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None

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UK CL (Edition K) B8C CW1 CW5
INT CL[5] B65B 11/06 11/10 11/12 11/14

(54) Wrapping machine

(57) A wrapping machine comprises three coplanar feed (1), wrapping (2) and product delivery (3) conveyors respectively, means (11, 12) for delivering sheets of wrapping material, and a wrapping bar (15) carried along a track (13) around the wrapping conveyor (2) for wrapping the said products. The means for delivering said sheets comprises at least two aligned conveyor members (11, 12) of which the downstream member (12) is equipped with a device (31) to cyclically vary its speed between the speed of the upstream conveyor (11) and the (slower) speed of the wrapping conveyor (2).

Fig. 1

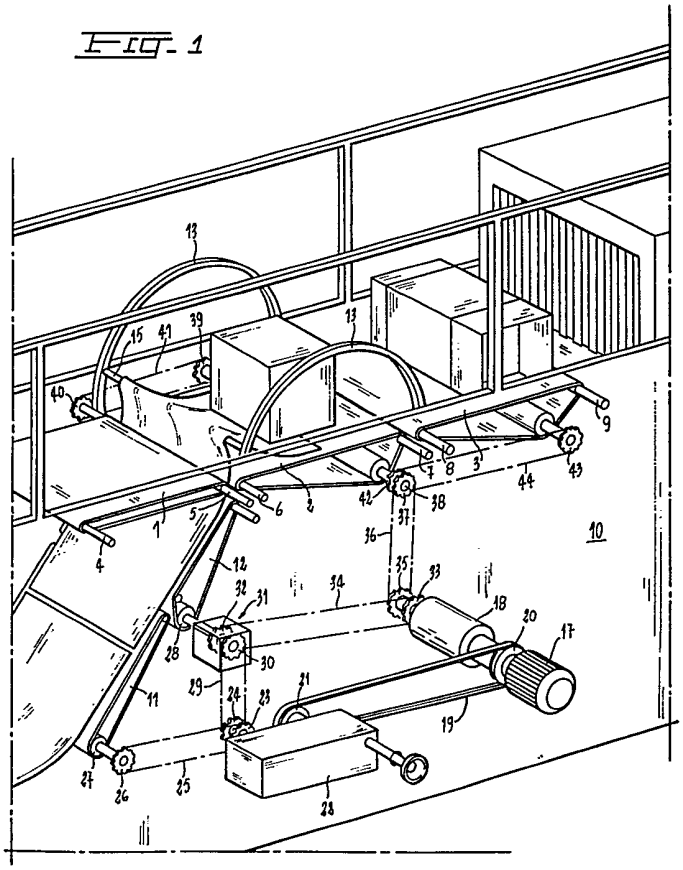

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Fig. 1

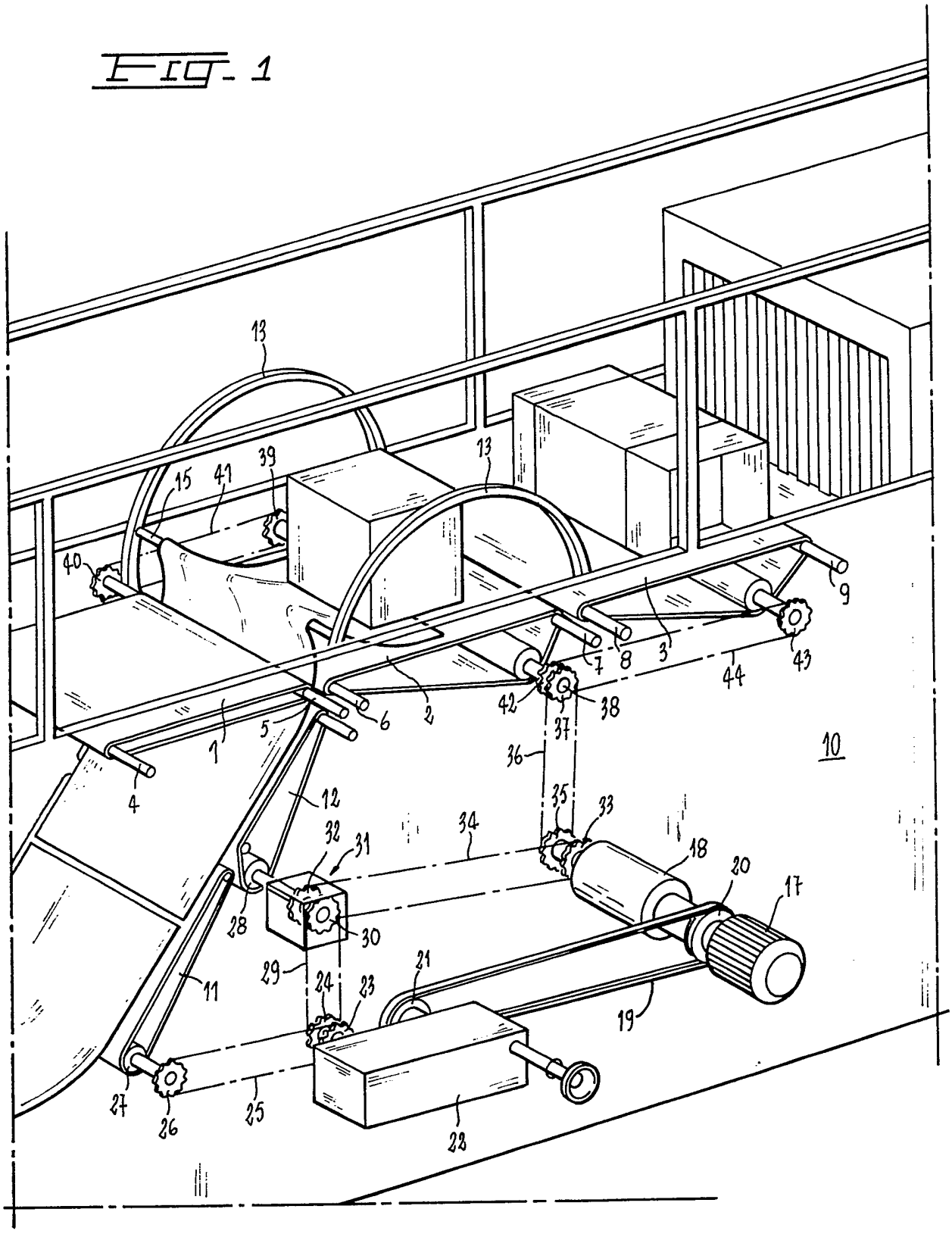
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Fig. 2

