PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:	WO 86/ 02904
B65C 9/18, B44C 1/17	A1	(43) International Publication Date:	22 May 1986 (22.05.86)

(21) International Application Number: PCT/EP85/00580

(22) International Filing Date: 31 October 1985 (31.10.85)

(31) Priority Application Numbers: 8427918
8501248

(32) Priority Dates: 5 November 1984 (05.11.84)
18 January 1985 (18.01.85)

(33) Priority Country: GB

(71) Applicant *(for all designated States except US):* JAKOB SCHLAEPFER & CO. AG [CH/CH]; Teufenerstrasse 11, CH-9001 St. Gallen (CH).

(72) Inventor; and
(75) Inventor/Applicant *(for US only) :* KURIHARA, Akira [JP/JP]; No. 480 Kamihasucho, Isezaki-shi, Gunma-ken (JP).

(74) Agents: EVANS, David, Charles et al.; F. J. Cleveland & Company, 40/43 Chancery Lane, London WC2A 1JQ (GB).

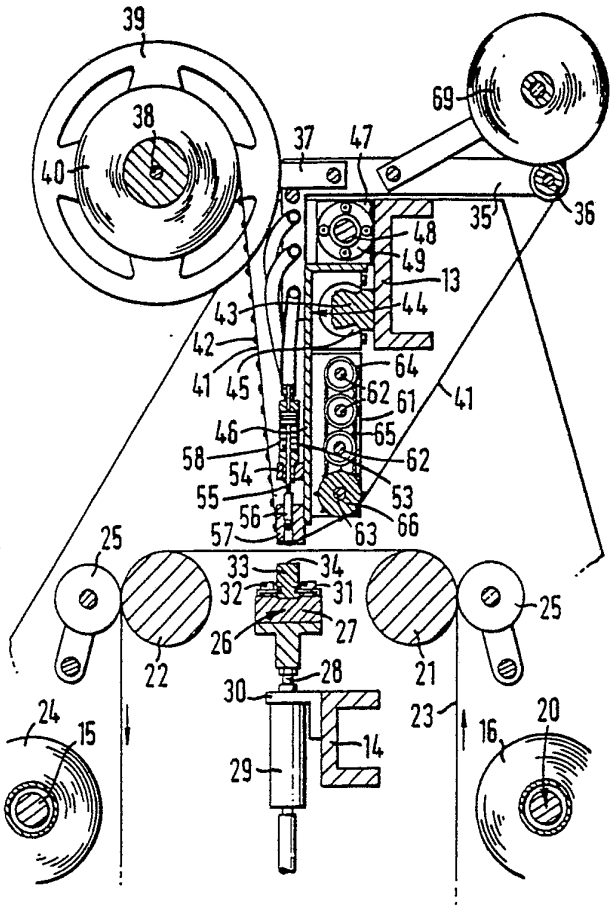
(81) Designated States: AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), HU, IT (European patent), JP, KP, KR, LU (European patent), NL (European patent), NO, SE (European patent), US.

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: IMPROVEMENTS IN AND RELATING TO THE PRODUCTION OF TRANSFERS

(57) Abstract

Method of mounting a decorative article on a receptor sheet material each of which articles has an adhesive layer on one surface thereof for the purpose of effecting a bond to a sheet material to which it is subsequently to be applied, which method is characterised by the steps comprising: mounting said article on a longitudinal tape (41) constituting intermediate support for each article, each article being mounted on said tape so that its adhesive layer is oriented in the same sense with respect to the tape, mounting said tape for supply to an article transfer station whereby at which articles from said tape presented sequentially for transfer to a sheet substrate (23) and thereafter causing or allowing the transfer of said articles at said transfer station from said tape to a substrate.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GA**	Gabon	**MR**	Mauritania
AU	Australia	**GB**	United Kingdom	**MW**	Malawi
BB	Barbados	**HU**	Hungary	**NL**	Netherlands
BE	Belgium	**IT**	Italy	**NO**	Norway
BG	Bulgaria	**JP**	Japan	**RO**	Romania
BR	Brazil	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SN**	Senegal
CH	Switzerland	**LI**	Liechtenstein	**SU**	Soviet Union
CM	Cameroon	**LK**	Sri Lanka	**TD**	Chad
DE	Germany, Federal Republic of	**LU**	Luxembourg	**TG**	Togo
DK	Denmark	**MC**	Monaco	**US**	United States of America
FI	Finland	**MG**	Madagascar		
FR	France	**ML**	Mali		

"IMPROVEMENTS IN AND RELATING TO THE PRODUCTION OF TRANSFERS"

DESCRIPTION

The present invention relates to the decoration of sheet materials and includes inter alia the production of transfers and in particular to the production transfers formed by a pattern of similar or different transferable items on a suitable carrier sheet for use in said decoration. Transfers comprising a carrier sheet for the article or articles to be transferred and one or more articles carried on the carrier sheet are well known. Such transfers are particularly well known in the textile industry where the carrier sheet has a contact adhesive on its surface which serves to retain temporarily the articles to be transferred, which latter each have a layer of an adhesive, typically a heat-sensitive adhesive, whereby on laying the transfer on a textile material to which the transfer is to be applied, the application of heat and pressure causes the heat sensitive adhesive on each of the articles to be transferred, to be activated to flow under the applied

pressure into the adjacent surface of the textile material and to develop a bond to the material which is greater than the bond between the carrier sheet and the article to be transferred. On release of the heat and the pressure, therefore, the carrier sheet can be peeled back from the transfer articles leaving the transferred articles in position.

This technique is generally well known and has been applied to many different kinds of articles, for example, colour foil, beads, rhinestones and embroidered articles, but the formation of the transfers comprising a number of individual transferable items has hitherto been a costly and time consuming business and, in many cases, requires individual preparation virtually by hand.

There is a need within the textile industry to provide complex designs and patterns of similar and/or different items on a sheet material in a reproducable manner. This is particularly important in the application of such patterns to pre-cut textile fabrics where it is important to ensure the registration between the design on the one hand and the cut textile fabric on the other. In order to achieve this it is necessary that the patterns themselves are as near identical as possible.

Furthermore, where transferable items are produced, it is essential that the patterns provided should be repeated at precise intervals on a carrier sheet to enable accurate registration or indexing of the pattern with the precut sheet or article by automatic handling equipment during application of the transfer. In particular, there is a need to provide a pattern in a reproducable form at a cheap price.

According to one aspect of the present invention there is provided a method of mounting a transferable article on a sheet material each of which articles has an adhesive layer on one surface thereof for the purpose of effecting a bond to a sheet material to which it is subsequently to be applied, which method comprises,

mounting said article on a longitudinal tape constituting intermediate support for each article,

each article as mounted on said tape being oriented so that its adhesive layer is disposed in the same direction relative to the tape,

mounting said tape for supply to an article transfer station at which one or more articles may be applied to a sheet substrate and

thereafter causing or allowing the transfer of said articles at said transfer station from said tape

either directly or indirectly to a substrate with the adhesive layer of the article juxtaposed the receptor sheet substrate whereby the application of heat and pressure causes or allows said articles to be attached to said substrate in a predetermined pattern.

The invention also includes a transfer tape for use in the method of the invention characterised by a longitudinal self-supporting perforated tape having an adhesive layer on one side thereof and a plurality of transferable articles adhering to said adhesive layer in a longitudinal array, each article being in register with a perforation in the tape.

The invention further includes apparatus for forming a pattern of articles on a substrate which apparatus comprises apparatus for forming a pattern of articles on a substrate, which apparatus comprises means for advancing a longitudinal length of substrate material along a substrate path, a transfer station comprising a plurality of transfer heads extending transversely of said path, each transfer head being adapted to transfer articles to said substrate, magazine means associated with said transfer head for the supply of said articles to said substrate and control means for controlling relative movement between the substrate and the transfer heads

characterised in that the magazine means includes a longitudinal tape carrying a plurality of said articles thereon for transfer to said substrate and means for advancing said tape to said transfer head at which an article or groups of articles are presented for transfer.

The invention also includes an intermediate carrier sheet for use in the method of the invention having on one surface thereof, a layer of adhesive characterised in that said layer carries a plurality of articles arranged in a regular pattern thereof, each article having a layer of heat sensitive adhesive on one surface thereof and oriented so that said layer is remote from the intermediate carrier sheet material.

In one embodiment of the method of the invention, the substrate is an intermediate carrier sheet having a layer of tack adhesive thereon said articles being transferred thereto at said article transfer station, each article being oriented with respect to the carrier sheet so that its adhesive layer is remote from the carrier sheet and thereafter applying the intermediate carrier sheet to a receptor sheet to be decorated with the adhesive layer of the articles juxtaposed said receptor sheet whereby the application

of heat and pressure causes adhesion of said articles to the receptor sheet thereby permitting removal of the carrier sheet to leave the pattern of articles applied to the receptor sheet. The articles may be disposed on said tape with the adhesive layer in contact with the adhesive layer on the tape surface.

In a further embodiment of the invention, the substrate may be the receptor sheet to be decorated. The transfer station may include heat and pressure means to provide sufficient adhesion between the adhesion layer on said article and said receptor sheet to retain said articles to form a pattern of articles thereon. The decorated receptor sheet may be subjected to the application of heat and pressure to effect more permanent bonding of the article to the receptor sheet material.

The tape may be a perforated tape and the article may be contacted therewith such that on contacting the adhesive layer of the tape for temporary adhesion thereto, each article covers a perforation in the tape. The article may be contacted with a perforated tape such as that at regular intervals, a perforation is uncovered to allow said uncovered perforations to engage a sprocket wheel for transport of the tape. In a particular embodiment of the invention, alternate

perforations of the tape are covered by articles.

Said transfer station may include one or more transfer head, each head being adapted to transfer articles from said tape to said substrate, said heads being disposed transversely with respect to the longitudinal axis of said substrate material and arranged for transverse movement with respect thereto, whereby integer movement of the substrate and transverse movement of the heads with respect thereto from its application of a pattern of articles to a substrate. The tape carrying said articles may be wound on a spool which may be mounted in juxtaposition to said transfer head for the sequential supply of articles thereto.

The apparatus of the invention may include a transfer station comprising tape guide means for guiding said tape, a reciprocatable member adapted to engage said tape, means to align an article on said tape with said reciprocatable member whereby operation of the reciprocatable member is caused to engage the tape and/or article thereon, to urge said article into adhesive contact with said substrate. Where the tape is perforated, sprocket means may be adapted to engage perforations in the tape to advance the tape to bring a perforation covered by an article into register with

the reciprocatable member whereby on operation of said reciprocatable member, said member enters the perforation and contacts the article to urge the article into adhesive contact with the substrate and simultaneously releasing the article from said tape.

The transfer station may include anvil means juxtaposed the substrate sheet and aligned with said reciprocatable member, the arrangement being such that operation of the reciprocatable member brings said article into adhesive engagement with the substrate by pressure against the anvil means. The anvil means may be a member may be movable between a pressure position and a free position so that in the pressure position it supports the substrate sheet to allow the reciprocatable member to press the adhesive layer of the substrate against the back pressure of said anvil member. Where the substrate is the receptor sheet material to be decorated, the anvil member may be heated. In this latter case, the articles may be disposed on the tape with the adhesive layer of the articles disposed on the side of each article remote from said tape for contact with the receptor sheet.

The control means may move the substrate sheet material forwards, in reverse or laterally with respect to the transfer station and/or provide integer

motion or stop/start operation. The control means may further act to control the movement of one or more of the transfer heads and/or the movement of the substate material thus allowing the formation of, for example, circles, curves and lateral lines.

In addition to the composition of patterns for direct or transfer application, the apparatus of the invention allows for the manufacture of patterns in the form of strips or individual motifs which may be cut subsequently and sold as strips or as individual motifs.

The articles may be applied directly to cut pieces. In this case the precut pieces of substrate material may be carried by a continuous mounting or backing sheet or on an endless carrier belt.

The present invention further includes a method of mounting a transferable article on a sheet material in which each article has an adhesive layer on one surface thereof for the purpose of effecting a bond with a sheet material to which it is subsequently to be applied, which method comprises sorting said articles to orient each article so that the adhesive layer of each article is disposed in the same direction, feeding the articles sequentially to a mounting station, providing a continuous tape having

an adhesive layer on one side thereof at said mounting station, contacting the article with the adhesive layer on the tape so that the article is carried on said tape and may subsequently detached therefrom while retaining the adhesive layer on the article substantially intact. In one aspect of the invention the adhesive layer on the article is in contact with the adhesive layer on the tape.

The articles may be supplied to the transfer head in a line and a reciprocating member may engage an article and push it into contact with the tack adhesive layer on said tape. The tape may be carried by at least one sprocket to permit accurate registration of a perforation and an article.

