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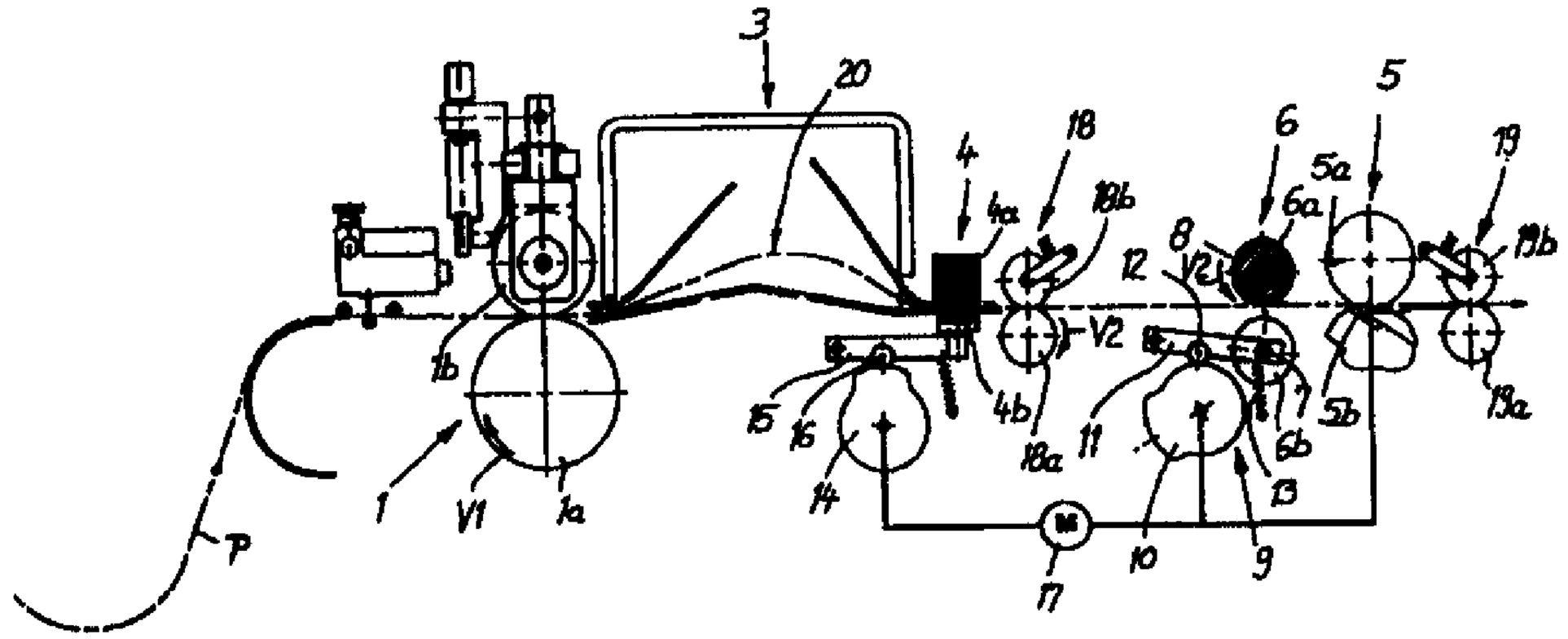
(54) **DISPOSITIF DE COUPE D'UNE BANDE CONTINUE DE PAPIER DANS LE SENS TRANSVERSAL**

(54) **DEVICE FOR CUTTING A PAPER WEB IN THE TRANSVERSE DIRECTION**



(57) La présente invention porte sur la coupe d'une bande continue de papier (P) dans le sens transversal, comprenant un premier convoyeur (1) continuellement en action qui déplace la bande continue de papier à travers le dispositif et le stocke en boucle à l'intérieur (réserve) pendant l'opération de coupe, un dispositif de coupe stationnaire (5), un dispositif de serrage (4) pour retenir temporairement la bande continue de papier, ainsi qu'un second convoyeur (6) qui déplace la bande continue plus loin une fois le papier stocké. Le second convoyeur (6) comprend un rouleau de transport (6a) continuellement en action et plusieurs rouleaux de

