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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Method of re-using waste fibres.**

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(73) Proprietor: **FABRIQUES DE TABAC REUNIES S.A.**
Quai Jeanrenaud 3 P.O. Box 11
CH-2003 Neuchâtel-Serrières (CH)

(72) Inventor: **Frattolillo, Antonio Paolo Alfredo**
Fbg, Ph.-Suchard 42
CH-2017 Boudry (CH)
Inventor: **Erkohen, Eliezer**
9, chemin du Treyblanc
CH-1006 Lausanne (CH)

(74) Representative: **Bass, John Henton et al**
REDDIE & GROSE 16 Theobalds Road
London WC1X 8PL (GB)

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Description

This invention relates to the re-use of waste or other recovered fibrous material and its conversion into useful products. It is especially, but not exclusively, concerned with the recovery and re-use of fibres from waste or reject cigarette filters, filter rods and tows employed in making them.

It is known to re-use waste fibrous material by breaking open articles containing such fibres, such as cigarette filters, separating off wrapping and other extraneous material, and utilising the fibres so recovered in various low-grade end uses, for example as a packing or stuffing material.

In US 3 615 997 it is proposed to re-use fibres recovered from waste cigarette filter material in the production of further filters, but by incorporating salvaged fibres with virgin fibre to the extent of 75 to 95% of the total, and subsequently carding the combined fibres and forming them into a tow and thence into a filter rod in the conventional manner.

The method of this invention is characterized in that waste or recovered fibres are dispersed in a liquid and deposited in a substantially random manner on an advancing surface to form a fibrous web, the web is caused to adhere to a carrier or backing sheet, either during or after deposition, and the assembly of fibres and carrier is subdivided into portions for the manufacture of fibrous products.

The resulting portions of the assembly can be treated in a variety of ways to produce a final product. Many of such products may rely on the filtration or capillary capabilities of the fibrous web, supported or indeed enclosed by the carrier sheet. For example, the assembly may be divided longitudinally and rolled transversely into a rod of indefinite length, the carrier sheet being sealed to itself along the length of the rod to enclose the fibres. Alternatively, portions of the assembly, divided transversely and/or longitudinally can be rolled up to form rod structures of helical section. Either type of rod structure can be cut into lengths to form such products as cigarette filters or absorbent ink carrier elements for pens.

The invention can be applied to a variety of fibres, for example, natural or synthetic fibres, cellulose acetate or polypropylene. In the case of thermoplastic fibres, a conventional plasticizer can be applied, either to the fibres or to the carrier sheet, to assist in bonding the fibres to one another or to the carrier sheet in the finished product. The fibres may also be crimped while held on the carrier sheet, for which purpose a disc crimper is preferred to minimize the risk of detachment of fibres from the carrier.

The carrier sheet may be of a variety of materials, for example, paper or plastics film. Alternatively, the carrier sheet may take the form of a continuous array or web of other fibres, previously formed before application to the deposited web of waste fibres. Such an array or web may be constituted by continuous filaments or staple fibres, depending on the properties required of the carrier sheet in the finished product. The sheet should have properties appropriate to the method of application as well as to the end-uses envisaged. Thus, if the fibres are to be deposited on the carrier sheet in dispersion in a liquid and the liquid drained off through a screen supporting the sheet, the sheet should be permeable by the liquid. Moreover, if the assembly is to be removed from the screen before being dried, the sheet should have sufficient wet strength to resist damage. If the fibrous web is applied to the sheet after draining, the sheet may be impermeable, and is after drying, then it need not have a high wet strength. It is thus possible to select carrier sheets that will have desirable properties in the final product, for example impermeability or, as the case may be, permeability as a filter wrap in tobacco smoke filters of different kinds, or impermeability or resistance to ink media in the case of pen elements.

The invention will be further described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic side elevation of apparatus for carrying out the method of the invention.

Figs. 2A and 2B show in plan view two modifications of the method illustrated by Fig. 1 and subsequent Figs.; and

Figs. 3 and 4 are views corresponding to Fig. 1 of further examples of the practice of the invention.