In an alternative embodiment, the mounting station may comprise a roller having a plurality of circumferentially spaced recesses, each adapted to accommodate an article in a particular orientation, a reciprocatable locating member adapted to lift an article from said supply into a recess and a sprocket wheel which engages a perforated tape, the sprocket engaging not more than alternative perforations, whereby the sprocket tines engage with the periphery of the roller intermediate the recesses so that on rotation, an article in a recess is brought into

engagement with the adhesive layer of the tape in register with a non-engaging perforation whereby the article adheres to said adhesive layer and is transported with said perforated tape.

The adhesive layer on the article is preferably a heat sensitive adhesive.

The invention further includes a method of providing a transferable pattern of articles which method comprises passing a transfer pattern receptor sheet progressively passed a transfer station said sheet having an adhesive layer on one side thereof, arranging a plurality of transfer heads at said transfer station in line across said sheet, providing a magazine of an article carrying transfer tape associated with each transfer head, causing the receptor sheet to move transversely of the transfer station and causing or allowing transfer of articles to take place from said tapes to said receptor sheet in accordance with a regular pattern across said receptor sheet.

In this way the apparatus of the present invention permits the production of a pattern and/or design on a carrier sheet in a reproducable manner. The machine is ideally suited to automated methods and digital control means may be provided for control of

the pattern within the machine.

An advantage of the present invention is that it permits the continuous production of patterns on endless sheet materials. This means that not only can a lengthy longitudinal sheet such as a roll of fabric be treated directly, but cut pieces of a sheet material to be decorated may be positioned on, for example, a conveyor belt and then decorated in accordance with the present invention. This is of very considerable advantage in the textile industry and particularly the fashion industry, since it will be appreciated by the man skilled in the art that it is extremely difficult to cut material after patterns of, for example, rhinestones, have been applied thereto. The same applies to a lesser extent to cut parts which have subsequently to be sewn or stitched to other components or materials.

The present invention provides either direct transfer of a carefully controlled pattern to an endless sheet material or the formation of an intermediate transfer or carrier sheet which may then be used subsequently to transfer the pattern of decorative articles to a final decorated fabric product. In this connection whichever transfer system is employed whether direct to the final finished

fabric product or by way of an intermediate carrier sheet, the patterns produced can be built up progressively, i.e. a first series of decorative articles may be deposited or applied in an initial pattern and then the final substrate material or intermediate carrier sheet may then be passed again through the machine in accordance with the invention in order to apply second pattern of similar or different articles, thus building up a complex pattern.

The patterns, part-patterns and so on may be controlled via the control means using properly prepared software which can be translated into a pattern forming operation through punched cards, magnetic cards and/or magnetic tapes.

In a further embodiment of the present invention where an intermediate transfer is produced, the intermediate carrier sheet will be produced by the machine in accordance with the present invention having a plurality of articles disposed on a carrier sheet, each article having a layer of a heat sensitive adhesive on the side thereof away from the surface of the transfer sheet material itself.

It then remains to lay the carrier sheet carrying the decorative articles on the substrate such that the

heat sensitive layer on each article is in contact with the substrate to which the article is ultimately to be transferred.

In one aspect of the invention the carrier sheet and the substrate are passed between the jaws of a heated anvil press which applies heat and pressure thereby activating the heat sensitive adhesive and causing the heat sensitive adhesive to adhere to the substrate so that after passing between the jaws of said anvil press, separation of the carrier sheet from the substrate results in the weaker bond between the articles and the contact adhesive on the carrier sheet surface breaking in view of the superior adhesion between the article and the substrate by means of the heat sensitive adhesive thereby leaving the articles disposed in the predetermined transfer pattern on the substrate itself.

In a further embodiment of the present invention it has been found that by vibrating one or other of the jaws of the anvil press, improved adhesion is obtained. In particular, vibration of the heated jaws of something of the order of 50 to 150 cycles per minute while applying a pressure of 0.5 to 3 kilograms per square centimetre for a sheet speed of 3 to 10 metres per minutes has been found to produce good

results.

In accordance with the invention it will be appreciated that the advantages of mounting decorations on an intermediate transfer sheet instead of applying direct to the fabric are inter alia that the transfer so produced can be stored for subsequent transfer on a heat transfer device of the type described above. Furthermore, it is possible to have larger production runs of the patterns per se and store these against need for use in connection with individual piece goods.

The production of transfer media tends to avoid multiple changes of fabric and/or decorative articles and programs on the machine. This allows a longer production run in respect of each particular pattern and each particular set of decorative articles.

Commercially, orders for specific patterns can be met more rapidly since patterns and transfers can be produced for stock. Furthermore, the pattern forming machine forming the subject of the present invention can be caused to operate at a much greater rate than will be the case if decorative articles were being transferred direct to the final substrate since in the latter case it is necessary for the machine to stop sufficiently long to allow for activation of the heat

sensitive adhesive to occur before proceeding to the next pattern-forming step.

In spite of the foregoing, however, there are cases where significant advantages follow from the operation of a direct transfer system. In particular direct transfer is suitable for fabrics with delicate surfaces which would suffer if brought into overall contact with the sticky contact adhesive surface of a carrier sheet, particularly if pressed and heated to effect the transfer and then subsequently torn apart and separated from the then-redundant carrier sheet after transfer. This problem can be overcome only by the direct transfer of articles from the tape to the fabric.

It will be appreciated that where direct transfer of articles is effected from the tape to the fabric substrate, the orientation of the articles on the adhesive layer of the tape will be different than if the articles are to be applied, for example, to an intermediate carrier in a transfer type operation. In the case of direct transfer, therefore, the decorative articles will be mounted on the tape with the layer of heat sensitive adhesive exposed for subsequent transfer directly to the final receptor using the apparatus in accordance with the present invention. In

the case of indirect transfer, i.e. initial transfer onto a receptor sheet, it will be appreicated that the articles will be mounted on the tape with the layer of heat sensitive adhesive in juxtaposition with the tack adhesive layer of the tape so that on transfer to an intermediate carrier sheet, the layer of heat sensitive adhesive will then be exposed. In the formation of the tapes carrying the decorative articles it will be appreciated that the rolling of the tapes into spools will provide for additional fixing of the articles into the adhesive layer of the tape itself.

Following is a description by way of example only and with reference to the accompanying drawings of methods of carrying the invention into effect.

In the drawings:-

Figure 1 is an end view of a machine for providing a regular repeatable pattern on a sheet of suitable carrier material.

Figure 2 is a section on the line A-A of Figure 1.

Figure 3 is a diagrammatic representation of the control mechanism for the machine of Figure 1.

Figure 4 is a block diagram of the control circuitry for use in the machine of Figure 1.

Figures 5, 6, 7 and 8 are details of the sequence of the application of the articles to a carrier sheet using the machine of Figure 1.

Figure 9 is a further detail of Figure 5.

Figure 10 is a detail of the tape and carrier sheet for use with the machine of Figure 1.

Figure 11 is a diagrammatic representation of the production of the perforated tape used in the machine of Figure 1.

Figure 12 is a diagram of the application of the transferable articles to the tape formed in Figure 8.

Figure 13 is an alternative method of the application to Figure 12.

Figures 14, 15, 16 and 17 illustrations the importation of registration of the receiprocatable transfer member with the perforation in the tape and also the registration of the transferable article of the perforation in the tape.

Figures 18, 19 and 20 show the orientation of the articles on the tape for direct application to a reciptor sheet material.

Figures 21, 22 and 23 show the orientation of the articles on the tape for application to an intermediate substrate for subsequent transfer to a receptor sheet material.

Figure 24 is a perspective view of an intermediate carrier sheet having a pattern based on two different articles.

Figure 25 is a perspective view of an intermediate carrier sheet having a pattern formed of a multiplicity of different decorative articles.

Figure 26 is a perspective view of another embodiment of a decorated textile material in which articles have been applied in register with an existing pattern thereon.

Figure 27 is a diagram of a modification of the apparatus of Figures 1 to 6 to produce the material of Figure 26.

Figure 28 shows a modification of the apparatus of Figures 1 to 6 for the direct application of articles to a textile fabric substrate.

The machine illustrated in Figure 1 comprises a plinth 10 having first and second erect side members 11, and 12 respectively, each of which side members carry a cross head beam 13. The frame thus formed is provided with an intermediate cross piece 14 (see Figure 2).

The frame supports via first and second side members 11 and 12 a roller 15 adapted to carry a roll 24 of carrier sheet materials. The roller 15 is

carried by means of an axle 17 journalled for rotation in each of first and second side frame members 11 and 12 respectively and carrying at its outer end gear means 18 which is operatively connected to drive motor 19 for driving of the roller 15 and its corresponding roll 24 of carrier sheet material. A corresponding supply roller 20 is provided rearwardly of roller 15 (see Figure 2) and corresponding drive means (not shown) is also provided.

Intermediate of each of rolls 24 and 20 and upwardly of the plane thereof is provided a first guide roller 21 and a second guide roller 22. Adapted to receive a continuous supply of carrier sheet 23 from roll 16 which passes about guide roller 21 and thence to roller 22 and passes along a carrier sheet path to take up roll 24 on roller 15. Each of rollers 21 and 22 is provided with a idler roll 25 which is biased into contact with the carrier sheet 23 passing about the surface of rolls 21 and 22 respectively.

Between rolls 21 and 22 there is provided an anvil assembly 26 comprising a central body member 27 fixedly secured to the upper end of a piston rod 28 of pneumatic cylinder 29 which latter is secured to intermediate cross piece 14 by means of bracket 30 (see Figure 2).

The anvil body member 27 is provided at its upper

end with an annulus 31 secured to the upper surface of body 27 by means of set screws 32, the body 27 including an upwardly extending anvil element 33 having a substantially planar upper surface 34 constituting an anvil surface.

Crosshead beam 13 is provided with a transverse bearing rail 43 which has mounted thereon a longitudinally extending carriage indicated generally at 44 having a contoured rail engaging member 45 capable of sliding movement along rail 43. The carriage 44 includes a depending support member 46 surmounted by a carriage block 47 having a central bore 48 with an annular threaded nut member 49 fixed thereto and adapted to accommodate threaded driven screw 50 driven by pneumatic motor 51 via gear train 52, the arrangement being such that operation of the motor 51 serves to rotate mounted screw member 50 which causes nut member 49 to move transversely of the apparatus and to drive carriage 44 transversely of the apparatus along rail 43 with respect to side members 11 and 12 respectively.

Block member 47 carries at its upper end a pair of spaced rearward arms 35 which together carry for rotation relative thereto a guide roller or rollers 36. Arms 35 carry at their forward end a forwardly extending bracket 37 carrying at its extremity a

transverse axial 38 which is adapted to carry a plurality of laterally spaced tape reels 39 carrying a roll 40 of perforated tape 41 carrying transferable articles 42 sequentially loaded thereon in the manner hereinafter described.

The support member 46 carries a plurality of laterally spaced pneumatic cylinders 53 one each of which is associated with a tape reel 39, the cylinders 53 each being secured to support member 46 by means of mounting block 54. Each cylinder 53 has associated piston rod 55 extending downwardly thereof and secured at its lower end to a cylindrical element 56 carried in guide block 57 for vertical sliding movement therein in response to movement of piston rod 55 under the action of pneumatic cylinder 53. In its rest position the piston rod 55 is biased upwardly by means of compression spring 58. The cylindrical element 56 is provided towards its lower end with a frustoconical intermediate portion 59 and terminates at its lower end in a pin 60 (see Figure 9). The lower extremities 61 of guide block 57 are contoured to constitute a guide surface for tape 41, the arrangement being such that the tape is guided in a path across the open cylindrical end of the bore in block 57 accommodating cylindrical element 56.

The rearward surface of support member 46 carries a mounting block 61 supporting three horizontally disposed vertically spaced shafts 62 and a lower shaft 63. Each of shafts 62 carries a synchronous wheel 64 each of which is toothed on its outer surface adapted to engage with a toothed synchronous belt 65, the arrangement being such that one or more of shafts 62 may be driven to provide synchronous drive of shaft 63. Shaft 63 carries a sprocket wheel 66 juxtaposed and aligned with guide block 57. Sprocket wheel 66 has a plurality of sprocket tines 67 circumferentially spaced about the periphery of wheel 66 and arranged to engaged every other perforation 68 in perforated tape 41.

The path of tape 41 extends from sprocket wheel 66 upwardly and rearwardly to engage guide roller 36 and onto tape up roll or spool 69.

Figure 3 discloses the control mechanism starting with a peripheral interface adaptor 70 which is connected with stepping motor driving devices 71 and 72 for the "X-axis" and "Y-axis" control motors 51 and 19 respectively.

Peripheral interface adaptor 70 also drives and controls the driving circuits for the solenoid in respect of each of the solenoid operating pneumatic

valves connected to the various pneumatic cylinders 53 adapted to drive cylindrical element 56 and associated pin 60 and the drive cylinder 29 for each of the anvil assemblies 26. The peripheral interface adaptor 70 also communicates with motor driving device 74 adapted to cooperate with the motor for winding and rewinding the carrier tape (not shown).