(57) A device for cutting a paper web (P) in the transverse direction has a first continuously driven conveyor (1) for moving the paper web through the device and storing the paper web therein (buffer) during cutting in the form of a loop (20), a stationary cutting device (5), a clamping device (4) for temporarily retaining the paper web, and a second conveyor (6) for moving the paper web further after it is stored. The second conveyor (6) comprises a continuously driven transport roller (6a) and several pressure rollers (6b) that can be intermittently pressed by a lifting device (9) onto the transport roller (6a), the paper web (P) being intercalated between the transport

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pression. Il est possible de synchroniser le dispositif de serrage (4) et le dispositif de relevage (9) avec le dispositif de coupe (5) de telle sorte que la bande continue soit retenue par le dispositif de serrage (4) tandis que les rouleaux de pression (6b) se relèvent du rouleau de transport (6a) pendant l'opération de coupe. Le second convoyeur (6) est disposé entre le dispositif de serrage (4) et dispositif de coupe (5). Son dispositif de transport (6a) a une couche superficielle (8) dont le coefficient de friction avec la bande continue de papier (P) est le plus élevé possible. Le dispositif de relevage (9) est conçu ou peut être commandé de telle manière que les rouleaux de pression (6b) se relèvent du rouleau de transport (6a) peu avant que la bande continue ne se tende lorsque la boucle (20) est défaite.

roller and the pressure rollers. The clamping device (4) and the lifting device (9) can be driven in step with the cutting device (5), so that the paper web is retained by the clamping device (4) and the pressure rollers (6b) are lifted from the transport roller (6a) while the paper web is cut. The second conveyor (6) is arranged between the clamping device (4) and the cutting device (5). Its transport roller (6a) has a surface layer (8) with the highest possible coefficient of friction with the paper web (P). The lifting device (9) is designed or can be controlled in such a way that the pressure rollers (6b) are lifted from the transport roller (6a) shortly before the paper web is stretched when the loop (20) is undone.

PCT

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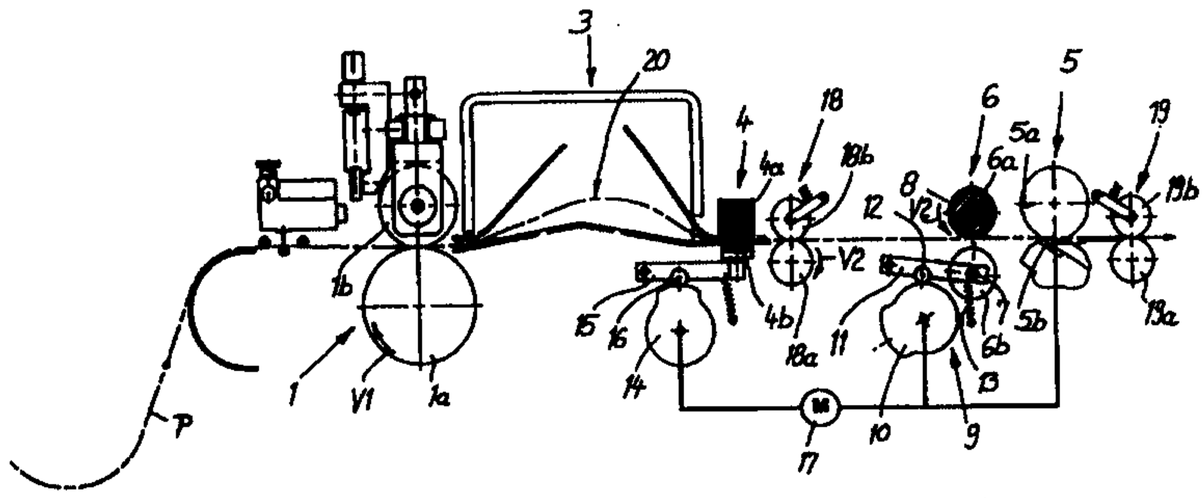
(54) Title: DEVICE FOR CUTTING A PAPER WEB IN THE TRANSVERSE DIRECTION