In the system shown in Fig. 1, waste fibres, for example waste or reject cigarette filters or tow after opening and separation of wrapper and other extraneous material, are chopped and dispersed in an aqueous medium in a chopper/mixer 10, to which the fibres are supplied at 11 and water at 12.

The resulting dispersion is then deposited continuously by a slurry applicator 13 on an advancing carrier or backing sheet 14 supplied from a roll 15 and supported by a moving endless fine-mesh screen 16 guided by rollers 17. Suction is progressively applied to the underside of the upper run of the screen as indicated at 18 to draw off as much liquid as possible from the substantially random fibrous web laid down on the sheet 14, for which reason it is preferred in this case that the sheet should be permeable. The fluffiness of the final web and, in the case of use in cigarette filters, the resistance to draw (RTD) of the final filter depend on the degree of suction applied.

At the end of the upper run of the screen, the assembly 20 of sheet and fibrous web is removed and transferred to a ventilated drier 21. It is desirable at this stage that the carrier sheet should retain much of its strength when wet, in order to avoid damage to the assembly when removed from its support.

When the assembly has been dried, it may be passed through a plasticizer applicator 22, in which a fine spray of plasticizer composition can be applied to the fibrous web for the purposes of

softening and bonding the fibres in subsequent stages of the production of fibrous products, in a manner analogous to the use of plasticizer in conventional filter production.

Finally, the completed fibre backing sheet assemby 23 can be assembled on a take-up roll 24 for transfer to processes and plant for the manufacture of final products. Where these involve the formation of fibrous rods by rolling up divided portions of the assembly, the assembly may be slit longitudinally into strips having a width corresponding either to the periphery of the desired rod, when the strip is to be rolled transversely and possibly continuously, or to the length of the desired rod, when the strip is to be cut transversely and rolled longitudinally.

In Figs. 2A and B are shown two modifications of the screen area in the systems shown in the other Figures. Where the assembly 23 of the fibres and carrier sheet is eventually to be split longitudinally into continuous strips, the fibrous web can be deposited correspondingly in spaced strips on the screen, or on the carrier sheet as the case may be. In Fig. 2A is shown a plan view of portion of the screen 16, to which is fitted a series of spaced longitudinal walls or partitions 25, dividing the area of the screen into longitudinal zones 26. The fibre slurry is deposited in strips defined by the walls and forms spaced longitudinal portions of fibrous web on the carrier sheet 14, whether this is passed over the screen as in Fig. 1, or applied later, as in Figs. 3 and 4. The walls 25 may be of sufficient thickness to leave bare zones on the carrier sheet, which may facilitate subsequent splitting of the sheet and provide an edge region for the resulting strips which can be used to overlap and adhere to the sheet at opposite edge of the strip when the strip is rolled transversely to form a continuous enclosed fibrous rod.

In the alternative, as illustrated in Fig. 2B, walls 25 are omitted and the fibres are deposited across the whole surface of the screen 16 to form a single continuous web extending from side to side of the screen.

Figs. 3 and 4 show further embodiments of the invention, corresponding items of the apparatus or materials being indicated by the same reference numerals as in Fig. 1.

In the example of Fig. 3, the fibres in slurried form are deposited directly on the screen 16 and the web is taken up on the carrier sheet 14 as it leaves the screen, the sheet being passed round a guide roll 28 adjacent to the discharge end of the screen. Drying and plasticizer application follow as before, but it is necessary in this case that the sheet 14 should retain ample strength after coming into contact with the wet fibrous web.

In the embodiment of Fig. 4, the fibrous web is formed in the absence of a carrier sheet, but is carried on the screen 16 through the drier 21 and only comes into contact with the sheet 14 after it has been dried. The carrier sheet passes over a guide roll 28 at the discharge end of the screen. A plasticizer applicator 22 may be mounted over the screen, as shown, to apply plasticizer to the dried web while still on the screen, and a further applicator 27 may be provided to apply plasticizer to a face of the sheet 14 before it contacts the web. Plasticizer can be applied at either or both of these stations, as desired. Alternatively, a plasticizer applicator could be provided downstream of the guide roll 28 in a position analogous to that in Fig. 3.

