Oct. 1, 1968 D. MORASH 3,403,817

METHOD OF AND APPARATUS FOR THE DISTRIBUTION OF FIBERS FOR FLOCKING MACHINES

Filed Dec. 5, 1966 4 Sheets-Sheet 1

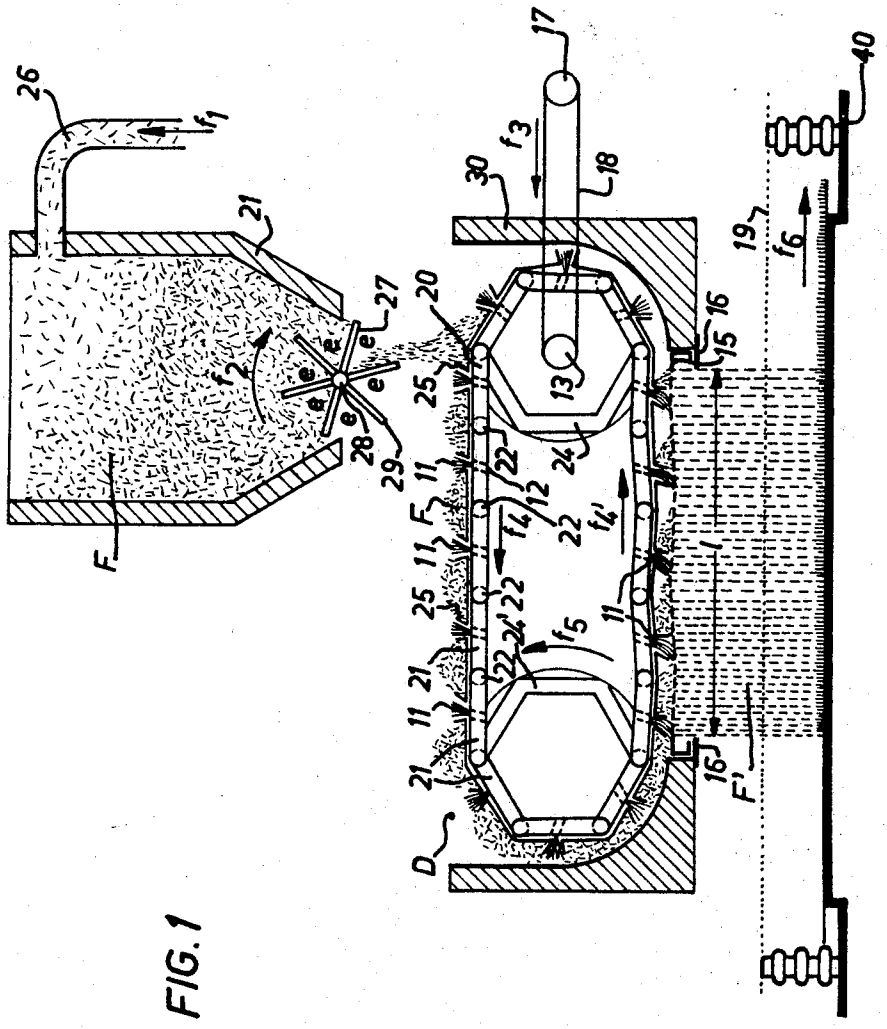

FIG. 1

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OF