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I-10121 Torino (IT)(54) **Machine for winding webbs on reels and reel therefor.**

(57) The strip-shaped elements (C) to be wound, which are constituted, for example, by strips of photographic paper coming from a developer (5), are connected to an entrainment belt or leader (2) by means of grippers each having a head portion which projects sideways from the strip-shaped element (C) and is connected removably to the entrainment belt (2). Substantially wedge-shaped separator means (13) separate the head portion of each gripper from the entrainment belt (2) so that the free end of the strip-shaped element (C) descends, with the gripper still attached thereto, along guide formations (14) for guiding it towards a respective winding reel (15). At least one of the side cheeks of the reel has a radial notch (17) which enables the gripper (9), with the free end of the strip-shaped element (C) connected thereto, to advance freely towards the hub of the reel (15). The subsequent rotation of the reel (15) about its axis winds the strip-shaped element (C) thereon.

The gripper (9) can then be removed from the strip-shaped element (C) by being removed axially from the hub of the reel (15).

The reel of paper, which may be several hundreds of meters long, is sent to the finishing stations of the process.

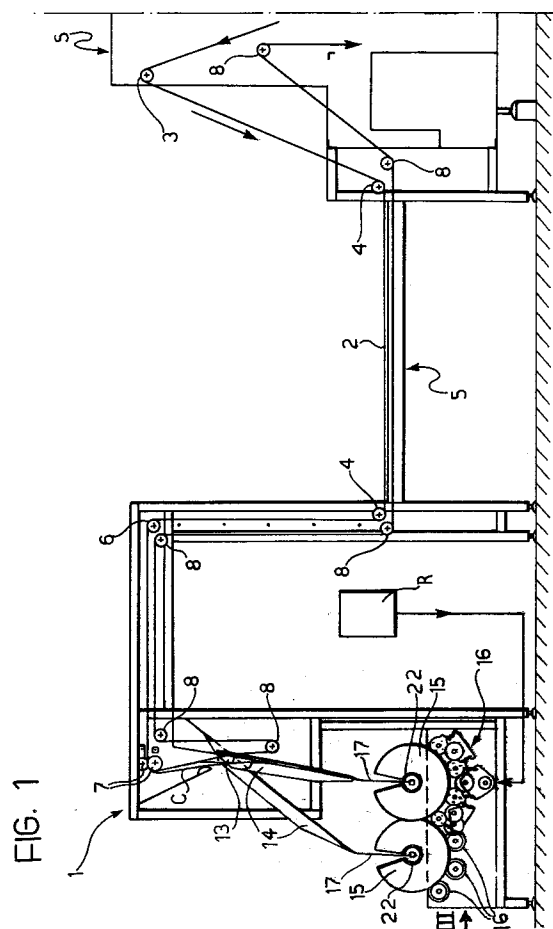


FIG. 1

EP 0 548 444 A1

The present invention relates in general to machines for winding strip materials onto reels.

The present invention has been developed with particular attention to its possible use in photographic laboratories, particularly for winding strips of photographic paper coming from a developing machine onto reels.

According to a widely known solution used in the sector, the strips of photographic paper are passed through the developing machine with the use of a motor-driven entrainment belt (the so-called "leader"). The leader belt moves along an endless path with at least one active portion in which the paper passing through the developing machine is entrained.

The strip of paper is connected to the leader belt by entrainment devices, currently known as "grippers", each including an elongate shank or rod to which the front end of the paper strip is coupled (and around which it is usually wound) as well as an end portion with coupling formations which enable the gripper to be connected to the leader belt, usually in a general snap-engagement arrangement.

The strip of paper emerges from the developing machine at a speed, for example, of the order of 20-25 meters per minute with the front end of the strip connected to and possibly wound around the gripper which in turn is connected to the leader belt.

In order to wind the strip of paper onto a reel (to be sent on for further operations, for example, for the finishing of the developed photographs and subsequent division into individual pictures) the front end of the paper strip is released from the gripper.

This operation is carried out by an operator who, after finding (for example, as a result of a sound and/or light signal emitted automatically by the developing machine) that the strip of paper is emerging from the machine, acts upon the front end of the strip, tearing its end portion which is wound around the gripper and then feeding the paper strip into an underlying reel so that it can be wound thereon.