The invention affords a number of advantages over other possible methods of recycling waste fibres.

For filtration purposes, random orientation of fibres gives a much more efficient filter than a longitudinal disposition for a given quantity of fibre, and can readily be achieved by the method of the invention. In the case of cigarette filters, this random orientation enables a filter of high efficiency to be produced having a low resistance to draw (RTD).

The carrier sheet not only serves to support and strengthen the web during fabrication of the final product, but also contributes to the structure and the performance of the product. Thus, in the case of cigarette filters, it can function as the filter plug wrap surrounding the filter body in the finished cigarette, and may have any desired degree of permeability as may be needed for a particular design of filter. The provision of a plug wrap in this manner is particularly advantageous when the fibre/sheet assembly is slit longitudinally and rolled transversely, as described.

Claims

1. A method of re-using waste or other recovered fibre material in which the fibres are dispersed and incorporated into a newly formed fibrous structure, characterised in that waste or recovered fibres are dispersed in a liquid and deposited in a substantially random manner on an advancing surface to form a fibrous web, the web is caused to adhere to a carrier or backing sheet (14), either during or after deposition, and the assembly (20) of fibres and carrier is subdivided into portions (23) for the manufacture of fibrous products.

2. A method according to claim 1, characterised in that the divided assembly portions (23) are formed into cylindrical products (24).

3. A method according to claim 2, characterised in that the assembly (20) is divided longitudinally into strips (25), which are rolled transversely and the carrier sheet (14) sealed to itself to form a fibrous cylinder totally enclosed by the sheet (14).

4. A method according to claim 3, characterised in that the fibres are deposited on the surface in longitudinal zones (26) corresponding to the strips (25) into which it is to be divided.

5. A method according to claim 2, charac-

terised in that the fibres are subjected to a crimping operation while on the carrier sheet (14).

6. A method according to any of claims 2 to 5, characterised in that the cylindrical product (24) is divided into lengths for use as tobacco smoke filters.

7. A method according to any preceding claim, characterised in that the fibre dispersion is deposited on a permeable carrier sheet (14) supported on a screen (16) adapted for removal of the liquid, the carrier sheet (14) having a mechanical strength which is substantially maintained in the presence of the liquid or is restored by drying prior to removal of the assembly (20) from the screen (16).

8. A method according to any of claims 1 to 6, characterised in that the fibre dispersion is deposited directly on a permeable screen (16) and the fibres are transferred to the carrier sheet (14) after draining of liquid through the screen (16), the carrier sheet (14) having a mechanical strength which is substantially maintained in the presence of the liquid or being applied to the fibrous web (20) only after the latter has been dried.

9. A method according to any preceding claim, characterised in that the fibres are thermoplastic and that a plasticiser (22, 27) is applied to the fibrous web (20) after deposition and drying and/or to the carrier sheet (14) before application thereto of the dried web.

Patentansprüche

1. Verfahren zur Wiederverwendung von Abfallmaterial oder anderem rückgewonnenem Fasermaterial, bei dem die Fasern dispergiert und in eine neu gebildete Faserstruktur eingesetzt werden, dadurch gekennzeichnet, daß die Abfallfasern oder die rückgewonnenen Fasern in einer Flüssigkeit dispergiert und in im wesentlichen zufallsverteilter Form auf einer sich weiter bewegenden Fläche zur Bildung einer Faserbahn abgelegt werden, die Bahn haftend an einem Träger oder einer Trägerbahn (14) entweder während oder nach dem Ablegen angebracht wird, und die Anordnung (20) aus Fasern und Träger in Abschnitte (28) zur Herstellung von Fasererzeugnissen unterteilt wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die unterteilten Anordnungsabschnitte (23) zu zylindrischen Erzeugnissen (24) geformt werden.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß die Anordnung (20) in Längsrichtung in Streifen (25) unterteilt wird, welche in Querrichtung gerollt werden und die Trägerbahn (14) dicht mit sich selbst verbunden ist, um einen Faserzylinder zu bilden, der vollständig von der Bahn (14) umschlossen ist.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, daß die Fasern auf der Fläche in Längszonen (26) abgelegt werden, die den Streifen (25) zugeordnet sind, in die die Anordnung zu unterteilen ist.

5. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß die Fasern einer Kräuselbehandlung auf der Trägerbahn (14) unterzogen werden.

6. Verfahren nach einem der Ansprüche 2 bis 5, dadurch gekennzeichnet, daß das zylindrische Erzeugnis (24) in Längsstücke zur Verwendung als Tabakrauchfilter unterteilt wird.

7. Verfahren nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Faserdispersion auf einer permeablen Trägerbahn (14) abgelegt wird, die auf einem Sieb (16) aufliegt, das zur Flüssigkeitsabfuhr bestimmt ist, und daß die Trägerbahn (14) eine mechanische Festigkeit hat, die in Anwesenheit der Flüssigkeit im wesentlichen beibehalten oder durch das Trocknen vor der Entfernung der Anordnung (20) von dem Sieb (16) wiederhergestellt wird.

8. Verfahren nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die Faserdispersion direkt auf eine permeable Bahn (16) abgelegt wird und die Fasern zu der Trägerbahn (14) nach der Ableitung der Flüssigkeit durch das Sieb (16) übergeben werden, und daß die Trägerbahn (14) eine mechanische Festigkeit hat, die im wesentlichen bei Anwesenheit der Flüssigkeit beibehalten oder bei der Faserbahn (20) nur nach der Trocknung derselben vorhanden ist.

9. Verfahren nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Fasern thermoplastisch sind, und daß ein Plastifikator (22, 27) auf die Faserbahn (20) nach dem Ablegen und Trocknen und/oder auf die Trägerbahn (14) vor der Aufbringung der getrockneten Bahn auf derselben aufgebracht wird.

Revendications

1. Procédé de réutilisation de rebuts de matière fibreuse ou autres matières fibreuses de récupération dans lequel les fibres sont dispersées et incorporées dans une structure fibreuse nouvellement formée, caractérisé en ce que les fibres de rebut ou de récupération sont dispersées dans un liquide et déposées d'une façon à peu près aléatoire sur une surface qui avançe, pour former une bande fibreuse, on fait adhérer la bande à une feuille porteuse ou de support (14), soit pendant soit après le dépôt, et l'ensemble (20) de fibres et du support est subdivisé en portions (23) pour la fabrication de produits fibreux.

2. Procédé suivant la revendication 1, caractérisé en ce que les portions d'ensemble divisées (23) sont formées en produits cylindriques (24).

3. Procédé suivant la revendication 1, caractérisé en ce que l'ensemble (20) est divisé longitudinalement en bandes (25) qui sont roulées transversalement et la feuille porteuse (14) est fermée sur elle-même pour former un cylindre fibreux totalement enfermé par la feuille (14).

4. Procédé suivant la revendication 3, caractérisé en ce que les fibres sont déposées sur la surface en régions longitudinales (26) qui correspondent aux bandes (25) en lesquelles elles doivent être divisées.

5. Procédé suivant la revendication 2, caracté-

risé en ce que les fibres sont soumises à une opération de frisage tandis qu'elles se trouvent sur la feuille porteuse (14).

6. Procédé suivant l'une quelconque des revendications 2 à 5, caractérisé en ce que le produit cylindrique (24) est divisé en longueurs pour être utilisé en tant que filtres pour fumée de tabac.