Figure 4 is a box diagram showing the inter-relationship between the various components for a multicolour pattern arrangement.

The operation of the mechanism for effecting the transfer of a decorative article from perforated tape 41 to carrier sheet 23 is more clearly shown in Figures 5a, 5b, 5c and 5d which together illustrate the sequence of operations. The sprocket wheel 66 is driven by means of a pneumatic cylinder 75 with a ratchet pawl 76 at the end of the piston rod thereof adapted to engage with ratchet detents on a ratchet wheel 77, the arrangement being such that reciprocation of the pawl results in advance of the ratchet wheel by one detent and corresponding rotation of the sprocket wheel to bring the next transferable article 42 into register with the bore in guide block 57.

The pneumatic drive in cylinder 29 is then

activated to advance piston 28 upwardly to being anvil surface 34 in contact with the underside of carrier sheet 23 and to urge the same into contact with the exposed surface 28 of transferable article 42 (see Figure 10) to bring the adhesive layer 79 into contact therewith. On completion of this operation the pneumatic cylinder 53 is activated to drive piston rod 55 downwardly thus causing pin 60 to enter the aligned perforation within the tape and to engage the adhesive surface 80 of article 42 so that continued downward movement of the pin 60 causes the pin to pass through the perforation and disengage article 42 therefrom and urge it into adhesive contact with the adhesive layer 79 of carrier sheet 23. On completion of this operation the pneumatic pressure supplied to each of cylinders 29 and 53 is relaxed resulting in withdrawal of the anvil assembly 26 to its datum position and withdrawal of the pin and associated assembly 60 also to its datum position while leaving the article 42 adhering to the adhesive surface 79 of the carrier sheet 23 as shown in Figure 8.

At this stage the stepping motors 51 and 19 for driving the on the Y-axis carrier sheet advances by the next integer and the sequence is repeated.

It will be appreciated that the stepping motor

driving devices 71 and 72 for the X-axis control and the control motors 51 and 19 for the Y-axis control may be arranged, for example, in the case of the Y-axis (motor 51 and 19) to move the sheet forwards or backwards to provide for the formation of circles, oblongs, squares and the like and for the formation of meandering lines. The Y-wards movement may be nil to allow X-ward movement of the cylinders 53 to permit the formation of lines of decorations which may be of the same or different colours transverse to the Y axis.

It will be appreciated that with a plurality of magazines 39 spaced across the machine as shown in Figure 1, it is possible to present sequences of articles and control of individual transfer mechanisms may result in only some of the number of transferable articles juxtaposed the transfer head assembly being transferred to the carrier sheet.

In an alternative, the pattern may be varied by, for example, having a different fill arrangement for transferable articles 42 on tape 41 and that the control can be readily effected by varying the instructions provided to the controlling microprocessor as shown in the block digram in Figure 4.

Furthermore, lateral movement of the transfer

assembly heads may be effected by relative operation of motor 51 thereby providing lateral movement of the transfer assemblies relative to the carrier sheet path thus providing greater control over the number and nature of patterns that may be provided.

In a typical embodiment of the present invention the transferable article may be a small rhinestone as shown in Figure 10 comprising a rhinestone element 42 having a shaped surface and a larger planar base surface which base surface is provided with a coating of heat sensitive adhesive 18. The carrier tape 41 should be a tape which is of a non yielding construction without stretch or shrinkage in operation and storage. Typically, the carrier tape 41 may be a tape such as that sold by the Minnosota Mining & Manufacturing Company and referred to as "3M's paper", which comprises a tape having a coating of adhesive on one side thereof. The transferable article 42 is arranged on said tape so as to be symmetrically disposed about the axis of a perforation therein as shown in Figure 10 from which it will be noted that the perforation is smaller than the decorative articles to be applied.

The adhesive layer 80 on the base of the transferable article 42 contacts the adhesive layer on the tape, so that on transfer as the pin 60 moves into

and through the perforation in the tape, it abuts the layer of adhesive 80 on transferable article 42 and continued movement of the pin 60 breaks the adhesion between the adhesive layer 80 and the adhesive layer of the tape and urges the exposed surface 78 of the transferable article 42 into adhesive contact with the adhesive layer 79 on the side of the carrier sheet 23. It will be appreciated that the carrier sheet should be of consistant properties, i.e. the adhesive layer should not show any significant derioration on storage and the dimensional properties should be stable with ageing. Typically, the carrier sheet 23 may be may of a sheet of material carrying a layer of adhesive of the type manufactured by the Minnosota Mining & Manufacturing Company.

In this way, a transferable pattern of individual transferable articles may be built up on these sheet and the patterns are entirely reproducable using the machine described above.

The manufacture of the tape and the method of applying the transferable articles will now be described with reference to Figures 11, 12 and 13 of the accompanying drawings.

A roll of tape 100 having an adhesive layer on one side thereof in the manner described above is

unrolled and passed to a take up spool 101. Perforation head 102 having a pair of spaced punches 103 is arranged to reciprocate against the tape on anvil base 104 to provide a line of perforations 68 in tape 41.

The perforated tape on take up spool 101 is then passed via control sprockets 105 passed a mounting station 106. The mounting station comprises a bin 107 containing a plurality of transferable articles 42 and sorting means comprising a supply tube 108 which orients the articles 42 and supplies them to a position below the tape 41 with the adhesive side 80 of the article 42 directed upwardly towards the adhesive side of tape 41. It will be appreciated that the orientation of the articles is dependant on whether they are to be applied to an intermediate transfer sheet or for direct application to a textile substrate. A reciprocable rod 109 then moves upwardly to engage the exposed surface 78 of article 42 and urge it into adhesive contact with the adhesive side of tape 41 such that the axis of article 42 is substantially coaxial with a perforation in the tape.

In an alternative embodiment as shown in Figure 13 a row of articles 42 is fed sequentially to a reciprocating rod 110. A roll 111 is provided with a plurality of shaped recesses 112 circumferentially

spaced about the periphery thereof, each recess 112 being adapted to receive and article 42 only in its correct orientation. Surface portions 113 between adjacent recesses 112 are each provided with a recess adapted to accommodate a sprocket tine 114 of sprocket wheel 115. Sprocket wheel 115 is mounted for rotation in engagement with roll 111 with the tines 114 engaging with the recesses in the peripheral portion 113 of roll 111. The perforated tape 41 is engaged with the tines 114 as shown in Figure 14 so that a sprocket peg 114 engages every other perforation. Integer rotation of roll 111 will bring a vacant recess 112 juxtaposed reciprocatable rod 110. The row of articles 42 is then advanced until an article is placed on the end of reciprocatable member 110. The reciprocatable member 110 is then raised until the extremity thereof 116 forms a continuum with the part cylindrical surface 117 of housing member 118. Continued rotation of roll 111 causes engagement between the walls of the recess 112 with the article 42 supported on the end 116 of rod 110 and serves to slide the article from the end of the rod 110 so that the adhesive layer thereof engages with the surface 117 of housing 118. Continued rotation will bring the article sequentially to a position where the recess 112 is disposed between

a pair of spaced tines 114 on sprocket wheel 115. The pressure of engagement between roll 111 and sprocket wheel 115 is such as to urge the article 42 accommodated within cooperating recess 112 into adhesive contact with the adhesive layer on tape 41 to effect adhesion thereto so that continued rotation of the roll 111 and sprocket wheel 115 engaged therewith results in the article 42 adhering to tape 41 being withdrawn from its corresponding recess to be retained on tape 41 for subsequent use or for winding on a reel 39 and to form a roll of decorative articles for use in the machine described above.

In the particular embodiment of the invention described above it is clearly desirable that there should be an acceptable registration between the pin 60 on the transfer head of the machine, the perforation in tape 41 and the transferable article 42. If there is misalignment either of the pin 60 with the perforation, or of the decorative article with the perforation, or both, then the result will be that on the application of downward movement to pin 60 the decorative article 42, if a solid or rigid article such as a rhinestone, will tend to fly out of the machine.

Turning now to Figure 24, the carrier sheet 23

has a row of perforations 201 along each longitudinal edge thereof. These perforations 201 areg adapted to engage with the tines provided on rollers 21 and 22 respectively so as to produce exact registration of sheet 23 with anvil surface 34 and pusher element 56 (see Figure 2) which together constitute a decorating head for the apparatus.

In this particular embodiment, a first series of decorations 202 have been applied initially and a second series of decorations 203 of a type different to the first series of decorations 202 has been applied during a second passage of carrier sheet 23 through the machine with different tapes 41 carrying different types of decorative elements.

Alternatively, the article of Figure 24 can be produced by the use of dissimilar tapes of articles provided on the decorating heads and by effecting lateral X-ward movement of the head and crossbeam assembly to align the decorating heads to produce the pattern of two dissimilar decorations in one pass of sheet 23.

Figure 25 illustrates a pattern which has been formed by two or possibly three successive passes of sheet material 23 through the apparatus in accordance with the invention. Dissimilar articles 202, 203 and 204 respectively having been applied to the transfer

sheet at each pass.

Figure 26 illustrates a further embodiment of the present invention in which a textile sheet material 210 is carried on a support sheet 211 having perforations 212 along each longitudinal edge thereof for registration of the sheet with the anvil and press pin constituting the transfer heads of the machine described and illustrated in Figures 1 to 6.

In this case, the material 210 has a printed or woven pattern 213 and it is required to apply different types of decorative articles 214 and 215 in a predetermined pattern in relation thereto as shown in Figure 26.

In this case, the perforations 212 ensure registration of the transfer head with the pattern at the appropriate location for transfer of the articles direct to the sheet material 210. In this case the anvil assembly will need to provide heat and pressure in order to activate the pressure sensitive adhesive on each of the decorative articles.

After application of the decorative articles 214, 215, the textile sheet 210 is separated from its backing sheet 211. A contact adhesive may be used on the surface of backing sheet 211 sufficient to ensure adhesion between the two sheets during the application of the

decorative articles 214, 215, but at the same time to allow subsequent ease of separation.

Figures 27 and 28 illustrate an alternative method of applying decorative articles direct to a previously decorated or indeed an undecorated textile sheet 210 (see Figure 28). In this case, sheet 210 is fed between a pair of guide bars 220 and to a contra-rotating roller 221 to provide a degree of stress to the fabric material 210. The rolls 21 and 22 of the apparatus described with respect to Figure 2 are substituted by sprockets 222 and 223 respectively which are coupled by means of an endless chain on each side 224 having grip means 225 of the type well known to produce a tentering effect on the material 210 as it passes thereover. The movement of the material 210 while gripped at its edge 226 is controlled by means of motor 227 which in this instance controls the Y-ward movement of the material. The arrangement described with respect of Figure 16 obviates the need for the use of the backing sheet 211 as described with respect to Figure 14 above.

Where the material 210 already has a pattern applied to or woven into it, it will be appreciated that the means for registration of the pattern on the material with respect to the transfer head assembly of the apparatus of Figures 1 to 9 will need to be

provided. This arrangement is shown in Figure 27 where two pairs of photoelectric switches are provided. In this case the supply roll 20 is caused to provide a depending loop 235 of material which passes each of control switches 231, 232 and the take-up roll 24 is arranged to provide a similar depending loop 236. The switches 231, 232 are arranged to sense the pattern already provided on textile sheet material 23 and correspondingly serve to control the movement of rolls 223 and 222 respectively by means of motor 227 (see Figure 28).

It will be appreciated by the foregoing that there are two ways in which the invention may be practiced. The first is the application of the article 42 to the tape and then the direct application of the article to the receptor material to be decorated. This sequence of events is clearly shown in Figures 18, 19 and 20 of the accompanying drawings. In Figure 18 the article 42 is a rhinestone which has a heat sensitive adhesive layer 18 thereon. The tape 41 is a tape of a material such as that manufactured by the 3M's Company having a layer of tack sensitive adhesive 81 on the surface thereof. The rhinestone 42 is mounted so that the surface 82 which will in the finished article be the upper or decorative surface, is in contact with the

tack adhesive layer 81 of 3M's tape 41 as shown in Figure 18.

In operation at the transfer head of the machine of the invention, the transfer member or push pin 60 enters the perforation 68 to expel article 42 from the tape and into adhesiving engagement with receptor sheet 83 to be decorated. The anvil member 27 which is heated moves upwardly towards pin 60 , the arrangement being such that the amount of heat generated by the anvil 27 and the amount of pressure applied is such as to produce sufficient adhesion between the adhesive layer 80 on the rhinestone 42 and the receptor substrate 83 to be decorated to retain the former thereon. The receptor sheet 83 is then passed between a press 84 whereby heat and pressure is applied sufficient to melt the adhesive layer 80 and to effect cause it to flow into the interstices of the receptor sheet 83 to provide a firm bonding of the rhinestone 42 thereto by means of an adhesive layer being dispersed into the substrate 83.