FIBERS FOR FLOCKING MACHINES
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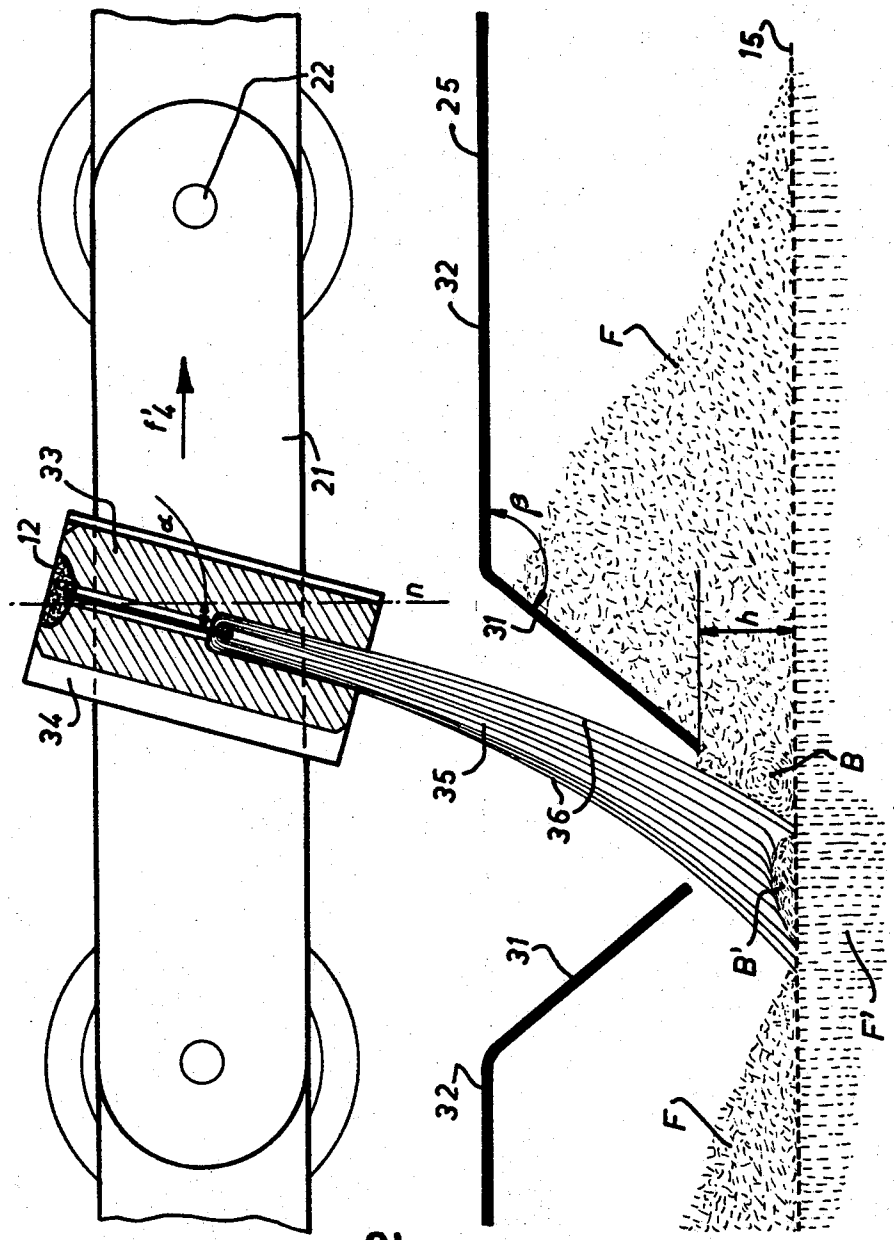

FIG. 2

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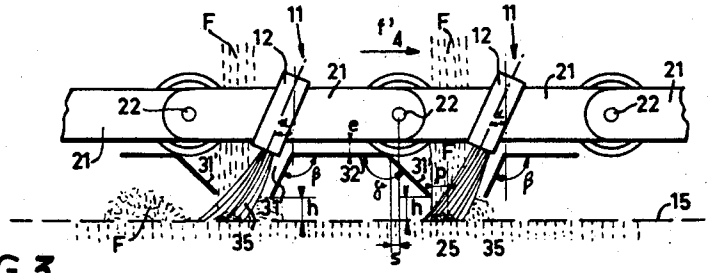

