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I-10060 None (Torino) (IT)(54) **Method for guiding portions of photographic film.**

(57) A method for guiding portions of photographic film that have already undergone at least a first treatment (development) is described, whereby with the aims of their further treatment (reprints) numerous portions (11) have to be guided through one or more utilising apparatuses, said portions (11) having to be united one to the other in the form of a continuous band by way of a conveyance support in a flexible material applied along a first edge of the said portions (11), where said support has the function to permit the guiding of said portions in succession through guiding means being part of said utilising apparatuses.

The method described presents the following phases:

- said portions of film (11) are inserted, singularly in succession, in a preliminary apparatus (fig. 4) that provides for applying to an edge of said portions of film (11) said flexible conveyance supports, that comprises in particular a first strip of supportive material and a first strip of adhesive tape, said two strips coming from a first (35') and a second supply bobbin (31') of said preliminary apparatus and being guided one over the other with said edge of the portions of film being interposed;
- said preliminary apparatus (30) provides for applying to the other edge of said portions of film (11) a second flexible conveyance support, parallel to the first conveyance support and

having the function of considerably improving (guiding, gathering, cleaning, protection of the portions of film) the phases of said further treatment (reprints), said second flexible conveyance support comprising in particular a second strip of supportive material and a second strip of adhesive tape, said two strips coming from a third (35) and a fourth supply bobbin (31) of said preliminary apparatus and being guided one over the other with said edge of the portions of film (11) being interposed;

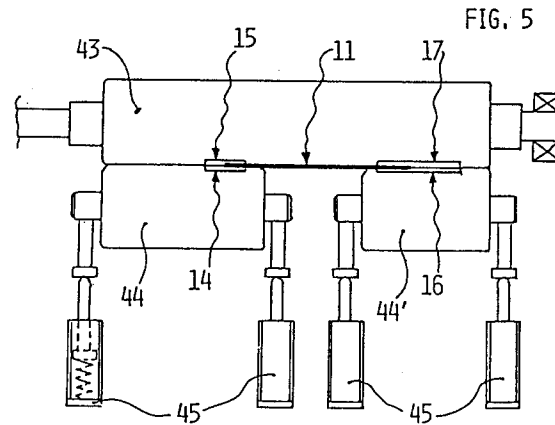
- the strips of supportive material and that of adhesive tape are made to pass through at least a pair of rollers (39,40;43,44), that press the strips of adhesive tape against those of supportive material, so as to create a bonding with the edges of the portions of film (11) being interposed for realising a continuous band (10) having double lateral conveyance supports;
- the continuous band with double support (10) supplies one or more successive utilising apparatuses being part of said further treatment (reprints), such as a cleaning machine, a printing machine, a wrapping machine, a cutter.;

The application of said second conveyance support has the function of:

- preventing flapping of said portions of film (11) during their passage through said utilising ap-

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- paratuses, and/or
- permitting said portions of film (11) to be guided along routes being distinctly curved during their passage through said utilising apparatuses, and/or
- permitting the correct winding of said continuous band (10) on supply and/or gathering bobbins (46) for said utilising apparatuses, and/or
- permitting the exertion of a greater mechanical action of cleaning on said portions of film (11) during their treatment, and/or
- permitting the cleaning of said portions of film (11) utilising high quantities of washing solutions, in particular washing solutions being non pollutant and/or natural, and their successive drying by way of a substantial production of hot air, without, said portions of film (11) losing their flatness, and/or
- permitting the simplified application to the continuous band of a protective envelope in the form of a wrapping.



The present invention refers to a method for guiding portions of photographic film that have already undergone at least a first treatment (development), whereby with the aims of their further treatment (reprints) numerous portions have to be guided through one or more utilising apparatuses, said portions having to be united one to the other in the form of a continuous band by way of a conveyance support in a flexible material applied along a first edge of the said portions, where said support has the function to permit the guiding of said portions in succession through guiding rollers being part of said utilising apparatuses.

As is known, development, printing and eventually reprinting processes of photographic films are actually carried out in suitable plants, that daily treat very large quantities of film; very schematically, the printing process of a photographic film within such plants is the following:

- the single rolls of film of various customers, after having been completely unwound, are attached one after the other, in such a way so as to form a very long continuous band, that is then wound onto a bobbin; such bobbins then feed the development and printing line, in which the continuous band is guided; upon termination of such process, the film is cut in pieces of a reduced length, that are introduced to suitable envelopes to be then returned to the customer along with the printed photographs.

In general, the entire developing and printing process in such plants of initial printing is carried out in an automatic and rapid manner, at least in the case of films of common use (for instance 16 mm, perforated along one side only, and 35 mm film, perforated along both sides).

When the customer wishes the reprint of a film, or of several exposures thereof, the said portions of film (the so called negatives), must be assembled once again, for carrying out the reprinting process: such process is also carried out automatically in plants of the type mentioned above, at least for films of the more common format.

For uniting the single portions of film in the reprinting process it has become common practice to apply a conveyance support (generally composed of a strip of paper and a strip of adhesive material) along one of the two edges of the negative: in this way the continuous band is re-obtained, that can be wound for obtaining the bobbins that feed the reprinting machine. It is also known to provide the portions of film with a length of paper tape upon which information can be affixed; such tape (tabbing), when present, is to be found between the two strips that constitute the said conveyance support.

From US Patent 4.368.969 an apparatus for guiding a continuous band of the described type, with a single support is known; such a patent has the aim of improving, and to ensure particularly laterally, the conveyance of such a band during its treatment, by providing guiding edges on the utilising apparatuses, suitably positioned.

The cited practice of applying an adhesive support strip to one of the lateral edges of the film portions and the relevant guiding system, of the type of that described in the cited US patent 4.368.969, does however present several drawbacks.

A first drawback is due to the fact that, as the band of film is guided through the various machinery by way of a unique conveyance support, lateral movements of the band itself can occur; for avoiding and/or correcting such movements, the machinery has to be equipped with appropriate sensors and correction mechanisms, being very complicated and that require continuous adjustments.

Another drawback is that, as the various portions of film are attached along a single side only and they have to be attached to the support strip at a certain distance between themselves, during conveyance the free edge of the portions of film tend to move up and down, or slip, with the risk of jamming the machinery, or even worse, scratching the portions of film.

For the same reasons, moreover, on the large bobbins, the band made up of a high number of portions of film are wound in an irregular fashion, so as that the actual bobbins take on a conical form, being extremely difficult to manage and with further risks of jamming or scratching the portions of film.

The mentioned problems of lateral movement and of flapping may also lead to negative effects regarding the quality of the copies obtained in the reprinting process of the single frames, as in such cases the film has to be positioned with extreme precision in correspondence of the exposure aperture of the machine that carries out the copies.

It should be noted that during the reprinting process the poor cleanliness of the negatives, can give rise to unsatisfactory effects concerning the quality of the final product and therefore the possibility would be desirable to realise and maintain a really efficient cleaning of the portions of film to be reprinted during the various treatment phases, and after which, for protecting the negatives even for eventual future manipulations.

The cited practice of applying a single conveyance support to the portions, does not however allow for efficiently solving the problem of cleanliness, partly due to the fact that, according to the prior art, a vigorous cleaning of the portions of film is not allowed, as they would break away from the

single support, and partly due to the aforementioned problems of lateral movement, flapping, irregular winding.

Said drawbacks of the prior art, concerning the poor level of cleanliness and the troublesome protection of the film portions, will be described in more detail in the following of the present description.

The above mentioned drawbacks are notably increased in the case of films of professional use (60 mm size, without perforations), the treatment of which requires a level of precision and accuracy being far greater than that of the films in common use: the eventual scratching of the portions of film cannot be simply or economically corrected.

From the Belgian Patent BE 535.449, a developing procedure for sheet film is known, according to which the single films can be articulated one to the other by uniting them along the external edges, by means of movable supports (such as tapes, wires, metallic wires, tweezers, etc.) which are able to resist the developing substances; the band formed by the sheet films and the cited supports is made to pass into the developing baths, after which the support must be removed. Said rudimentary system, briefly described and having an aim (to speed up the development of a great number of single films) being different in respect of the present invention, does not however suggest any acceptable solutions about how to obtain a band formed by a plurality of film portions and how to use it during a treatment process.

The aim of the present invention is that of resolving the abovementioned drawbacks and in particular to indicate a method that allows to guide in a simple, reliable, precise manner without risks of scratching, a band constituted by a plurality of portions of photographic film, through treatment apparatuses, and which allows to ensure a high grade cleanliness and protection to said portions during their treatment, and after. A related aim of the present invention is that of indicating a method and apparatuses which allow for the advantageous realisation and use of a continuous band formed by a plurality of portions of photographic film, during a printing process.

For reaching said aims, the objects of the present invention are a method and the apparatuses as resulting from the enclosed final claims.