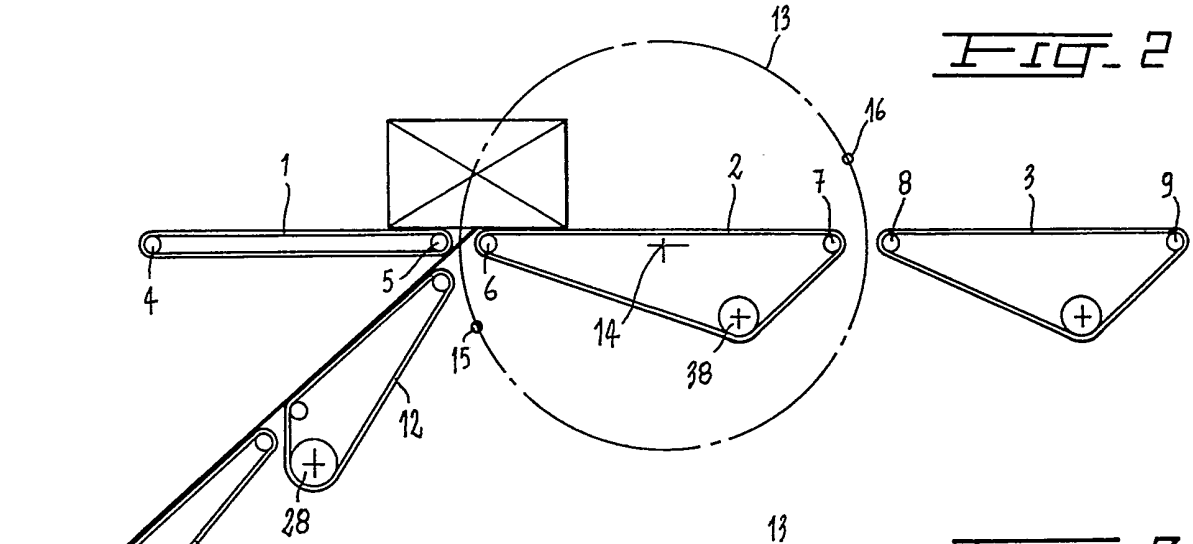


Fig. 3

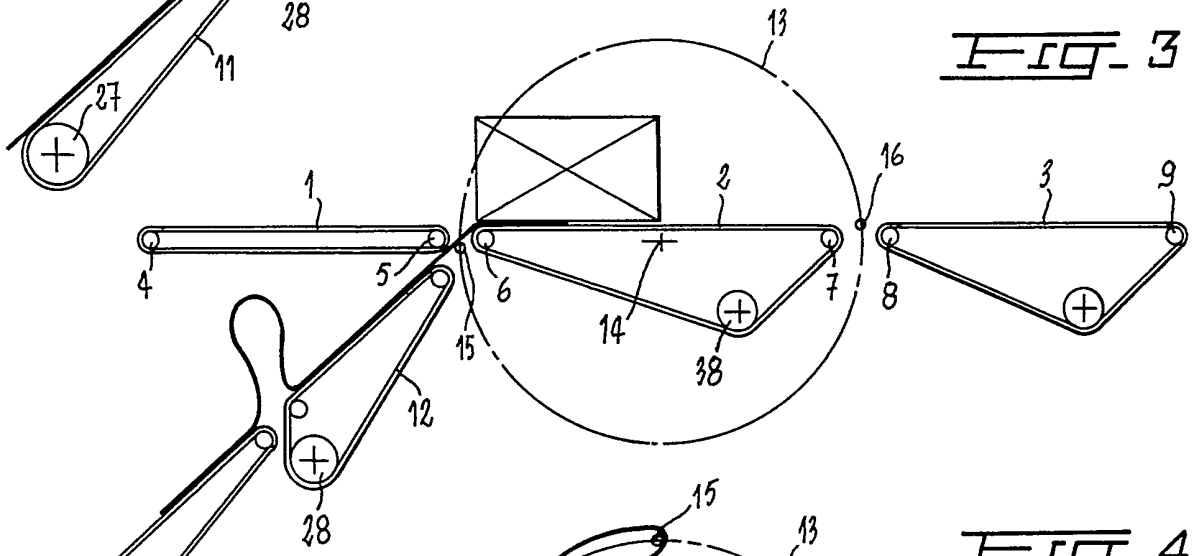


Fig. 4

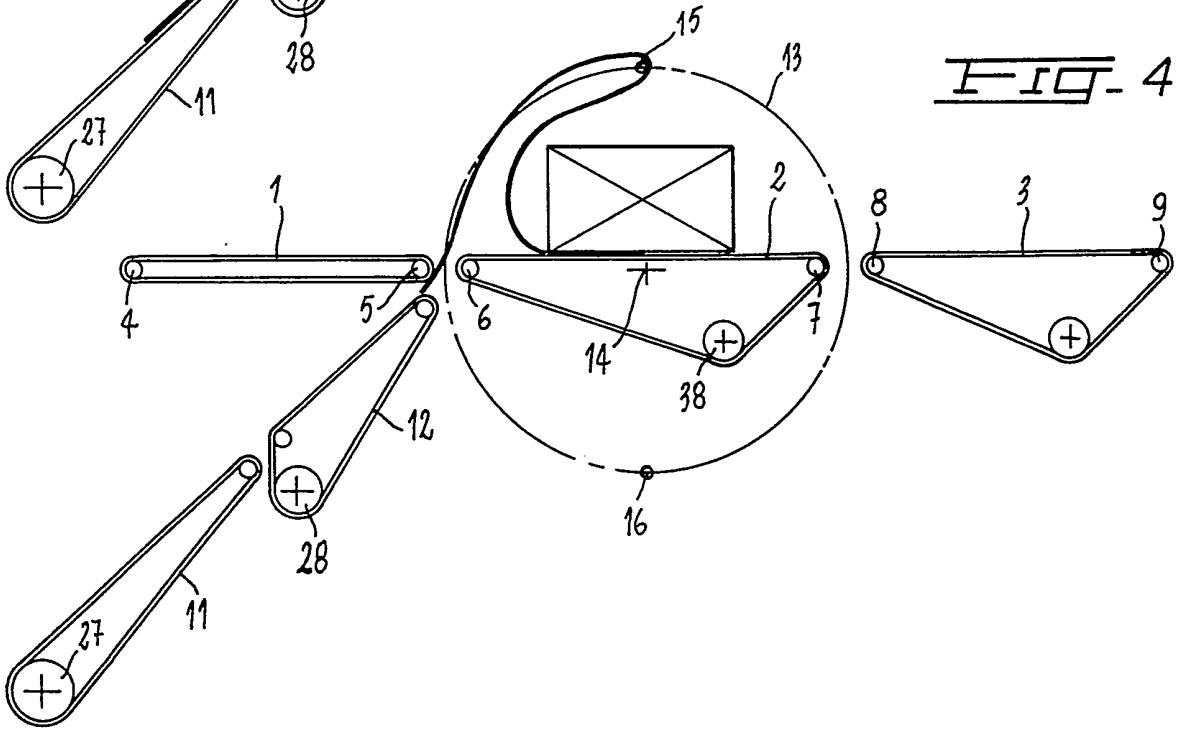


Fig. 5

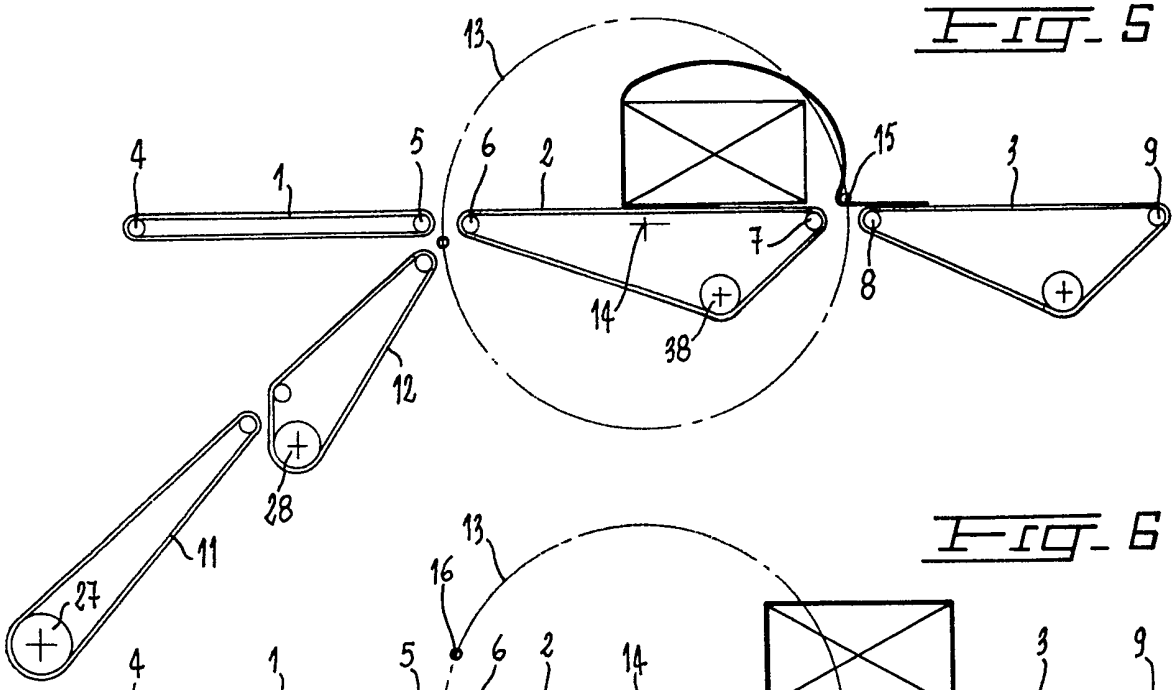


