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(71) Applicant: **C.M.C. S.r.l.**
I-06011 Citta' di Castello (Perugia) (IT)

(72) Inventor: **Ponti, Giuseppe**
I-06011 Cerbara di Città di Castello (IT)

(74) Representative: **Dall'Olio, Giancarlo**
INVENTION s.n.c.
Via del Cestello, 13
I-40124 Bologna (IT)

(54) Apparatus for wrapping articles with a strip of wrapping material

(57) An apparatus for wrapping articles (1) with a strip (17) of wrapping material includes conveying means (6), situated along a wrapping line (4) and operated by a motor (9) in phase relation with means (2) for feeding the articles (1). Sensor means (11) detects the presence of articles (1) on the conveying means (6). Second conveying means (12), operated by respective motor means (15), extend through a a station (13) where the articles (1) are wrapped with a strip (17) of wrapping material. The second conveying means (12) working speed will be slowed down if there are no articles (1) on the conveying means (6). Means (18) for making joining and cutting lines transversal to the strip are operated in phase relation with movement of the articles (1) along said second conveying means (12).

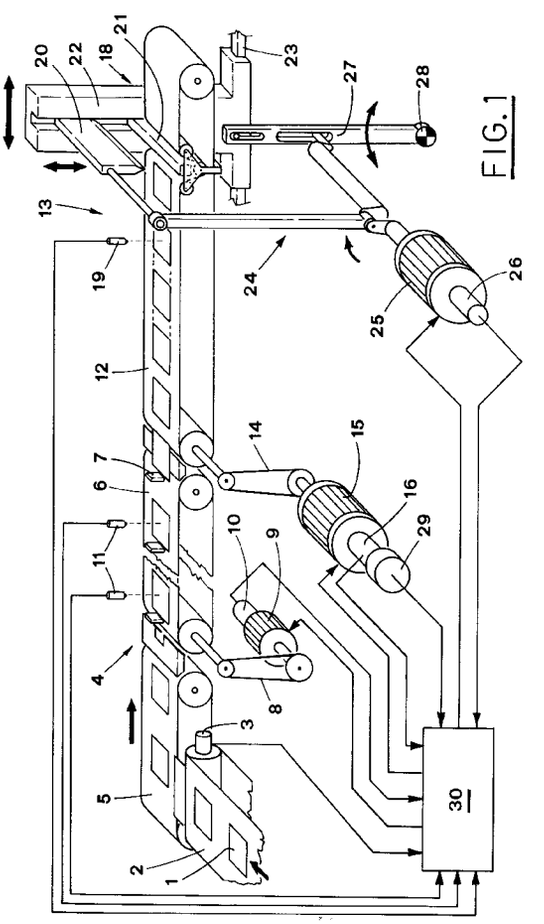

FIG.1

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Description

The present invention relates to wrapping articles with a strip of wrapping material.

It is known that articles like books, magazines, booklets and the like are wrapped with a sheet of protective material that keeps them safe from damages.

This protective sheet is generally made of thermoplastic transparent film, like polyethylene and similar.

This sheet permits also to package together with the magazine and the like an insert or inserts, usually enclosed therewith.

For wrapping the articles with a plastic film, devices are usually used which include pushers that regularly space apart the same articles.

The articles are directed to a wrapping station, and a continuous plastic film is fed thereto as well.

The film is folded over the articles by suitable guides. Subsequently, a longitudinal welding and a double transversal welding between the articles are made, and the film is cut between the transversal weldings, so as to obtain single packages.

Otherwise, the articles are wrapped with a strip of paper or the like.

An apparatus for wrapping books, magazines and the like, with paper is disclosed e.g. in the European Patent No. 0.480.882. This apparatus features conveyors for the articles to be packaged and a spool that delivers paper in direction longitudinal to the articles movement direction; spraying means apply strips of suitable glue transversally to the sheet of paper, between the articles.

The strip of paper is folded around the articles and, simultaneously, other spraying means apply suitable glue on longitudinal edges of the sheet of paper; these longitudinal edges are put one on the other and pressed by suitable pressing means so as to be glued.

The articles are supplied to the wrapping line either directly at the outlet of the production line, or from a storage magazine, this last case being specifical to Companies working for a third party only to carry out the wrapping of the articles.

It is to be pointed out that, in the first case, the articles are supplied by the production line with high speed, so the wrapping stages must fit to this speed.

The disadvantage of these devices results from possible lack of one or more articles along the wrapping line, due to their irregular supply by the production line (in other words, an "empty" place, i.e. lacking article, instead of "occupied" place, i.e. present article), or due to possible reject, immediately upstream of the wrapping line, of incomplete articles without inserts, that cannot be fed to the wrapping line.

The lack of articles at the wrapping station can disrupt the line operation, because the sheet of paper that cannot wrap the article, gets crumpled.

In order to avoid this inconvenience, there have been proposed suitable suction means, aimed at removing the crumpled part of the sheet.

However, this solution does not work if more than one article are missing, so it is usually necessary to stop the apparatus in order to restore correct working conditions.

Obviously, if the apparatus is fed directly by the production line, stop of the wrapping stages also affects the production stages.