7. Procédé suivant l'une quelconque des revendications précédentes, caractérisé en ce que la dispersion de fibres est déposée sur une feuille porteuse perméable (14) soutenue sur un tamis (16) adapté pour l'extraction du liquide, la feuille porteuse (14) ayant une résistance mécanique qui est à peu près conservée en présence du liquide, ou est rétablie par sèchage avant l'enlèvement de l'ensemble (20) du tamis (16).

8. Procédé suivant l'une quelconque des revendications 1 à 6, caractérisé en ce que la dispersion de fibres est déposée directement sur un tamis perméable (16) et les fibres sont transférées sur la feuille porteuse (14) après égouttage du liquide à travers le tamis (16), le feuille porteuse (14) ayant une résistance mécanique qui est à peu près conservée en présence de liquide, ou lors de l'application de la bande fibreuse (20) seulement après que cette dernière ait été sèchée.

9. Procédé suivant l'une quelconque des revendications précédentes, caractérisé en ce que les fibres sont thermoplastiques et en ce qu'un plastifiant (22, 27) est appliqué sur la bande fibreuse (20) après dépôt et sèchage et/ou sur la feuille porteuse (14) avant application à celle-ci de la bande sèchée.

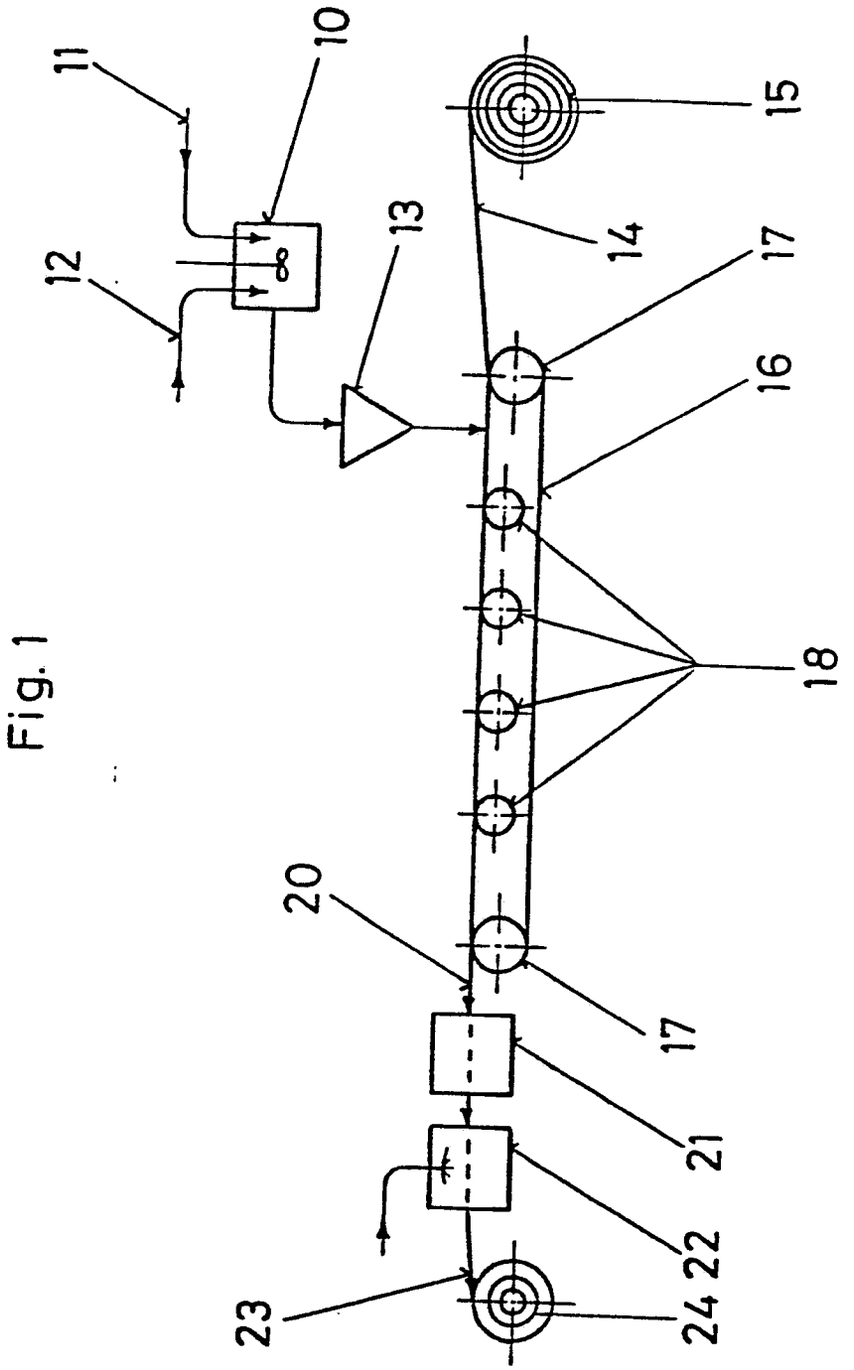


Fig. 1

Fig. 2 b

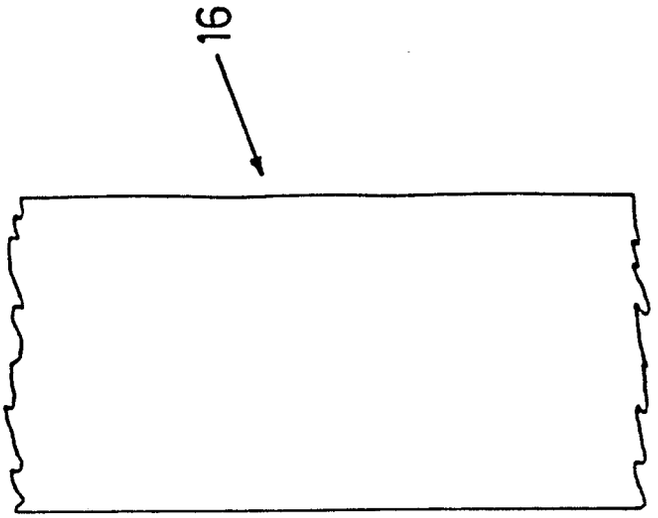
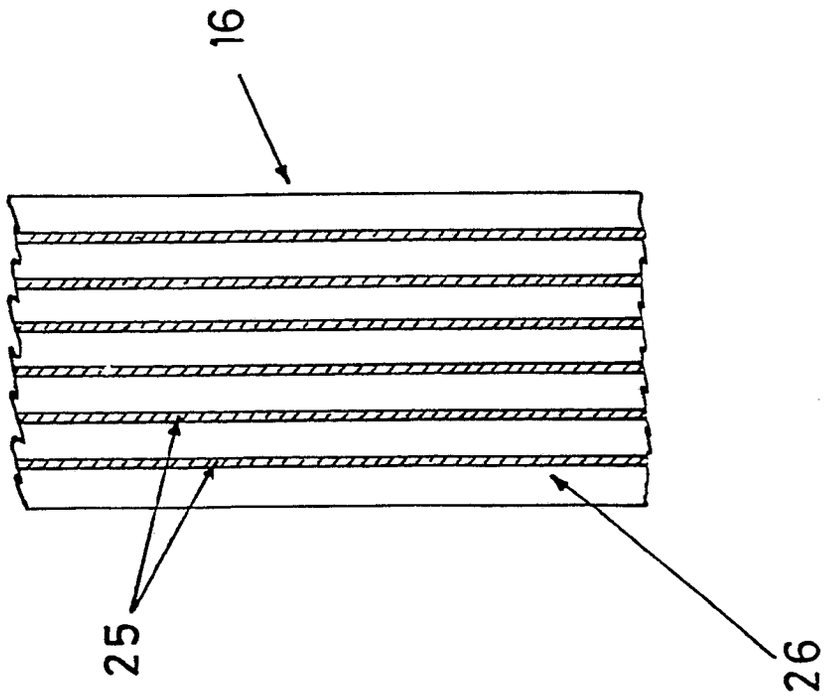