Fig. 6

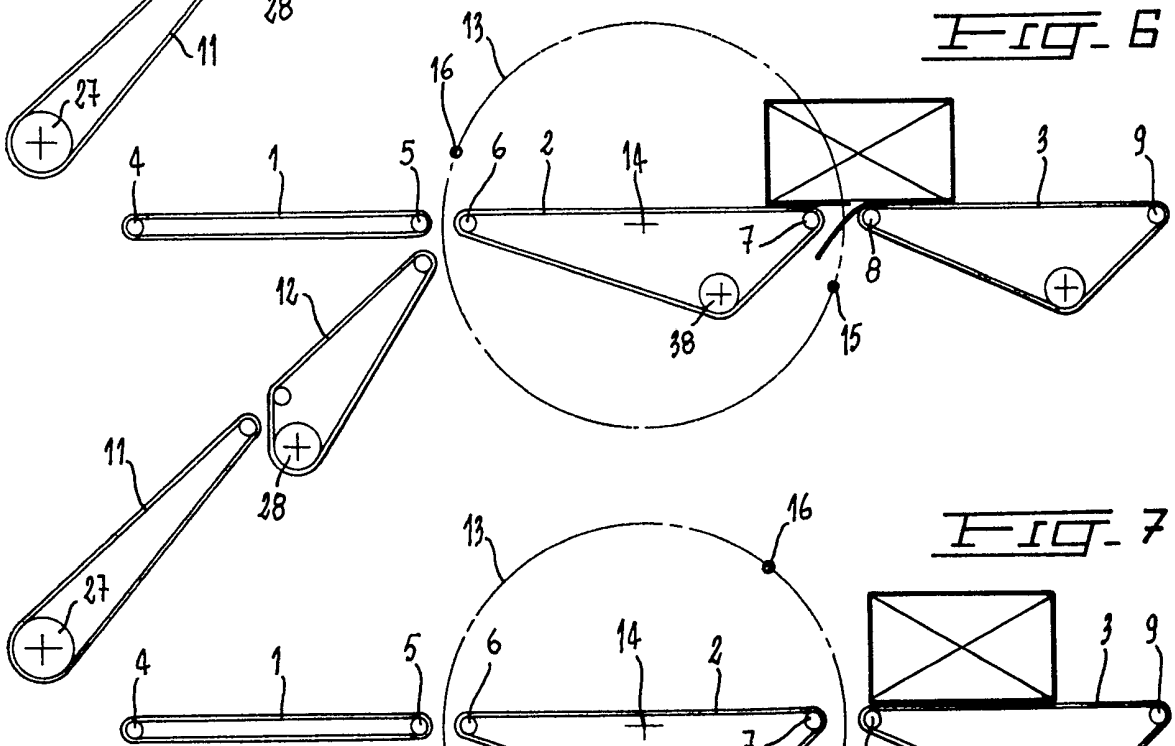
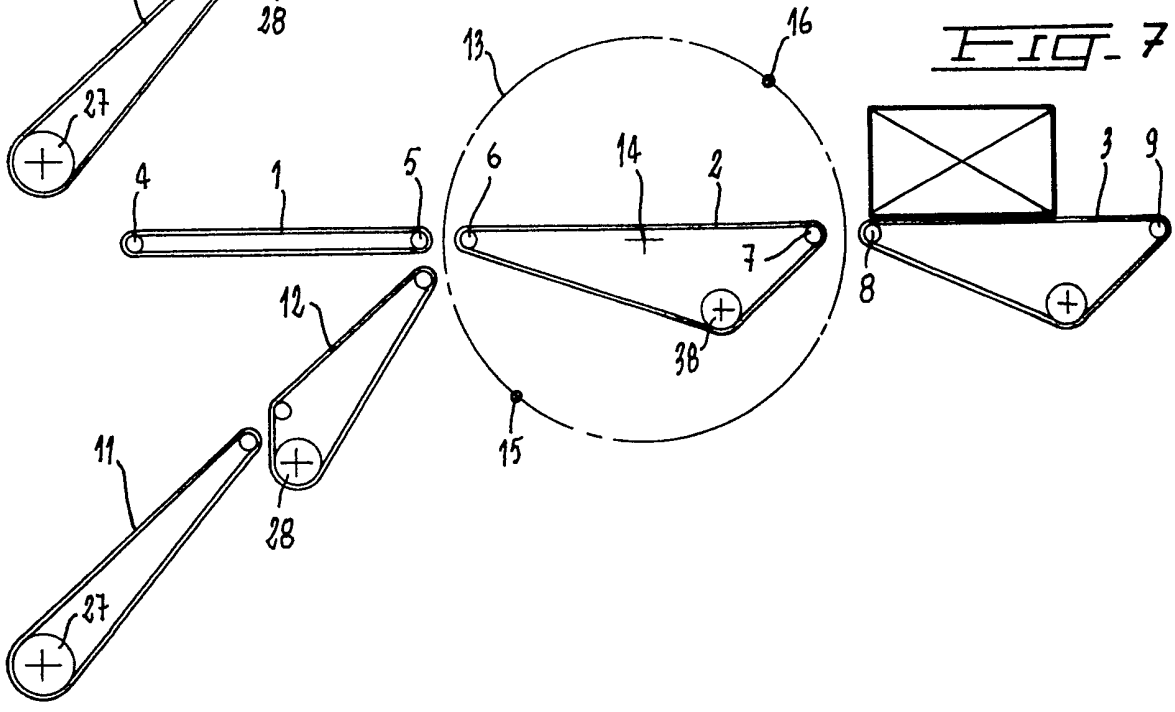


Fig. 7



WRAPPING MACHINE

This invention relates to a wrapping machine, more especially of the kind having three coplanar feed, wrapping and product delivery conveyors respectively, means for delivering sheets of the said wrapping material, and wrapping means for wrapping the said products.

