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Packaging machine

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(56) Related Art

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US 3775242

Abstract

The present invention relates to a packaging machine which has transport means in the form of two transport chains (5, 6) for lateral grasping and transporting of a length of material (7) consisting of packaging material. In particular with longer plants above approximately 10m in transport length the stretching property of the transport chains owing to the load has a marked effect on the precision of the transport distance. This results in fluctuations of the transport distance between the two transport chains and therefore distortions of the length of material, which, depending on the type of packaging material, can even lead to tearing of the length of material. In order to minimise these fluctuations, the first transport means (5) has a first engagement element (10) engaging in the first transport means (5) and the second transport means (6) a second engagement element (11) engaging in the second transport means (6), the first engagement element (10) being coupled to the second engagement element (11) in such a way that the two engagement elements are synchronised.

(Fig. 2)

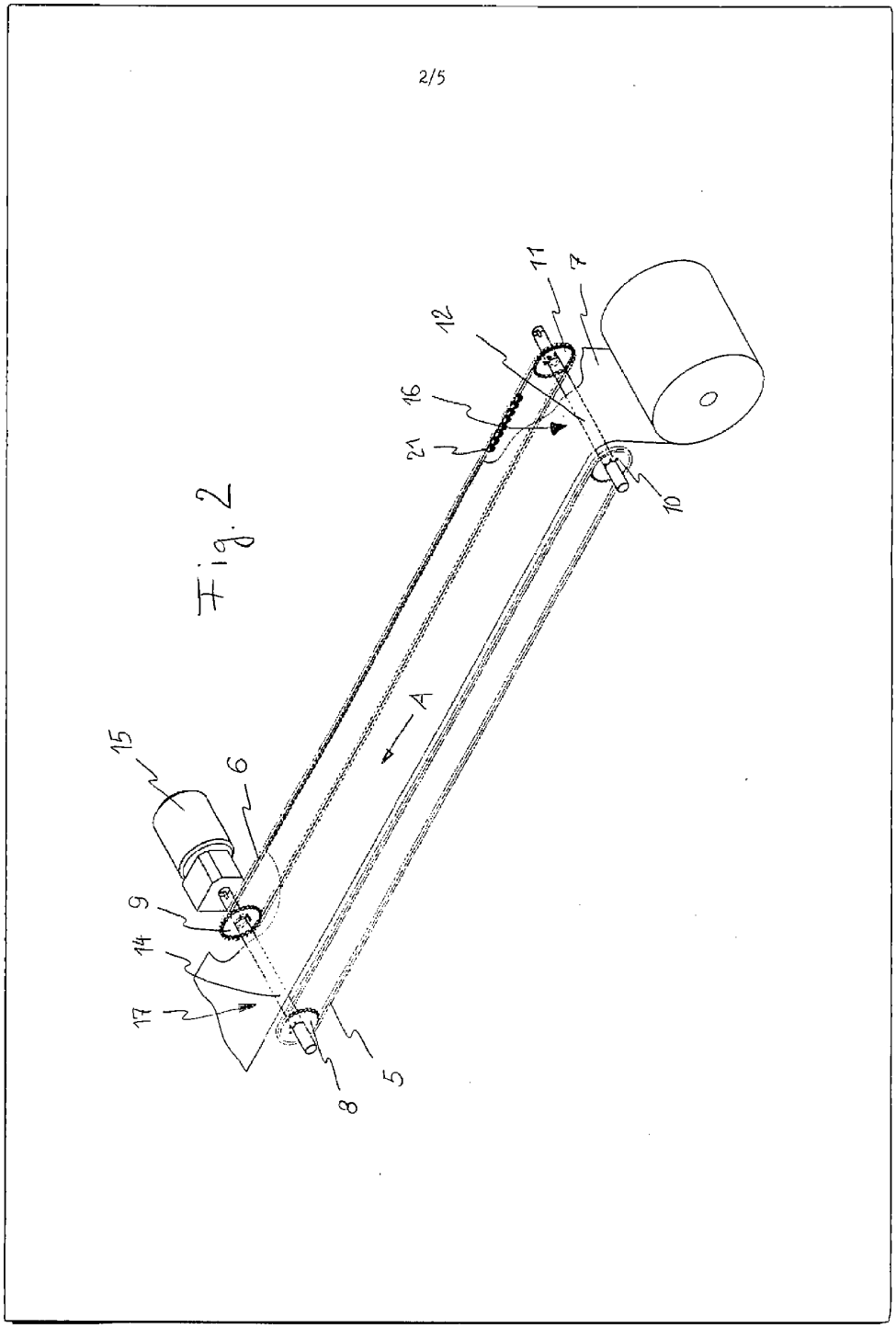


Fig. 2

P/00/011
Regulation 3.2

AUSTRALIA

Patents Act 1990

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title: "PACKAGING MACHINE"

The following statement is a full description of this invention, including the best method of performing it known to us:

Packaging machine

The present invention relates to a packaging machine according to the preamble of patent claim 1.