This solution cannot be considered satisfactory, since it requires the almost constant presence of an operator to supervise the developing machine. In this connection, it should be noted that most developing machines currently produced for photographic laboratories provide for the parallel processing of a certain number (typically four or six) of strips of paper which are thus present almost simultaneously for winding onto reels at the output of the developing machine.

There is therefore a need to provide a solution which substantially facilitates the operations described above, for example, by making the winding

of the strip onto the reel completely automatic without the need for the intervention of an operator.

The object of the present invention is to provide a machine which can satisfy this requirement.

According to the present invention, this object is achieved by a machine having the specific characteristics recited in the following claims.

In summary, the present invention is based on a solution in which the gripper is not removed before the paper is rewound but becomes an active element in the operation.

This is achieved by virtue of the particular shape of the winding reel which has a notch, preferably but not necessarily a radial notch, in at least one of its two lateral cheeks.

The weight of the gripper can lead the paper, which is guided by the radial notch or another suitable shape, into the hub of the reel and, from this position, can provide the necessary opposition to the initial movement of the reel which would otherwise tend to lose contact with the end of the paper strip.

Amongst other things, the winding of the paper without tearing or cutting the strip of paper to remove the gripper which, on the contrary, is kept within the reel enables the strip of paper to be fixed to the hub of the winding reel without the need for more complex solutions.

As has been seen, with known systems, the paper strip is torn above the gripper, which is thus removed, and the paper is then wound onto the reel manually.

The invention will now be described, purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a schematic side elevation showing the general structure of a machine according to the invention,

Figure 2 shows in greater detail the way in which the strip of material is entrained within a machine such as that illustrated in Figure 1, and Figure 3 shows in detail the structure of the elements indicated by the arrow III in Figure 1.

In Figure 1, a machine for automatically winding onto a reel a strip material constituted, in the embodiment illustrated, by a strip of photographic paper C emerging from a developing machine S, is generally indicated 1.

With reference to Figure 2, it can be seen that the strip of paper C is entrained through the developing machine S towards the machine 1 by being connected to an entrainment belt or "leader" 2, that portion of the path of the latter which is between the output of the developing machine S and the machine 1 being visible in Figure 1. This portion of the leader 2 includes an upper pass which entrains the strip C and which extends from an output roller 3 at the output of the developing

machine S to form a horizontal portion between two rollers 4. In this portion, the leader 2 and the paper strip C slide along a viewing surface 5 in a position in which they are easily visible to an operator who wishes to inspect the quality of the photographs on the sheet of paper C.

At the output of the viewing surface 5, the upper or active pass of the leader 2 (which is intended to entrain the paper C) passes around the roller 4 and is directed vertically towards a further roller 6 and then enters the actual operating zone of the machine 1 (the reeling machine) by means of a roller or a pair of contrarotating rollers 7. From the position thus reached, the sheet of paper C is available for the reeling operation.

Once it has been released from the sheet of paper C (according to criteria which will be described further below), the leader 2 returns towards the developing machine S, passing around a set of rollers which are generally indicated 8 and are usually in positions homologous to and facing the rollers 3, 4, 6 and 7 described above.

As already stated, most developing machines S produced at the moment can operate on a certain number of paper strips C in parallel (typically four or six strips). For this purpose, the developing machine is equipped with a corresponding number of motor-driven leaders 2 (usually two or three) each of which is intended to entrain two strips of paper C on opposite sides.

For simplicity, the following part of the present description will refer to only one of the leaders 2 of the machine (and to only one strip of paper C), it being understood that characteristics almost identical to those described (at most with specular symmetry) will generally be found in the other leaders 2 of the machine.

Each strip of paper C will thus have a respective reeling station such as that which will be described below. In any case, the detailed description, which refers to one of the reeling stations, is intended also to apply to all the other stations of the machine 1.

The paper strip C is connected to the leader 2 which pulls it through the developing machine S and towards the reeling machine 1 by means of entrainment elements 9 currently known as "grippers".

Each gripper 9 is generally comparable in shape to a key, having a shank or rod 10 and a head portion 11.