Further aims and advantages of the present invention will become clear from the following description and annexed drawings supplied as a non-limiting example, wherein:

- figure 1 partially and schematically represents a continuous band constituted by a plurality of portions of photographic film, united between them according to a substantially

known technique;

- figure 2 partially and schematically represents a continuous band constituted by a plurality of portions of photographic film, united between them according to the method subject of the present invention;
- figure 3 represents a first schematic view of an apparatus through which it is possible to obtain the band of figure 2;
- figure 4 represents the apparatus of figure 3 in a second schematic view;
- figure 5 represents a sectioned view of a particular of the apparatus of figure 4.
- figure 6 schematically represents an apparatus for the cleaning, or washing, of the band of figure 2;
- figure 7 schematically represents an apparatus for the reprinting of the negatives which constitute the band of figure 2;
- figure 8 schematically represents an apparatus for wrapping the band of figure 2 inside a protective envelope.

Figure 1 partially and schematically represents a continuous band constituted by a plurality of portions of photographic film, united between them in a known manner, to be utilised in reprinting processes; said band is indicated in its entirety with the reference number 1; with the reference number 2 two portions of photographic film are indicated, being substantially similar in size (for instance four frames); reference number 3 indicates a flexible conveyance support, applied to the superior edge of the portions of film 2.

As in the known technique, the support 3 is made up of a first continuous strip of paper material 4, placed over a face of the pieces of film 2, and by a second strip of adhesive material 5, placed over the other face of the portions of film 2, so as to also adhere to the paper strip 4.

Between the paper strip 4 and the adhesive strip 5, that is transparent, an informative paper tab can eventually be found (the abovementioned tabbing).

During the reprinting process, therefore, the band 1 is conveyed through the various machinery by way of the support 3; upon termination of such process the band 1 is cut, and the portions of film 2 with the relative portions of support 3 are returned to the customer.

Figure 2 partially and schematically represents a continuous band constituted by a plurality of portions of photographic film, united between them according to the method subject of the present invention; such continuous band is indicated in its entirety with the reference number 10; with reference number 11 two portions of photographic film are indicated, identical to those indicated with 2 in figure 1.

As is noted, in this case, the various portions of film 11 that make up the band 10 are united by way of two distinct supports, each of which applied to each edge of the portions of film; such two conveyance supports are indicated in their entirety with reference numbers 12 and 13.

The superior support 12 is made up of a first continuous strip of paper material 14, placed in contact with the lower face of the portions of film 11, and a continuous strip of an adhesive material 15, applied in part to the superior face of the portions of film 11 and the remaining part to the surface of the paper strip 14; as is seen in figure 2, the paper strip rests in part on the lower face of the portions of film, but without overlapping the superior perforations of the film; both the strips 14 and 15 are of a length being greater than that of the overall length of the portions of film 11, that are arranged at a certain distance from one another.

The lower support 13, being substantially of a width twice that of the support 12, is made up of a first strip of a paper material 16, that rests on the lower face of the portions of film 11, and of a second strip 17, transparent and adhesive on one side, applied in part to the superior face of the portions of film 11 and for the remaining part to the paper strip 16.

Reference number 18 indicates the tabbing; such tabbing 18 is abutted and fixed to the portions of film 11 by way of an adhesive tape, not visible, applied in part to the lower face of the portions of film 11 and for the remaining part to the lower surface of the tabbing itself; the tabbing therefore does not superimpose not even in part the portions of film 11.

As is noted in figure 2, on the tabbing 18 (that is generally applied to the portions of film 11 after the first printing of the photographs, i.e. before respects the two supports 12 and 13) boxes 19 are printed, within which the already mentioned information can be inserted (for instance to indicate which frames are to be reprinted or for allowing to organise the reprints with their relative portions of film, etc.); such information is always visible, in that the adhesive strip 17 that superimposes the tabbing 18 is made of a transparent material.

As the portions are arranged at a certain distance between one another, in the free zones 20 the adhesive strip 17 results in being completely fixed to the paper strip 16; in view of the fact that the paper strip 16 is periodically fixed to the adhesive strip 17, even for the portions of the continuous band in which the strip 16 is not completely in contact with the strip 17, there is a substantial contact between the same strip 16 and the lower face of the portions of film.

The band 10 can be wound on a bobbin, even of a considerable size, and the plurality of portions

of film 11 are guided by way of the supports 12 and 13 through the machine or machines making up part of the reprinting process, as will be clear in the following of the present description, avoiding the drawbacks verified in the known art.

Upon termination of the reprinting, the band 10 is wrapped inside a protective envelope and then passed through appropriate cutters, so as that the portions of film 11, with the relative portions of the supports 12 and 13 are contained in a protective wrapping for being returned to the customer.

In figures 3, 4 and 5 the apparatus that allows for the realisation of the band 10 of figure 2 is schematically illustrated; the schematic structure of such apparatus is indicated in its entirety with reference number 30.

Numbers 31 and 31' indicate the two adhesive tape feeder bobbins, independent between themselves and freely mounted on the same support 32; in particular the bobbin 31 contains the adhesive strip 15 while the bobbin 31' contains the adhesive strip 17.

Numbers 33 and 34 indicate two passing rollers, being spaced; in particular the two adhesive strips 15 and 17 pass below the roller 33, that is of a plastic material, and then pass over roller 34; such roller 34 has a suitably shaped surface (for instance ribbed), so as to avoid that the strips stick to its surface and for limiting the loss of adhesive capacity of the said strips 15 and 17; it is also to be observed that, as the bobbins 31 and 31', the rollers 33 and 34 are idle, i.e. free and of independent rotation.

Numbers 35 and 35' indicate two paper strip feeder bobbins; in referring once more to the band 10 of figure 2, the bobbin 35 contains the paper strip 14 while the bobbin 35' contains the paper strip 16; the bobbins 35 and 35' are also independent between themselves and freely mounted on the same support 36; after such bobbins 35 and 35' the paper strips 14 and 16 pass a guiding roller (50, figure 3).

Reference number 37 indicates a feeder buffer, not visible in figure 3, in which guides where the adhesive tapes 15 and 17 pass are defined; with reference number 38 the insertion zone of the portions of film (11) is indicated; such insertion zone is made up of a lower plate (indicated with 38' in figure 4) on which guides, where the paper strips 14 and 16 pass, are defined; on such plate 38' an interchangeable template 38'' is arranged, for the insertion of the portions of film.

With number 39 an idle roller of a plastic material, for instance polizene® is indicated, below which a twin pressing unit is mounted, constituted by two idle rollers also made of polizene® (one of which being visible in 40), mounted on adjustable springing systems; such springing systems are

calibrated so as that the rollers 40, being narrower than roller 39, exert about a modest pressure on roller 39.

The unit made up of roller 39 and its twin pressing unit (40) is mounted so as to be adjustable in its height and its angle (i.e. the possibility of regulating the angle of the axis of the rollers 39-40 if compared to the conveyance direction of the strips 14-17 and the portions of film 11).

Reference number 41 indicates an opaline screen, that can be illuminated; before such screen 41 a small idle roller of a plastic material is mounted, indicated with 42 (figure 4), slightly higher than the plane of the screen 41; with number 42' a second small idle roller is indicated, mounted after the screen 41, being similar to that indicated with 42 and being at the same height.

With reference number 43 a rubber motorised roller is indicated, in particular in adiprene®, (the motor is not visible), under which a twin pressing unit is mounted (44, 44', 45); in particular from figure 5 (that represents a section of roller 43 and relative pressing unit) it is noted that such twin pressing unit is made up of two idle rollers 44 and 44', in adiprene®, mounted on spring supports 45 (similar to the supports with which rollers 40 are equipped); the force exerted by such supports 45 on rollers 44 and 44' can be precisely adjusted by way of appropriate calibrated screws, for simplicity not represented; said supports 45 are adjustable so as that the rollers 44 and 44' exert a considerable pressure on roller 43.

The complete unit constituted by roller 43 and its twin pressing unit (44, 44', 45) is mounted in such a way so as that its position may be adjusted in three directions; in fact such unit is adjustable in height, depth and in a way so as to adjust its working angle (i.e. so as to vary with a single adjustment the angle of the axes of the rollers 43, 44 and 44' compared to the conveyance direction of strips 14-17 and of the portions of film 11).

As can be seen in figure 4, the line of passage of the strips 14-17 and the portions of film 11 on the rollers 42 and 42' is to be found on a higher plane compared to the line of passage of the strips and portions of film between the two rollers 39 and 43 and the relative pressing units.

Reference number 46 (figure 3) indicates a motorised bobbin (the motor is visible in 47) for the winding of the band 10; the support of such bobbin 46 is equipped with a rocking arm 48, so as to guarantee a correct winding of the band 10.

The apparatus illustrated in figures 3, 4 and 5 works in the following way.

After the preparatory operations (for instance charging the feeder bobbins 31, 31' and 35, 35' and the necessary adjustments, depending on the type of portions of film to be treated) the apparatus

30 is activated by the user who applies to the insertion zone 38 of the template 38" a film portion 11; a sensor detects the insertion of the portion and causes the activation of the motor of roller 43; the portion 11, that may be eventually already supplied with a tabbing, then passes to the pre-sticking zone, i.e. within the unit constituted by roller 39 and rollers 40 and the small roller 42 (as mentioned, the pressure between roller 39 and rollers 40 is modest); upon passing between rollers 39 and 40, the two adhesive tapes 15 and 17 are applied to the superior face of the negative and the two paper strips 14 and 16 to the lower faces; the conveyance of the strips and film portion, in the sense indicated by the arrow, is realised in virtue of the motorised roller 43.

