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(54) Method and apparatus for removing the thermoadhesive film-splicing element after developing and printing

(57) A method for removing the thermoadhesive film-splicing element (5) after developing and printing, characterised by heating said splicing element to a temperature sufficient to soften the adhesive material so as to cause the splicing element (5) to separate from the ends (3,4) of two adjacent film pieces.

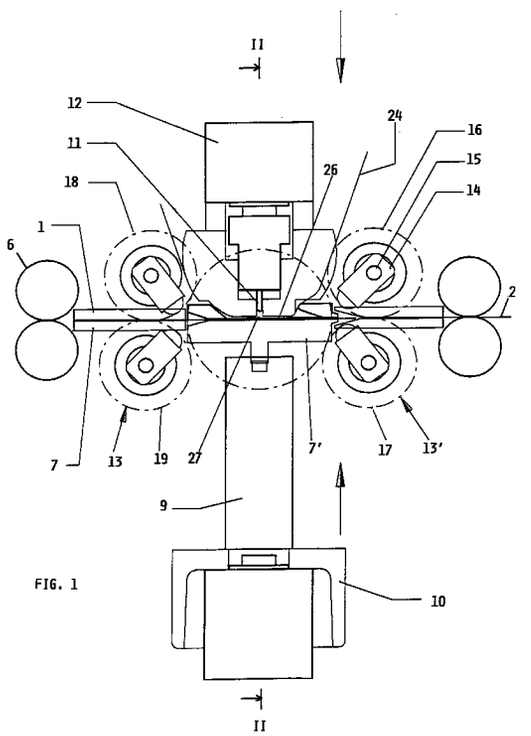

FIG. 1

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Description

This invention relates to a method for removing the thermoadhesive film-splicing element after developing and printing, and an apparatus for implementing the method.

The field to which the invention relates is the handling of already developed and printed film.

Film contained in a spool is rewound onto the spool core after exposure and sent to special laboratories for developing and printing. Within these laboratories the normal procedure is to extract the film from the spool and join the individual film pieces together by splicing using a thermoadhesive tab, to form a continuous strip wound on a reel which constitutes the production batch. This reel then passes through the conventional developing and printing stages, after which the continuous strip is again divided into the original individual film pieces, which are inserted into working envelopes.

In the past the individual film pieces were separated by a cutter, however current photographic practice requires the film to be reinserted into its original spool, and for this purpose the film is provided at its tail end with a slotted hole between two circular holes. The slotted hole is used for engagement by an insertion member which hooks the circular holes onto teeth provided on the spool core.

For this reason such film cannot be cut at the splicing element because if done incorrectly the film portion comprising the holes could be cut off.

An object of the invention is to eliminate these drawbacks by enabling the splicing element between adjacent film pieces wound on the reel to be removed in a simple and comfortable manner.

This object and further one are attained according to the invention through a method for removing the thermoadhesive film-splicing element as described in claim 1.

A further object of the invention is to provide an automatic apparatus for effecting this removal.

This object is attained through an apparatus as described in claim 3.

A preferred embodiment of the present invention is further clarified hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of an apparatus for implementing the method of the invention,

Figure 2 is a cross-section on the line II-II of Figure 1,

Figure 3 is a view from below of the device for operating the film gripping and separation elements, and

Figure 4 is a detailed view of the splicing element applied to the ends of two adjacent film pieces.

As can be seen from the figures, the apparatus according to the invention comprises a pair of parallel guides 1 for retaining the continuous strip 2, driven by rollers 6, which is formed from the individual film pieces, the ends 3 and 4 of which are spliced by strips of thermoadhesive paper 5.

Each guide is formed substantially in three parts 7,7' each consisting of a rectangular frame, with the two end parts 7 fixed and the horizontal portions 8 of the central part 7' movable vertically, as described hereinafter.

At said central part 7' there is provided a heater head 9 movable horizontally away from and towards said part under the control of a pneumatic actuator 10, on the other side of the guides there being provided a counteracting blade-shaped element 11 also movable horizontally away from and towards said central part under the control of a pneumatic actuator 12.

The apparatus also comprises two pairs of locking and traction elements indicated overall by 13, 13', each consisting of an arm 14 rigid with a pin 15 mounted on a corresponding gearwheel 16,17,18,19, all with the same number of teeth.

Specifically, the gearwheel 16 engages the gearwheel 17, and the gearwheel 18 engages the gearwheel 19. The gearwheels 17 and 18 engage a further gearwheel 20 with a larger number of teeth.