The technique currently in use for packaging single articles of substantially rectangular shape, or more frequently to wrap groups of individual articles comprising for example containers for consumables in general and in particular food products and the like of a unit rectangular shape, subsequently referred to for simplicity merely as articles, with heat-shrinking material, provides for the use of so-called automatic machines with an intermediate of continuous movement which are designed on the basis of multiple modes for wrapping the heat-shrinking material around the individual articles being wrapped.

In accordance with this wrapping technique it is usual to wrap the article which is to be wrapped in the direction in which it is moving using the heat-shrinking sheet material in such a way that the said material extends beyond the two opposite sides of the said article and then the whole assembly is passed through a tunnel stove to cause the said material to adhere by heat-shrinking to the wrapped sides and the said two opposite sides of the said article before folding the corresponding material onto the said latter sides.

Some known machines for wrapping such individual articles which are caused to advance in a continuous succession in an intermittently equally spaced arrangement or in a continuous manner use two sheets of the said heat-shrinking material which are simultaneously passed above and below two successive articles respectively in a so-called sealing station where they are transversely joined together by welding and then cut so as progressively to close off or seal the enclosure or wrapping for a preceding article and respectively join the said sheets for wrapping of the next article.

Articles are so wrapped are then caused to advance through a tunnel stove to cause the said material to adhere by heat-shrinking to the wrapped sides and to the said opposite sides of the corresponding surplus material has been folded up against the latter two sides (see for example US Patents Nos 3,869,844 and 3,927,507).

Other known machines for packaging the said articles which are caused to advance in an equidistant arrangement with continuous movement instead provide for the use of a single sheet of the said heat-shrinking material.

One of these latter known machines provides for the said sheet to be fed parallel to the direction of movement of the longitudinally equally spaced articles, folding it as it advances in a tubular shape with its corresponding longitudinal edges overlapped around the said advanced articles with provision for the said overlapping edges to be

joined by heat welding.

The articles so wrapped or enclosed in the tubular shape of sheet are then caused to pass in a continuation of their continuous movement first through a first station or first tunnel stove for a first heat-shrinking of the material around the said articles, and then to leave the said first station through a second station to cut the said sheet in tubular form between two successive articles so that there is surplus material all around the posterior and anterior sides respectively of two successive articles, and finally through a third station or second tunnel stove to complete the action of causing the said material to adhere by heat-shrinking to the wrapped sides and to the said anterior and posterior sides of the same article after the corresponding material has been folded up against these latter sides (see GB Patent No 1 382 842).

Other such known machines using only one sheet for wrapping articles which are caused to advance in an equally spaced arrangement with continuous movement instead provides for the sheet to be fed from the top in such a way as to extend it over the said articles, again in such a way as to overlap the two opposing lateral sides, and to carry it, drawing from the corresponding spool downwards in a loop folded form between successive articles so as to thrust it in the direction of movement of the articles beneath the previous articles where the said looped portion is cut producing two ends or edges of wrapping material, which are

posterior for the said preceding article and anterior for the immediately following article respectively.

In the course of the continuous movement of the articles the edges corresponding to each article are caused to overlap each other on the lower or bottom side of the said article and then, again in the course of their continuous movements, the articles so wrapped are successively placed within a tunnel stove to cause the said wrapping material to adhere by heat-shrinking in the usual way to the wrapped sides and the two opposite sides of the article after the corresponding material has been folded against the latter two sides (see GB Patent No 1 355 571).

From the known art in the field of packaging it is already known how sheets or pieces of packaging material, cut from a sheet delivered from a feed spool across the path of articles requiring to be packed, can be provided in a continuous movement in such a way as to become folded in a horizontal U-shape against the anterior side and the two upper and lower parallel sides of the article adjacent thereto with the terminal parts of the arms of the said U extending beyond the posterior side and then fold the said terminal parts onto the latter side where they are joined or sealed together when partly overlapped.

The means provided to implement this form of packaging normally comprise at least two pairs of opposing belt means performing a closed movement to carry the longitudinal edges of the said sheets to convey them across

the said direction of movement of the objects being packed (see GB Patent No 1 037 261 and US 2,424,406), or by only two of the said means in closed movement located respectively at the said longitudinal edges so as to hold then by suction (see GB Patents No 958 377 and US 2,871,257).

The machines which use the latter method of U-shaped bending of the packaging material with final folding and joining of the edges of the sheets by sealing on the posterior side of the articles being wrapped require complicated devices both for this last folding and for sealing with a result that in machines for the wrapping of articles with heat-shrinking material which already have a tunnel stove to cause the material to adhere to the said articles by heat-shrinking of the heat-shrinking material which is therefore heat-weldable, it is preferred, if not directly expedient, that the method described above which, as mentioned, involves first folding the said heat-shrinking material around the anterior, upper and posterior sides of the article with an overturned U-fold and then refolding the terminal parts of the said U onto the bottom side of the said article with partial overlap should be adopted.

The object of eliminating the said complicated bending and sealing arrangements for the edges on the posterior side of products using the heat source of the tunnel stove to effect joining and sealing of the overlapping parts of the edges of the U of the wrapping material on the lower side of the articles at the same time as the action of

the stove causing the heat-shrinking packaging material to adhere to the product by heat-shrinking and therefore providing greater flexibility, i e a greater productive output per unit time and a more constant cost for wrapping with these machines using the said heat-shrinking material, in practice has not been possible to pursue because of the complexity of the mechanisms used to achieve folding and overlapping of the aforesaid terminal parts of the edges of the U material turned over the said lower side of the said articles (see for example the aforesaid GB No 1 355 571).