The alternative method is illustrated in Figures 21, 22 and 23 of the accompanying drawings. In this case the article 42 is applied to an intermediate substrate or carrier sheet 23. In this case, the rhinestone 42 is located on the tape 41 with its layer

of heat sensitive adhesive 80 in contact with the tack adhesive layer 81 of the tape. In other words, in this instance, there is adhesive to adhesive contact but the adhesive action being between the surface of the heat sensitive adhesive 80 and the tack adhesive layer 81 carried on the tape as shown in Figure 21. In this case, transfer to an intermediate carrier sheet 23 is provided as shown in Figure 22 where the rhinestones 42 are deposited with their decorative surface 82 in contact with the adhesive layer 79 on carrier sheet 23 so that the layer of heat sensitive adhesive 80 on article 42 is disposed on the surface of the article away from the body of the carrier sheet 23. In this latter case, heating of the anvil is unnecessary. The decorated carrier sheet thus carries the patterns which are subsequently to be transferred to a receptor sheet 83. To effect the further transfer the carrier sheet 23 and the receptor sheet 83 are brought together so that the adhesive layer 80 of articles 42 are in contact with sheet 83. Heat and pressure is then applied to melt the adhesive layer 80 and cause it to merge into and fuse with the material of receptor sheet 83 thereby producing a permanent bonding of the article 42 to the final decorated receptor sheet 83. This is shown diagrammatically in

Figure 23; although a roller press is illustrated, a platen press may also be employed.

It will be appreciated by the man skilled in the art that the use of the machine in accordance with the present invention permits initially the formation of a continuous tape carrying decorative articles of similar or dissimilar type and that the use of that tape in the machine of the invention permits an almost infinite number of patterns to be formed either on a carrier sheet in an intermediate carrier sheet for subsequent transfer to a textile sheet material to be decorated, or to a textile sheet material. In particular the machine of the present invention also provides in one aspect means whereby decorative articles may be applied to an already patterned textile sheet material in a systematic and reproducable manner thus overcoming major disadvantages inherent in the prior art.

CLAIMS

1. A method of mounting a decorative article on a receptor sheet material each of which articles has an adhesive layer on one surface thereof for the purpose of effecting a bond to a sheet material to which it is subsequently to be applied,

which method is characterised by the steps comprising:-

mounting said article on a longitudinal tape constituting intermediate support for each article,

each article being mounted on said tape so that its adhesive layer is oriented in the same sense with respect to the tape,

mounting said tape for supply to an article transfer station whereby at which articles from said tape presented sequentially for transfer to a sheet substrate and

thereafter causing or allowing the transfer of said articles at said transfer station from said tape to a substrate.

2. A method as claimed in claim 1 characterised in that the substrate is an intermediate carrier sheet having a layer of tack adhesion thereon and in that said articles are transferred thereto at said article

transfer station, each article being oriented with respect to said carrier sheet with itse adhesive layer on remote from the carrier sheet and thereafter applying the intermediate carrier sheet to a receptor sheet to be decorated with the adhesive layer of the article juxtaposed said receptor sheet and applying heat and pressure to cause adhesion of said articles to said reeptor sheet thereby permitting removal of the carrier sheet to leave the pattern of articles applied to the receptor sheet.

3. A method as claimed in claim 2 characterised in that the articles are disposed on said tape with said adhesive layer in contact with the adhesive layer on the tape surface.

4. A method as claimed in claim 1 characterised in that the substrate is the receptor sheet to be decorated.

5. A method as claimed in claim 4 characterised in that the transfer station includes heat and pressure means to provide at least tack adhesion of said adhesive layer on said article and with said receptor sheet to form a pattern of articles thereon.

6. A method as claimed in any preceding claim characterised in that the articles are fixed to the receptor sheet by the subsequent application of heat and pressure to effect more permanent bonding of the article to said receptor sheet material.

7. A method as claimed in any preceding claim characterised the tape is a perforated tape and the article is contacted therewith such that on contacting the adhesive layer of the tape for temporary adhesion thereto, each article covers a perforation in the tape.

8. A method as claimed in the preceding claim characterised the article is contacted with a perforated tape such that at regular intervals, a perforation is uncovered to allow said uncovered perforations to engage a sprocket wheel for transport of the tape.

9. A method as claimed in claim 8 characterised in that the articles cover alternate perforations in said tape.

10. A method as claimed in any preceding claim characterised in that said transfer station includes one or more transfer heads, each adapted to transfer articles from said tape to said substrate, said heads being disposed transversely with respect to longitudinal axis of said substrate material and arrange for transverse movement with respect thereto, whereby integer movement of the substrate and transverse movement of the heads with respect thereto permits the application of a pattern of articles to said substrate.

11. A transfer tape for use in the method claimed in any one of the preceding claims characterised by longitudinal self-supporting perforated tape having an adhesive layer on one side thereof and a plurality of transferable articles adhering to said adhesive layer, each article being in register with a perforation in the tape.

12. A tape as claimed in claim 11 characterised in that the articles are arranged on the tape in a regular sequence so that a regular pattern of perforations are left unoccupied by articles for engagement with a sprocket.

13. A tape as claimed in claim 11 or claim 12 characterised in that the articles arranged on the tape are different and are arranged in a regular sequence for application to a substrate in a pattern.

14. A tape as claimed in any one of claims 11 to 13 characterised in that the articles on said tape are similar.

15. Apparatus for forming a pattern of articles on a substrate in accordance with the method claimed in claim 1, which apparatus comprises

means for advancing a longitudinal length of substrate material along a substrate path,

a transfer station comprising a plurality of transfer heads extending transversely of said path, each transfer head being adapted to transfer articles to said substrate,

magazine means associated with said transfer head for the supply of said articles to said substrate and

control means for controlling relative movement between the substrate and the transfer heads

characterised in that the magazine means includes a longitudinal tape carrying a plurality of said articles thereon for transfer to said substrate and

means for advancing said tape to said transfer head at which an article or groups of articles are presented for transfer.

16. Apparatus as claimed in claim 15 characterised in that said tape has an adhesive layer on at least one side thereon and that each of said articles is releaseably secured thereto for sequential presentation to said transfer head.

17. Apparatus as claimed in claim 15 or claim 16 characterised in that the articles are carried by said tape for sequential presentation at said transfer head.

18. Apparatus as claimed in any one of claims 15 to 17 characterised in that tape is as claimed in any one of claims 11 to 14.

19. Apparatus as claimed in any one of claims 14 to 17 characterised in that the transfer station comprises tape guide means for guiding said tape, a reciprocal table member adapted to engage said tape, means to align an article on said tape with said reciprocal member whereby operation of the

reciprocatable member is caused to engage the tape and/or article thereon and urge said article into adhesive contact with said substrate.

20. Apparatus as claimed in claim 19 characterised in that the tape is perforated and that sprocket means is adapted to engage perforations in the tape to advance the tape to bring a perforation covered by an article into register with the reciprocatable member whereby on operation of said reciprocatable member, said member enters the perforation and contacts the article to urge the article into adhesive contact with a substrate while simultaneously releasing the article from said tape.

21. Apparatus as claimed in claim 20 characterised in that the transfer station includes anvil means juxtaposed the substrate sheet path and aligned with said reciprocatable member, the arrangement being such that operation of said reciprocatable member brings said article into adhesive engagement with said substrate by pressure against said anvil means.

22. Apparatus as claimed in claim 21 characterised in that the anvil member is movable between a pressure position and a free position so that in the pressure position it supports the substrate sheet to allow the reciprocatable member to press the article into the adhesive layer of the substrate against the back pressure of said anvil member.

23. Apparatus as claimed in claim 21 or claim 22 characterised in that the substrate is the receptor sheet material and further characterised in that the anvil member is heated.

24. Apparatus as claimed in claim 23 characterised in that the articles are disposed on said tape with the adhesive layer of said articles disposed on the side of each article remote from said tape for contact with said receptor sheet.

25. Apparatus as claimed in any one of claims 14 to 23 characterised in that the substrate material is an intermediate carrier sheet having an adhesive layer on a surface thereof juxtaposed said tape as it passes the transfer station and in that each article is disposed on said tape with the adhesive layer thereon

in tack adhesion with the adhesive layer on the tape surface whereby transfer of the articles is effected to the intermediate transfer sheet such that each article is oriented with its adhesive layer remote from the receiving surface of the intermediate carrier sheet.

26. An intermediate carrier sheet for use in the method claimed in claim 1 having on one surface thereon a layer of adhesive, characterised in that said layer carries a plurality of articles arranged in a regular pattern thereon, each article having a layer of heat sensitive adhesive on one surface thereof, and being oriented so that said layer is remote from the intermediate carrier sheet material.