In this manner, the rotation of the central gearwheel 20 causes the gearwheels 17 and 18 to rotate in the opposite direction and the gearwheels 16 and 19 to rotate in the same direction.

An arm 21 is rigid with the central gearwheel and has its other end operated by a rod 22 movable axially under the control of a pneumatic actuator 23.

In correspondence with the central region of the guides there is interposed between the guide part 7' and the blade 11 a continuous paper strip 24 guides along a surface 26 comprising a seat 27 for housing the blade 11, and wound on drive bobbins (not shown on the drawings).

The apparatus of the invention also comprises a microprocessor controlling the entire operating cycle and operating the various actuators on the basis both of its own logic and of external signals received from the various sensors, which in themselves do not form part of the invention but will be referred to at appropriate points of the ensuing description of operation.

The reel (not shown on the drawings) comprising the wound strip formed from the various film pieces joined together by the splicing elements 5 is positioned to the side of the apparatus, the free end of the strip, with the splicing element on the same side as the blade 11, being passed firstly between the drive rollers 6 (to the left in Figure 1), then through the guides 1 and finally between the other pair of drive rollers.

In this configuration the heater head 9 and the blade 11 are at their maximum distance from the film strip, the locking elements 13,13' being maintained in a configuration such as not to interact with said strip.

The pairs of drive rollers 6 are then rotated until a

sensor senses that the splicing element 5 of two adjacent film pieces is positioned at the aperture in the guides of the central part 7'.

The rotation of the rollers 6 is consequently halted and the heater head 9 (which is at a temperature of about 170°C, this being higher than the softening temperature of the paper adhesive) is advanced axially towards the two ends 3,4 of the film pieces and the interposed splicing element 5 so as to rest them against the support paper and hence against the surface 26.

During this stage the heater head 9 interacts via rollers 25 with a suitable inclined surface 28 provided on the guide part 7' facing it, so that the effect of its advancement is to force apart the two horizontal portions 8 of the frame of the central part 7'.

The reason for this is to provide a heater head of the same width as the film pieces while at the same time compensating for any positioning errors of the splicing element between the two adjacent film pieces.

The blade 11 is then made to advance axially to lock the support paper 24 against the splicing element 5 within the discontinuity region defined by the end edges 3,4 of the two adjacent film pieces.

In this situation the thrust of the blade 11 is greater than the thrust of the heater head 9, so that there is a slight axial retraction of said heater head which however, with the aid of the blade 11, maintains the splicing element 5 and the strip 24 of support paper in mutual contact.

As soon as the heater head has softened the adhesive material of the splicing element, the pneumatic actuator 10 withdraws it from the film pieces, and a pneumatic command causes the rod 22 to move axially with consequent rotation of the gearwheel 20 which, engaged as described heretofore with the gearwheels 17 and 18, themselves engaging the gearwheels 16,19, causes the arms 14 of each pair to rotate in the opposite direction. As the distance of the axis of the pivot pin 15 of each arm 14 from its end is greater than the distance of said axis from the film, the rotation of said arms results firstly in locking of the two film pieces followed by their mutual axial withdrawal, so achieving quick separation of the ends of the two film pieces from the splicing element.

A subsequent command to the rod 22 in the reverse direction causes the locking elements 13,13' to rotate in the opposite direction to disengage the two film pieces, after which the blade 11 is made to undergo its return travel so that the entire splicing element 5 remains fixed on the support paper 24.

The strip 24 of support paper is then made to advance, as are the two film pieces, to begin a new cycle.

Claims

1. A method for removing the thermoadhesive film-splicing element after developing and printing, characterised by heating said splicing element to a temperature sufficient to soften the adhesive material so as to cause the splicing element to separate from the ends of two adjacent film pieces.

2. A method as claimed in claim 1, characterised by transferring the splicing element onto a support.

3. An apparatus for implementing the method, characterised by comprising:

   - guide means (1,7,7') for the film pieces to be separated,
   - means (6) for driving the film pieces along the guide means,
   - a heater element (9) acting on the splicing element (5) when said splicing element faces said heater element,
   - means (13,13') which, following the action of the heater element and the consequent softening of the adhesive material of the splicing element, cause the ends of two adjacent film pieces to separate from said splicing element.

4. An apparatus as claimed in claim 3, characterised by also comprising a support (24) onto which said splicing element (5) is transferred when separated from the ends of the film pieces.

5. An apparatus as claimed in claim 4, characterised in that the support onto which the splicing element is transferred consists of a paper strip (24).