A packaging machine of this kind is known, for example, from DE 2 123 133. It has a frame, having two frame parts arranged parallel to one another in the longitudinal direction. At one end of the two frame parts chain wheels are provided in each case, via which run two transport chains in the form of continuous chains. The individual chain links of the transport chains are equipped with clamps which hold a length of packaging material, such as a foil, at the edges. When the chain links come into engagement with the chain wheels the clamps open, so the length of packaging material is inserted into the clamps. When the chain links are released from the chain wheels the clamps close and the length of packaging material is held in tensioned state between the transport chains. The chain wheels are in each case cantilevered on an axle. Between the chain wheels a foil guide drum for the length of packaging material is supported as freely rotatable about an axle. At the other end of the two frame parts further chain wheels are provided, which serve to open the clamps again by engaging in the transport chains, so the length of packaging material is released from the clamps. Various working stations are arranged along the frame. During transport of the length of packaging material through the working stations high precision of the forward feeds of both chains is required, in order to achieve as low forward feed tolerances as possible during successive operating cycles. Higher tolerances require more packaging material and cause increased costs. The transport chains have limited stability,

however, and are elastically stretched like a spring under load. In particular with longer plants of more than approximately 10m in transport length this stretching property has a marked effect on the precision of the transport distance, as the load increases owing to the length and higher driving power results in even greater stretching. The relative stretching with greater length of the plant simultaneously gives rise to higher amounts of stretching, which cause practically over-proportionately higher tolerances. Additionally, the fluctuations can come out differently on the two transport chains and therefore cause distortions of the length of packaging, which, depending on the type of packaging material, can even lead to tearing of the length of material.

Fig. 5 should be referred to as an example. There three lines a-a, b-b and c-c are shown at the inlet of the transport length. Each of the lines represents an imaginary connecting line between two chain links corresponding to one another. Line a-a therein represents the ideal state, in which the imaginary connecting line runs parallel to the shaft 14 at the outlet, i.e. no misalignment occurs on the transport path of the two transport chains 5 and 6. Lines b-b and c-c show the possible fluctuation range of the distortion of the length of material 7. Line b-b shows the case in which chain 5 is in advance of chain 6 in transport direction A, whereas line c-c shows the case in which chain 5 is running behind chain 6. In trials it has been established that with a plant length of 10m and a load of 3000N an elastic lengthening of the transport chain of 15mm can occur. A misalignment of 15mm may sometimes be sufficient for the length of packaging material to tear or for the working station not to process the length at the correct position. A plant which is longer than 10m cannot

therefore be implemented, at least not according to conventional methods.

It is therefore the object of the present invention to create a packaging machine with which the tolerances of the transport paths can be minimised.

This object is achieved with a packaging machine according to claim 1.

Advantageous further developments and particular embodiments of the packaging machine are the subject of the subordinate claims.

In that the first engagement element is coupled to the second engagement element in such a way that both engagement elements are coordinated to one another with synchronous angles, it can also be ensured at the inlet on the entrance side that the transport paths of the two transport means are of equal length. Possible tolerances because of uneven stretching of the transport means owing to high tensile loads can thereby be compensated. Consequently the packaging machine can be configured with a greater length than previously, without impermissibly large tolerances being obtained in the transport paths of the two transport means.

It is advantageous to provide a torsion-proof shaft, on which the two engagement elements are arranged as fixed against rotation, as this enables a simple and economical solution to the problem on which the invention is based. Additionally it is thereby possible to retrofit old plants without great constructional outlay, by subsequently mounting the two

already existing engagement elements, supported rotatably on axles, as fixed against rotation on the shaft.