This has instead been achieved by the applicant, first in his Italian Patent No 1,169,175 of 23rd February 1983, proposing and subsequently constructing a machine for the wrapping of articles fed to an equally spaced succession by means of a continuously moving conveyor with sheets cut progressively from a sheet of heat-shrinking material extending beyond the two lateral sides of the said articles and then subsequently moved by suction holding means along the corresponding longitudinal edges across the direction of advance of the individual successive articles so as to be folded onto the anterior, superior and inferior faces of a corresponding article in a horizontal U-shape with a terminal portion of the said U extending beyond the corresponding posterior side in such a way as to be folded against the said posterior side and overlapped at the folded terminal portion over the inferior face providing the said conveyor constructed from two lengths of adjacent transporter sheet

and the said holding means supported opposite the zone consisting of the said two adjacent lengths of sheet material and in which the contiguous zones of the two sheets pass round at least one corresponding pair of return rollers supported by an alternately moving carriage parallel to the direction of transport and the said holding means moving alternately vertically and parallel with respect to the movement of said carriage, and subsequently in his other Italian Patent No 1 186 646 of 11th November 1985, providing an improvement in such a machine proposing different means for feeding sheets cut from the sheet of heat-shrinking wrapping material across the line of movement of the articles requiring to be wrapped and improving the efficiency provided by the said two adjacent lengths of transporter sheet.

Substantially, these different means for feeding the sheets of wrapping material comprise at least one pair of wrapping bars supported horizontally in continuous motion along a track surrounding the article which is to be wrapped in a continuous movement so that while one of the said bars wraps the wrapping material around a following article in the shape of a horizontal U on the anterior side and the two upper and lower sides of the said following article, the other folds the terminal portion of the wrapping material onto the posterior side of the preceding article while the tail end of the said terminal zone is folded back onto the underside above the initial zone of the said improved contiguous lengths of transporter sheet thus achieving the

maximum technological development of these machines now commercially available for continuous packaging using heat-shrinking sheet material in respect of both the quality of product obtained and greater productivity per unit time.

An object of the present invention is to improve the known type of machine for the wrapping of articles advanced intermittently with heat-shrinking sheet material which is regarded in the art as an intermittent machine synonymous with saving and particularly on account of the lower productivity per unit time in comparison with the aforesaid continuous moving type.

More specifically the object of this invention is to provide improvements designed to operate this type of intermittent movement machine in continuous movement employing a conveyor system which is coordinated with the movement with at least one wrapping bar by successively positioning one end of a piece of wrapping material at one end of a conveyor activated intermittently by the wrapping system, for example as described and claimed in US Patent No 3,791,100, in which an article which is being wrapped is placed on the positioned end of the wrapping material and then is moved forward until it is completely supported on the conveyor, after which the conveyor is stopped. While the article is on the stopped conveyor the wrapping bar is moved along a track which passes round the conveyor and carries the other end of the wrapping material about the article, positioning it in such a way that when the article moves on

another conveyor in the system the latter folds the end positioned beneath the article and the edge is then welded and the wrapping material is heat shrunk to form a adhering or enclosing sleeve wrapping. In this US Patent No 3,791,100, means are also provided for controlling the feed of wrapping material from a continuous spool mounted below the conveyor system, located between the track of the movement of the wrapping bar to separate the piece of material of desired length and to hold the anterior end of the separated material in position at the end of the intermittent conveyor until the article is placed upon it. More specifically such a known machine essentially comprises a wrapping conveyor having a feed end, a delivery end and an upper surface between the two ends to support and convey successive articles which need to be wrapped; means to receive articles adjacent to the delivery end of the said wrapping conveyor but spaced therefrom; an endless transporter carrying at least one wrapping bar along a track which surrounds the said wrapping conveyor to wrap the wrapping material about an article on the said wrapping conveyor; means to feed the wrapping material to supply a first piece of wrapping material to the said wrapping conveyor and place the anterior end thereof above the upper surface of the said wrapping conveyor adjacent to its feed end, the said means for the feed or wrapping material including means to maintain the said first piece of wrapping material suspended during the travel of the said wrapping

bar, and means including the said wrapping bar to carry the suspended piece and advance it to the feed end of the said wrapping conveyor; means for feeding articles to pass at least a first article which has to be wrapped to the feed end of the said wrapping conveyor and onto the anterior end of the wrapping material; first sensitive means activated when the said first article is positioned on the said conveyor in a predetermined position, with at least part of the said article placed on the anterior end of the said wrapping material in order to stop the said wrapping conveyor; operative means when the said conveyor is stopped to move the endless transporter means and the wrapping bar in movement along the said track to pass the posterior end of the said first piece of wrapping material over the said first article and then in front of it, adjacent to the delivery end of the said wrapping conveyor, while the anterior end of the wrapping material remains retained beneath the said article; the said means for feeding the wrapping material are synchronised with the said wrapping bar to provide a second piece of wrapping material and advance the anterior end thereof to the inlet end of the said conveyor while the said wrapping bar is passing the posterior end of the first piece over and then in front of the said first article; and operating means when the said wrapping material is thus passed around the said first article to start up the said wrapping conveyor to pass the said article onto the said means for receiving articles to cause the posterior end of

the said wrapping material to pass over the anterior end thereof beneath the article.

With a machine constructed in this way the article which is to be wrapped is stopped at the time when it is wrapped with the wrapping materia by the wrapping bar which is also stopped during the stages in which the article advances before and after the said wrapping stages with the result that such a machine is universally regarded as a machine having a low production rate per unit time.