6. An apparatus as claimed in claim 3, characterised in that the guide means consist of three separate parts (7,7'), each consisting of a rectangular frame, the two end parts (7) being fixed and those portions (8) of the central part (7') extending parallel to the film edges being able to be spaced apart.

7. An apparatus as claimed in claim 3, characterised in that the heater element (9) is movable away from and towards said guides (1,7,7') under the control of a pneumatic actuator (10).

8. An apparatus as claimed in claims 3 and 5, characterised in that facing said heater element (9) there is provided a counteracting member (11) which maintains the support paper (24) against the splicing element (5) during its separation from the ends of the film pieces.

9. An apparatus as claimed in claim 3, characterised in that the means which cause the ends of the film pieces to separate consist of a pair of gripping elements (14) positioned on opposite sides of the two film pieces.

10. An apparatus as claimed in claim 9, characterised in that each gripping element (14) is rotatably rigid

with a gearwheel (16,17,18,19).

11. An apparatus as claimed in claim 10, characterised in that the gearwheels have the same number of teeth.

12. An apparatus as claimed in claim 10, characterised in that the gearwheels (16,17,18,19) of each pair of gripping elements are mutually engagable.

13. An apparatus as claimed in claim 10, characterised in that a gearwhell (17,18) of each pair engages a further gearwheel (20) having a larger number of teeth.

14. An apparatus as claimed in claim 13, characterised in that a lever arm (21) operable by a pneumatic actuator (23) is rigid with the gearwheel (20).

15. An apparatus as claimed in claim 6, characterised in that the portions (6) are spaced apart by interference of the heater head with a corresponding inclined surface (28) of them.