It is advantageous to provide a drive device which jointly drives the first and second engagement elements. In this way the transport device is driven at two points by two drive devices, making it possible for introduction of the load on to the transport means to take place at several points, so it is reduced per introduction point. Moreover, the advantage is achieved that it is thereby possible to use smaller drive devices.

It is further advantageous to provide one drive device each in each case for the first and the second engagement element and drive them synchronously. It is thereby possible to use even smaller drive devices. The drive devices are advantageously controlled by a control device, so they are synchronised with one another. In this way angle-synchronous rotation of the drive shafts is implemented, i.e. so-called electronic shafts are therein implemented, wherein one shaft acts as "master" and the other as "slave", in that it is triggered as a function of the master shaft.

The invention is explained in greater detail below using several preferred embodiment examples, referring to the attached figures.

Fig. 1 is a side view of a first embodiment example of a packaging machine according to the invention.

Fig. 2 is a perspective view of the first embodiment example of a packaging machine according to the invention.

Fig. 3 is a perspective view of a second embodiment example of a packaging machine according to the invention.

Fig. 4 is a perspective view of a third embodiment example of a packaging machine according to the invention.

Fig. 5 is a perspective view of a conventional packaging machine.

Referring to Fig. 1, a packaging machine according to a first embodiment example has a frame 1, containing two frame parts arranged parallel to one another in the longitudinal direction, only frame part 1a being seen in Fig. 1. The packaging machine transports a length of packaging material 7 from an inlet 16 on an entrance side to an outlet 17 on an exit side in transport direction A. The frame parts are carried by pairs of supporting legs 18, 19 and 20. Along frame parts 1a are arranged working stations 2, 3 and 4, at which the length of packaging material is processed. Transport of the length of packaging material 7 takes place via transport chains 5 and 6 in the form of continuous chains.

In Fig. 2 and all further figures 3 to 5, to simplify legibility of the figures, illustration of the frame parts has been dispensed with. According to Fig. 2 a first chain wheel 8 is allocated to the first frame part at the outlet 17 and a first engagement element 10, also constructed as a chain wheel, at the inlet 16. Correspondingly a second chain wheel 9 is allocated to the second frame part at the outlet 17 and a second engagement element 11, also constructed as a chain wheel, at the inlet 16. The two transport chains 5 and 6 run

in each case via the two chain wheels 8, 9 at the outlet and via the two engagement elements 10, 11 at the inlet 16.

Each transport chain 5, 6 consists of a multiplicity of chain links, only a few of which are schematically illustrated in Fig. 2 under the reference numeral 21. The individual chain links 21 are equipped with clamps, not illustrated here, which hold the length of packaging material 7, e.g. a synthetic material foil, at its longitudinal edges. When the chain links 21 come into engagement with the engagement elements 10, 11 at the inlet 16, the clamps open, so the length of packaging material 7 can enter the clamps. When the chain links 21 are released from the engagement elements 10, 11 the clamps close and the length of packaging material is held in tensioned state between the transport chains. In reverse the clamps open at chain wheels 8 and 9 at the outlet 17. In this way the length of packaging material 7 is released from the clamps again and can leave the packaging machine via the outlet 17, while the transport chains 5, 6 are deflected by 180° via the chain wheels and run back again.

The chain wheels 8, 9 are supported as fixed against rotation on a common drive shaft 14. The drive shaft 14 is coupled to a drive device 15 in the form of an electric motor. The shaft is dimensioned in such a way that it is as torsion-proof as possible, i.e. the drive shaft is as far as possible not twisted when the transport chains 5, 6 are driven, in order to prevent transport chain 5, arranged further away from the drive device 14 and driven via chain wheel 8, running behind transport chain 6, which is arranged closer to the drive device 14 and driven via chain wheel 9. The drive device 14 rotates the chain wheels 8, 9 anti-clockwise in Fig. 2, so the

length of packaging material 7 is transported in transport direction A.

However, as the transport chains have limited stability, when loaded they are elastically stretched like a spring, this occuring in particular with longer plants of more than 10m in transport length. To prevent this, the engagement elements 10, 11 provided at the inlet 16 in the form of further chain wheels are connected as fixed against rotation to one another via a torsion-proof shaft 12, so the two engagement elements 10 and 11 are forced to run synchronously to one another.

In operation the rotation-proof connection between the engagement elements 10, 11 leads to the chain links of one transport chain being forced to run at a synchronous angle to the chain links of the second transport chain.