The presence of the small rollers 42 and 42', respectively arranged at the beginning and the end of the opaline screen 41, allows for obtaining a perfectly linear packet between the strips 14-17 and portion 11 (with or without tabbing); moreover the fact that the small rollers 42 and 42' are arranged on a plane being slightly higher (approximately 0,5 mm) than that of the screen 41, avoids the dragging (and therefore every risk of scratching) of the portions of film 11 along the surface of the screen 41.

When the portion 11 passes the introductory zone 38, the sensor no longer detects its presence and a timer device, connected to the sensor, provides for delaying the stopping of the motor of roller 43 for several instants; when such delayed stopping takes place, the portion has reached a determined position over the screen 41.

On screen 41, which is illuminated, the user controls the film portion and can eventually read the information contained on the tabbing or add more information to the transparent adhesive strip 17, in correspondence to the boxes (19) of the tabbing itself (the minimum distance between the negative and the screen in fact allows for writing).

After having controlled the length of film portion 11, the user inserts another portion in the template 38" of zone 38 and the sensor causes the motor of roller 43 to start again, until the new portion reaches the mentioned determined position of the screen 41. In the meantime the first portion 11 passes through the sticking (and conveyance) zone, constituted by the unit of the small roller 42', the motorised roller 43 and rollers 44 and 44'; in the moment of passing between roller 43 and rollers 44 and 44' the definitive sticking of the portion and adhesive/paper strips is in fact realised, because, as mentioned, the pressure between roller 43 and rollers 44 and 44' is considerable.

Upon exiting the sticking zone, the band 10 results therefore complete and, as further portions of film 11 are inserted in the apparatus, such band

10 is wound around the final bobbin 46, the motor of which is commanded by the rocking arm 48, that detects the tension of the band and guarantees a correct winding; the motor of roller 43 therefore realises the conveyance of the strips and portions of film, while motor 47 only carries out the winding of the obtained band around the bobbin 46.

The bobbin 46 is then transferred to feed the machine or machines making up part of the reprinting process, through which the band 10 can be guided by way of the supports (12, 13).

As previously mentioned at the beginning of the present description, the portions of film should be as clean as possible the moment of passing along the reprinting apparatus, or printing machine; before, during and after assembly of the band, portions of film could be dirty.

For example, if on the rear of a portion (i.e. the part opposite the emulsion) a scratch is present, there will be no printing problems if such scratch is cleaned (as the light of the printing machine is diffused); on the contrary, if on the negative dust is present that was not possible to remove from the scratch, the latter will remain impressed on the reprinted photo, which is clearly inconvenient and which supposes a further treatment of that particular frame, maybe manual, to be carried out.

The washing of the portions of film joined by a single conveying support is not satisfactory for eliminating drawbacks of the cited type, partly due to the cited problems of lateral movements and flapping, and partly due to the fact that the single support does not allow for realising an incisive mechanical action on the negatives; in fact, being as they are supported from one side only, an excessive pressure on them would produce, besides the previously mentioned negative effects, the portions detaching from the support, with the risk of jamming the machines and of loss of the customers negatives.

According to the present invention, on the contrary, the band 10 is supplied with two supports 12 and 13, it is possible to exert a strong mechanical action, without risks and the cited problems, by way of an opportune washing machine.

In figure 6 the schematic structure is in fact illustrated of an apparatus for the washing of negative of the band according to the method subject of the present invention.

In such figure, 50 indicates a washing section of the apparatus, with 51 a drying section and with 52 a polishing and rewinding section.

With 46 the bobbin is indicated upon which the band 10 is wound, or in practice the exit bobbin of the apparatus of Figure 3; such bobbin 46, that supplies the washing apparatus, is inserted on a suitable friction support 53; with 54 a passage roller for the band 10 is indicated.

With 55 a bobbin is indicated upon which a tape is wound 56 for the cleaning of the negative, for example velvet. Such tape 56 passes under a first passage roller 57, an injector being of a cylindrical form 58 and a second passage roller 59, then to be wound on a bobbin 60, made to rotate by a suitable motor.

Likewise, the underside of the washing section 50, comprises a bobbin 61 for a velvet tape 62, a first passage roller 63, a second passage roller 64 and a motorised bobbin 65 for rewinding the tape 62.

The injector 58 and the passage roller couples 57-59 and 63-64 have respective positions such that the two washing tapes 56 and 62 carry out a distinct curve; for this purpose the injector 58, that is spring mounted, exerts a certain downward mechanical pressure.

As can be seen, the band 10 coming from bobbin 46 is made to pass between the two tapes 56 and 62, through the distinct curve under the injector 58.

Such injector 58 is connected through a duct 66 to a tank 67, on which a temporised solenoid valve is inserted, that provides for the flowing in determined times and quantities of a washing solution to the injector; the injector 58 provides a lower opening, in order that the washing solution deposits on the tape 56; advantageously, for increasing the quality of the washing, also a soaking system for the lower velvet tape 62 could be provided.

As is seen from the detail of part A of figure 6 the injector 58 has a substantially cylindrical surface, on which a relief 58A is present, where the soaking opening is obtained; such relief has substantially the same width as the film portions arranged between supports 12 and 13 of the band 10: in such a way, that when the injector 58 presses downwards on the tape 56, the greater cleaning mechanical action is exerted on the actual negative to be cleaned, and not on the conveyance supports.

The functioning of the washing section is the following: the two bobbins 60 and 65 are started, in order that tapes 56 and 62 scroll along the curve under the injector 58, which provides to amply drench the tape 56 with the washing solution coming from tank 67; simultaneously the band 10 passes through the two tapes, in such a way that the negatives are washed.

Upon exiting the washing section 50, the band 10 is made to pass through the drying section 51.

With 68 a box-like body is indicated within which upward and downward jets of hot air are blown in, through opportune generators 69 and 70; inside the body 68 of the drier five idle rollers 71 are provided, between which the band 10 slides; as can be seen from the detail of part B of figure 6,

such rollers 71 have a cylindrical extremity 71A between which a central portion 71B is arranged being of opposed double truncated cones; on the flat surfaces of the extremities 71A the conveyance supports of the band 10 pass, while in the lower central part 71B pass the portions of film, that may thus come into contact with the hot air and dried.

After the drier 51 the band 10 then passes between two motorised velvet brushes 72 and 73, that provide for polishing the portions, eliminating the halations that may have eventually formed on the portions of film.

The band 10 washed, dried and polished, is finally wound on a rewinding bobbin 75, mounted on a motorised support 76, after passing a roller 74.

Advantageously the washing apparatus also provides an upper friction support 77; after the washing and the polishing of the band 10 have been carried out, on such support 77 the bobbin 75 is mounted, while the original bobbin 46 is moved on the motorised support 76: in this way, therefore, the washing machine may be advantageously utilised for obtaining the rewinding of the band 10 on the bobbin 46, re-establishing the original order of portions.

According to the prior art, the cleaning of the portions is based on the use of a reduced quantity of chemical solvents being of rapid evaporation, and exercising a modest mechanical action; as mentioned, such system is not however always effective and supposes the use of polluting substances.

The best cleaning results are obtained by using a greater quantity of washing agent and a greater mechanical action: according to the proposed method, the washing of the portions may be carried out using a considerable quantity of a natural solvent, being neither toxic nor pollutant, and a more incisive mechanical action, if compared to the operation according to the prior art.

The evaporation of the natural solvent used in the method subject of the present invention, composed of water and citrus essences, is produced by making the band 10 pass through the drier 51, wherein the hot air is produced that dries the portions of film; the film then passes between the two polishing brushes 72-73 and is then rewound.

It is to be noted that the use of the proposed drying method can not be utilised on bands of the type as those illustrated in fig. 1, as the portions, held on one side only and heated, would lose their flatness, "curving", and therefore increase the previous mentioned problems of lateral movements and flapping, jamming in the various passages and a very poor winding on the bobbins; the film, being no longer flat, would then determine evident focusing problems on the printer, with considerable risks

for the client regarding the loss of negatives.

Going back to the method subject of the present invention, the bobbin 46, containing the band 10 washed and polished, is passed on to the reprinting machine, or printer, for carrying out the copying of the frames of interest for the client.

In figure 7 a printer used in the method according to the present invention is in fact illustrated schematically; such printer is realised with a technique substantially known, and will not therefore be described in detail, but with the addition of a cleaning device.

The printer of figure 7 has an upper transportation group for the photographic paper to be exposed, comprising a decoiling group 80, a printing zone 81 and a rewinding group 82.

With reference number 83 an optical group is indicated, with 84 a negative support plate is indicated, with 85 an illuminating head and with 86 a print window; furthermore the printer comprises a transportation group of the band 10, for its winding from the bobbin 46, the passage along the plate 84 in connection with window 86, and finally its rewinding on to a bobbin 87.