The shank or rod 10 is constituted substantially by a stem with a central longitudinal slot 12 which enables the free end or head of the paper strip C to be inserted into the shank 10. This end can be rolled around the shank 10 by the rotation of the gripper 9 relative to the paper strip C, this usually being done manually (according to widely known

criteria) upstream of the developing machine S.

The head portion 11 of the gripper 9 is constituted substantially by a coupling unit which is intended to be connected to the leader 2 so as to keep the shank 10 oriented perpendicular to the leader 2.

In one possible embodiment (which is known and to which Figure 2 relates), the head 11 of the gripper 9 is constituted by a closed annular body including two straight sides which are intended to be oriented perpendicular to the strip 2 (and hence parallel to the shank 10) and two V-shaped sides which form loops projecting inwardly of the head 11.

The gripper 9 is usually made of plastics material so that the two V-shaped sides of the head 11 are flexible. The leader can thus be passed beneath the straight sides of the head 11 so that an intermediate portion of the leader 2 passes over the two V-shaped sides of the head, bending them resiliently.

In this manner (and also as a result of the longitudinal tension to which the leader 2 is subjected by its drive system) the gripper 9 is fixed to the leader 2 sufficiently firmly to ensure that the leader 2 entrains the sheet of paper C with the head portion 11 of the gripper 9 projecting sideways from the paper strip C and connected to the leader 2.

Downstream of the output roller or pair of output rollers indicated 7 is a wedge-shaped element 13 positioned very close to the path of the leader 2 like a scraper. The element 13 can thus interfere with the paths of movement of the grippers 9 fitted to the leader 2; when a paper strip C with its head connected to the leader 2 by a respective gripper 9 reaches the position corresponding to the wedge-shaped element 13, the element 13 is thus inserted between the leader 2 and the gripper 9 so as to detach the gripper 9 from the leader 2 (in practice to pull it off) (against the resilient reaction exerted by the two V-shaped sides of the head 11 which grasp the leader 2), separating the paper strip C from the leader 2 which descends from the roller or rollers 7 towards the first of the rollers 8.

In this situation, the free end of the paper strip C with the gripper 9 connected thereto hangs downwardly from the roller or rollers 7.

At this point, in the solutions according to the prior art, an operator intervenes to tear the paper strip C immediately above the gripper 9 which is thus removed. The operator then inserts the torn end of the paper strip into a reel with side cheeks and assists the taking-up of the paper onto the hub or spool of the reel with his hands during the first turns of the reel.

In the solution according to the invention, however, the free end of the strip C, with the gripper 9

still attached, is guided towards an underlying reel 15 by respective guide formations (constituted, for example, by metal straps 14 fixed to the frame of the reeling machine 1).

It will be appreciated that two pairs of guides 14 and two respective reels 15 are visible in the elevational view of Figure 1. As already stated above, each developing machine (and hence the reeling machine 1 associated therewith) is generally arranged so that it can operate on several paper strips C in parallel; two reels 15 are therefore visible in the elevational view of Figure 1 for receiving two respective paper strips C advancing in parallel (possibly entrained on two opposite sides of the same leader 2) through the developing machine and towards the reeling machine.

The fact that two reels 15 (as well as the respective systems 14 for guiding the strip and the respective drive rollers 16) are visible is due simply to the fact that, for reasons of overall bulk (and also to prevent any interference between the heads 11 of the grippers 9 associated with two strips C which are wound simultaneously onto two adjacent reels 15), the reels which are intended to operate on adjacent paper strips C are preferably slightly offset from each other longitudinally of the machine.

An important characteristic of the solution according to the invention is that, unlike what happens in the solutions of the prior art, the gripper 9 is kept connected to the paper strip C whilst it is wound onto its reel 15.

Amongst other things, the presence of the gripper 9 connected to the free end of the strip has the advantage of making the guiding action of the guides 14 more precise and secure.

A characteristic of the reels 15 used in the machine according to the invention is that one or both the lateral cheeks (and more precisely, at least the cheek which is on the same side of the reel 15 as the head 11 of the gripper 9) has a V-shaped radial recess or notch 17 which extends through an angle of the order, for example, of $10^\circ \div 15^\circ$.

In the arrangement in which the reels 15 are loaded in the machine 1, the notches 17 are kept aligned with the direction from which the paper strip C is expected to come (that is, upwardly in the embodiment illustrated, in which the strip C falls downwardly from the roller or rollers 7).