In Fig. 3 an alternative embodiment example is shown. Construction of the packaging machine shown there is in principle identical to that of the packaging machine shown in Figs. 1 and 2, so description of the coinciding parts is dispensed with, or reference is made to the preceding description.

The alternative embodiment example differs from the structure seen in Fig. 1 in that, as in conventional packaging machines, chain wheels supported freely on axles (not illustrated) are provided at the inlet. However, additionally provided between the inlet and the outlet is a further torsion-proof shaft 12, on which the two engagement elements 10, 11 are mounted as fixed against rotation in the form of chain wheels. Additionally, the shaft 12 is coupled to a further drive

device 13 in the form of an electric motor. The two drive devices 13 and 15 are therein synchronised via a control unit, not illustrated, so they rotate at the same number of revolutions with synchronous angles. The packaging machine can therefore be configured as longer, the driven shaft 12 being arranged at a distance of approximately 10m from the first driven shaft 14, as, as already initially mentioned, the tolerance of the transport paths of the two transport chains would become impermissibly large above approximately 10m owing to their elastic stretching because of increased loading.

In Fig. 4 a further alternative embodiment example is shown. Construction of the packaging machine shown there is in principle identical to that of the packaging machine shown in Figs. 1 and 2, so description of the coinciding components is dispensed with or reference is made to the preceding description.

The alternative embodiment example differs from the structure seen in Fig. 1 in that, as with conventional packaging machines, chain wheels 30, 31 freely supported on axles (not illustrated) are provided at the inlet 16. However, additionally provided at the level of the inlet below the chain wheels 30, 31 is the torsion-proof shaft 12, on which the two engagement elements 10, 11 are mounted as fixed against rotation. For this purpose the transport chains 5, 6 are deflected by approximately 90° from the horizontal downwards into the vertical in Fig. 4 via deflection rollers 22, 23 on the return side arranged below the length of packaging material 7 and run via the engagement elements 10, 11, wherein they are again deflected by 180° upwards, so they approach the length of packaging material 7 again, and are

finally deflected again by approximately 90° into the horizontal via the chain wheels 30, 31.

In the same way the torsion-proof shaft 14 at the outlet 17 is arranged as offset downwards, wherein the transport chains 5, 6 are correspondingly deflected via chain wheels 28, 29 and deflection rollers 26, 27. Additionally, the drive device 15 is, by contrast with the first embodiment example, not directly coupled to the shaft 14. Instead, mounted on the shaft 14 as fixed against rotation is a further toothed wheel 32, which is in engagement with a toothed belt 24. The toothed belt 24 is, moreover, in engagement with a drive pinion 25, which is coupled to drive device 15 via a drive shaft, not shown. The drive device is arranged in such a way that it is located directly below the shaft 14. In this way the drive device can be accommodated in a space-saving manner inside the frame 1 and does not project laterally outwards in the width direction.

The same arrangement is also possible for drive device 13 of shaft 12.

Moreover, according to a modification, not illustrated, it is possible to drive each of chain wheels 8 to 11 via its own drive device and to match each drive device as angle-synchronous via a control unit.

A further advantageous configuration of the invention provides the use of a toothed belt instead of the transport chain.

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Claims

1. Packaging machine with

a frame with two lateral frame parts opposite one another and

with a transport device for grasping and transporting a length of material from an entrance side to an exit side and

with first and second drive motors for moving the transport device, wherein the transport device has a first and a second transport means running from the entrance side to the exit side, wherein

at least one first engagement element engaging in the first transport means and one second engagement element engaging in the second transport means is provided, the first engagement element being coupled to the second engagement element in such a way that the two engagement elements are synchronised, wherein the first and the second engagement elements are arranged on the entrance side of the transport device and the first drive motor is arranged on the exit side of the transport device; and

wherein the second drive motor directly and jointly driving the first and second engagement elements through a shaft synchronously.

2. Packaging machine according to claim 1, characterised in that the first and second engagement element are connected to one another as fixed against rotation via a torsion-proof shaft.

3. Packaging machine according to claims 1 or 2, characterised by a control device which controls the second drive motor in such a way that it is synchronised with the first drive motor.

4. Packaging machine according to one of the preceding claims,

characterised in that the transport device is constructed as continuous chains and the engagement elements are constructed as toothed wheels engaging in the continuous chains.