As is seen, before passing along the print window 86, the band 10 is made to pass through a cleaning unit 88, that has the function of eliminating eventual residues (for instance powder or hair) from the portions of film, that could negatively influence the quality of the print.

For carrying out such further cleaning, preliminary to the reprinting, fixed brush systems are known, that are not however efficient; rotary brush systems are also known, with eventual suction of the residues gathered by the brushes, for the cleaning of entire films (i.e. rolls of film completely unwound) in the phase of the initial printing.

The use of such rotary brush system, for a reprint band of the type as that of fig. 1, would however be very risky and would require various guides, for reducing, but not however eliminating, the usual problems of lateral movement and flapping, etc., and therefore of jamming and damaging the negative; in any case a truly effective cleaning action would not be possible for such reasons.

With the band 10 according to method of the present invention, on the contrary, the complete cleaning of the portions of film is carried out without the aforementioned problems; furthermore a strong mechanical cleaning action may be exercised, without the risk that the portions of film detach from the conveying support.

In part A of figure 7 the cleaning unit 88 is schematically illustrated; such unit 88 includes a box-like body 89 equipped with an entrance passage 90 and an exit passage 91 for the band 10.

Two brushes 92 and 93 are arranged inside the body 89, made to rotate by a motor (not repre-

sented for simplicity) between which the band 10 is made pass; such brushes 92 and 93 are arranged in order that the mechanical cleaning action on the surfaces of the portions of film is such to ensure the complete removal of residues eventually present; to the rear part of the body 89 two conducts 94 are provided for the suction of eventual residues gathered by the brushes 92 and 93.

According to the method subject of the present invention, on the printer of figure 7, portions of film of the band 10, wound by the bobbin 46 arrive clean on the print window 86 and, after the required reprints, the band 10 is wound on the bobbin 87. After having passed along the printer, the band 10 can then be rewound on the bobbin 46, for re-establishing the original order.

After such operation, or when the desired copies have been obtained, for ensuring the cleanliness and protection of the negatives for future manipulations, the band 10 according to method subject of the invention, is made to pass along a wrapping machine.

In the known reprinting process, the practice of wrapping the band of figure 1 having a single conveying support is not utilised, due to the difficulty and the aforementioned problems.

Figure 8 schematically illustrates the wrapping machine utilised in the method according to the invention. Such machine is realised with techniques being substantially known, of the type utilised for wrapping negatives coming from the development process and initial printing; the modifications introduced essentially regard the sizing of the passage points of the band 10 and that of the transparent tapes utilised for obtaining the wrapping (that are obviously of a width being greater than that of the band 10).

For this purpose, advantageously, the sizes of the supports 12 and 13 could be chosen in order that, for example, a band 10 composed of portions of film of a more common size (for example the size of LEICA) with two supports 12 and 13 be as wide as a 60 mm professional film, in order to allow for such band 10 the use of a standard wrapping machine for 60 mm films.

The wrapping machine of figure 8, on which the usual bobbin 46 is mounted, has an entrance zone 95 of the band 10, an upper bobbin 96 and a lower bobbin 97 for the supply of two transparent tapes 98 and 99 (one of which being wider than the other), two passage rollers 100 and 101, a folding and gluing group 102, two pressure rollers 103 and 104 and a bobbin 105 for the rewinding of the wrapped band 10.

The wrapping machine operates in the following way: the band 10, coming from the bobbin 46 through the entrance zone 95, passes between the two

rollers 100 and 101; between such rollers 100 and 101, on the lower surface and on the lower of the band 10 the two transparent tapes 98 and 99 are placed; the whole being constituted by two tapes with the interposed band 10 then reaches the folding group 102; in such group 102 the lateral edges of the wider tape are folded over the edges of the other tape, with the contemporary application of a gluing substance (for example acetone). On exiting from group 102 the ensemble band-tapes then passes between rollers 103 and 104, where the gluing between the two tapes 98 and 99 is improved, in order to obtain a wrapping that contains the band 10; the band 10 encompassed within the wrapping is rewound on the exit bobbin 100.

Advantageously, after the entrance zone 95, the wrapping machine may be equipped with a cleaning unit as that shown with 88 in figure 7, in order to obtain a package of the band 10 surely clean inside the protective wrapping.

At this point, the band 10, already protected by the wrapping is made to pass along a suitable cutting machine, for separating the different portions of film making up the band 10.

Also the cutting machine, that has not been represented, is realised with substantially known techniques, i.e. is of the type as those used for cutting the rolls of film in portions after the initial printing, but modified for the passage sizes of the band 10. Other modifications concern the command system of the blade of the cutter, that will provide for cutting sections of supports 12 and 13 and the wrapping present between two successive portions of film (zone 20 visible in figure 2).

With the method subject of the present invention, thus, upon termination of the treatment, original portions of film, with the relative sections of supports 12 and 13 are clean and protected inside the wrapping, to be delivered to the client together with the reprinted photographs.

From the given description the characteristics of the method for guiding portions of photographic film subject of the present invention are clear, as are also clear its advantages, mainly represented by the fact that the presence of a double support allows:

- for having, in all treatment phases of a photographic film and in particular those of reprints, a perfect conveyance of the portions of film;
- for placing with great precision the different frames in connection with the critical points of the film treatment cycle, without the necessity of complicated mechanisms and continuous adjustments;
- for avoiding lateral movements, inasmuch as both supports can be utilised for directing the band, and to avoid the flapping phenomenon

of the portions of film and the consequent risks of scratching during the phases of washing, reprinting, cleaning, wrapping, etc.;

- for winding bands of considerable length in an optimal manner, without the risk to having poorly wound or conical bobbins;
- for having, during the whole reprinting process, a level of cleanliness certainly being higher than that available according to the prior art, which means higher product quality and higher treatment reliability

It therefore follows that the slight increase in costs of the process (due to the presence of the second sliding support) is largely compensated by an improved quality in the treatment of the films.

From the given description the characteristics and advantages of the apparatus that allows for realising and treating the described double support conveyance band are also clear.

It is to be considered that the apparatus 30 allows for creating bands of different types with homogenous portions of film, i.e. it allows to obtain double support bands for portions of film of 16 mm, perforated on one side only, or with portions of film of 35 mm, perforated on both sides, or with professional films of 60 mm, without perforations.

Supports 32 and 36 in fact provide suitable fixing seats, that consent the diversified placement between bobbins 31-31' and 35-35', and the buffer 37 and the plate 38' having different sliding guides (respectively for tapes 15, 17 and 14, 16) selectively utilised according to the width of portions of film; likewise, the template 38'' of the insertion zone 38 is interchangeable with templates having rails apt for the insertion of portions of film of different sizes.

Furthermore, to pass from a band 10 of portions of film 11 of 35 mm to a band 10 of portions of film of 60 mm, it is necessary for example:

- to move the bobbin 31 on the support 32 and move the adhesive strip 15 in the buffer 37 from one of its seats to another;
- to remove the template 38'' with the rails for portions of film of 35 mm and move the paper strip 14 in the fixed plate 38' from one of its seats to another;
- to mount the template 38'' with rails for portions of film of 60 mm and a winding bobbin 46 larger than that previously present on the machine.

The apparatus 30 can therefore be prepared by carrying out the mentioned modifications very rapidly with a loss of approximately one meter of adhesive and paper strip as test, something of which occurs however also in machines of the known type that stick a single conveyance support. It is clear that modifications in the way of allowing the treatment of bands of different dimensions

could be eventually provided also for the other apparatuses making up part of the method according to the invention.

As mentioned, the position of the screen 41 is adjustable in height, as rollers 40 and 44-44' are of variable pressure and the units of elements 39-40 and 43-45 are adjustable in various senses; such adjustments, that have the aim of assuring a perfectly linear conveyance on the screen 41, are carried out only during the installation phase of the machine or following occasional regulations.

Another characteristic to be underlined is the fact that the apparatus is not equipped with motorised winders for the feeder bobbins; in fact, both the bobbins 31-31' and the rollers 33 and 34 are idle, i.e. free and of independent rotation and distanced between them; such solution allows for overcoming the fact that the strips of adhesive material 15 and 17, being of different widths, have different functional characteristics: they therefore have a different release and memory (whereby for release it is meant the necessary force for unwinding an adhesive tape wound around itself and for memory it is meant the characteristic that an adhesive tape, when pulled, lengthens slightly, to then return after a short time to its original length). In machines of the type known, that apply a single support, below the feeder bobbin of adhesive tape a motorised winder is arranged instead.

Among the possible variants of the apparatus 30, the possibility of changing the positioning of the paper strip feeder bobbins 35 and 35' and those of the adhesive tape feeder bobbins 31 and 31' is cited. For example, bobbins 31 and 35 could be positioned downstream in respect of the insertion zone 38, so as the conveyance support 12 be applied to the portions of film after the application of support 13, before the passage of the band between the roller 43 and the twin pressing unit 44, 44', 45.

It is however clear that numerous variants are possible by the man skilled in the art to the method and relative apparatuses subject of the present invention, without for this departing from the novelty principles inherent in the inventive idea.