An object of the present invention is the provision of an apparatus that allows the articles to be wrapped with a strip of wrapping material without any need to stop the wrapping machine due to inconvenience caused by a lack of one or more articles, so that a continuous working is ensured for the overall wrapping line.

The above mentioned object is achieved by the apparatus as defined in claim 1.

The characteristic features and advantages of the present invention will be apparent as it is better understood from the following description with reference to the accompanying drawings, in which:

- Figure 1 is a schematic perspective view of the subject apparatus;
- Figure 2 is a schematic, partial plan view of the same apparatus, in normal working conditions;
- Figures 3a, 3b, 3c, and 3d are lateral schematic views of welding means and cutting means of the apparatus, in following working steps;
- Figures 4 and 5 are schematic plan views of the apparatus, during the steps, in which normal working conditions are restored, after the lack of one article;
- Figures 6 and 7 are the same schematic plan views of the apparatus, during the steps in which normal working conditions are restored, after the lack of more than one article.

With reference to the above mentioned figures, the articles 1 are to be wrapped with a strip of wrapping material, constituted by e.g. film of transparent plastic material.

The articles 1 are fed one by one by a belt conveyor 2 that is connected with the articles 1 production line. The speed of the belt conveyor is detected by a sensor element 3 that includes an encoder.

The articles 1 are moved from the belt conveyor 2 to a wrapping line 4 that extends transversally to the same belt conveyor 2.

The wrapping line 4 includes a first belt conveyor 5, aimed at receiving the articles 1, and a second belt conveyor 6, designed to control the rhythmical movement of the articles 1.

The belt 6 is equipped with trailers 7 that, in known way, keep the articles 1 regularly space apart. The belt conveyor 6 is operated by a motor 9 through a transmission 8.

The speed of the belt conveyor 6 is detected by a related encoder 10 mounted on the motor 9. Sensor elements 11, e.g. photocells, aimed at detecting the actual presence of the articles 1 to be wrapped, are designed

to cooperate with the belt conveyor 6.

The articles 1, moved rhythmically, regularly spaced apart, are transferred to another belt conveyor 12 that extends through a wrapping station 13 and that is operated by a motor 15 through a transmission 14.

The speed of the belt conveyor 12 is detected by a related encoder 16 connected with the motor 15. Also a dynamo 29 is connected to the axle of the motor 15.

The plastic film 17, fed continuously to the station 13, is folded, to take a tubular shape, by suitable guides, not shown, so as to wrap up the articles 1, and is then welded longitudinally in a known way (see fig. 2).

Then, a double transversal welding between the articles, is made on the plastic film 17 by a device 18 that subsequently cuts the film 17 between the transversal weldings.

The welding and cutting device 18 is controlled on the basis of the outputs of other sensors 19, aimed at detecting the position of the articles 1 being wrapped, downstream of the same device 18.

The device 18, that is a known one, includes a welding and cutting blade 20 that cooperates with a counter-blade 21.

The blade 20 is supported by a carriage 22 and is allowed a vertical sliding motion, while the counter-blade 21 is also supported by the carriage but in a stationary position.

The carriage 22 slides on a guide 23 in direction longitudinal to the line 4. The blade 20 is operated with reciprocating movement by a mechanism 24 that includes a crank and a connecting rod, driven by a motor 25.

The working speed of the crank-rod mechanism 24 is detected by a related encoder 26 connected to the motor 25. The crank-rod mechanism 24 also operates a crank and slotted link mechanism 27 having its lower part pivoted on a pin 28 and hinged to the carriage 22, so that the carriage is given a reciprocating horizontal motion.

The crank and slotted link mechanism 27 allows to adjust the stroke of carriage 22 to fit the need.

As seen in Figs. 3a, 3b, 3c and 3d, the combined operation of the crank-rod mechanism 24 and the crank and slotted link mechanism 27 provokes reciprocating movements of both the blade 20 and the carriage 22 that supports the same blade 20 and the counter-blade 21.

For the sake of clarity, the positions assumed by the above mentioned crank-rod mechanism 24 and crank and slotted link mechanism 27 are depicted with dashed lines 24a and 27a.

The welding and cutting device 18 is controlled on the basis of the outputs of the photocell 19 that detects the position of the articles 1 being wrapped on the belt conveyor 12.

When the photocell 19 detects that an article 1 has reached a pre-determined position, e.g. when the free part of the plastic film between an article and the next one passes below the photocell, the motor 25 operates the blade 20 and the carriage 22, which move in phase relation with each other (Fig. 3a).

The blade 20 joins the counter-blade 21, thus welding transversally the plastic film and then cutting it along the middle of the welding (Fig. 3b).

Subsequently, the blade 20 and the carriage 22 perform a return stroke (Figs. 3c and 3d). The motors 9, 15, and 25 are controlled by programmable processors 30, like known PLC, that receive and process signals issued by the encoders 3, 10, 16 and 26, and by the photocells 11 and 19.

The above mentioned motors 9, 15 and 25 are brushless motors and give a quick response. In normal working conditions, the articles 1 are fed from the belt conveyor 2 to the wrapping line 4 one by one.