Improvements have already been made in practice to adapt intermittent movement machines to operate with a continuous movement by taking steps to control the movement of the wrapping material from the corresponding spool by breaking and by providing one or more loops as a buffer for this wrapping material to alter the rate of feed in a cyclical manner in respect of both the so-called spool changing stage, see for example Patents US 2,953,880, GB 1 296 306 and US 3,995,791, and as regards feed of the individual pieces of the said wrapping material, and also in order to use operations relating to the formation of the said individual products, see for example US Patent 4,875,329, both mechanically and electromechanically.

According to the invention there is provided a wrapping machine comprising an endless wrapping conveyor having a feed end, a delivery end and an upper surface between the said two ends to support and convey in continuous movement successive articles requiring wrapping; transporter

means for supplying a succession of pieces of wrapping material to the said wrapping conveyor; and endless conveyor means carrying at least one wrapping bar along a track which passes around the said wrapping conveyor to wrap the said pieces of sheet around the respective articles on the said wrapping conveyor; wherein said transporter means comprises a first endless transporter driven at a speed slower than that of the wrapping conveyor, and a second transporter positioned between the first endless transporter and said wrapping conveyor, driven at a speed which varies cyclically between a slow speed at or near the speed of the first endless transporter and a fast speed at or near the speed of the wrapping conveyor.

The invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 shows this improved machine diagrammatically in a foreshortened frontal-longitudinal perspective view, and

FIGURES 2 to 7 are diagrammatic representations showing some stages in the operation of the said machine.

The improved machine according to this invention comprises a feed conveyor 1, a wrapping conveyor 2, and a receiving conveyor 3 each with a carrying surface moving in an endless loop and carried respectively on pairs of shafts 4, 5; 6, 7; 8, 9 located in the same horizontal plane and aligned and respectively spaced by a supporting base which is shown diagrammatically and indicated as a whole by a base 10.

The base 10 also supports two coplanar transporters

11, 12 which are located and inclined beneath the three conveyors 1, 2, 3 in such a way that the downstream one indicated by 12 ends close to the space separating the two conveyors 1 and 2 in the series of three conveyors 1, 2, 3, and a supporting structure 13 which is rotatable around the conveyor 2 about a horizontal axis 14 and supporting two horizontal wrapping rods 15, 16 the function of which will be better understood from Figures 2 to 7.

The drive for the two series of conveyors 1, 2, 3 and 11, 12 respectively is by means of a drive motor 17 which directly drives the speed reduction gear 18 and a speed varying device 22 indirectly by means of a motion transmitting belt or chain 19 which passes around two belt or chainwheels 20.

On the output shaft (not shown) of the speed varying device 22 there are keyed two belt or chainwheels 23, 24 for providing respectively a drive for the transporter 11, by means of a belt or chain 25 which also passes around a corresponding chainwheel 26 keyed to a drive roller 27 supporting the lower end of the transporter 11, and a first input drive to said cyclical differential device 31 by means of a belt or chain 29, and a further belt or chainwheel 30. The cyclical differential device 31 receives a second input drive by way of a belt or chainwheel 32, a belt or chain 34 and a belt or chainwheel 33 on the output shaft of the speed reduction gear 18.

The conveyors 1, 2 and 3 receive their drive from

the reduction gear 18 by way of a chainwheel 35, a chain 36, and a chainwheel 37 attached to one end of a drive roller 38 driving the wrapping conveyor 2. The feed conveyor 1 is driven from the other end of the drive roller 38 by way of a chainwheel 39, a chain 41 and a chainwheel 40. The receiving conveyor 3 is driven by a chainwheel 42 on the roller 38, a chain 44 and a chainwheel 43.

The transporter 12 is driven by the drive roller 28, which, *via* the cyclical differential device 31 with alternative couplings, can be actuated in alternation to provide a cyclically varying speed output by the speed varying device 22 *via* the wheel 24, the chain or belt 29 and the wheel 30, or else, alternatively, by the speed reducer 18 *via* the wheel 32, the chain or belt 34 and the wheel 32.

The speed reducer 18, *via* the chainwheel 35 and the chain 36, likewise passing around the chainwheel 37, also actuates the drive shaft 38 of the conveyors 2, 1 and 3, *via* corresponding chainwheels 39 and 40 and chain 41, and chainwheels 42, 43, and chain 44 (see Figure 1).

The structure 13, bearing the wrapping rods 15 and 15, may be driven in a known manner (not shown), either by the drive mechanism of the conveyors 1, 2, 3, by the speed reducer 18 or by any other device of the machine, but synchronously with the transport of the article to be packed, so that the horizontal wrapping bar 15 will emerge from the underlying plane between the conveyors 1 and 2 when the article in its entirety is situation on the wrapping conveyor

2 (see Figure 3), proceed to move around the upper part of the said conveyor 2 until is returns to the underlying plane, and pass between the conveyors 2 and 3 before the said article begins to move off the conveyor 2 (see Figure 5).

In operation the pieces of material for the wrapping are fed from the transporters 11 and 12, the transporter 11 being provided with means for constant motion, the speed of which can be varied by the speed varying device 22 without affecting the cycle of the feed mechanism for the articles, while the transporter 12 is able to take on two different speeds, differentially imparted to it by the device 22 *via* the drive means 24, 29, 30, and equal to that of the transporter 11, and by the reduction gear 18 via the drive means 33, 34, 32, and equal to the speed of the conveyors 1, 2, 3, this latter speed being lower than the preceding speed.