(54) Bezeichnung: VORRICHTUNG ZUM QUERSCHNEIDEN EINER PAPIERBAHN

(57) Abstract



A device for cutting a paper web (P) in the transverse direction has a first continuously driven conveyor (1) for moving the paper web through the device and storing the paper web therein (buffer) during cutting in the form of a loop (20), a stationary cutting device (5), a clamping device (4) for temporarily retaining the paper web, and a second conveyor (6) for moving the paper web further after it is stored. The second conveyor (6) comprises a continuously driven transport roller (6a) and several pressure rollers (6b) that can be intermittently pressed by a lifting device (9) onto the transport roller (6a), the paper web (P) being intercalated between the transport roller and the pressure rollers. The clamping device (4) and the lifting device (9) can be driven in step with the cutting device (5), so that the paper web is retained by the clamping device (4) and the pressure rollers (6b) are lifted from the transport roller (6a) while the paper web is cut. The second conveyor (6) is arranged between the clamping device (4) and the cutting device (5). Its transport roller (6a) has a surface layer (8) with the highest possible coefficient of friction with the paper web (P). The lifting device (9) is designed or can be controlled in such a way that the pressure rollers (6b) are lifted from the transport roller (6a) shortly before the paper web is stretched when the loop (20) is undone.

DEVICE FOR CUTTING A PAPER WEB IN THE TRANSVERSE DIRECTION

The invention relates to a device for cutting a paper web in transverse direction according to the preamble of Claim 1.

Such a device for the transverse cutting of a paper web is known from the CH-A-633 230. The pressure rollers are in this conventional device only lifted off from the paper web for the duration of the cutting operation, during the remaining time, however, they are continuously pressed by spring force on the continuously driven transport roller of the second conveyor. In order for the stored loop to be undone and the paper web to be tightened again, the conveyor speed of the second conveyor is significantly higher than the one of the first conveyor. However, as soon as the loop has been taken up, the transport rollers of both conveying devices continue to rotate at different speeds until the adjusted cut-off length is reached. Slip between the quickly rotating second transport roller and the paper web must take place during this time with the paper web tightened, since the slower rotating first transport roller conveys only at the lower conveying speed. The paper web would tear without slip on the second transport roller. In order for this slip to be possible, the transport roller of the second conveyor is designed as a metal roller and the spring force acting onto the pressure rollers is adjusted relatively small. The maximum possible pulling force of the second conveying device is limited in such a manner that the paper web may not show any pressure points whatsoever when the mentioned slip occurs, and on the other hand the paper web may not tear at the moment

of the tightening of the same when the loop has just been undone. The second conveyor thus has here also a relatively small pulling force and therefore cannot sufficiently quickly accelerate the paper web from standstill after it has been released by the clamping device. Thus the cutting performance of the known device is limited.

The second conveyor is, in a conventional device for the transverse cutting of a paper web of this type (DE 31 31 101 A1), arranged in feed direction of the paper web in front of the clamping device and the latter is placed directly in front of the cutting device. A joint crank drive is provided to operate the clamping device, the cutting device and the lifting device, which joint crank drive coordinates through three connecting rods the movements of the aforementioned devices in such a manner that for the duration of the cutting operation the paper web is clamped by the clamping device and the pressure rollers are lifted off from the transport roller. Since during the clamping of the paper web the first conveyor continuously runs and the second conveyor is inactive because of the lifted-off pressure rollers, a loop is formed in the area in front of the second conveyor. As soon as the cutting operation has ended, the pressure rollers are again pressed on the transport roller of the second conveyor and the paper web is moved on by said second conveyor at a conveying speed, which is increased relative to the first conveying speed, which first causes the loop to be undone and the paper web to be tightened. The paper web is subsequently moved on by the first conveyor and the second conveyor. The pressure rollers of the second conveyor are pressed by spring force on the transport roller, whereby this spring force