Thus, although - as a result of the presence of its head 11 - the length of the gripper 9 is greater than the width (that is, the corresponding dimension) of the reel, it can nevertheless fall until it reaches the hub region 15a of the reel 15, pulling the free end of the strip C with it. The hub 15a preferably also has a perimetral notch or recess 15b so that the gripper 9 can enter the hub 15a, the axis of which is kept horizontal.

The reel 15 is moved, in order to wind the paper strip C thereon, by the rollers 16.

There are usually a certain number of rollers (four in the embodiment illustrated) for cooperating with the periphery of the reel 15. Preferably, the rollers have rubberised surfaces (that is, resiliently yielding surfaces) and are mounted on the frame of the reeling machine 1 for rotation about respective horizontal axes which lie on an imaginary cylindrical surface coaxial with the axis of the reel 15 so that the set of rollers 16 is arranged generally like a basin housing the reel 15. This means that the generatrices of the rollers 16 along which they contact the periphery of the reel 15 extend along an imaginary cylindrical surface which has a horizontal axis and whose radius corresponds to that of the periphery of the reel 15.

The rollers 16 are driven by a main motor 18 which rotates (for example, by means of a belt transmission 18a) a first roller 19 which is intermediate the innermost rollers 16 to which it transmits its motion by contact.

Each of two further rollers 20 is interposed between and in contact with one of the rollers 16 which is driven directly by the roller 19 and the corresponding outer roller 16. Spring formations 21 force the rollers 19 and 20 (which are mounted on floating devices) into rolling contact with the rollers 16 so as to ensure that the motion is safely transmitted.

The fact that the free end of the paper strip C (with its associated gripper 9) has reached the hub region 15a of the respective reel 15 by falling downwardly along the guides 14 from the roller or rollers 7 is detected by a sensor such as, for example, an optical sensor 22 which operates the motor 18 (by means of a general control unit R of the machine 1, such as a PLC controller) so as to rotate the reel 15 and thus wind the paper strip C thereon.

The length of the strip C is usually determined so as to be sufficient to fill the reel 15.

The fact that the paper strip is finished is usually detected (in known manner) by sensor elements associated with the developing machine S and/or by other sensor means, for example, optical sensors (indicated schematically 23) associated with the reeling machine 1. The detection of the end of the paper strip C indicates to the control unit R of the machine that the reel 15 will shortly finish its winding motion.

At this point, the reel 15 with the paper strip C wound thereon can be removed from the reeling machine 1 to be replaced by a new empty reel 15 ready for the winding of another paper strip C.

A reel 15 with the strip C wound thereon can be removed and replaced by an empty reel, onto which a new paper strip is to be wound, by an

operator, or - in a particularly advantageous embodiment of the invention - by an automatic device such as a robot which automatically transfers the reel 15 towards further processing stations (for example, finishing stations).

The gripper 9, which is fixed to the end of the paper strip C wound onto the reel 15 and projects axially from the hub 15a of the reel 15, can easily be recovered for reuse by being removed from the reel axially, thus tearing in a controlled manner the end of the paper strip C to which the gripper 9 is connected. Since, when the gripper 9 is removed, the end of the paper strip C is wound onto the hub of the reel 15 and surrounded by a certain number of turns of paper, the tearing of the end as a result of the removal of the gripper 9 takes place in a precise and controlled manner along a tear line which is usually even (and not an uneven and jagged line as usually occurs in machines according to the prior art), enabling the paper strip C to be coupled more easily and precisely to any further automatic processing machine.

Naturally, the principle of the invention remaining the same, the details of construction and forms of embodiment may be varied widely with respect to those described and illustrated, without thereby departing from the scope of the present invention.

Claims

1. A machine for winding strip-shaped elements (C) onto reels (15), the strip-shaped elements (C) being advanced by an entrainment belt (a leader) (2) and grippers (9) which are fixed to the strip-shaped elements (C) and have respective head portions (11) which project sideways from the strip-shaped elements (C) and are connected removably to the entrainment belt (2), characterised in that it includes:

- at least one winding reel (15), at least one lateral cheek of which has a notch (17) which can be aligned with the path of advance of the strip-shaped element (C) so as to enable the strip-shaped element (C) to advance towards the hub (15a) of the reel (15) with the head portion (11) of the gripper (9) projecting from the strip-shaped element (C) and from the at least one cheek of the reel (15), the subsequent rotation of the reel (15) causing the strip-shaped element (C) to be wound onto the reel (15).