5. Packaging machine according to one of the preceding claims, characterised in that the drive of the transport device has a first drive element for the first transport means, and a second drive element for the second transport means, and a shaft on which the drive elements are mounted as fixed against rotation, and a first drive motor for driving this shaft.

6. Packaging machine according to one of the preceding claims, characterised in that two or more pairs of synchronised engagement elements are provided along the transport path.

7. Packaging machine according to the preceding claim, characterised in that the pairs of engagement elements are optionally provided with a second drive motor.

8. Packaging machine according to the preceding claim, characterised by a further control device which controls the second drive motor in such a way that it is synchronized with the first drive motor.

9. Use of at least a first and a second engagement element in a packaging machine with

a frame with two lateral frame parts opposite one another and

with a transport device for grasping and transporting a length of material from an entrance side to an exit side and with a first and second drive motors for moving the transport device, wherein the transport device has a first and a second transport means running from the entrance side to

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the exit side;

wherein at least said first engagement element engages in the first transport means and said second engagement element engages in the second transport means, the first engagement element being coupled to the second engagement element in such a way that the two engagement elements are synchronized, and wherein the first and the second engagement elements are arranged on the entrance side of the transport device and the first drive motor is arranged on the exit side of the transport device and wherein the second drive motor directly and jointly driving the first and second engagement elements through a shaft synchronously, for minimizing the tolerances of the transport paths of the two transport means.