is adjusted so weak that, with the paper web being tightened, slip occurs between the transport roller rotating at a high speed and the paper web. The conveying speed of the web is determined exclusively by the conveying speed of the first conveyor. In order for the mentioned slip between the transport roller of the second conveyor and the paper web to be able to occur, the second transport roller is designed as a metal roller. The maximum possible pulling force is hereby limited on the one hand in such a manner that no pressure points whatsoever may show in the paper web when the mentioned slip occurs, and on the other hand the paper web at the moment of the tightening of the same, when the loop has just been undone, may not tear. The second conveyor has thus a relatively small pulling force and therefore cannot sufficiently quickly accelerate the paper web from standstill, after it has been released from the clamping device, thus causing the cutting performance of this known device to be very limited. Furthermore, there also exists the danger of a paper jam. Namely, in order to achieve an as high as possible cutting performance, the pressure rollers of the second conveyor must, after the cutting operation has ended, be pressed as quickly as possible again on the transport roller. When at this time the clamping jaws of the clamping device are not yet completely opened, there exists the danger that the paper web gets caught on the partially open clamping jaws and a paper jam occurs. The pressure rollers can therefore only be pressed on the transport roller when the complete opening of the clamping device has been secured. This also results in limiting the cutting performance.

Another conventional device for the transverse cutting of a paper web (DE 196 24 277) has a design similar to the aforedescribed device, with the difference that the second conveyor is arranged between the clamping device and the cutting device, and that this second conveyor lacks a lifting device for lifting off the pressure rollers. The pressure rollers are in this conventional device continuously pressed by spring force on the continuously driven transport roller of the second conveyor. Since same is arranged in paper running direction behind the clamping device, however, the paper web is clamped by the clamping device during the cutting operation, a slip between the second conveyor and the paper web must be possible during the cutting operation. In order to accomplish this, the transport roller of the second conveyor is designed as a metal roller and the spring force acting on the pressure rollers is adjusted relatively low. The maximum possible pulling force of the second conveyor is here also limited in such a manner that no pressure points whatsoever may show in the paper web when the mentioned slip occurs and the paper web, at the moment of a tightening of the same, when the loop has just been undone, may not tear. Thus the second conveyor has here also a relatively small pulling force and can therefore not sufficiently quickly accelerate the paper web from standstill, after it has been released from the clamping device. The cutting performance also of this conventional device is limited in this manner at a form length of approximately 9 cm to 50,000 cuts per hour.

Therefore the basic purpose of the invention is to provide a device for the transverse cutting of a paper web of the type disclosed in the preamble of Claim 1,

which device most of all enables a significant increase in the cutting performance.

This purpose is attained by the characteristics disclosed in Claim 1.

The pressure rollers of the second conveyor can in this new device for the transverse cutting of a paper web be pressed immediately following the end of the cutting operation again on the transport roller of the second conveyor. As soon as this has taken place, the initially resting paper web is much accelerated by the transport roller. This high acceleration is possible because the surface coating of the transport roller has a high coefficient of friction relative to the paper web and can therefore transmit a high pulling force to same. The paper web can be accelerated already at a time, at which the clamping device is only partially open since the second conveyor is arranged behind the clamping device and therefore pulls the paper web through the clamping device. The danger of a paper jam at the clamping device is thus eliminated. It is also important that the pressure rollers are again lifted off from the transport roller by the lifting device shortly before the paper loop is undone and the paper web is tightened. Otherwise the paper web would namely tear due to the high acceleration of the paper web and the high pulling force of the transport roller. As a whole the time needed for an undoing of the loop is significantly shortened by the high acceleration of the paper web, which in particular in the case of short form lengths results in a significant increase of the cutting performance. Thus it is, for example, possible at a form length of 10 cm to achieve a cutting performance of up to 100,000 cuts per hour or more than 27 cuts per second. This means that

within a time period of only 0.036 seconds the paper web is accelerated from standstill after the end of a cutting operation, is moved 10 cm by the second conveyor, is clamped by means of a clamping device, and is cut by the cutting device. At a form length of approximately 30 cm, the new device makes it still possible to reach a cutting performance of up to approximately 36,000 cuts per hour.

Further advantageous developments of the invention are characterized in the subclaims.

The invention will be discussed in greater detail hereinafter in connection with one exemplary embodiment schematically illustrated in the drawing.