2. A machine according to Claim 1, characterised in that it includes:

- separator means (13) for disconnecting the head portion (11) of each gripper (9) from the entrainment belt (2) thus separating

the strip-shaped element (C) from the entrainment belt (2),

- guide means (7, 14) for guiding the strip-shaped element (C), which has been separated from the entrainment belt (2) and to which a respective gripper (9) is connected, towards the notch (17) in the at least one winding reel (15).

3. A machine according to Claim 2, characterised in that the guide means include roller means (7) which can cause the strip-shaped element (C) to fall downwardly with the gripper (9) connected to the end of the strip (C).

4. A machine according to Claim 3, characterised in that the separator means (13) are downstream of the roller means (7) in the direction of movement of the strip-shaped element (C).

5. A machine according to Claim 1, characterised in that the notch (17) extends generally radially of the at least one winding reel (15).

6. A machine according to Claim 2, characterised in that the separator means include at least one wedge-shaped formation (13) which can be inserted between the head portions (11) of the gripper formations (9) and the entrainment belt (2).

7. A machine according to any one of the preceding claims, characterised in that the axis of the at least one reel (15) is kept substantially horizontal.

8. A machine according to Claim 1 or Claim 7, characterised in that drive means associated with at least one reel for the rotation thereof include at least one roller (16) which is driven by a motor (18) and cooperates with the at least one reel (15) in tangential contact therewith.

9. A machine according to Claim 8, characterised in that the at least one motor-driven roller (16) has a resiliently yielding surface.

10. A machine according to Claim 8 or Claim 9, characterised in that it includes a plurality of rollers (16) which are driven by the motor (18) and whose axes of rotation are arranged on an imaginary cylindrical surface coaxial with the axis of the reel.

11. A machine according to Claim 8, characterised in that it includes a plurality of rollers (16) which are connected by rollers (19, 20) for

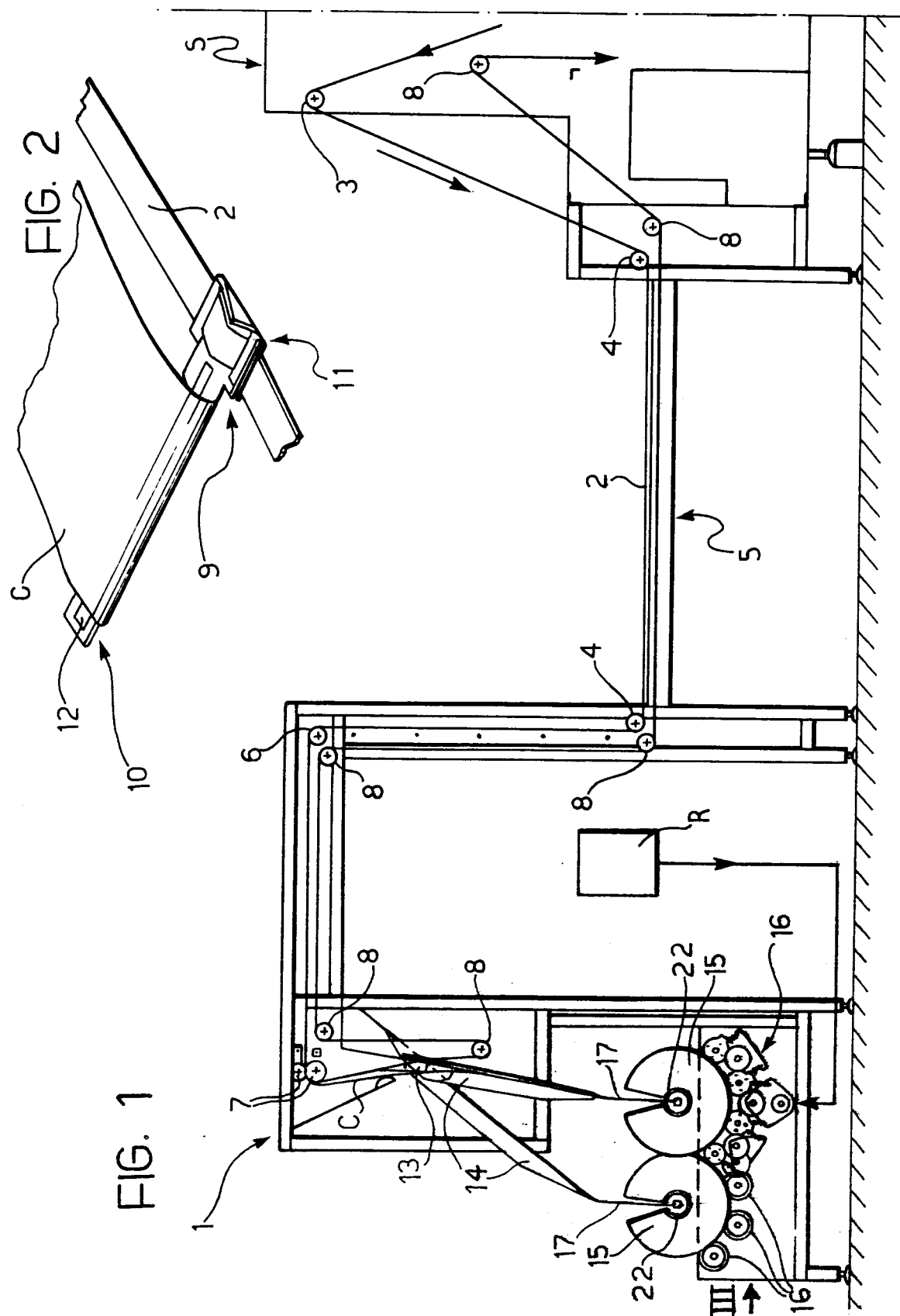
transmitting the drive.