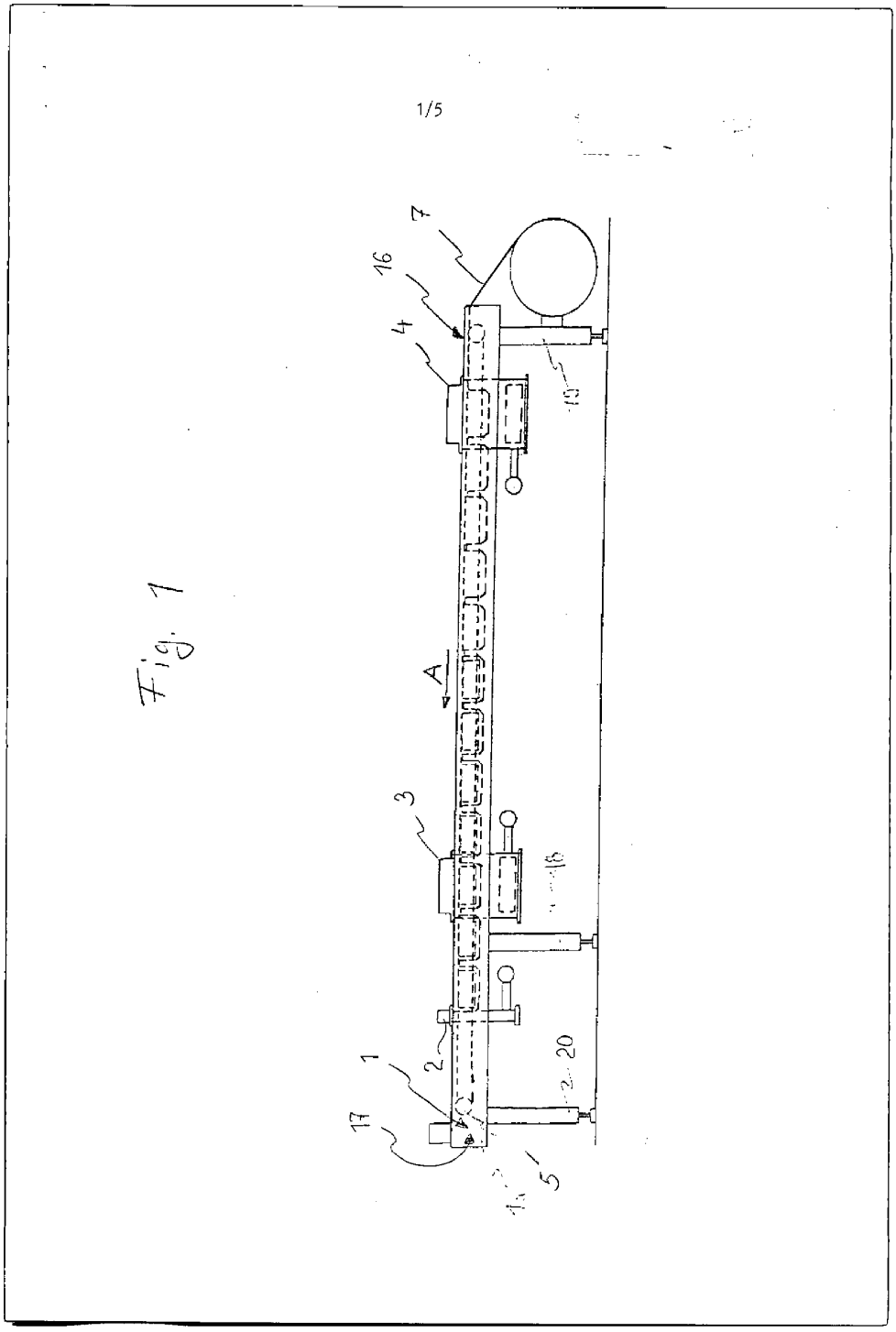


Fig. 1