Claims

1. Method for guiding portions of photographic film that have already undergone at least a first treatment (development), whereby with the aims of their further treatment (reprints) numerous portions (11) have to be guided through one or more utilising apparatuses, said portions (11) having to be united one to the other in the form of a continuous band by way of a conveyance support in a flexible material (13) applied along a first edge of the said

portions (11), where said support (13) has the function to permit the guiding of said portions (11) in succession through guiding means being part of said utilising apparatuses, characterised in the following phases:

- said portions of film (11) are inserted, singularly in succession, in a preliminary apparatus (fig. 4) that provides for applying to an edge of said portions of film (11) said flexible conveyance supports (13), that comprises in particular a first strip of supportive material (16) and a first strip of adhesive tape (17), said two strips (16,17) coming from a first (35') and a second supply bobbin (31') of said preliminary apparatus and being guided one over the other with said edge of the portions of film (11) being interposed;
- said preliminary apparatus (fig. 4) provides for applying to the other edge of said portions of film (11) a second flexible conveyance support (12), parallel to the first conveyance support (13) and having the function of considerably improving (guiding, gathering, cleaning, protection of the portions of film) the phases of said further treatment (reprints), said second flexible conveyance support (12) comprising in particular a second strip of supportive material (14) and a second strip of adhesive tape (15), said two strips (14,15) coming from a third (35) and a fourth supply bobbin (31) of said preliminary apparatus (fig. 4) and being guided one over the other with said edge of the portions of film (11) being interposed;
- the strips of supportive material (14,16) and that of adhesive tape (15,17) are made to pass through at least a pair of rollers (39,40;43,44), in particular for applying pressure to the strips of adhesive tape (15,17) against those of supportive material (14,16), so as to create a bonding with the edges of the portions of film (11) being interposed for realising a continuous band (10) having double lateral conveyance supports;
- the continuous band with double support (10) supplies one or more successive utilising apparatuses being part of said further treatment (reprints), such as a cleaning machine (fig. 6), a printing machine (fig. 7), a wrapping machine (fig. 8), a cutter;

said second conveyance support (12) having the function of:

- preventing flapping of said portions of film (11) during their passage through said utilising apparatuses (figs. 6-8), and/or
 - permitting said portions of film (11) to be guided along routes being distinctly curved during their passage through said utilising apparatuses (fig. 6), and/or
 - permitting the correct winding of said continuous band (10) on supply and/or gathering bobbins (46) for said utilising apparatuses (figs. 6-8), and/or
 - permitting the exertion of a greater mechanical action of cleaning on said portions of film (11) during their treatment, and/or
 - permitting the cleaning of said portions of film (11) utilising high quantities of washing solutions, in particular washing solutions being non pollutant and/or natural, and their successive drying by way of a substantial production of hot air, without, said portions of film (11) losing their flatness, and/or
 - permitting the simplified application to the continuous band of a protective envelope (fig. 8) in the form of a wrapping.
2. Method for guiding portions of photographic film, according to the previous claim, characterised in that said utilising apparatus is a machine for the cleaning, or washing, of said portions of film (fig. 6), on which said continuous band (10) is guided, along at least one route being distinctly curved and/or under a substantial mechanical pressure, between two cleaning tapes (velvet), at least one of said tapes (56,62) for the cleaning is drenched with a considerable quantity of a cleaning solution, said solution being of a natural and non polluting basis.
 3. Method for guiding portions of photographic film, according to at least one of the previous claims, characterised in that after the washing, in particular after the passage between said cleaning tapes (56,62), said band (10), is guided through a hot air drier (51), that provides for drying said portions of film (11).
 4. Method for guiding portions of photographic film, according to at least one of the previous claims, characterised in that band (10) in particular after the passage in said drier (51), passes through polishing means (72,73) that provide for polishing said portions of film (11), eliminating eventual haloes.

5. Method for guiding portions of photographic film, according to claims 2, 3 and 4, characterised in that said drier (51) and said polishing means (72,73) are comprised in said cleaning machine (fig. 6). 5
6. Method for guiding portions of photographic film, according to claim 1, characterised in that said utilising apparatus is a printing machine (fig. 7) on which said band (10) is guided, before the printing window (86) of said printing machine, said band (10) being in particular made to pass in a cleaning device (88 fig. 8-A) of rotating brushes (92,93) apt at exerting a substantial mechanical action on said portions of film (11), said cleaning device (88) further comprising suction means (94) of eventual residues collected by said rotating brushes (92,93). 10 15 20
7. Method for guiding portions of photographic film, according to claim 1, characterised in that said utilising apparatus is an apparatus apt at closing said continuous band (10) within a protective envelope (98,99), in particular a wrapping machine (fig. 8) upon the exit of which said band (10) is closed within a wrapping (98,99) being of at least the same length as said band (10). 25 30
8. Method for guiding portions of photographic film, according to claim 1, characterised in that said utilising apparatus is a cutting machine apt at cutting said supports (12,13) so as that said continuous band (10) results in being divided in as many pieces as the portions of film (11) of which it is made. 35 40
9. Method for guiding portions of photographic film, according to the previous claim, characterised in that said cutting machine is supplied with said band (10) already closed within said protective wrapping (98,99) and provides in particular for cutting the sections (20, fig. 2) of said supports (12,13) and said protective wrapping (98,99) being present between two successive portions of film (11) of said band (10). 45 50
10. Method for reprinting portions of photographic film joint between them in a continuous band 10, according to one or more of the previous claims, characterised in that it comprises, in combination, one or more of the following phases: 55
 - the portions of film (11) are joint between them in a continuous band (10), on two edges by way of two lateral conveyance supports (12,13) constituted by paper strips (12,13) and adhesive strips (15,17);
- the thus formed band (10) is cleaned (50) utilising a substantial quantity of washing agent, in particular an agent being natural and non polluting, and exerting a strong mechanical cleaning pressure on the portions of film (11) and/or making the band (10) follow at least one route being distinctly non linear;
- the band passes a drying apparatus (51), where the washing agent on the portions of film (11) is dried by way of the substantial presence of hot air, and eventually passed in a polishing apparatus (72,73) for eliminating eventual haloes;
- the band (10) supplies a printing apparatus (fig. 7), where before the positioning on the printing window (86), the portions of film (11) are made to pass a cleaning device (88) of rotating brushes (92,93) that exert a substantial mechanical cleaning action on the portions of film (11), in particular with the simultaneous suction of eventual residues collected;
- an apparatus (fig. 8) provides for closing said band (10) in a protective envelope (98,99), in particular a wrapping constituted by two transparent tapes being joint between them;
- the band is made to pass in a cutting machine, that eliminates the sections (20) of said supports (12,13) and eventually said protective envelope (98,99) being present between two successive portions of film (11) of said band (10).
11. Method for joining portions of photographic film so as to create a continuous band of the length being at least equal to the total length of the portions of film, apt at being guided by at least one roller (50) to an insertion zone (38) of the portions of film (11);
 - a first strip of supportive material (14), coming from a first supply bobbin (31), is guided by at least one roller (33,34) to said insertion zone (38) of the portions of film (11), but in a position being shifted respect that from where the strip of supportive material (14) arrives, so as that the strip of adhesive tape remain raised respect that of the supportive material (14);
 - a second strip of adhesive tape (17), coming from a fourth supply bobbin (31'), is guided by at least one roller (33,34) parallel to said first strip of adhesive tape (15);

- the strips of supportive material (14,16) and those of adhesive tape (15,17) are made to pass through at least one pair of rollers (39,40;43,44), that press the strips of tape against those of supportive material, so as to cause their gluing;
 - said strips, glued together, are adopted by a gathering or utilising device;
 - a portion of film (11) is placed in said insertion zone (38), arranging above (below) at least one strip (14) of supportive material, and below (above) at least one strip of adhesive tape;
 - a motor is started that operates a conveyance roller (43), that advances the strips, in such a way that the portion of film is conveyed through said pair of rollers (39,40;43,44), so as that it proceeds it remains fixed between the strips of supportive material and the strips of adhesive tape;
 - when the entire portion of film has passed through the said pair of rollers, the motor is made to stop and, if necessary, the procedure re-commences by inserting a new portion of film.
- 12.** Method for joining portions of photographic film, according to claim 11, characterised in that said pair of rollers (39,40;43,44) comprise at least one idle roller (39), below which a variable pressure unit is mounted (40), said pressure unit being in particular twin and comprising a pair of idle rollers (40), being narrower compared to said idle roller (39), the pressure exerted by said variable pressure unit (40) on said idle roller (39) is modest.
- 13.** Method for joining portions of photographic film, according to claim 11, characterised in that said pair of rollers (39,40;43,44) comprise at least one motorised roller (43), below which a variable pressure unit is mounted (44), said pressure unit being in particular twin and comprising a pair of idle rollers (44), being narrower compared to said motorised roller (43), the pressure exerted by said variable pressure unit (44) on said motorised roller (43) is firm, on the passage between said motorised roller (43) and the relative pressure unit (44) obtaining the actual gluing between said strips of supportive material (14,16), the portions of photographic film (11) and said strips of adhesive tape (15,17).
- 14.** Method for joining portions of photographic film, according to claim 12 or 14, characterised in that the adjustment of the assembly is provided constituted by said idle roller (39), or motorised (43), and the relative pressure unit (40;44).
- 15.** Method for joining portions of photographic film, according to at least one of the previous claims, characterised in that said strips (14-17) and said portions of film (11) slide through rollers being of a contained diameter (42,42') arranged at the two extremities of a shield (41), the line of passage of said strips (14-17) and said portion of film (11) along said rollers being of contained diameter (42,42') being arranged in particular on a plane being slightly higher respect the superior surface of said shield (41) and on a plane higher respect the line of passage of said strips (14-17) and said portion of film (11) between said first idle roller (39), or motorised (43) and the relative pressure unit (40;44).
- 16.** Method for joining portions of photographic film, according to at least one of the previous claims, characterised in that the force necessary for the unwinding of said strips (14-17) from said supply bobbins (31,31',35,35') and/or the force for the conveyance of said strips of supportive material (14,16), of said strips of adhesive tape (15,17) and said portions of film (11) is obtained by way of said motorised roller (43).
- 17.** Method for joining portions of photographic film, according to at least one of the previous claims, characterised in that of providing for the detection of the presence of one of said portions of film (11) in said insertion zone (38) and the consequent starting of the motor of a conveyance roller (43), and the delaying the stopping of said motor when the presence of said portion of film (11) in said insertion zone (38) is no longer detected, the delay time of said stopping being regulated in such a way so as to allow said portion of film (11) to reach a determined position on said shield (41).
- 18.** Method for joining portions of photographic film, according to at least one of the previous claims, characterised in that it is used for the obtaining of bands being of different widths with homogeneous portions of photographic film, in particular portions of film of 16mm, perforated along one side only, or with portions of film of 35mm perforated along both sides, or with portions of professional film of 60mm, without perforations.