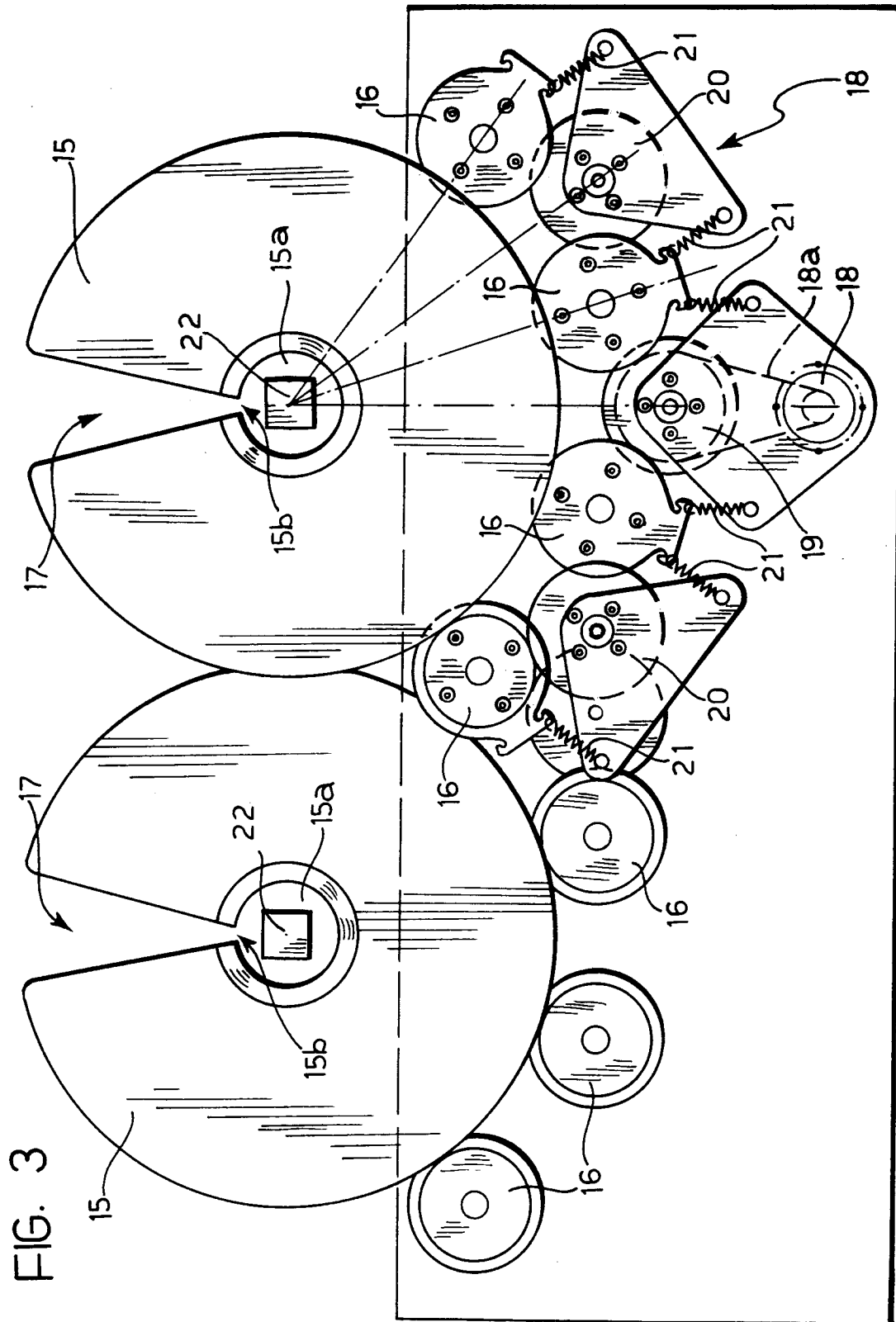
12. A machine according to Claim 11, characterised in that it includes resilient means (21) for keeping the rollers (19, 20) which transmit the drive in tangential contact with the driven rollers. 5
13. A machine according to any one of Claims 10 to 12, characterised in that it includes a main drive roller (19) which transmits the drive to the driven rollers (19). 10
14. A machine according to any one of the preceding claims, characterised in that it includes sensor means (22) for detecting the condition in which the strip-shaped element (C) has reached the hub region of the at least one reel (15) in order to start the rotation of the reel (15). 15 20
15. A machine according to any one of the preceding claims, characterised in that it includes further sensor means (23) for detecting the passing of the tail end of the strip-shaped element (C) in order to indicate the completion of the winding of the strip-shaped element (C) onto the at least one reel (15). 25
16. A machine according to Claim 2, characterised in that it includes, generally upstream of the separator means (13), a surface (5) on which the strip-shaped element (C) can be viewed, with transmission means (4) which cause the entrainment belt (2) to move along a substantially horizontal path in correspondence with the viewing surface (5). 30 35
17. A machine according to any one of the preceding claims, which can process several strip-shaped elements (C) in parallel, characterised in that it includes at least one reel (15) for each strip-shaped element (C) processed in parallel. 40
18. A machine according to any one of the preceding claims, characterised in that it includes means (3 to 8) for its operative connection to a machine for developing strips of photographic paper (C) which constitute the strip-shaped elements (C). 45 50