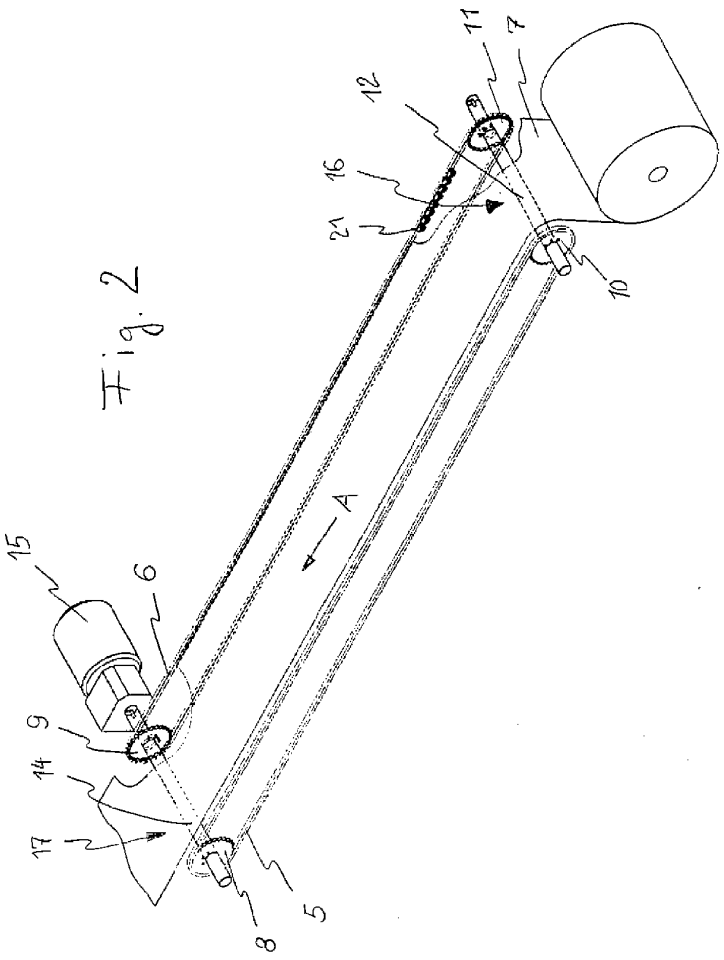
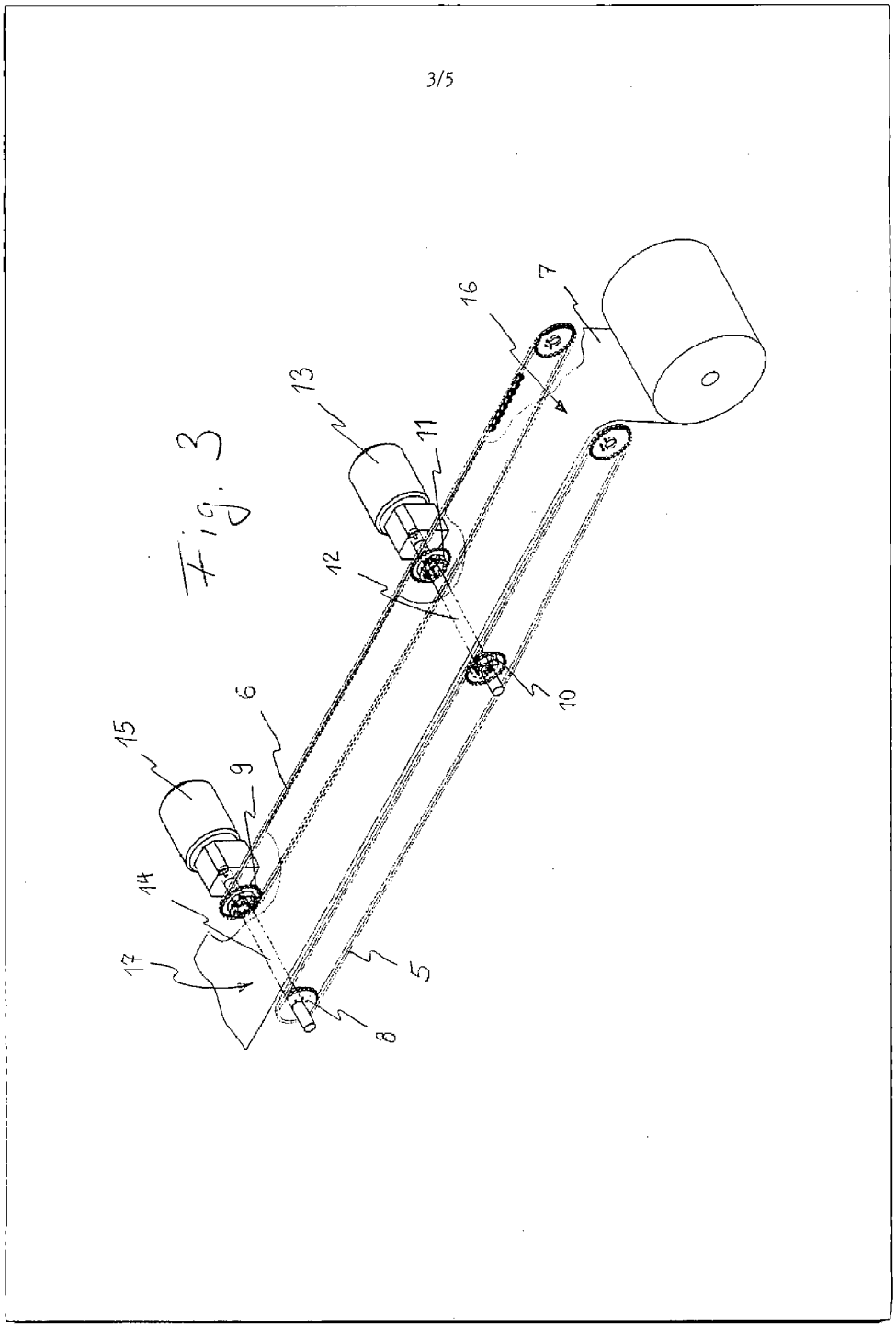