19. Method for joining portions of photographic film, according to the previous claim, characterised in that, with the aims of obtaining a bands of different widths the arrangement of the supply bobbins (31,31',35,35'), the arrangement of said strips of supportive material and/or adhesive tape in respective seats, and the size of said entrance zone (38) of said portions of film can be varied.

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20. Apparatus for implementing in particular the methods according to one or more of the previous claims, which comprise in particular interchangeable parts according to the width of the portions of film that have to be joint and/or guided.

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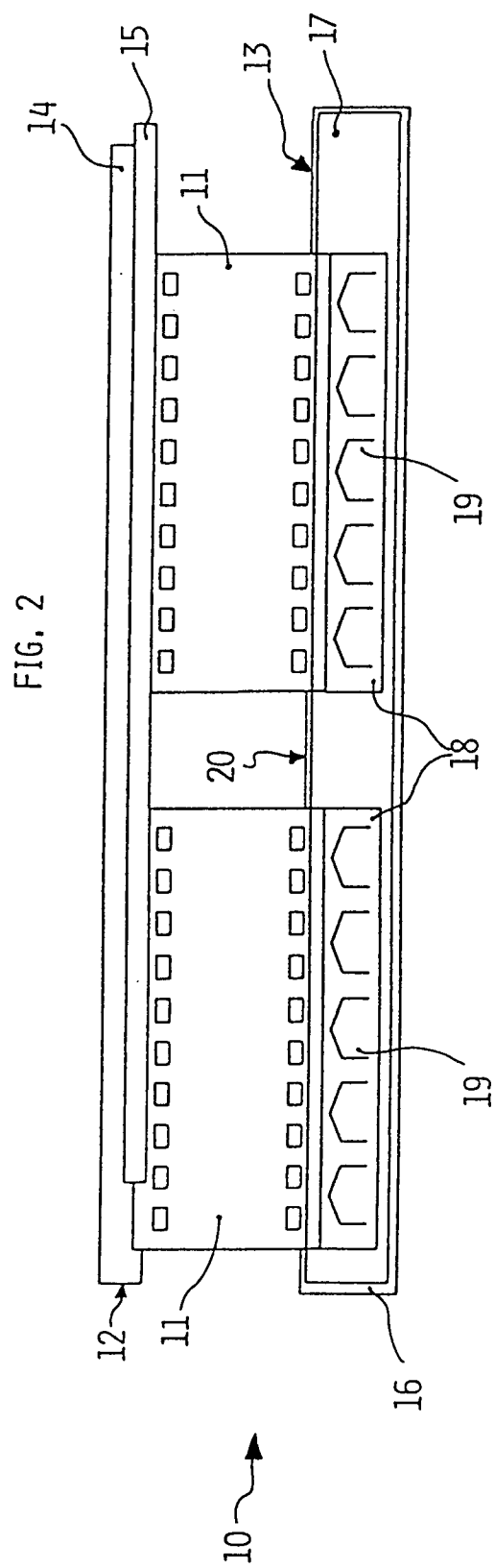
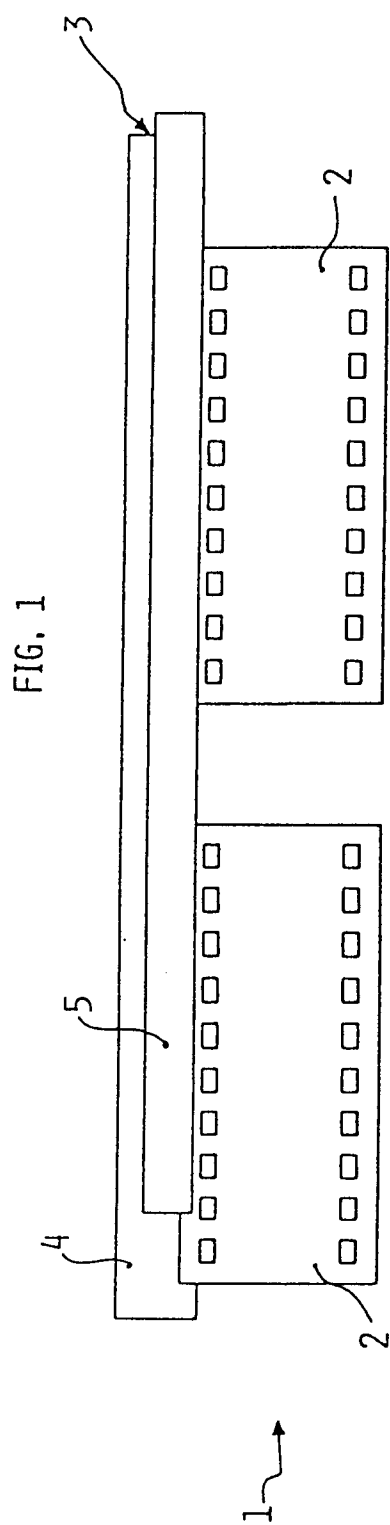
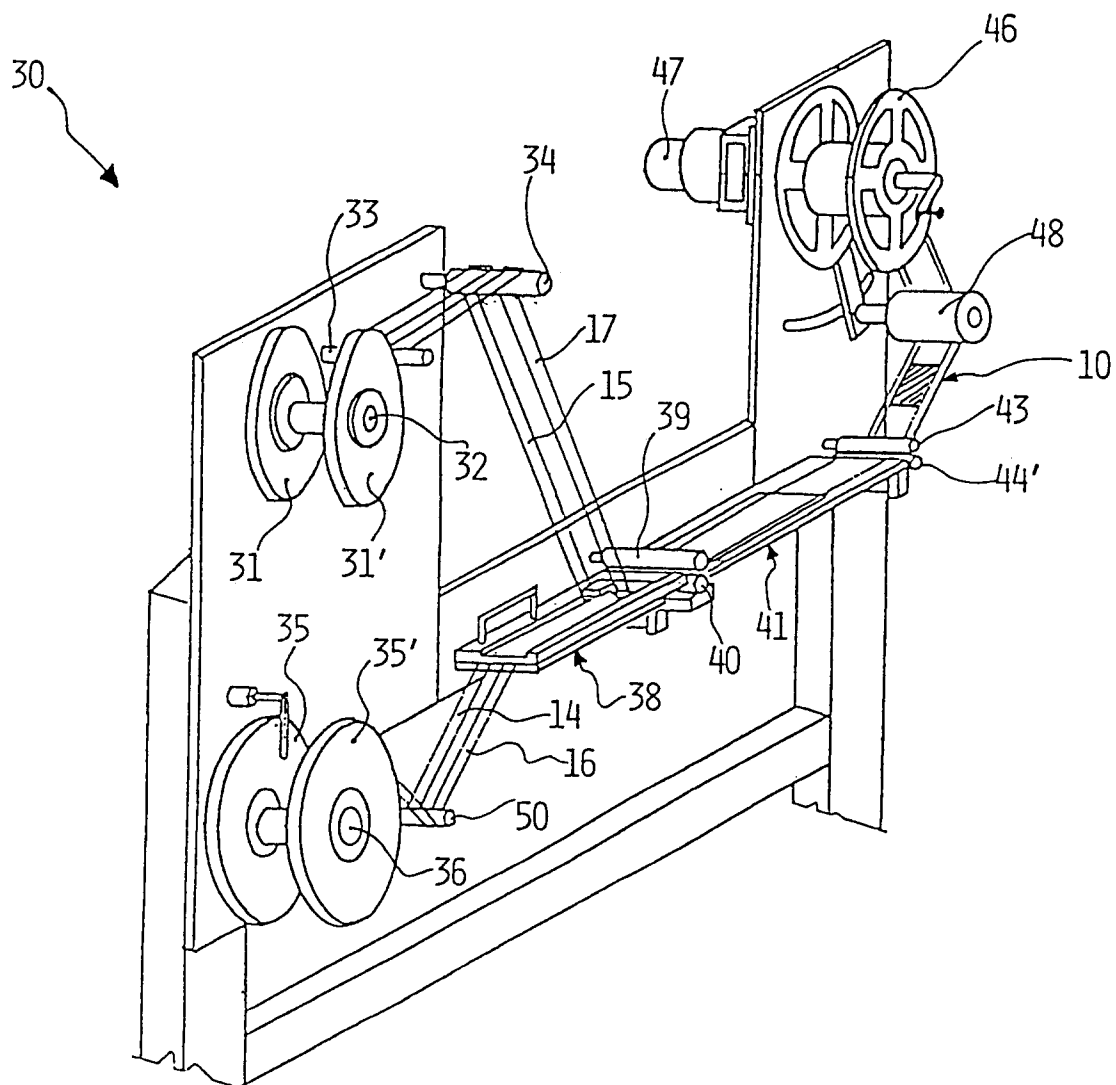