19. A reel for the winding of strip-shaped elements (C) advanced by an entrainment belt (a leader) (2) and grippers (9) which are fixed to the strip-shaped elements (C) and have respective head portions (11) which project sideways from the strip-shaped elements (C) and are connected removably to the entrainment belt (2), 55

characterised in that at least one lateral cheek of the reel (15) has a notch (17) which can be aligned with the path of advance of the strip-shaped element (C) so as to enable the strip-shaped element (C) to advance towards the hub (15a) of the reel (15) with the head portion (11) of the gripper (9) projecting from the strip-shaped element (C) and from the at least one cheek of the reel (15), the subsequent rotation of the reel (15) causing the strip-shaped element (C) to be wound onto the reel (15).

20. A reel according to Claim 19, characterised in that the notch (17) extends generally radially of the reel (15).

21. A reel according to Claim 20, characterised in that the notch (17) extends through an angle of the order of 10-15°.







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EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0582

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 218 978 (AGFA-GEVAERT AG) * the whole document * ---	1	B65H19/28 B65H75/28 G03D3/13
A	US-A-4 188 108 (FALOMO) * the whole document * ---	1	
A	FR-A-1 391 723 (SPIRA) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65H G03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 SEPTEMBER 1992	Examiner MEULEMANS J.P.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			