Fig. 2


Fig. 3
16
7
13
11
12
6
15
9
10
14
17
5
8

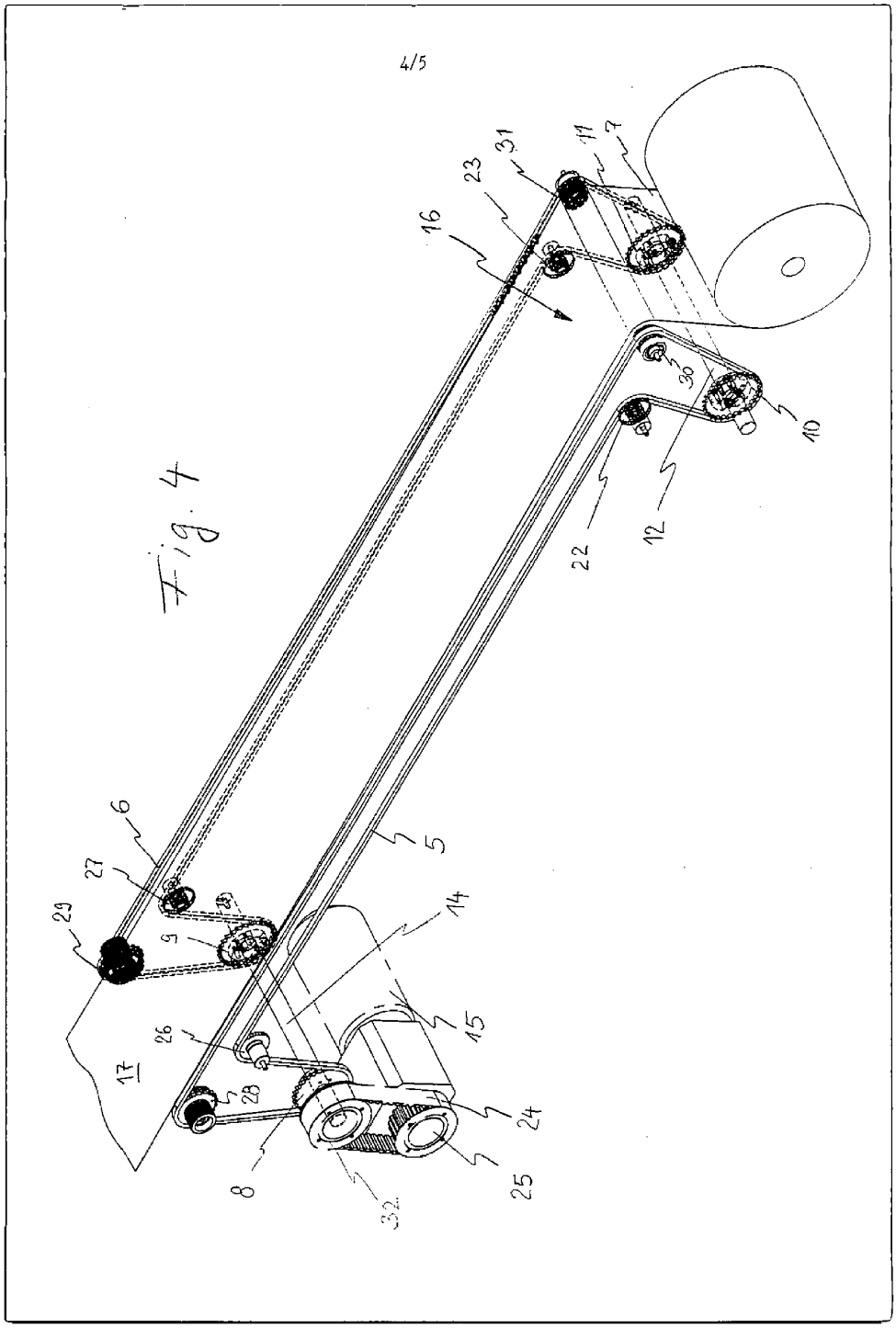


Fig. 4

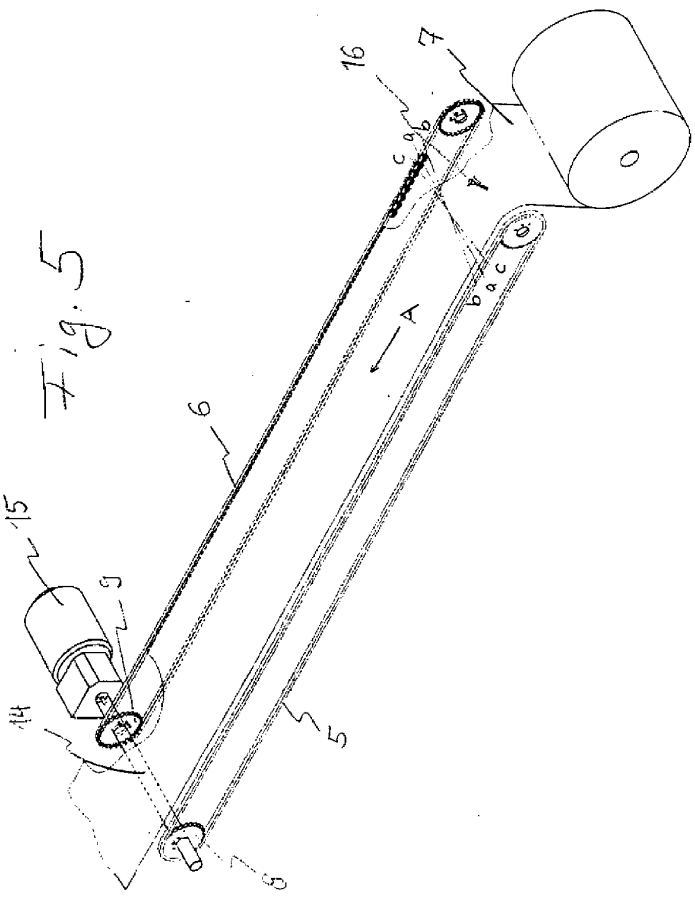


Fig. 5