Fig. 2a



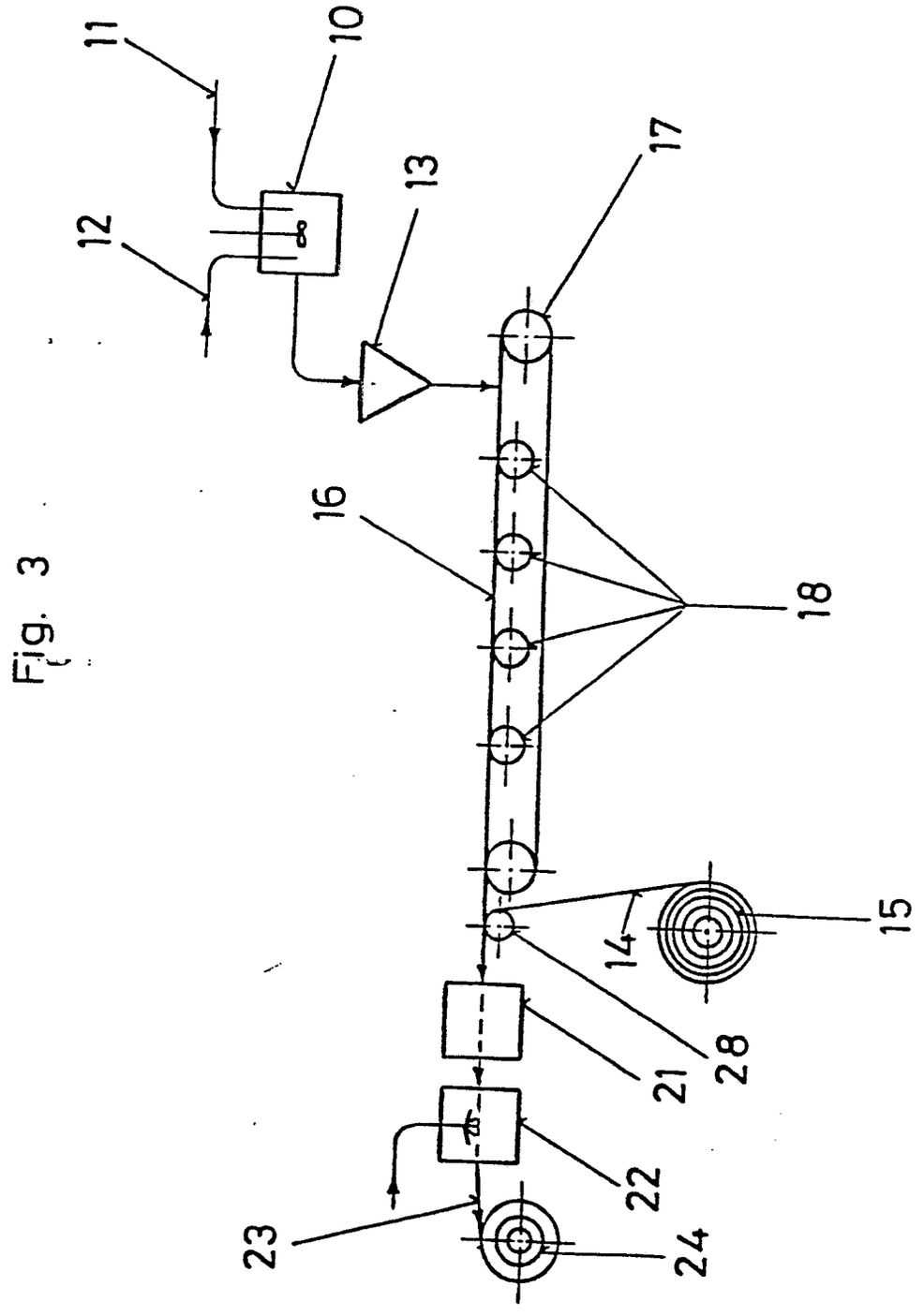