FIG. 3



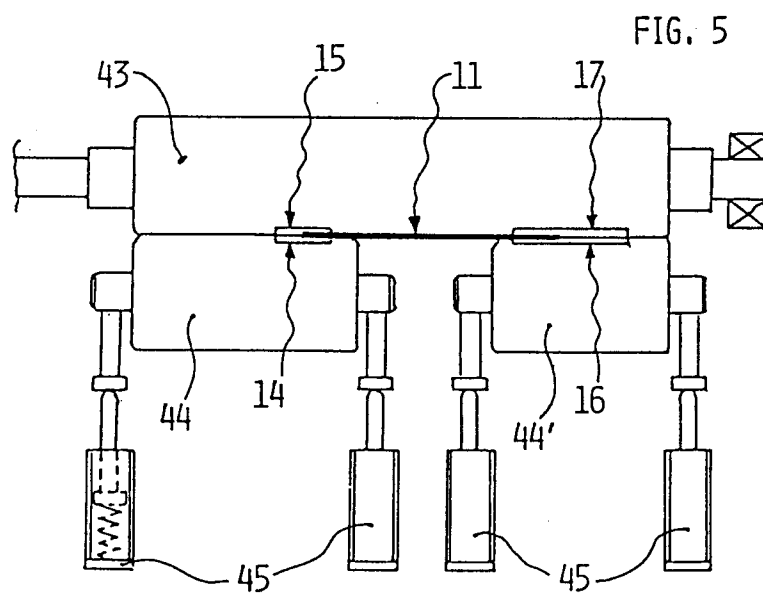
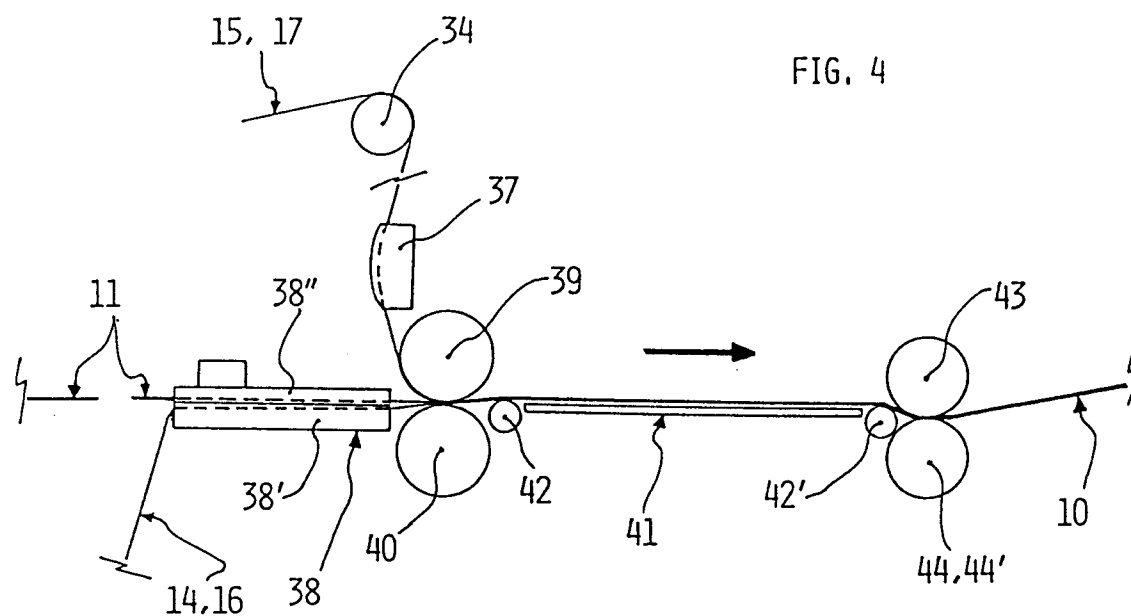