1/14

FIG.1

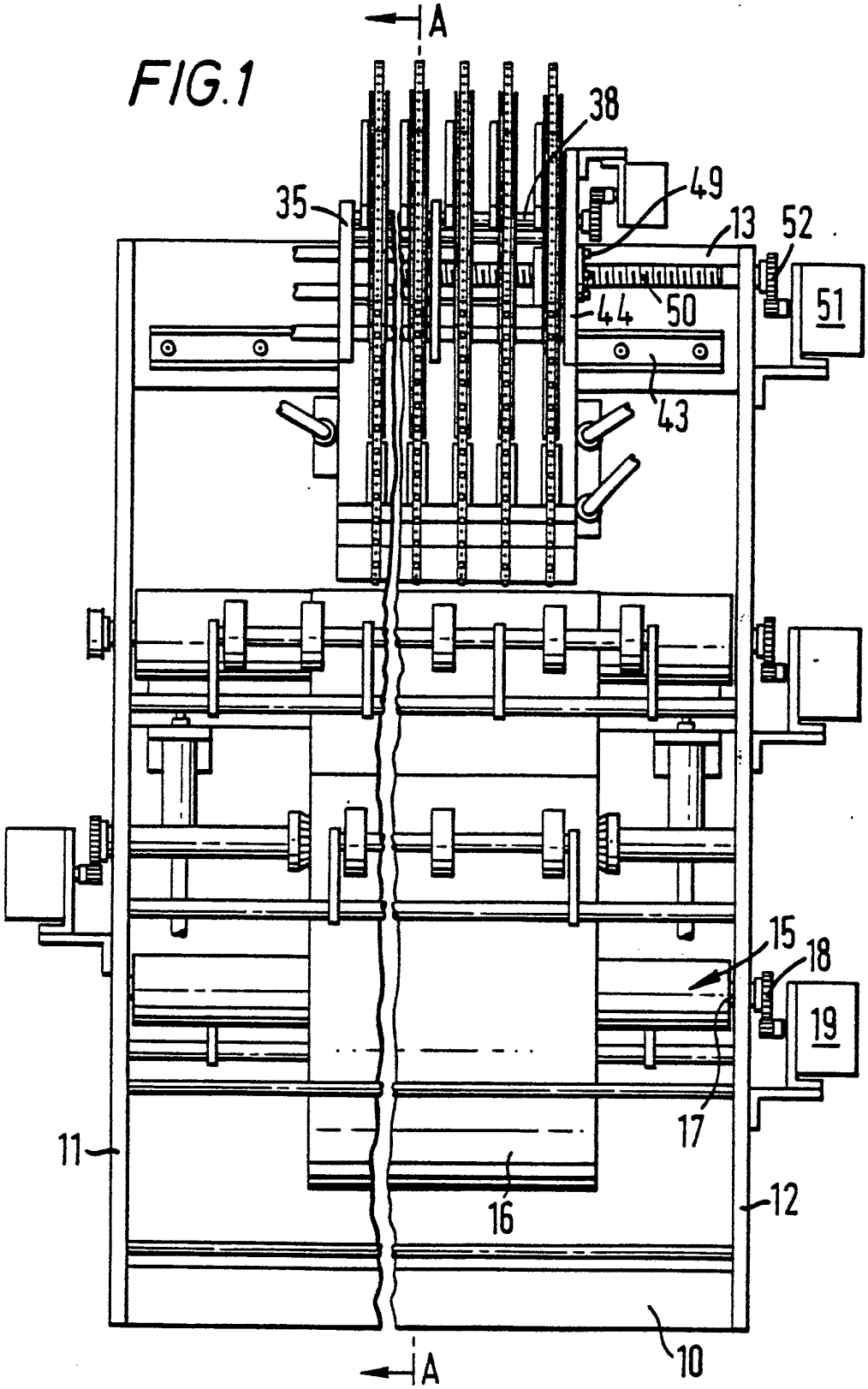


FIG. 2

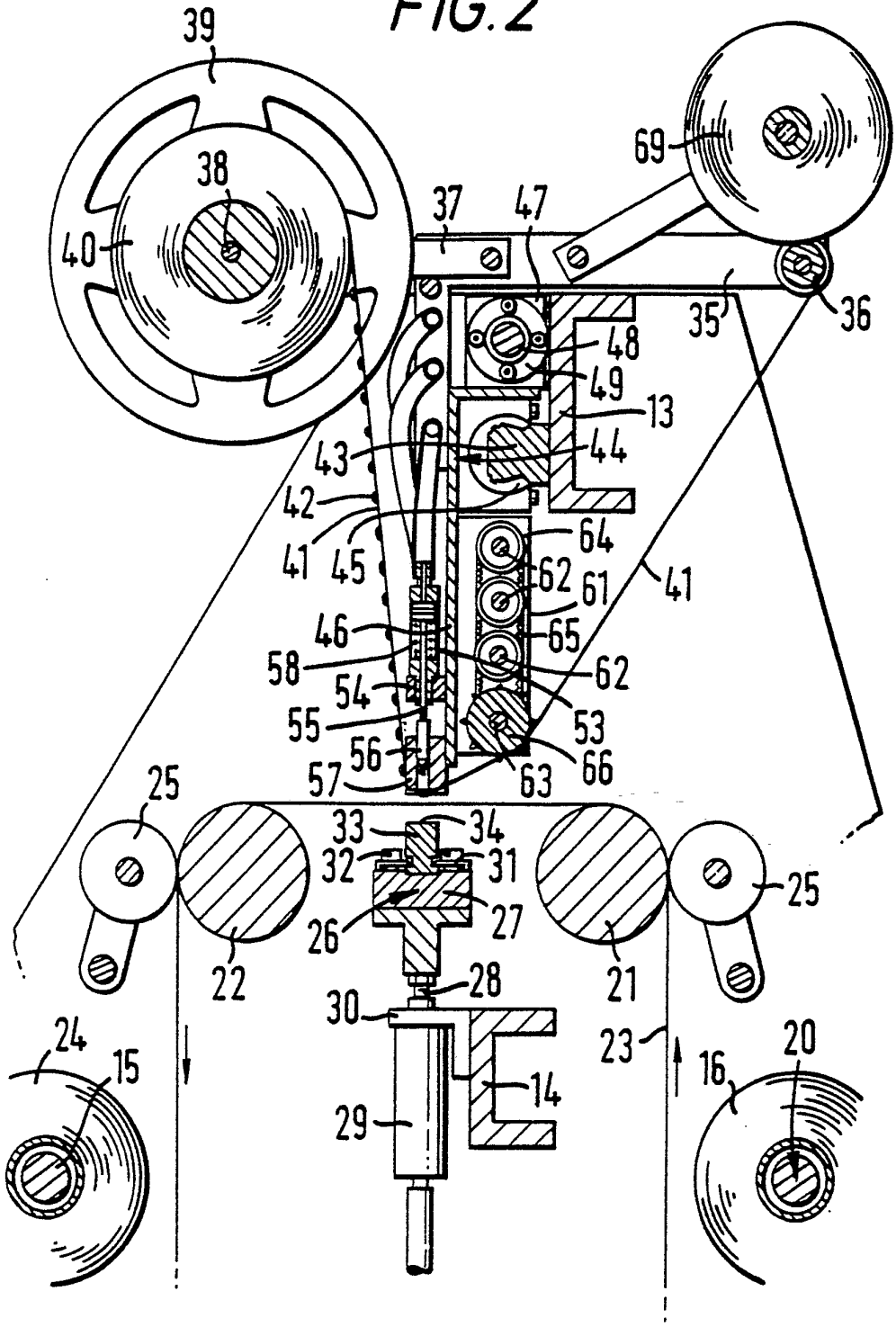

39
38
40
37
47
69
35
36
48
49
13
44
43
42
41
45
64
62
61
41
46
65
58
62
54
55
53
56
57
63
66
25
33
34
32
31
26
27
22
21
25
28
30
24
15
23
20
16
14
29

FIG.3

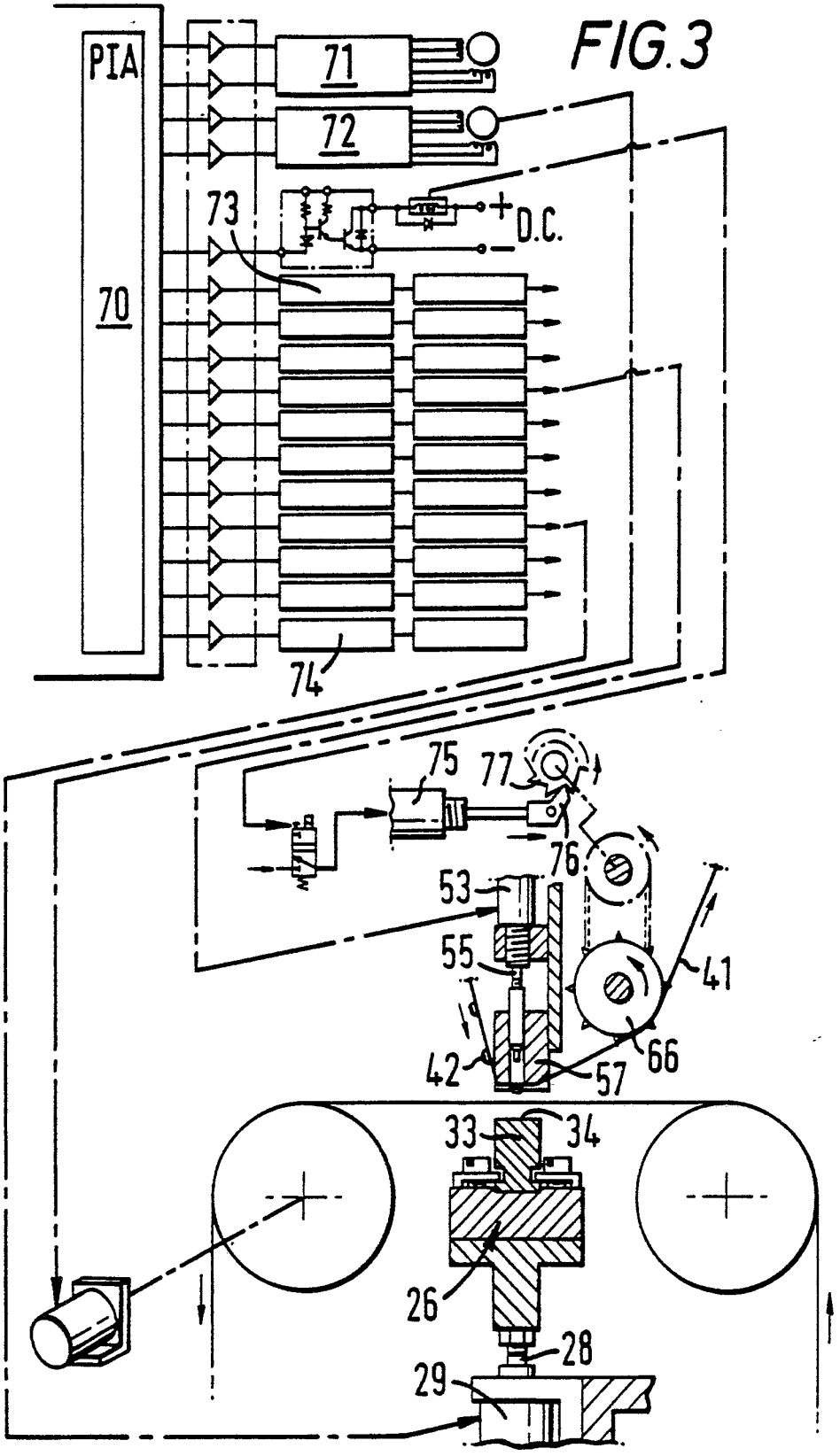
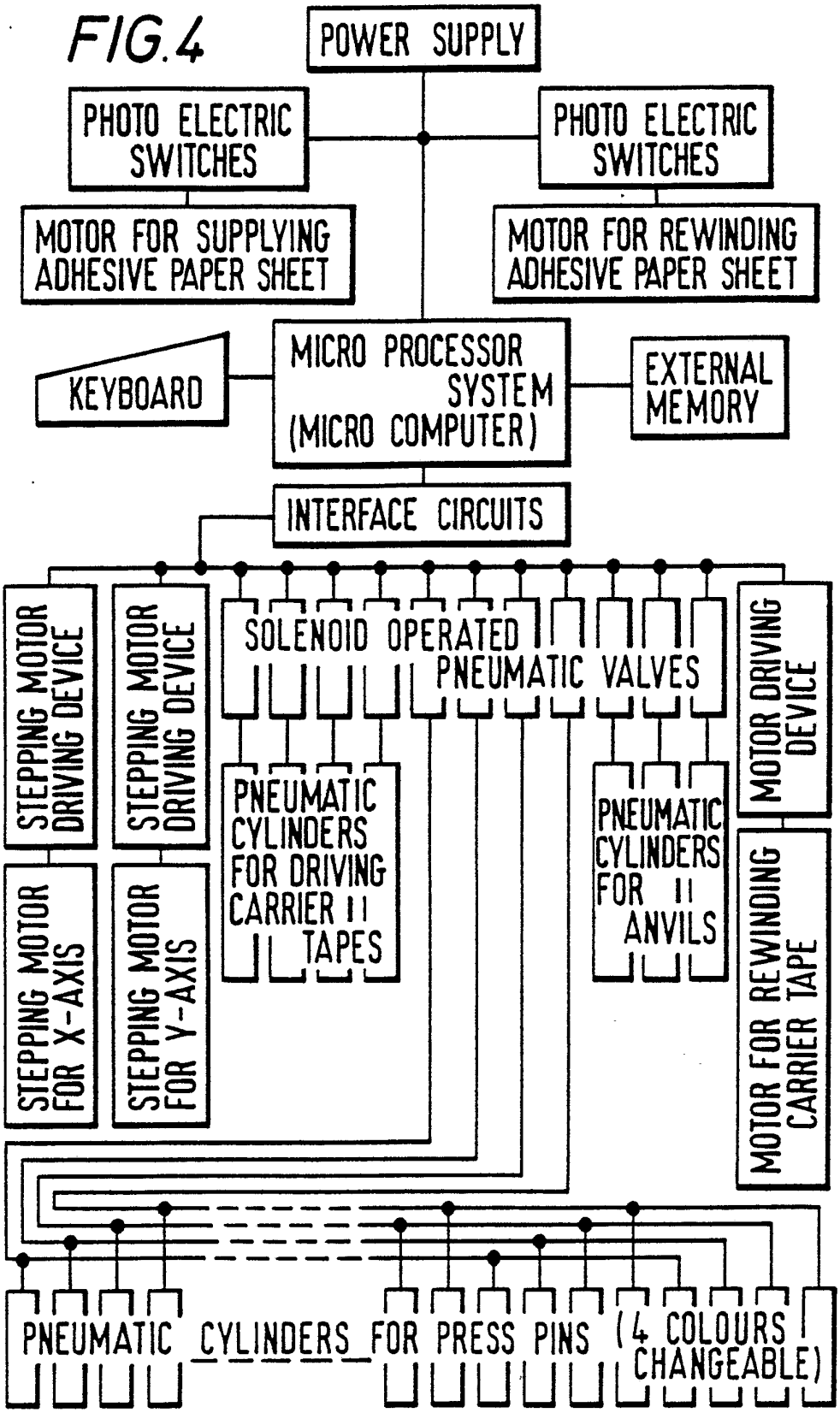


FIG.4


POWER SUPPLY
PHOTO ELECTRIC SWITCHES
PHOTO ELECTRIC SWITCHES
MOTOR FOR SUPPLYING ADHESIVE PAPER SHEET
MOTOR FOR REWINDING ADHESIVE PAPER SHEET
KEYBOARD
MICRO PROCESSOR SYSTEM (MICRO COMPUTER)
EXTERNAL MEMORY
INTERFACE CIRCUITS
STEPPING MOTOR DRIVING DEVICE
STEPPING MOTOR DRIVING DEVICE
SOLENOID OPERATED PNEUMATIC VALVES
MOTOR DRIVING DEVICE
STEPPING MOTOR FOR X-AXIS
STEPPING MOTOR FOR Y-AXIS
PNEUMATIC CYLINDERS FOR DRIVING CARRIER II TAPES
PNEUMATIC CYLINDERS FOR II ANVILS
MOTOR FOR REWINDING CARRIER TAPE
PNEUMATIC CYLINDERS FOR PRESS PINS (4 COLOURS CHANGEABLE)

