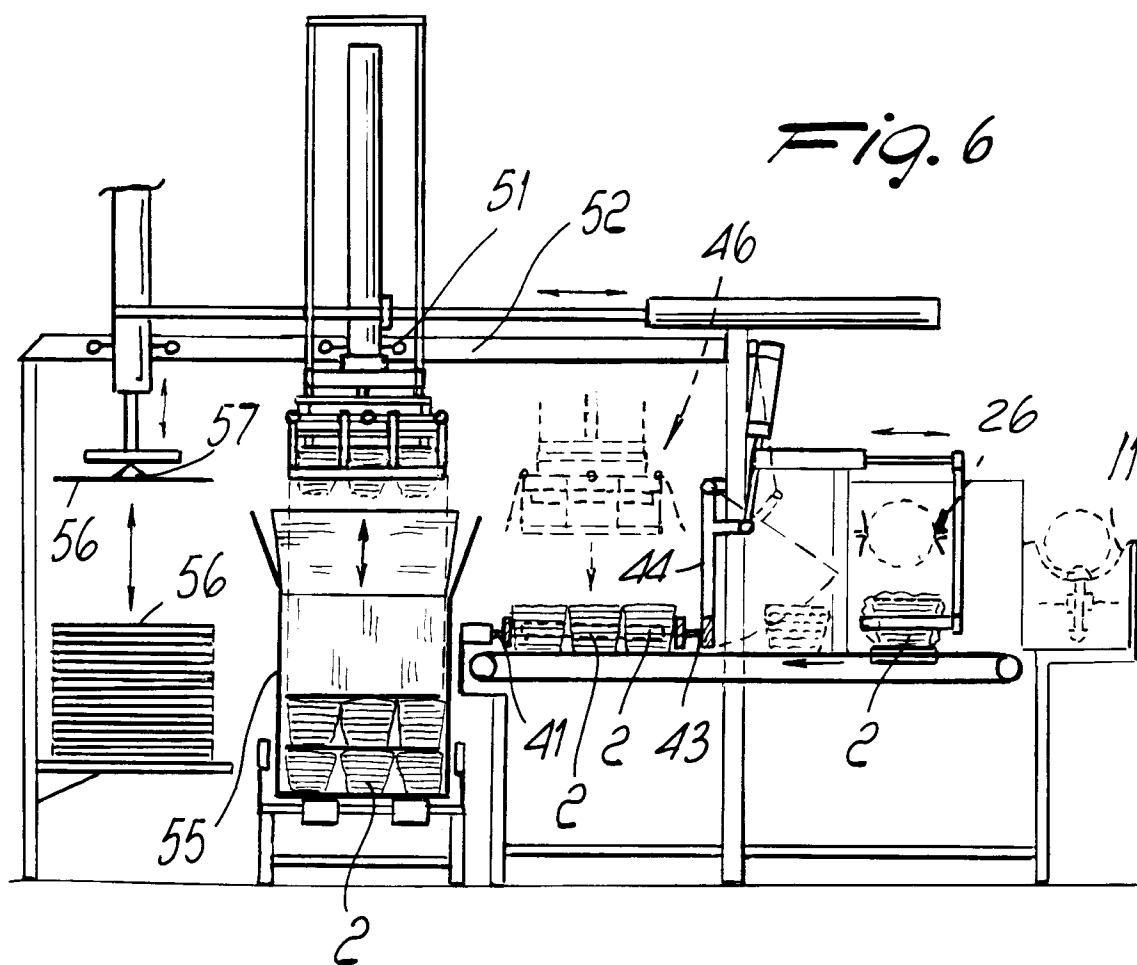


Fig. 3



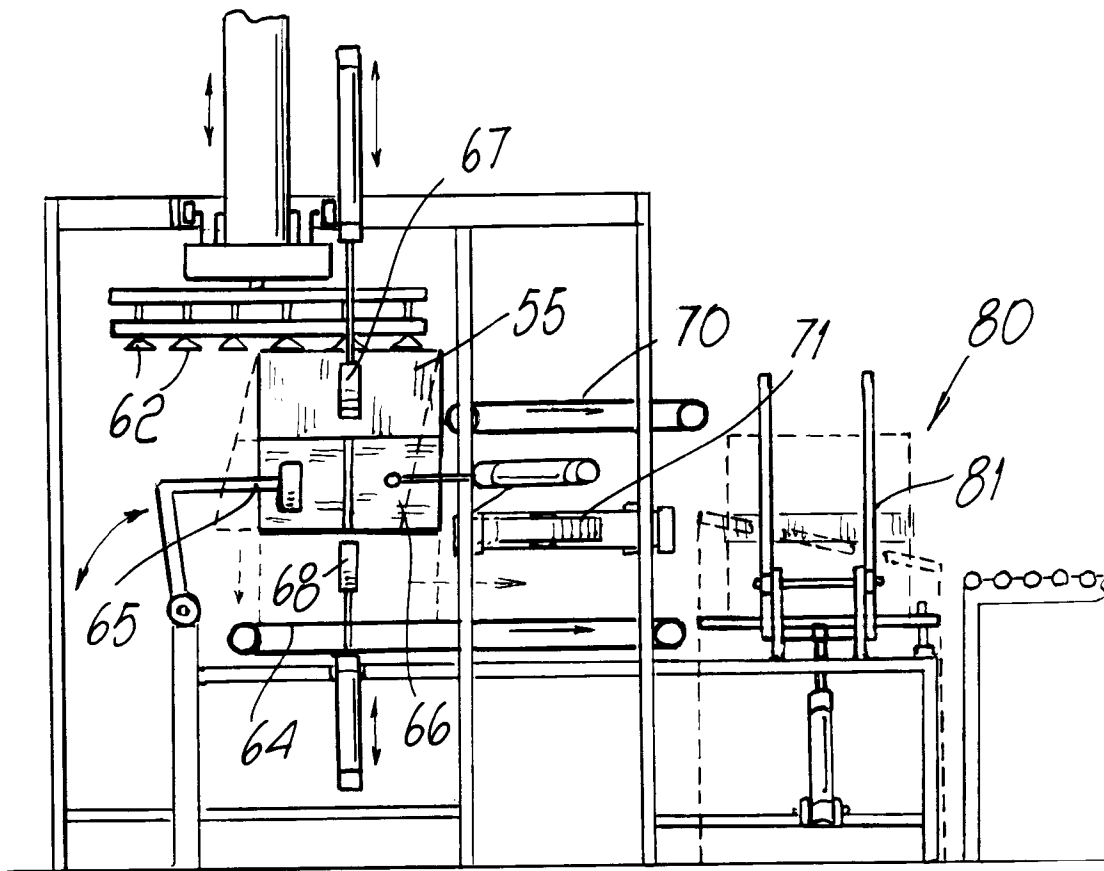


Fig. 8

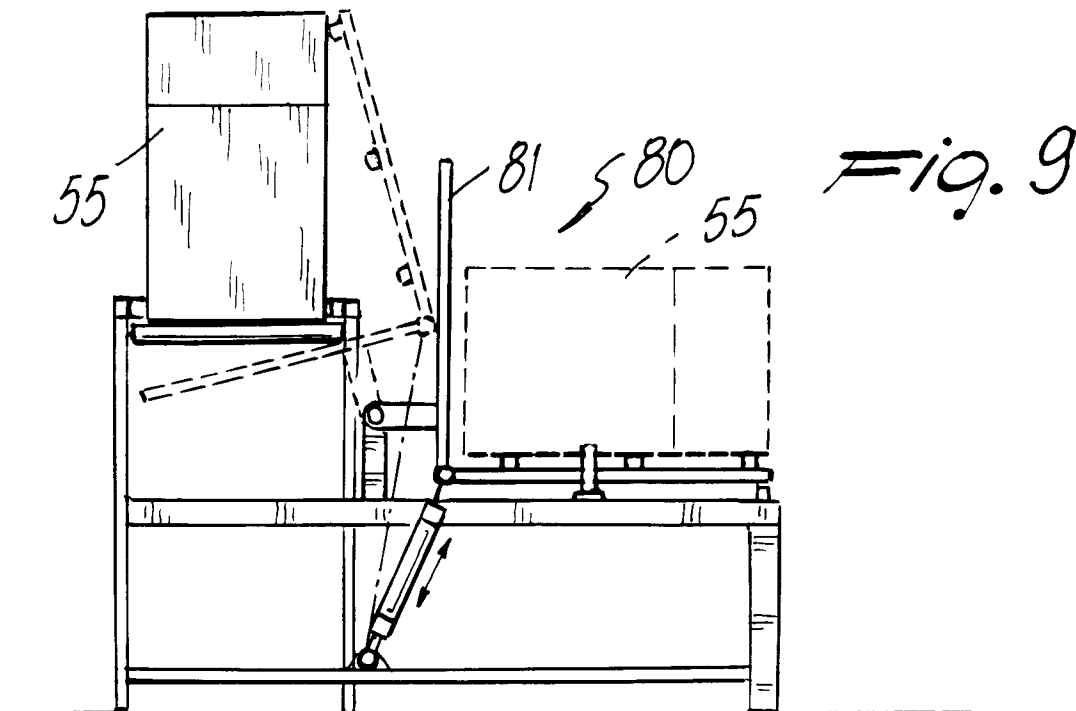


Fig. 9



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EUROPEAN SEARCH REPORT

Application Number

EP 91 11 5923

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.5)
A	BE-A- 894 318 (MOREL) * Page 2, last paragraph - page 3, paragraph 6; figures 1,2 * ---	1,12	B 65 B 5/10
A	US-A-4 731 977 (MAEKAWA) * Whole document * ---	1	
A	US-A-2 641 095 (BURBANK) * Column 3, lines 34-52; figure 3 * ---	2	
A	GB-A-1 214 709 (KLEER-VU) * Whole document * ---	3-5	
A	GB-A-1 384 682 (GOLANTSEV) * Page 5, lines 26-119; figure 4 * -----	11	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26-05-1992	Examiner CLAEYS H.C.M.
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 I : 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			



CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,

namely:

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- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims: 1-12



LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-12: Film wrapping and boxing machine for spools and the like
2. Claims 13-15: Carton forming machine