The articles 1 are transferred to the belt conveyor 6 that is equipped with the trailers 7 that regularly space apart the articles 1.

The belt conveyor 6 moves forward in phase relation with the belt conveyor 2 that is operated continuously to feed the articles 1. At this point, inserts, postal labels and the like can be added.

The photocells 11 detect the presence of the articles 1 on the belt conveyor 6 and thereafter, the belt conveyor 12 brings the articles 1 to the wrapping station 13.

At the wrapping station 13, the photocell 19 checks the correct position of each article and operates the device 18 for transversal welding and cutting of the plastic film 17.

If the photocells 11 detect lack of one article on the belt conveyor 6 of the wrapping line 4, due to a possible "empty" place on the line 2 or due to a reject on the belt conveyor 6 by known, not illustrated means, (in Fig. 4 the lacking article M is depicted with broken line), the movement speed of the wrapping belt 12 is suitably lowered, until the next article arrives, thus keeping constant the distances between the articles placed thereon (see Fig.4).

At the same time, the working speed of the motor 25 of the welding device 18 is lowered.

When the next article arrives, the belt conveyor 12 and the welding and cutting device 18 work again with their normal speed (Fig.5).

It is to be pointed out that normal working conditions are restored in a time corresponding to the passage of only one article, with high speed.

If there are more subsequent articles lacking, e.g. two lacks M (Fig.6), the wrapping belt 12 will be first slowed down and then, upon detection of the second lack, stopped completely.

Also the welding device 18 will be first slowed down and then stopped, while the motor 9 of the belt conveyor 6 will be kept on working in phase relation with the movement speed of the articles feeding belt 2 (Fig. 7).

Obviously, also in this case, when the next article arrives, the normal working conditions of the belt conveyor 12 and the welding and cutting device 18 are re-

stored.

Normal conditions restoration, after one or more lacks, is activated automatically and controlled by the programmable processors 30 that control the motors 9, 15 and 25, on the basis of signals issued by the encoders 3, 10, 16 and 26 and the photocells 11 and 19, and processed thereafter.

In fact, the shaft of the belt conveyor 2 feeding the articles 1 is operated continuously and the encoder 3, connected therewith, supplies a reference parameter that is compared to the parameter issued by the encoder 10 of the belt conveyor 6, and the result is used to operate the conveyor 6 in a way to match the motion of the conveyor 2.

The wrapping belt 12 moves forward regularly, operated by the motor 15, only if the photocells 11 detect the presence of all the articles 1 on the belt conveyor 6.

The processors 30 determine the speed of the wrapping line that determines the distance between the articles 1.

When speed of the feeding belt conveyor 2 is changed or the belt conveyor 2 is stopped, speed of the belt conveyor 6 can be varied accordingly, by means of the signals issued by the encoders 3 and 10.

The motion speed of the blade 20 of the welding device 18 is determined by the motor 25 that is controlled on the basis of the signals issued by the encoders 16 and 26 and the dynamo 29.

The position of the blade 20 is instead determined in accordance with the position of the articles 1 on the wrapping belt 12, detected by the photocell 19.

Therefore, if the reciprocal position of the articles 1 on the wrapping belt 12 changes, operation time of the blade 20 changes accordingly in every cycle, automatically.

Consequently, the blade 20 always takes the intermediate position between an article and the following one, it welds and cuts a section that can be defined by digital control, and the cycle continues so that the blade returns to its starting position in phase for the next cycle.

In normal working conditions, the feeding belt conveyor 2 controls the belt conveyor 6, by operation of the encoders 3 and 10 and the processors 30.

The belt conveyor 6 controls the wrapping belt 12 that, in its turn, controls the translation of the blade 20 of the welding device 18.

When one article lacks, the prefixed speed of the belt conveyor 6 remains unchanged, while the wrapping belt 12 and the welding and cutting device 18 are suitably slowed down, and accelerated again when the next article arrives.

If two or more subsequent articles lack, the belt conveyor 12 and the device 18 slow down along the space occupied by one article and then they stop so as to start again when the next articles arrive.

In this way, the plastic film does not get crumpled in wrapping stage, and the working continuity of the line is not interrupted, so possible disadvantages resulting therefrom, as reported in the introductory note, are avoided.

The constructive characteristics of the apparatus, as described, allow it to keep high working speeds.

An apparatus for wrapping articles with plastic films has been described as a pure example, therefore it is obvious that the disclosed working principles can be used also for wrapping articles with other materials, as a sheet of paper or the like.

In this case, means spraying suitable glue can be used instead of means for longitudinal and transversal welding.

Claims

1. Apparatus for wrapping articles in a continuous sheet of material along a wrapping line (4) provided with first means (2,5) for feeding articles (1) to the wrapping line (4), the said apparatus being characterised in that it includes:

   second means (6) for conveying articles (1) to be wrapped, these conveying means being operated by first motor means (9) in phase relation with said first means (2,5) for feeding articles (1) thereto; sensor means (11) for detecting articles (1) placed on said first conveying means (6);
   second conveying means (12) extending through a station (13) for wrapping said articles (1) with a strip of wrapping material (17), and being driven by related second motor means (15) controlled by said sensor means (11) in a way such as to change the operation speed of the said second conveying means (12) in case one or more of the said article (1) are missing; means (18) for making crosswise joining lines and cutting lines in said strip of material (17), these means being operated in phase relation with the advancement of the articles (1) along said second conveying means (12).