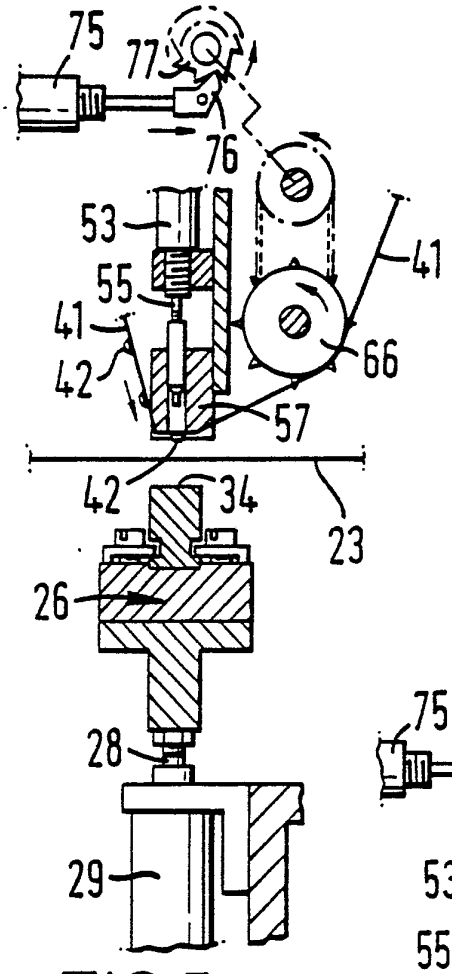


FIG.5

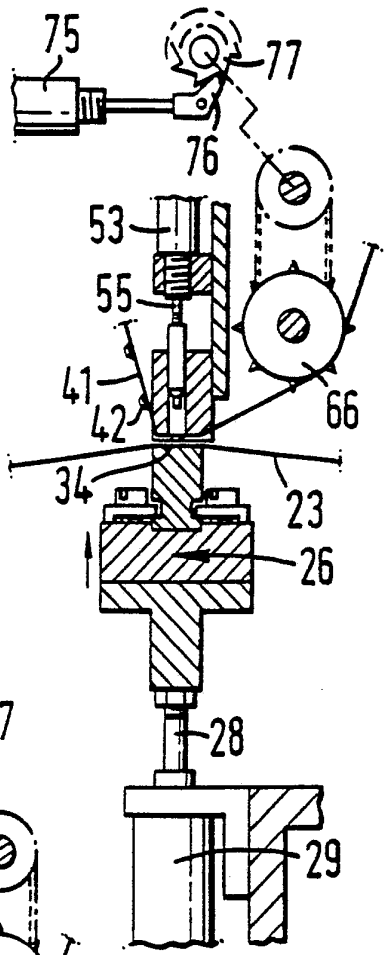


FIG.6

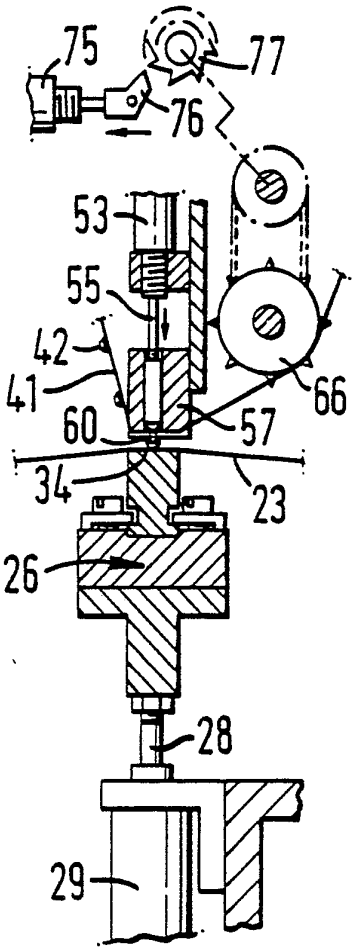


FIG.7

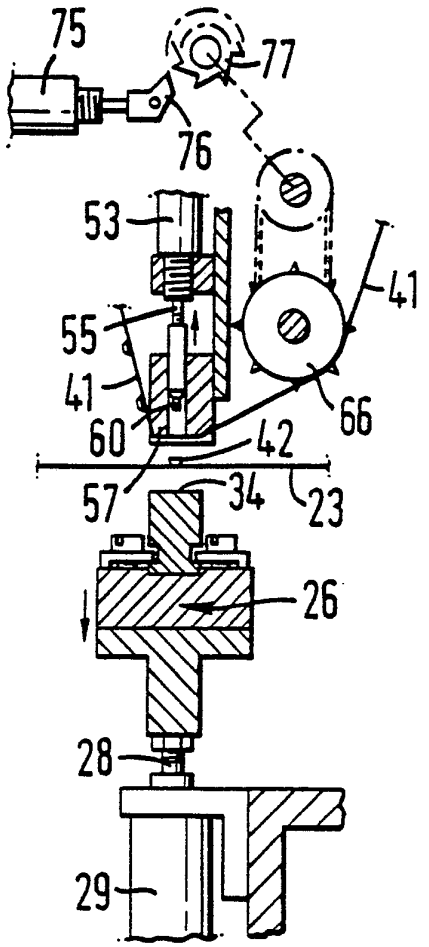

75
77
76
53
41
55
41
60
66
42
57
34
23
26
28
29

FIG.8

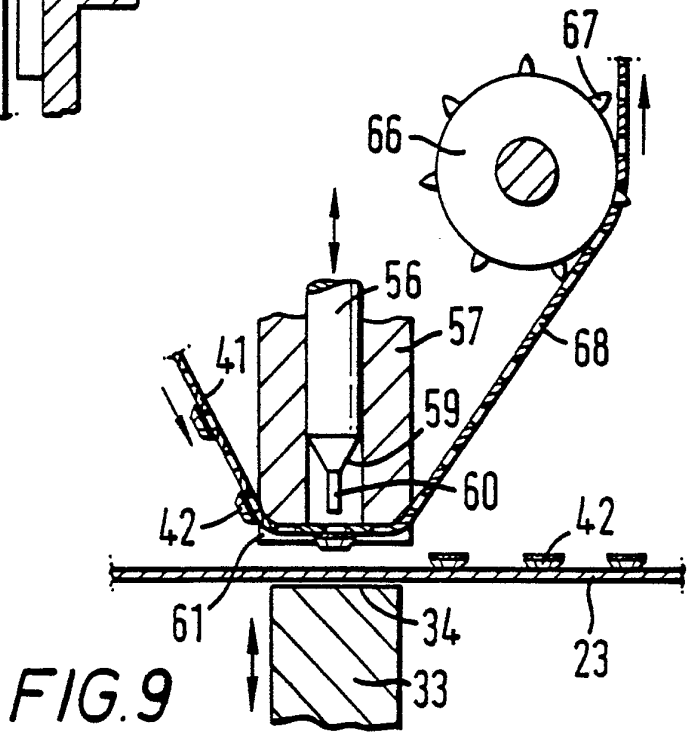

67
66
56
57
68
41
59
60
42
42
61
34
33
23

FIG.9

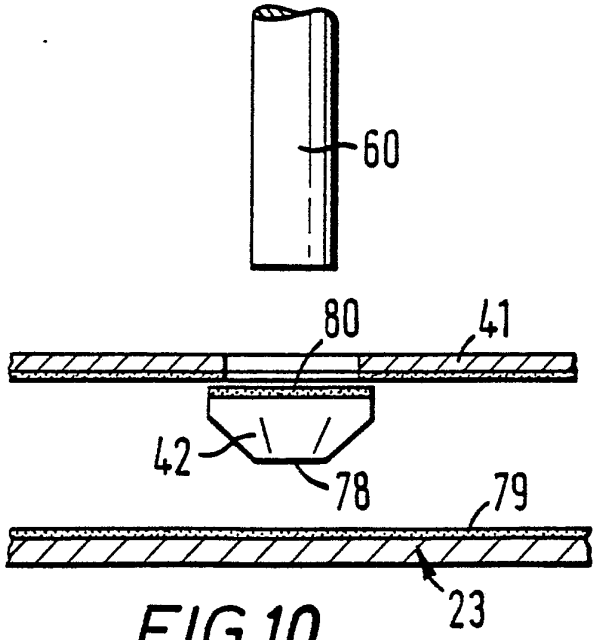


FIG.10

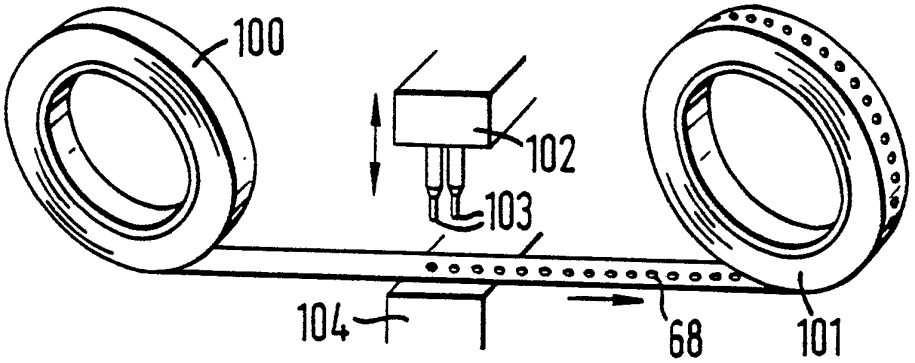


FIG.11

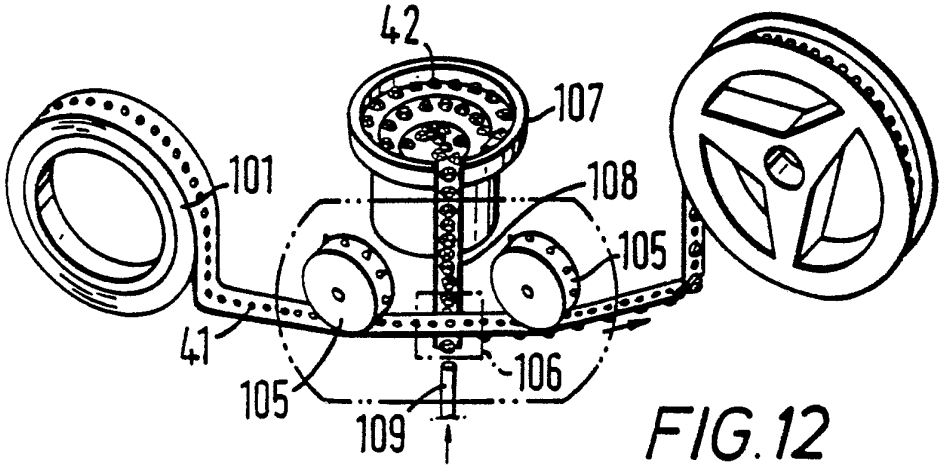

42
107
101
108
105
41
105
106
109

FIG.12

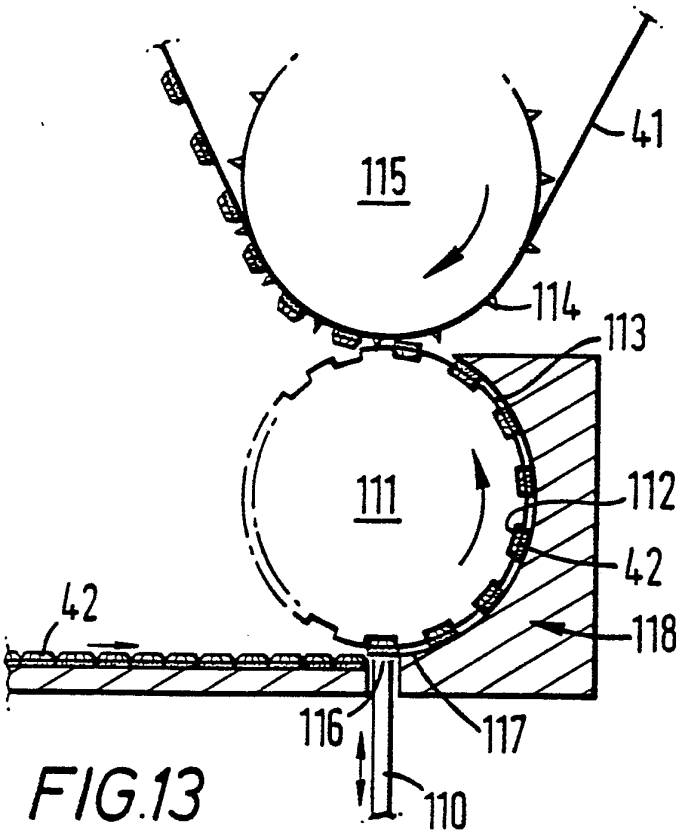

41
115
114
113
111
112
42
42
118
116
117
110

FIG.13

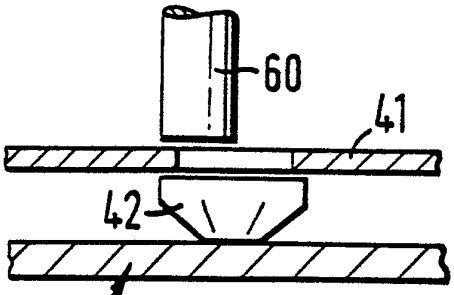


FIG.14

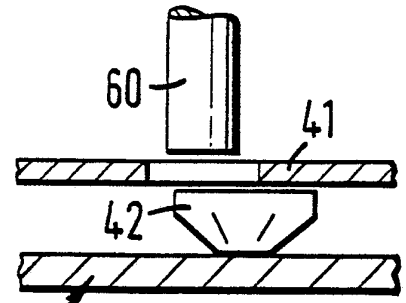


FIG.15

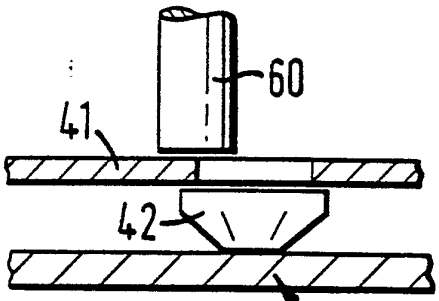


FIG.16

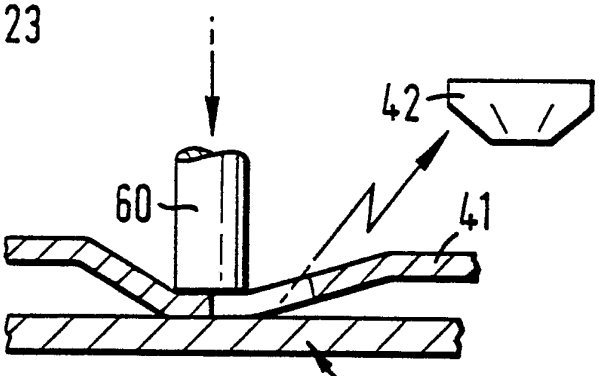


FIG.17

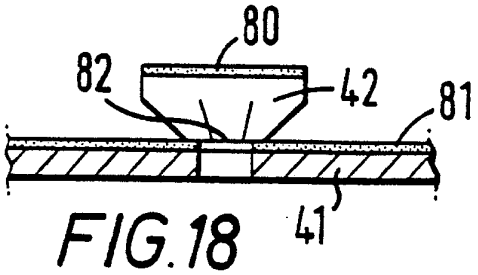


FIG.18

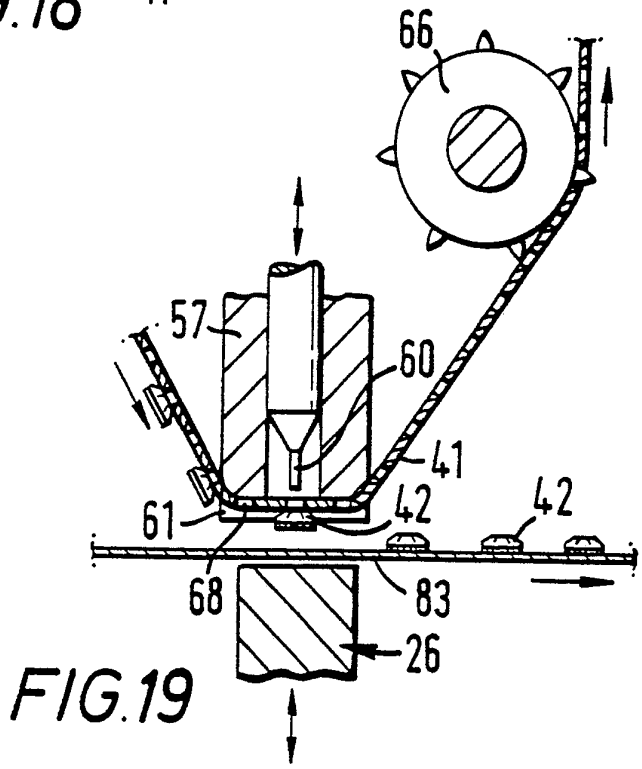


FIG.19

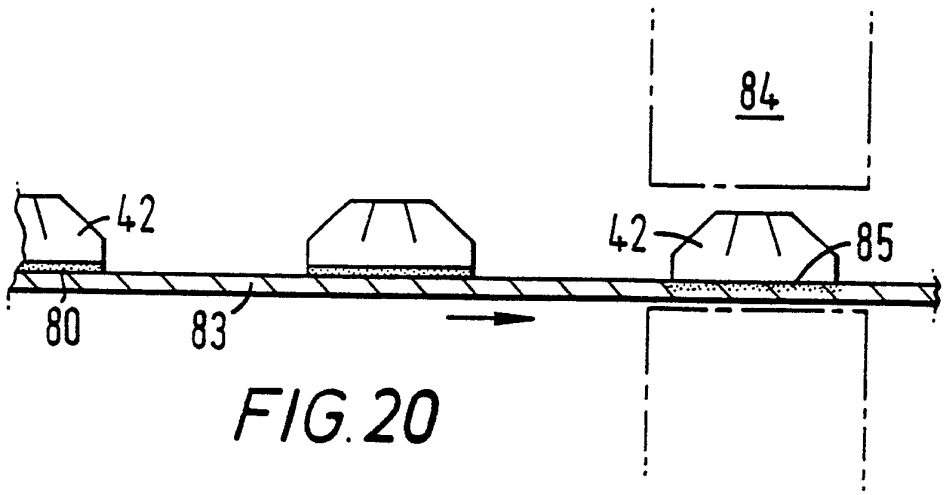


FIG.20

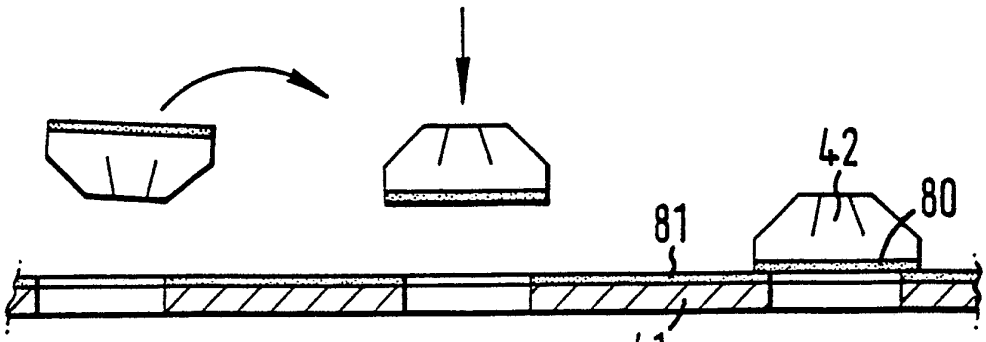


FIG.21

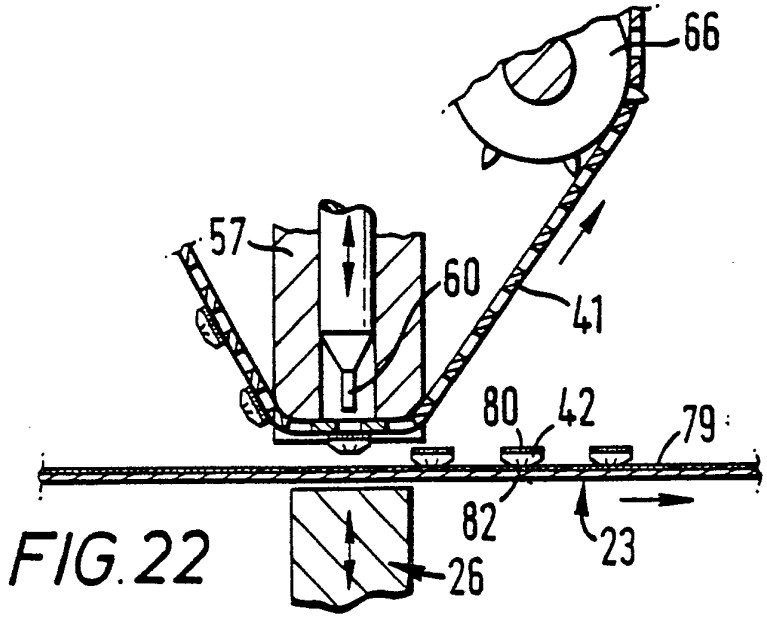


FIG.22

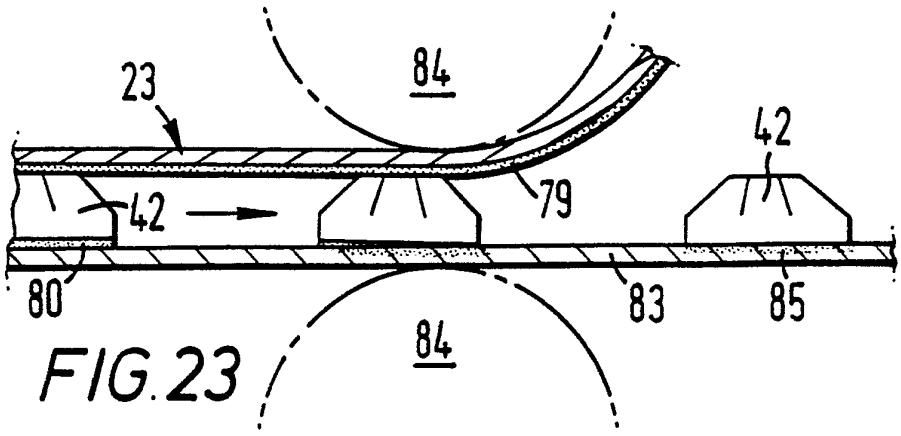


FIG.23

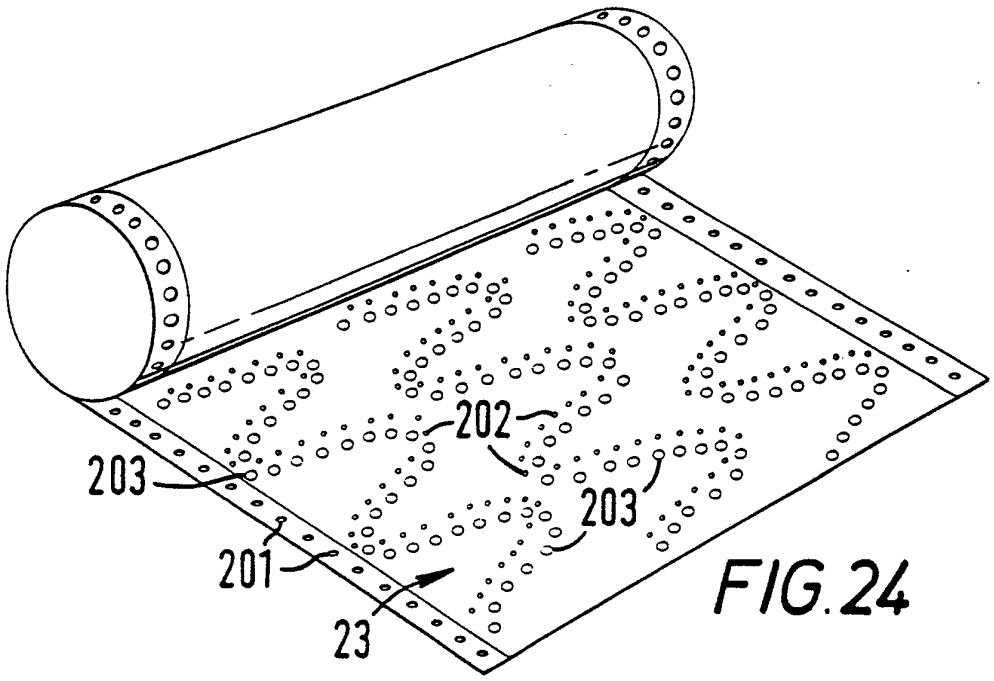


FIG.24

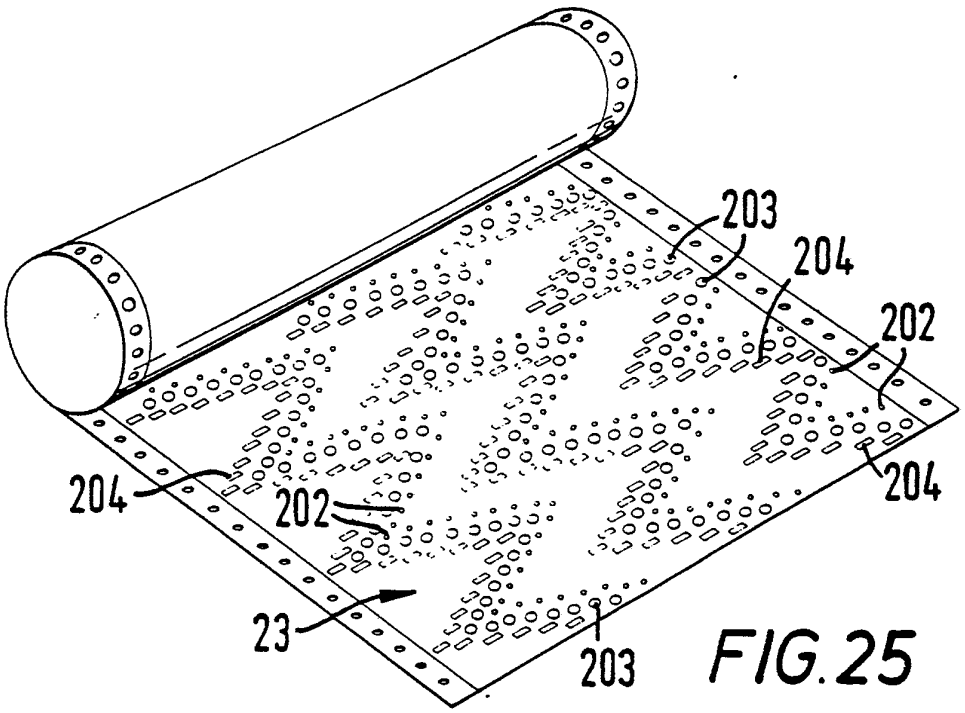


FIG.25

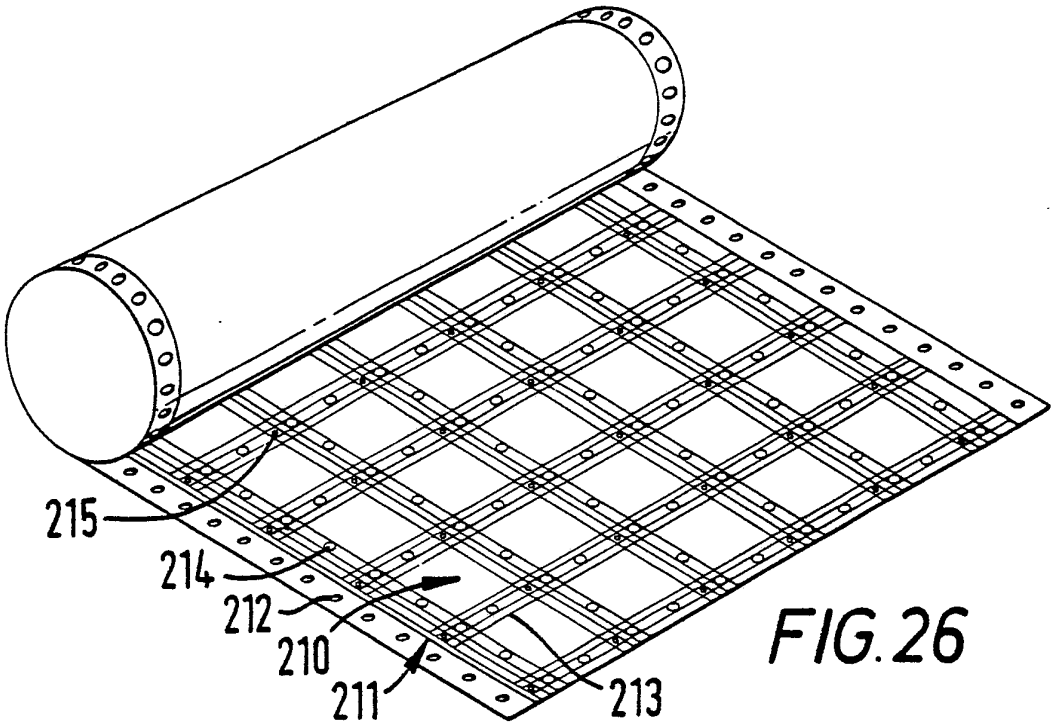

215
214
212
210
211
213

FIG.26

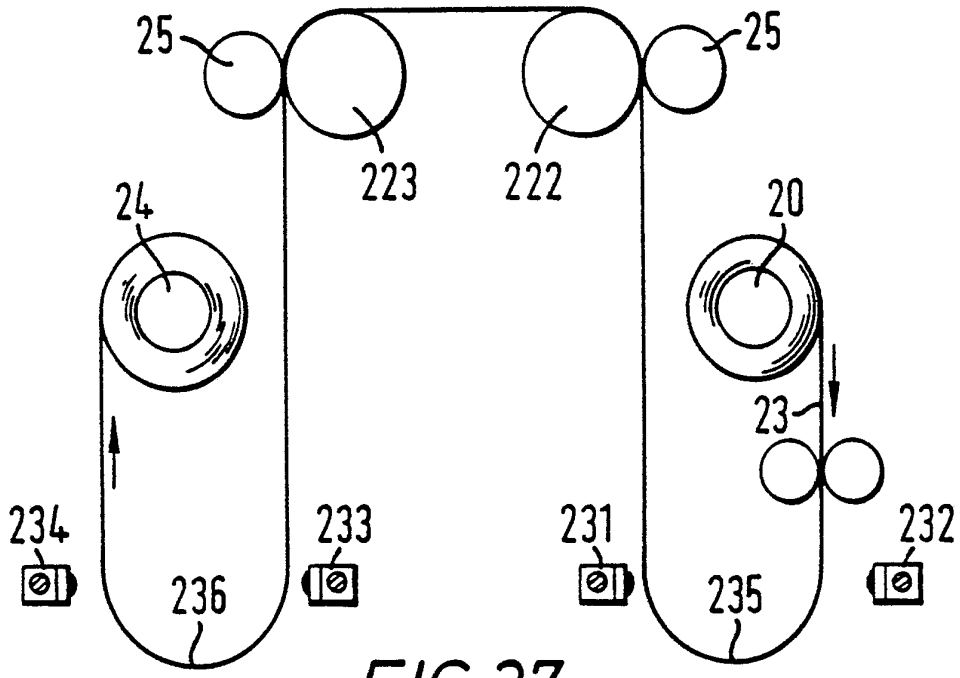

25
25
223
222
24
20
23
234
233
231
232
236
235

FIG.27