The paper web P is continuously fed to the device for the transverse cutting by means of a first conveyor 1 consisting of a driven transport roller 1a and a pressure roller 1b. The transport roller 1a is continuously driven with a first peripheral speed V1 and gives the paper web a conveying speed V1, which corresponds, for example, to the delivery speed of a not illustrated laser printer connected in front thereof. The first conveyor can also be a socalled tractor consisting of two conveyor belts arranged parallel to one another and engaging with their points the perforations in the longitudinal edges of the paper web. A loop-forming station 3 follows the first conveyor 1, the function of which will be discussed in greater detail later on in connection with the description of the operation of the device. The loop-forming station 3 is followed by a clamping device 4, consisting of at least one stationary clamping jaw 4a and a movable clamping jaw 4b. A second conveyor 6 is provided between the clamping device 4 and a cutting device 5. The cutting device 5 is preferably a cutting device with a rotating knife 5a, which cooperates with a

stationary knife 5b. However, it is also possible to provide a cutting device with one up and down movable knife and one stationary knife.

The second conveyor device 6 consists of a continuously driven transport roller 6a and several pressure rollers 6b, which can be pressed on the transport roller with the interposotioning of the paper web P. The pressure rollers 6b are arranged spaced apart on a common axle 7. The transport roller 6a has a surface coating or a layer 8, which has an as large as possible coefficient of friction relative to the paper web P. The surface coating 8 consists preferably of a rubber-elastic material, in particular of polyurethane elastomer on the basis of naphthalin-1,5-diyldiisocyanate (known under the registered Trademark Vulkollan).

The pressure rollers 6b can according to the invention be pressed intermittently on the transport roller 6a with the interpositioning of the paper web P. A lifting device 9 is provided for this purpose. Same consists of a rotatable cam plate 10 and a rocker arm 11, on the free end of which is arranged the axle 7. The rocker arm 11 is supported through a support roller 12 on the cam plate 10. A spring 13 assures that the support roller 12 is always held on the cam plate 10. The movable clamping jaw 4b of the clamping device 4 is driven in a similar manner through a cam plate 14, a rocker arm 15 and a support roller 16.

The cam plates 10 and 14 and the rotating cutting knives 5a are driven by a common motor 17, which causes the drive of the lifting device 9 and of the clamping device 4 to occur in step with the cutting device 5.

A third conveyor 18 is advantageously additionally provided between the clamping device 4 and the cutting

device 5, which conveyor 18 is advantageously arranged adjacent to the clamping device 4, whereas the second conveyor 6 is provided adjacent to the cutting device 5. The third conveyor 18 consists of a continuously driven transport roller 18a and several pressure rollers 18b pressed on the transport rollers by springs. The transport roller 18a has a metal surface. The bearing pressure, with which the pressure rollers 18b are pressed on the transport roller 18a with the interpositining of the paper web P, is chosen in such a manner that the transport roller 18a can continue to rotate even when the paper web is clamped in without leaving pressure points in the paper web.

The two transport rollers 6a and 18a are driven continuously with a peripheral speed V2, which is higher than the peripheral speed V1 of the first conveyor 1.

A fourth conveyor 19, also consisting of a continuously driven transport roller 19a and several pressure rollers 19b, which can be resiliently pressed on the roller 19a with the interpositioning of the paper web P, is provided behind the cutting device 5. The peripheral speed V2 of the transport roller 19a corresponds with the peripheral speed of the transport rollers 6a and 18a.