2. Apparatus according to claim 1, characterised in that said first and second motor means (9,15) are controlled by programmable processor means (30) on the basis of signals issued by said sensor means (11) and by encoders (3,10,16) respectively connected to said feeding means (2,5) of said articles (1) and to said motor means (9,15).

3. Apparatus according to claim 1, in which said conveying means (6) are equipped with trailing means (7) that set the articles (1) regularly spaced out, characterised in that said trailing means are operated continuously and in phase relation with said feeding means (2), by means of an encoder (10) connected to said motor means (9) whose output is

compared with the output of an encoder (3) connected to said feeding means (2).

4. Apparatus according to claim 1, characterised in that said welding and cutting means (18) are controlled by further sensor means (19) which detect the position of said articles (1) being wrapped on said further conveying means (12).

5. Apparatus according to claim 1, characterised in that said further conveying means (12) as well as said welding and cutting means (18) are controlled by programmable processor means (30) in such a way as to slow down when lack of an article (1) on said conveying means (6) is detected then being kept slowed down until a subsequent article arrives, and to stop when lack of more than one article is detected on the same conveying means (6).

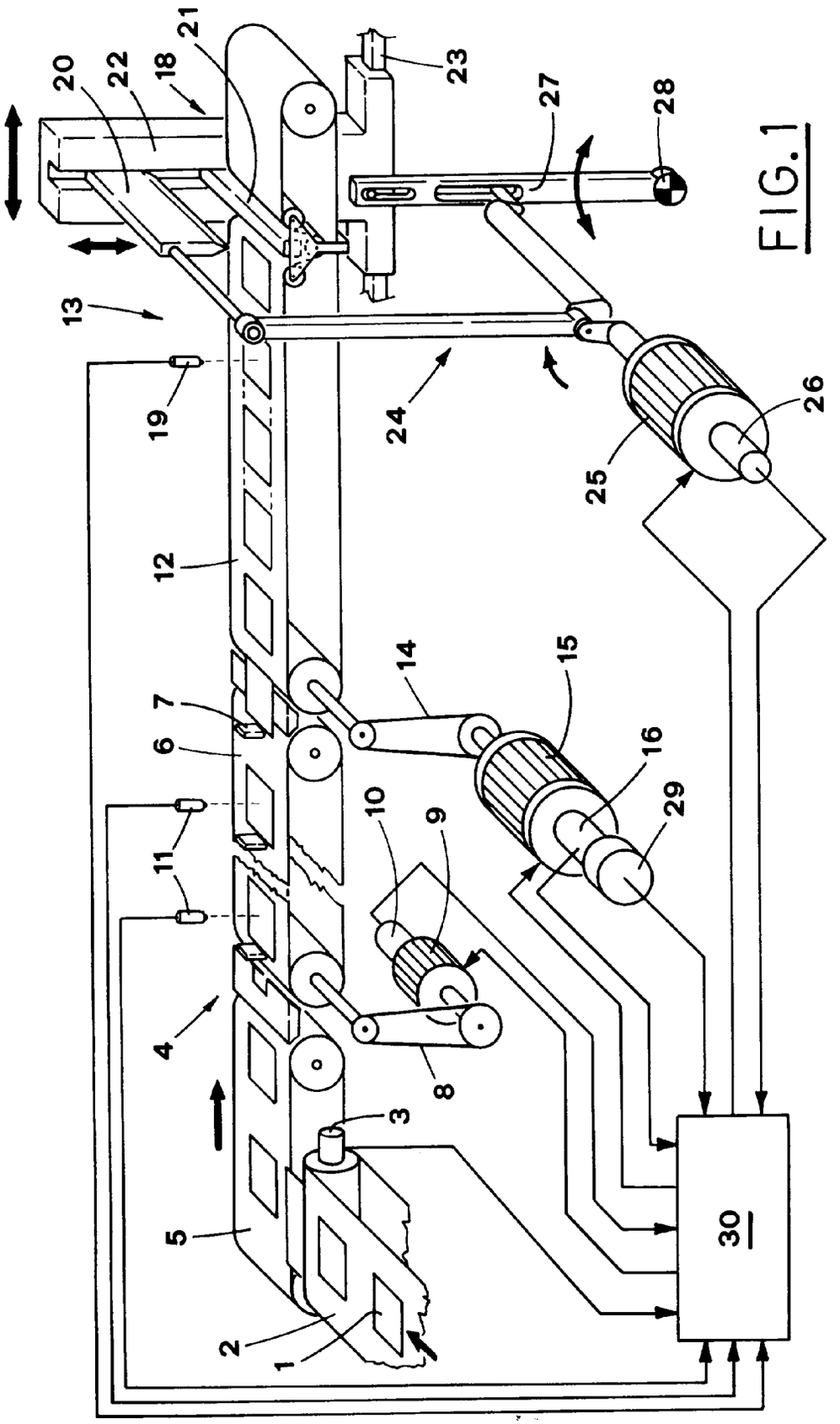


FIG.1

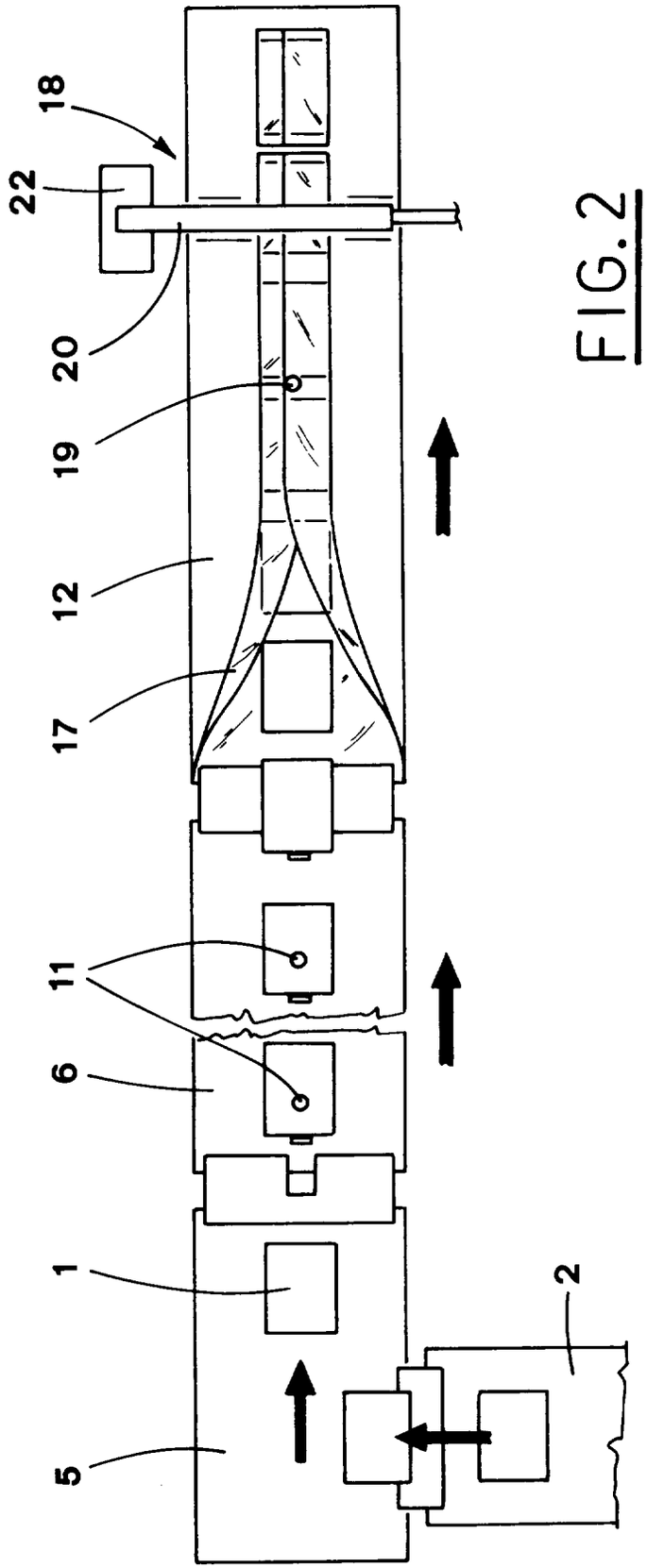


FIG. 2

FIG.3d

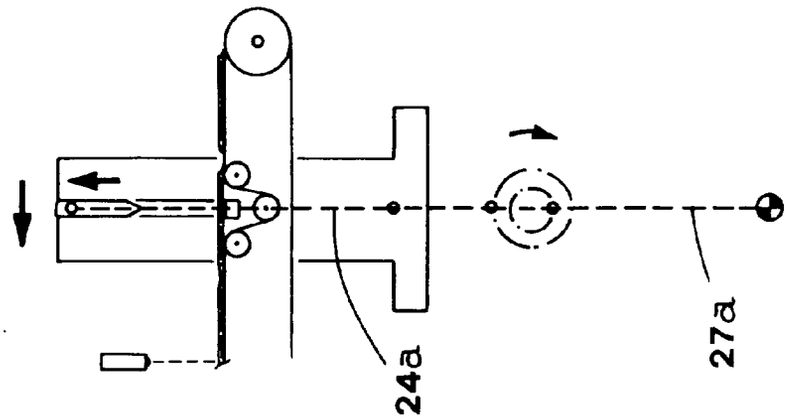


FIG.3c

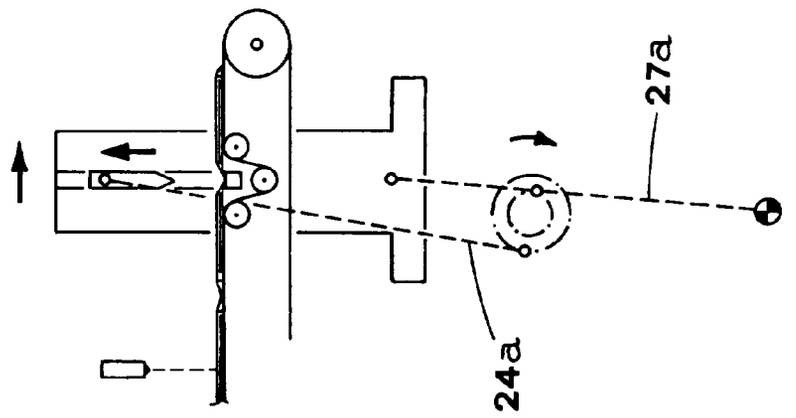


FIG.3b

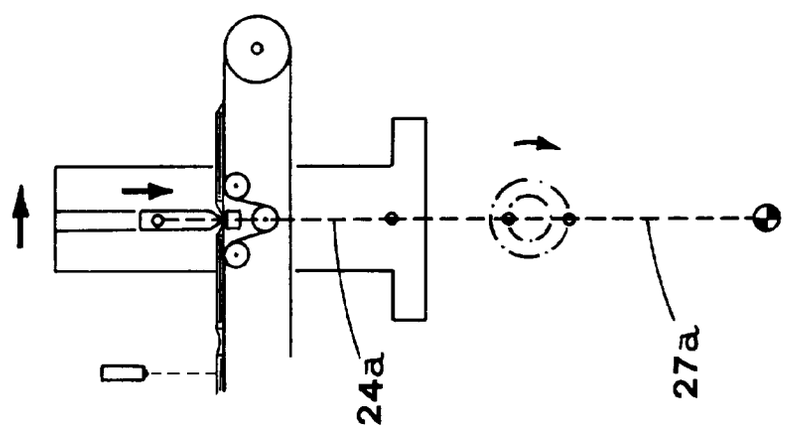
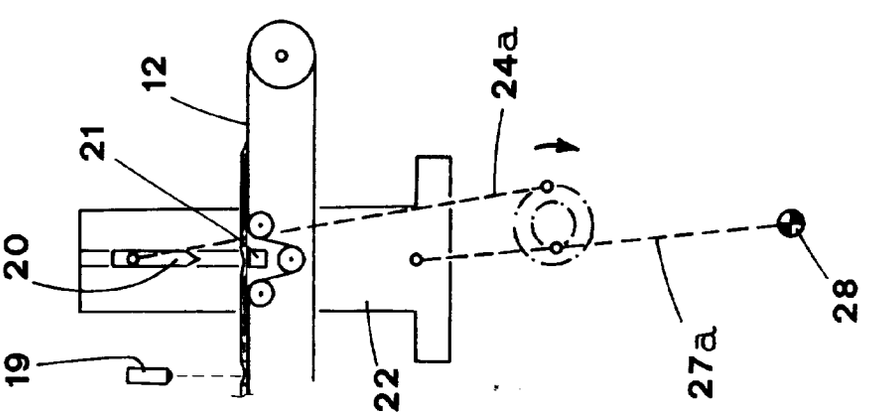