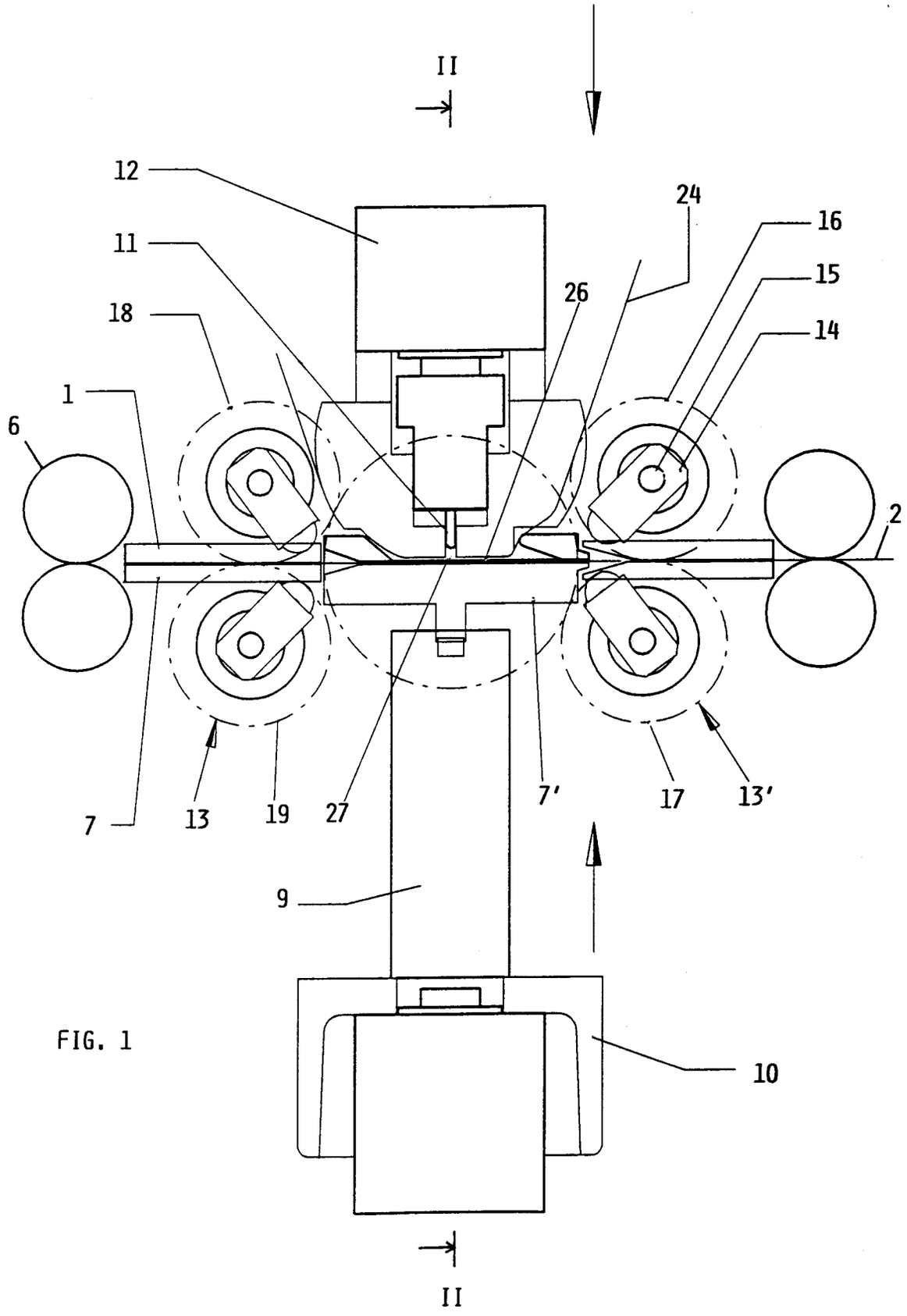

FIG. 1

FIG. 2

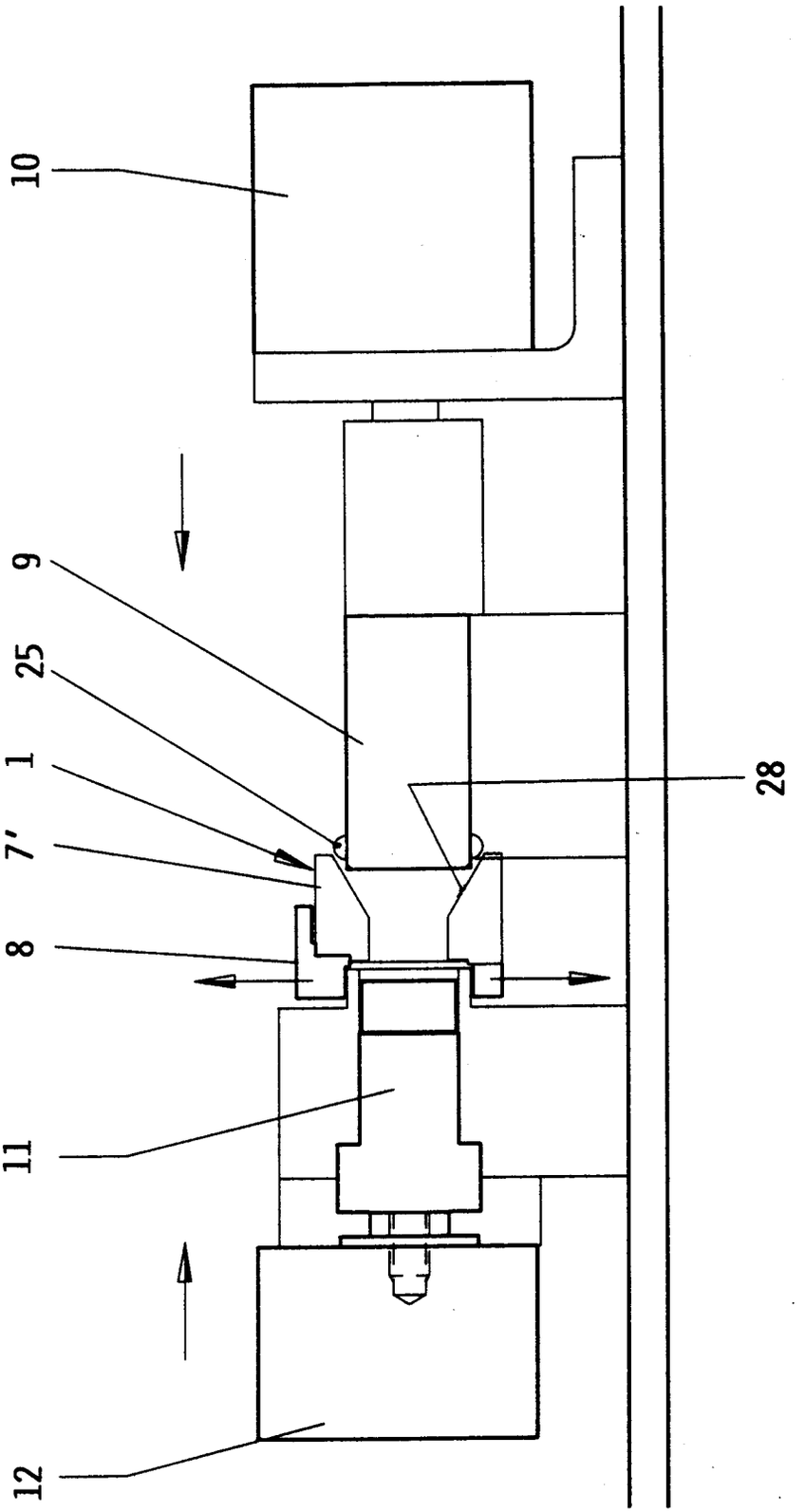

FIG. 3

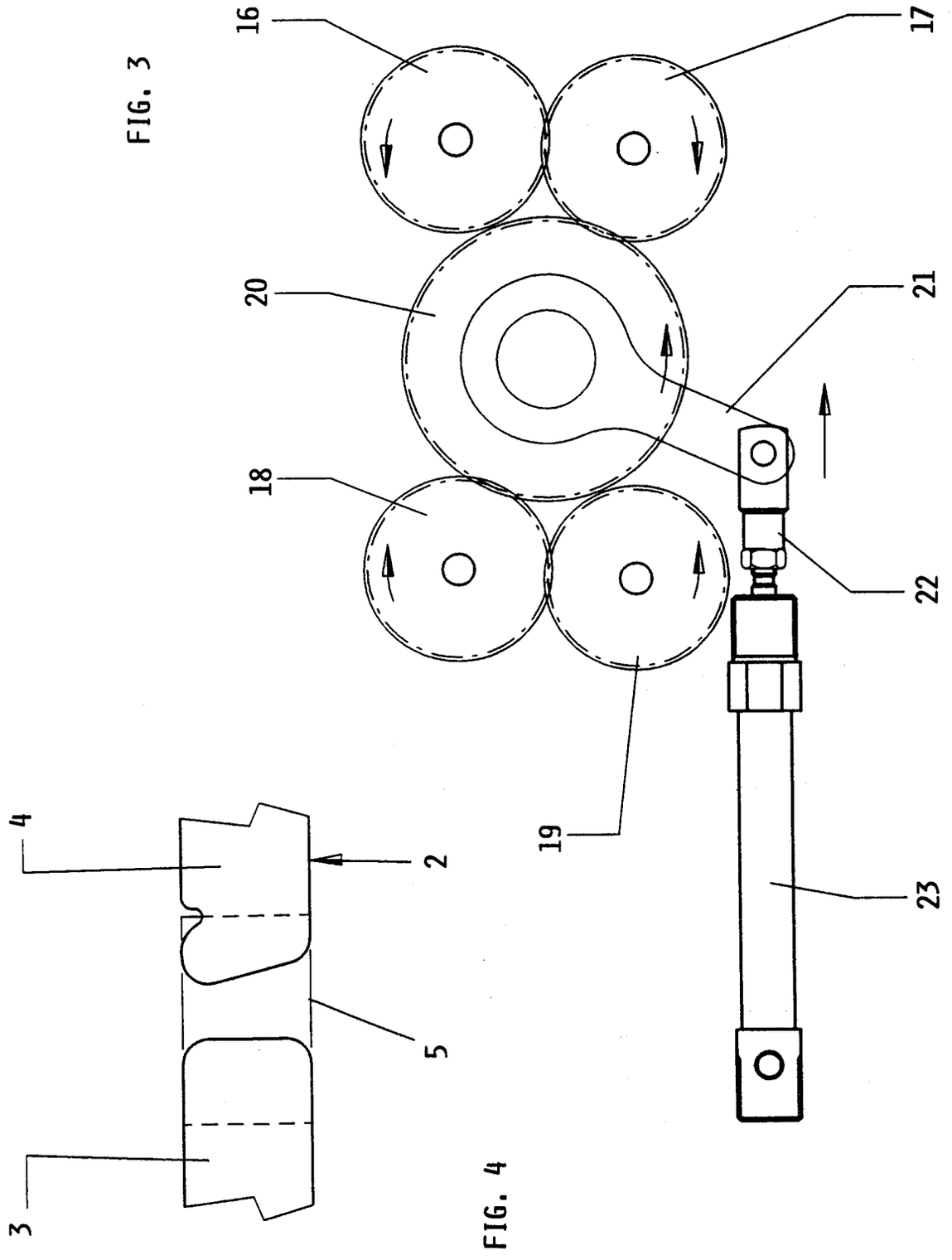

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 9255

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 A	US-A-5 373 339 (GREENE ET AL.) * abstract; figure 1 * ---	1-4,7-9 5,6	G03D15/04
A	US-A-4 370 184 (JENSEN ET AL.) * claim 1; figure 3 * -----	1,3	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

G03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 November 1996	Romeo, V

CATEGORY OF CITED DOCUMENTS

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