FIG. 6

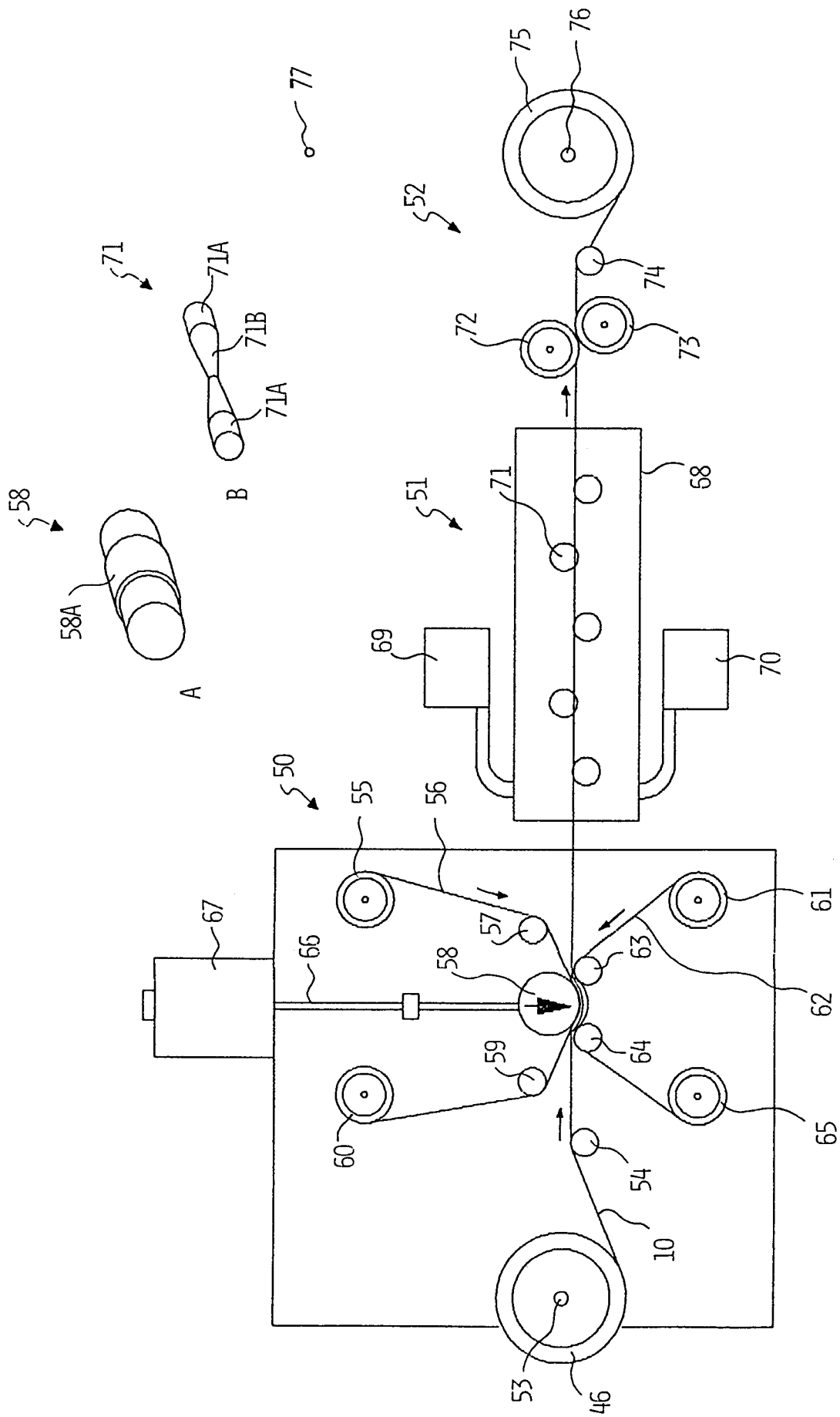


FIG. 7

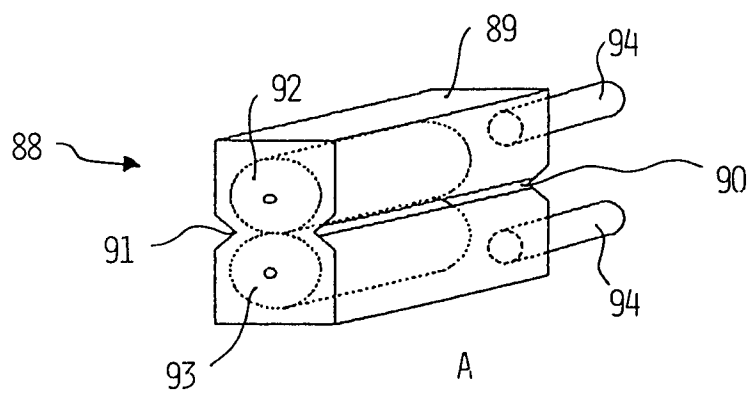
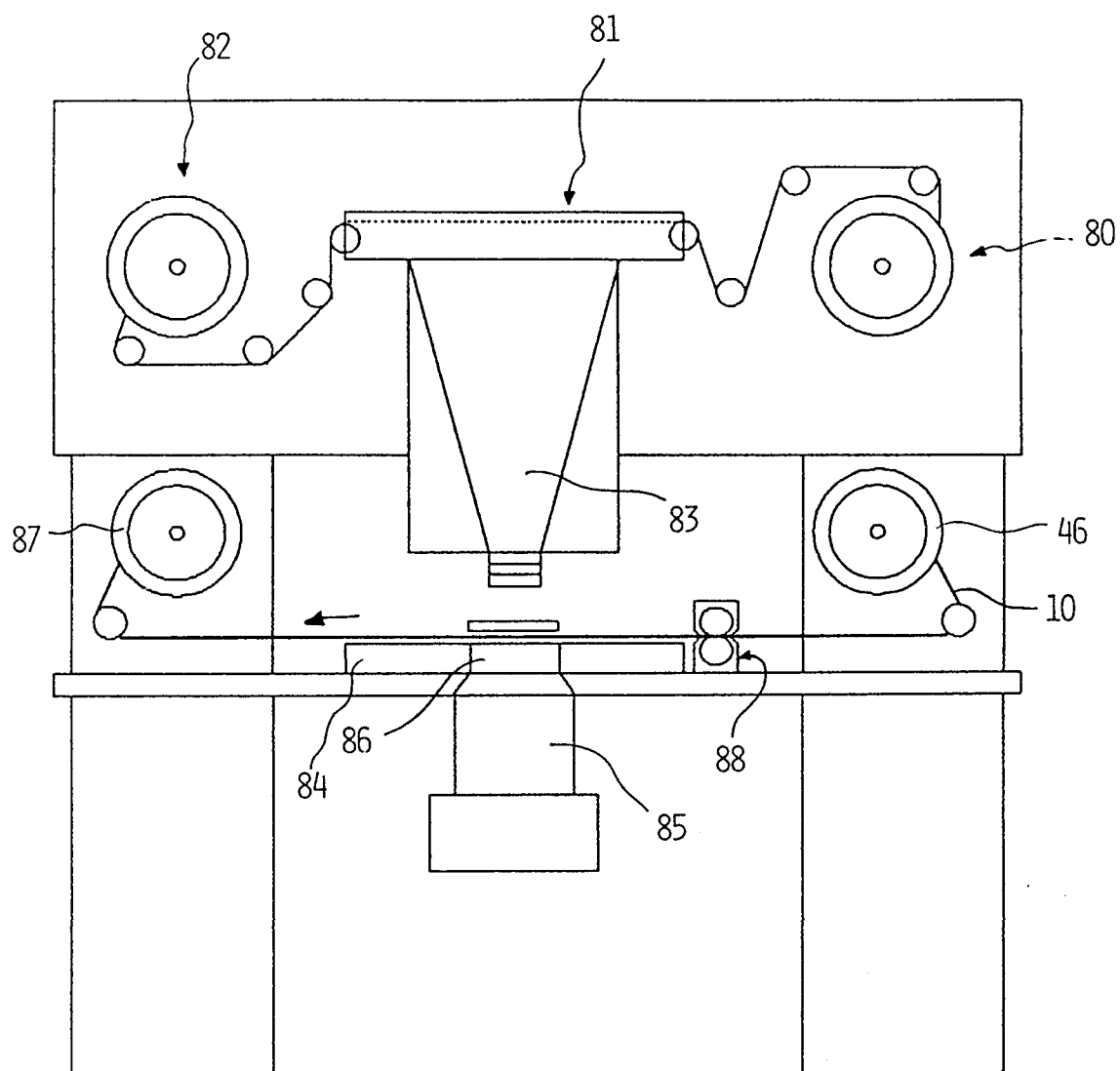
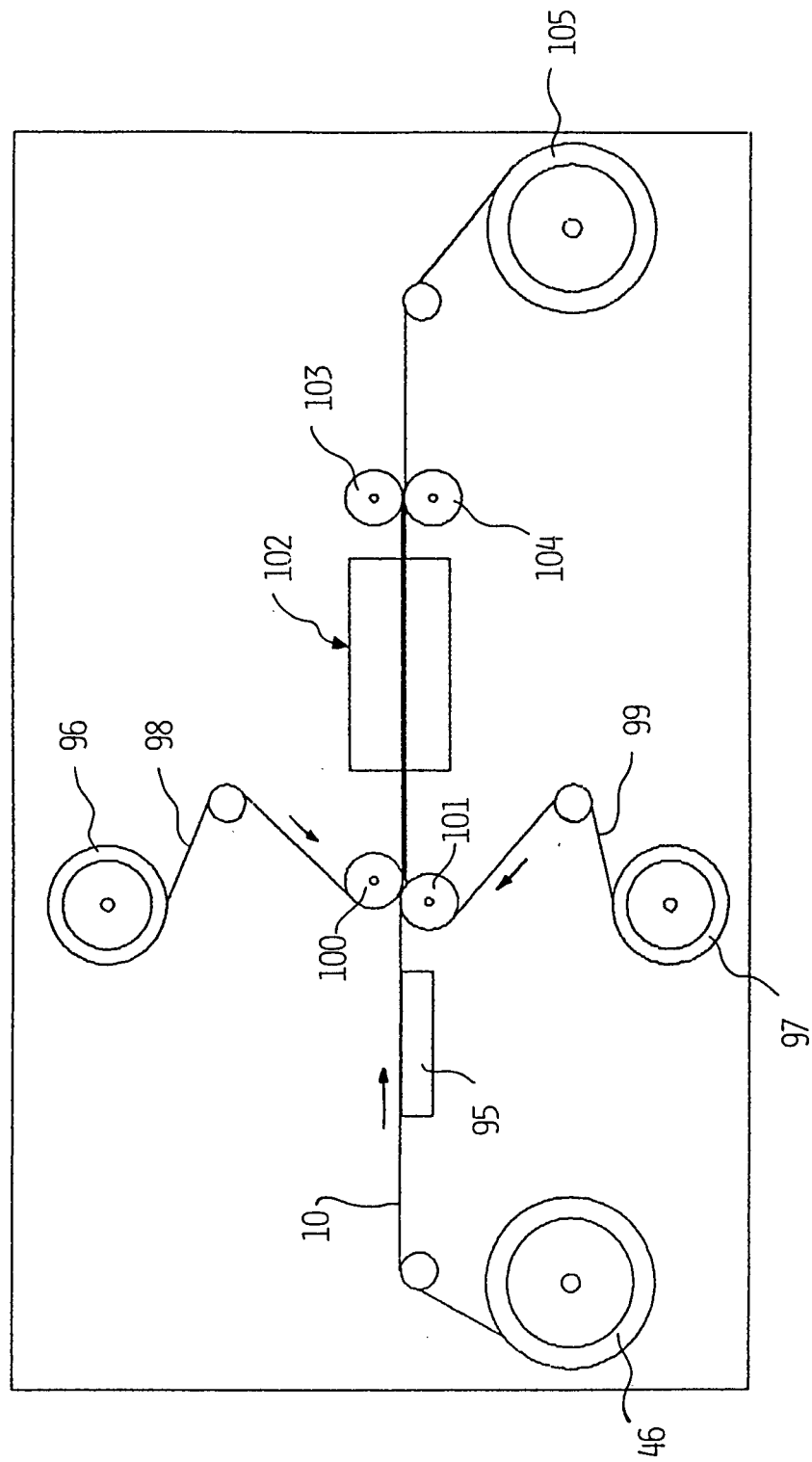


FIG. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 9087

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)
D,A	BE-A-535 449 (SCHLEUSSNER FOTOWERKE) * page 2, line 16 - line 36; figures 2,6-8 *	1,11,18	G03D3/13
D,A	--- US-A-4 368 969 (BASCHUNG) * column 3, line 15 - column 4, line 55; figure 1 * -----	1,11-14, 18	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06 SEPTEMBER 1993	Examiner ROMEO V.L.
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