FIG.3a



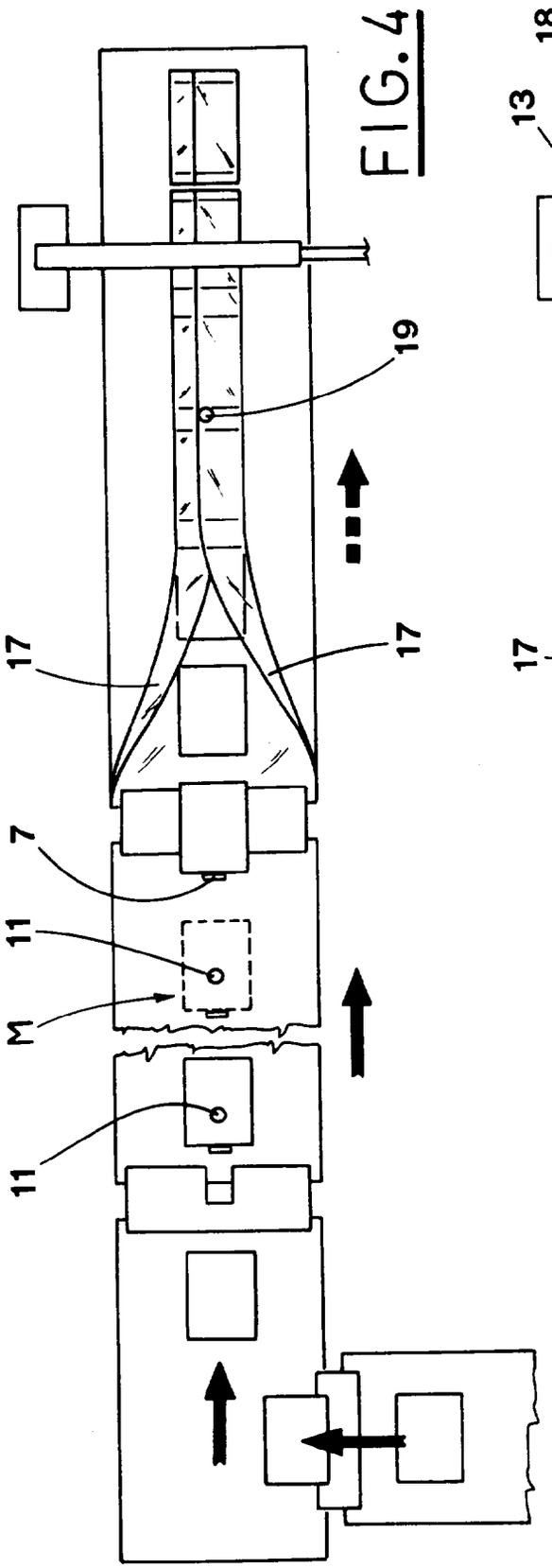


FIG.4

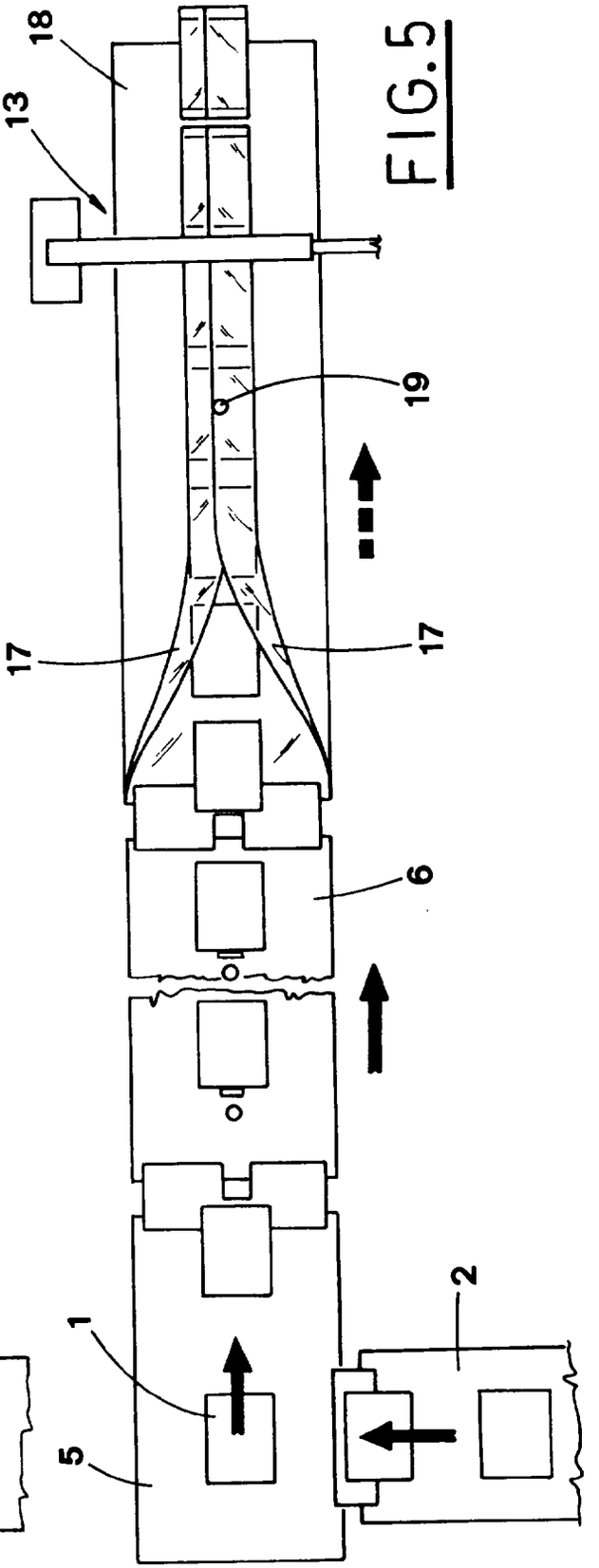


FIG.5

FIG. 6

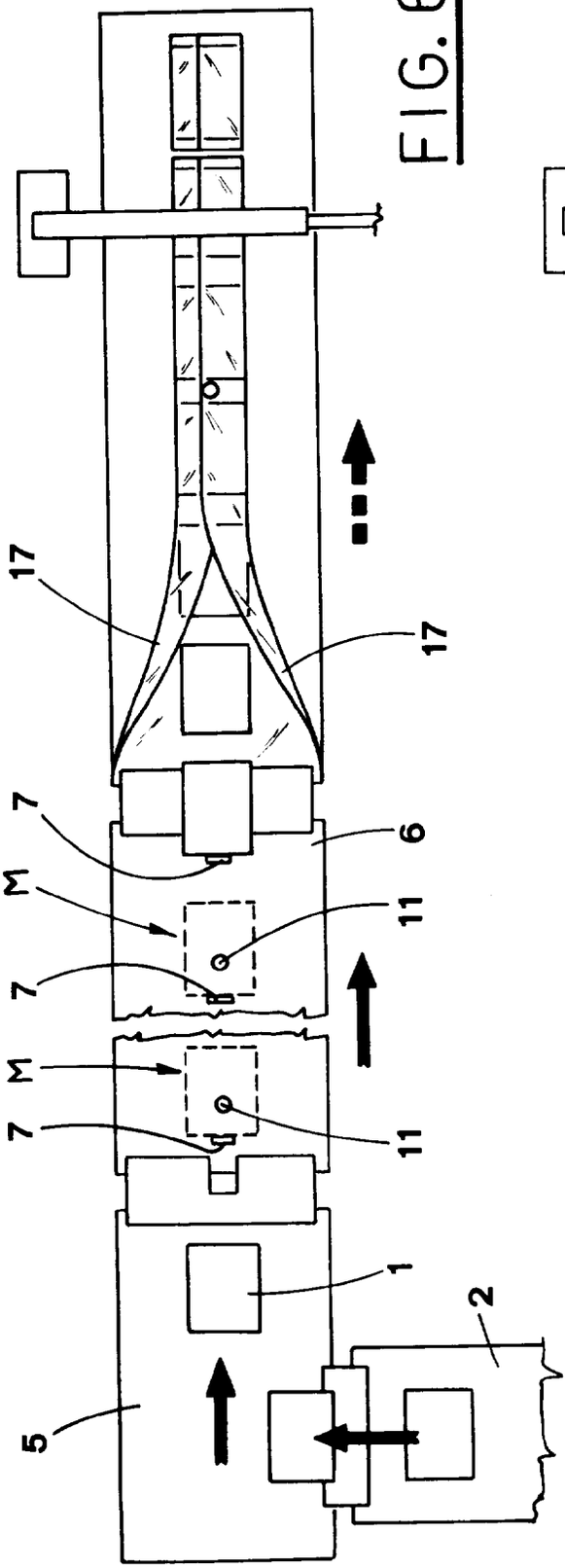
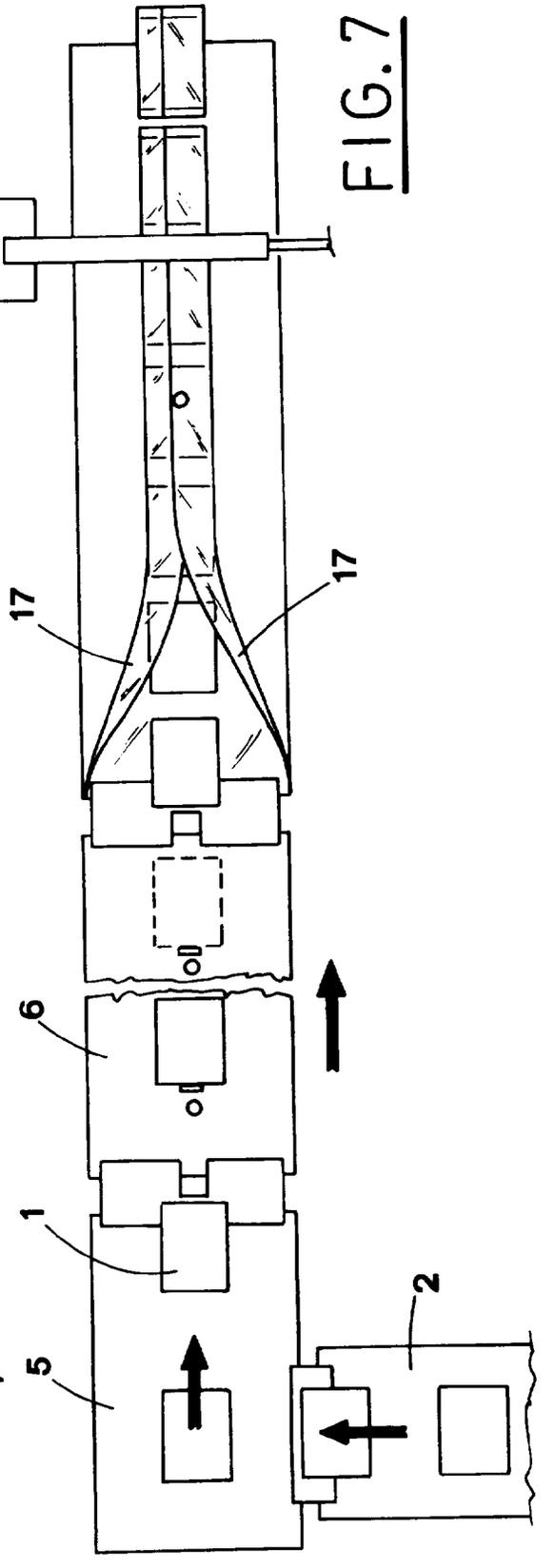


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0478

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X,P A	EP-A-0 640 526 (FRANSEN) * column 2, paragraph 3 * * column 4, line 4 - column 8, line 35; figures 1,2 * ---	1-4 5	B65B9/06 B65B57/14
A	EP-A-0 375 857 (FUJI) * abstract; figure 2 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 February 1996	Claeys, H

CATEGORY OF CITED DOCUMENTS

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