The so far described device operates as follows:

The paper web P is moved at a constant speed by the first conveyor into the device of the invention for the transverse cutting. The paper web is ther cyclically clamped by the clamping device 4 while the cutting device 5 carries out the cutting operation. While the paper web is clamped by the clamping device 4, the paper web P is continuously moved on by the first conveyor 1, and the thereby moved amount of paper is stored in the form of a

loop 20 in the loop forming station 3. While the paper web is clamped by the clamping device 4, the transport roller 18a of the third conveyor 18 rotates while slidingly engaging the paper web, whereby, however, the pressure rollers 6b of the second conveyor 6 are lifted off from the transport roller 6a, and the latter thus does not apply any transporting action to the paper web. The paper cut off by the cutting device 5 is moved on by the forth conveyor 19. After the cutting operation has been carried out, the clamping device 4 is released by the cam plate 14 and the pressure rollers 6b are at the same time pressed on the transport roller 6a by the cam plate 10. Due to the high coefficient of friction of the surface coating 8 the transport roller 6a applies a high pulling force to the paper web P and speeds the paper web up in the shortest time to an increased conveying speed, which corresponds with the peripheral speed V2 of the transport roller 6a and also of the transport roller 18. Since the peripheral speed V2 is greater than the conveying speed V1 of the first conveyor 1 the paper loop 20 formed during the clamping of the paper web is undone. Just before the paper loop is undone and the paper web is tightened, the pressure rollers 6b must again by lifted from the transport roller 6a since the paper web would otherwise tear. The on-time lifting of the pressure rollers 6b is done by a suitable design of the cam plate 10. The paper web is, with the pressure rollers 6b being lifted, moved on by the third conveyor 18 and in the case of larger form lengths also by the fourth conveyor 19 until the predetermined form length has been reached. The paper web is subsequently again clamped by means of the clamping device 4 and the cutting is done by means of cutting device 5. Through the intermittently acting

transport roller 6a with a surface coating 8 with a high coefficient of friction relative to the paper web, the paper web is accelerated within the shortest time, thus significantly shortening the duration of a taking up of the loop 20, in particular in the case of short form lengths. This results in a significant increase in the performance of the entire device.

The cam plates 10, 14 illustrated in the drawing can also have an outwardly limited control cam in the form of a groove, into which the rollers 12 or 16 engage from the side. An automatic control of the rollers 12 or 16 upwardly and downwardly is achieved in this manner and the spring 13 can be eliminated.

Claims:

1. A device for the transverse cutting of a paper web (P), comprising a continuously driven first conveyor (1), by means of which the paper web (P) is moved at a constant, first conveying speed (V1) into the device, and is there stored (buffered) in a loop-forming station (3) in the form of a loop (20) during the cutting operation, comprising a clamping device (4) arranged in paper-running direction behind same for the intermittent clamping of the paper web, comprising a second conveyor (6) provided behind the clamping device (4) to move the paper web on after its storage at a second conveying speed (V2) increased with respect to the first conveying speed (V1), consisting of a continuously driven transport roller (6a) and several pressure rollers (6b), which can be intermittently pressed on said transport roller, with the interpositioning of the paper web, by means of a lifting device (9), and comprising a cutting device (5) stationarily arranged behind the second conveyor (6), whereby the clamping device and the lifting device are driven in step with the cutting device in such a manner that for the duration of the cutting operation the paper web is closed by the clamping device and the pressure rollers are lifted off from the transport roller, characterized in that the transport roller (6a) of the second conveyor (6) has a surface coating (8) of a rubber-elastic material, and that the lifting device (9) is designed and controlled in such a manner that the pressure rollers (6b) are lifted off from the transport roller (6a) shortly before the loop (20) is undone and the paper web (P) is tightened.

2. The device according to Claim 1, characterized in that the surface coating (8) consists of polyurethane-elastomer on the basis of naphthalin-1,5-diyldiisocynate.

3. The device according to one of the Claims 1 or 2, characterized in that the lifting device (9) includes a cam gear (10-12).

4. The device according to one of the Claims 1 to 3, characterized in that a third conveyor (18) is arranged between the clamping device (4) and the cutting device (5), which third conveyor consists of a continuously drivable transport roller (18a) and several pressure rollers (18b) resiliently pressable on said transport roller, whereby said transport roller (18a) is driven with the same peripheral speed (V2) as the transport roller (6a) of the second conveyor (6).

5. The device according to Claim 4, characterized in that the second conveyor (6) is arranged adjacent to the cutting device (5) and the third conveyor (18) adjacent to the clamping device (4).

6. The device according to Claim 4 or 5, characterized in that the transport roller (18a) of the third conveyor (18) has a metal surface.