Referring to Figure 2, the piece of wrapping material fed from the transporters 11 and 12, which over part of their cycle move at equal speeds, the drive being essentially from the wheel 30 being engaged according to control by the device 31. When the front end of the piece of material emerges between the conveyors 1 and 2 and the article is partly positioned on the wrapping conveyor 2, the device 31 causes the drive to shift from the wheel 30 to the wheel 32 thus differentially increasing the speed of the transporter 12 to equal that of the wrapping conveyor 2, so that the front end of the piece will interpose itself between the article and the conveyor 2.

In Figure 3 the article is advanced with the front part of the piece of wrapping material correctly positioned between the article and the conveyor 2, the speed of the transporter 12 being equal to that of the conveyor 2, and as that of the transporter 11 is greater than that of the transporter 12 a loop of material is produced between these latter two transporters, while the wrapping bar 15, correctly synchronised with the pitch of the articles and their length, makes contact with the piece of wrapping material when the entire article is positioned on the transporter 12.

Consequently, as indicated in Figure 5, the bar 15 will proceed to spread the piece of material over the article to be wrapped, returning to the underlying plane, passing between the conveyors 2 and 3 before the article begins to move off the conveyor 2.

Finally, as shown in Figures 6 and 7, the article is transferred to the receiving conveyor 3, and during its passage the rear end of the piece of wrapping material is positioned under the front end of said piece for the known welding and heat shrinkage operations.

The advantage of an operating system of this kind, over known machines, is that the three conveyors 1, 2 and 3, by which the articles to be wrapped are fed into position will function at operating speed with continuous constant motion; the transporter 11 for the withdrawal of the pieces of wrapping material will function at operating speed with continuous constant motion; and the transporter 12 for

feeding the said pieces to the wrapping conveyor 2 and to the wrapping bar 15 will function continuously but at different speeds, resulting in a significant improvement in output at a given time and thus solving the inertia problems caused by the acceleration and deceleration of the articles to be wrapped, of the reel of material, of the piece of wrapping material and of units for feeding the piece of material to the wrapping means.

In practice, the drive mechanism is arranged so that a continuous movement of the wrapping operation is achieved, by driving the three conveyors 1, 2, 3 feeding the articles which are to be wrapped in a constant continuous movement at a speed which is in a ration of 0.5 to 1 of the speed of transporter 11; and which is in a speed ratio respectively 0.5, for 120°, and 1, for 240°, of the speed of the transporter 12 which feeds the pieces of wrapping material S (see in particular Figures 2 to 7). This arrangement achieves a considerable increase in the production speed per unit time over those intermittent machines which are considered to be slow in the specific field of low cost packaging.

CLAIMS:

1. A wrapping machine comprising an endless wrapping conveyor (2) having a feed end, a delivery end and an upper surface between the said two ends to support and convey in continuous movement successive articles requiring wrapping; transporter means (11, 12) for supplying a succession of pieces of wrapping material to the said wrapping conveyor; and endless conveyor means (13) carrying at least one wrapping bar (15) along a track which passes around the said wrapping conveyor to wrap the said pieces of sheet around the respective articles on the said wrapping conveyor; wherein said transporter means comprises a first endless transporter (11) driven at a speed slower than that of the wrapping conveyor (2), and a second transporter (12) positioned between the first endless transporter (11) and said wrapping conveyor (2), driven at a speed which varies cyclically between a slow speed at or near the speed of the first endless transporter and a fast speed at or near the speed of the wrapping conveyor.

2. A wrapping machine as claimed in claim 1, wherein a differential device is provided for the drive of said second transporter (12), said device having a first input transmission path for moving said second transporter at the same speed as the first transporter (11) and a second input transmission path for moving said second transporter (12) at the same speed as the conveyor, said device varying the drive between the transmission paths cyclically.

3. A wrapping machine as claimed in claim 2,

wherein the speed of the wrapping conveyor is substantially 0.5 to 1 of the speed of the first transporter and is in a speed ratio of 0.5, for 120°, and 1, for 240°, of the speed of the second transporter (12).

4. A wrapping machine substantially as described with reference to the accompanying drawings.

5. An improvement designed to operate in continuous movement those types of machines which traditionally operate with an intermittent or stepwise movement to wrap articles with pieces of sheet of heat-shrinking material comprising essentially a wrapping conveyor having a feed end, a delivery end and an upper surface between the two ends to support and convey successive articles requiring to be wrapped, means for feeding the wrapping material to provide a succession of pieces of wrapping material to the said wrapping conveyor placing the anterior end of these pieces above the upper surface of the said wrapping conveyor at its feed end; means for delivering and receiving the said articles located in sequence respectively adjacent to but at a distance from the corresponding feed and delivery ends of the said wrapping conveyor; endless transporter means carrying at least one wrapping bar along a track which surrounds the said wrapping conveyor to wrap the said pieces of sheet of heat-shrinking material around a corresponding article on the said wrapping conveyor; and drive means for synchronously driving the said wrapping conveyor, the said means for feeding the wrapping material, the said means for delivering and receiving

articles and the said endless means carrying a wrapping bar, the improvement being characterised in that the said drive means are continuously driven drive means and the said means for supplying the wrapping material to provide a succession of pieces of wrapping material to the said wrapping conveyor placing the anterior ends thereof on the upper surface of the said wrapping conveyor at its feed end comprise at least two transport members located in series one after the other in which the downstream member in the direction of transport movement is served by a device which cyclically differentiates the drive transmission speed which is in turn subject to the said continuously moving drive means.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

GB 9205889.0

Relevant Technical fields

(i) UK Cl (Edition K) B8C (CW1, CW5)

(ii) Int Cl (Edition 5) B65B 11/06, 11/10, 11/12, 11/14

Search Examiner

S R SMITH

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

21 AUGUST 1992

Documents considered relevant following a search in respect of claims 1-5

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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