Fig. 3

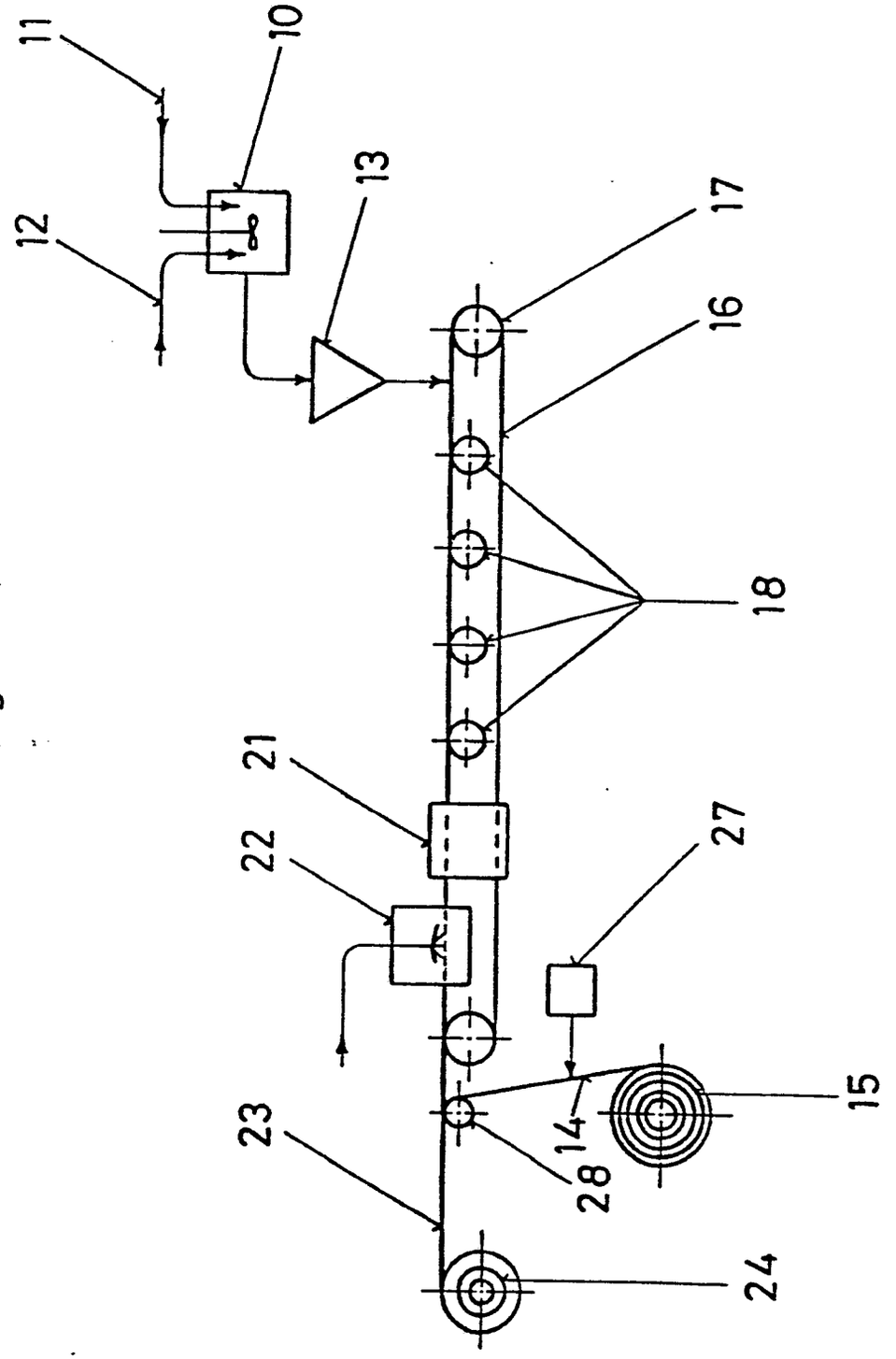


Fig. 4