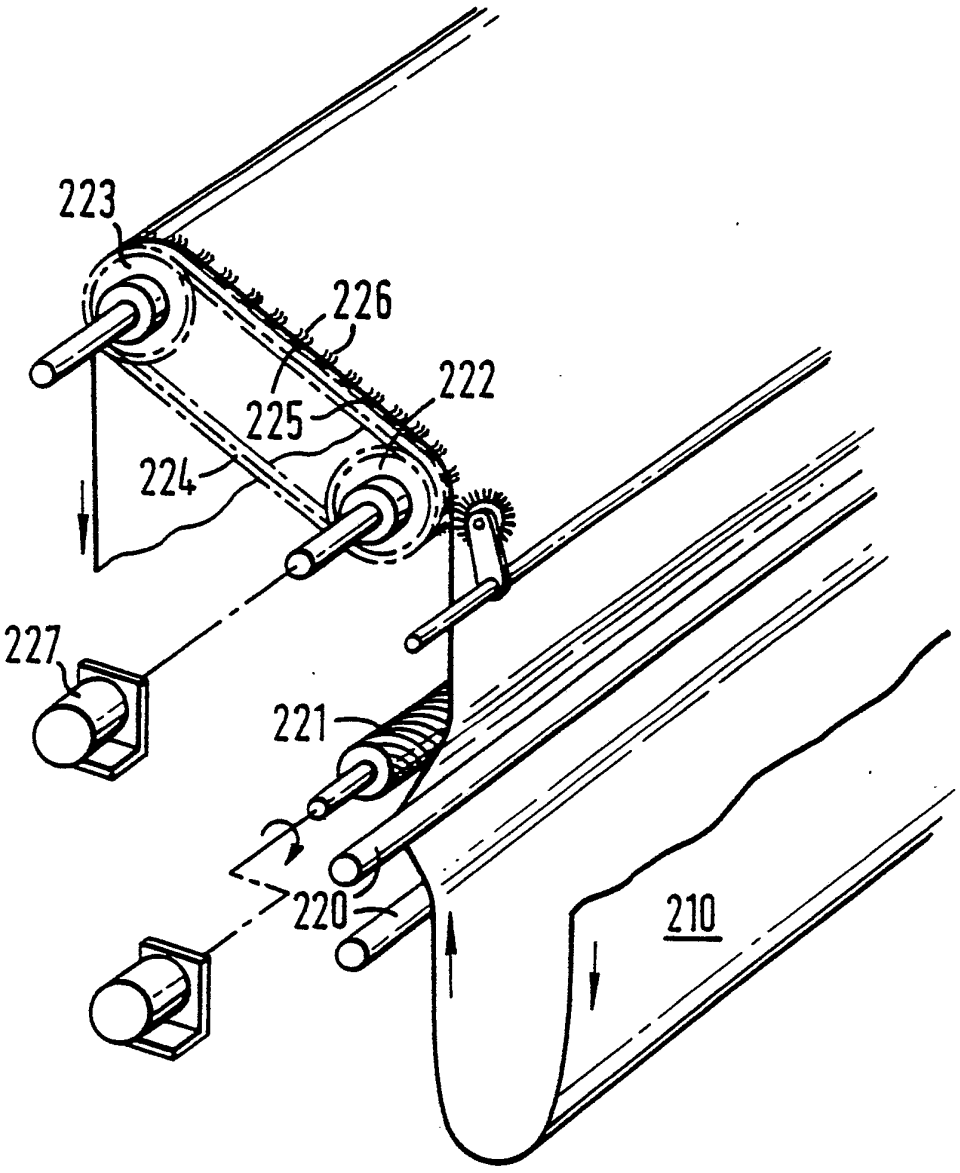


FIG. 28

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 85/00580

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: B 65 C 9/18; B 44 C 1/17

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	B 65 C B 44 C D 06 Q

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	DE, A, 2644462 (H. LAMERS) 25 August 1977, see page 16, paragraph 1 - page 17, paragraph 1; figures 10,14-17	1,3,4,5,7, 8,11,15-20
A	US, A, 3861986 (F. WOCHNER) 21 January 1975, see column 2, line 13 - column 5, line 16; figures 2A,2B	1,4,8
A	DE, A, 2953314 (ETIFIX) 30 October 1980	
A	US, A, 3852140 (W. JENKINS) 3 December 1974	
A	US, A, 3852139 (W. JENKINS) 3 December 1974	
A	US, A, 4094438 (G. NEUBAUER) 13 June 1978	

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
8th March 1986	01 AVR. 1986
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/EP 85/00580 (SA 11261)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 19/03/86

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A- 2644462	25/08/77	JP-A-	52059600	17/05/77
		GB-A-	1563892	02/04/80
		US-A-	4217164	12/08/80
		JP-A-	55012096	28/01/80
		JP-A-	55012097	28/01/80
		CA-A-	1097269	10/03/81
		CA-A-	1122169	20/04/82
		US-A-	4547252	15/10/85
		US-A-	4454180	12/06/84
US-A- 3861986	21/01/75	US-A-	3709755	09/01/73
DE-A- 2953314	30/10/80	None		
US-A- 3852140	03/12/74	DE-A,C	2230876	11/01/73
		DE-A,B,C	2247732	10/01/74
		US-A-	3783083	01/01/74
		FR-A-	2155210	18/05/73
		US-A-	3852139	03/12/74
		AU-A-	4380272	03/01/74
		GB-A-	1402722	13/08/75
		GB-A-	1402723	13/08/75
		GB-A-	1402724	13/08/75
		GB-A-	1402725	13/08/75
		GB-A-	1402726	13/08/75
		GB-A-	1402727	13/08/75
		GB-A-	1402728	13/08/75
		GB-A-	1402729	13/08/75
		GB-A-	1402730	13/08/75
		CA-A-	994292	03/08/76
		CA-A-	1017195	13/09/77
		CA-A-	1017565	20/09/77
		CA-A-	1042473	14/11/78
		CA-A-	1042715	21/11/78
		JP-A-	52089500	27/07/77
		JP-A-	52070800	13/06/77
		JP-A-	52067299	03/06/77
		JP-A-	48066400	11/09/73
US-A- 3852139	03/12/74	DE-A,C	2230876	11/01/73

INTERNATIONAL APPLICATION NO. PCT/EP 85/00580 (SA 11261)

		DE-A,B,C	2247732	10/01/74
		US-A-	3783083	01/01/74
		FR-A-	2155210	18/05/73
		US-A-	3852140	03/12/74
		AU-A-	4380272	03/01/74
		GB-A-	1402722	13/08/75
		GB-A-	1402723	13/08/75
		GB-A-	1402724	13/08/75
		GB-A-	1402725	13/08/75
		GB-A-	1402726	13/08/75
		GB-A-	1402727	13/08/75
		GB-A-	1402728	13/08/75
		GB-A-	1402729	13/08/75
		GB-A-	1402730	13/08/75
		CA-A-	994292	03/08/76
		CA-A-	1017195	13/09/77
		CA-A-	1017565	20/09/77
		CA-A-	1042473	14/11/78
		CA-A-	1042715	21/11/78
		JP-A-	52089500	27/07/77
		JP-A-	52070800	13/06/77
		JP-A-	52067299	03/06/77
		JP-A-	48066400	11/09/73
US-A- 4094438	13/06/78	GB-A-	1555376	07/11/79
		JP-A-	52022900	21/02/77
		AU-B-	500699	31/05/79
		CA-A-	1080671	01/07/80
		CA-A-	1088032	21/10/80