FIG. 3

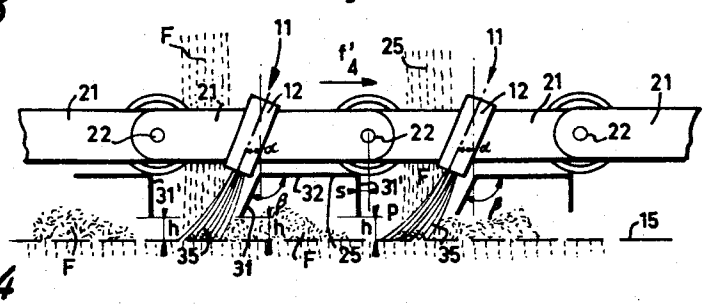

FIG. 4

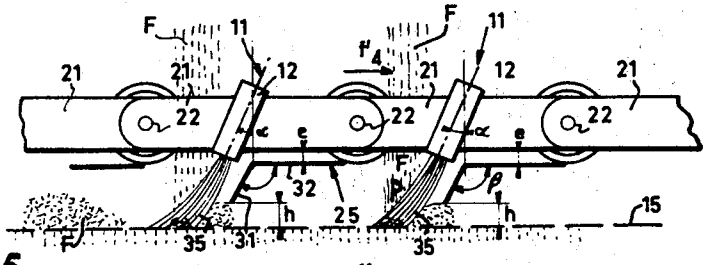

FIG. 5

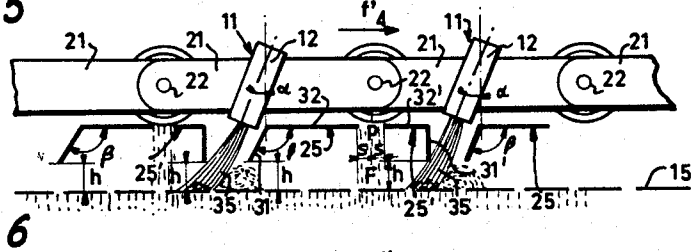

FIG. 6

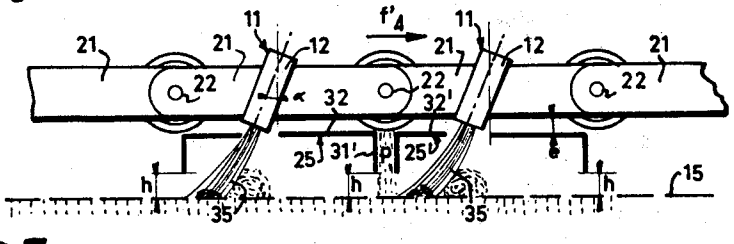

FIG. 7

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METHOD OF AND APPARATUS FOR THE DISTRIBUTION OF FIBERS FOR FLOCKING MACHINES

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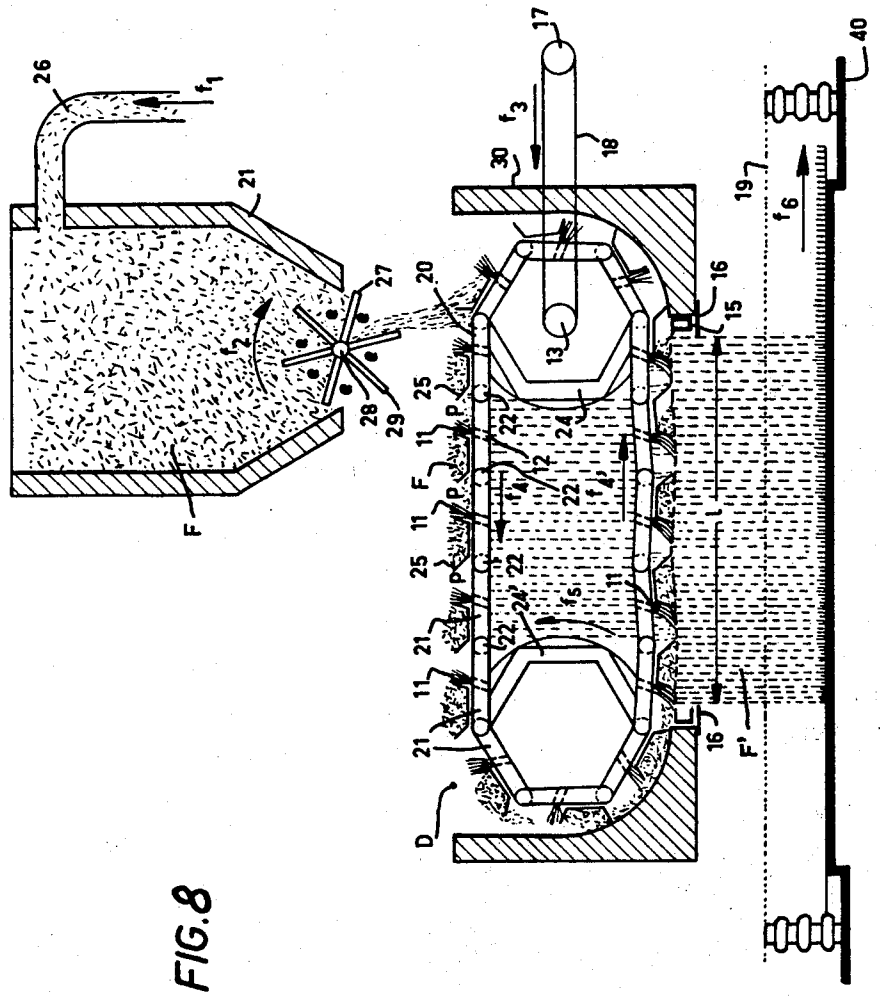

FIG. 8

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METHOD OF AND APPARATUS FOR THE DISTRIBUTION OF FIBERS FOR FLOCKING MACHINES

Daniel Morash, La Celle-Saint-Cloud, France, assignor to Societe Besnier-Flotex S.A., Paris, France

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Claims priority, application France, Dec. 29, 1965, 44,086; Jan. 20, 1966, 46,526
19 Claims. (Cl. 222—1)

ABSTRACT OF THE DISCLOSURE

In particular for electrostatic flocking, a method and apparatus for the distribution of natural, artificial or synthetic textile fibers for all non-woven products, in which the passage of said fibers through a screen is assisted by brushes, consisting in that each brush carried by a link of an endless conveyor chain and inclined with respect to the vertical in a direction opposite to that of the forward movement of the chain, is applied with a certain elasticity and with a certain practically constant pressure over the entire width of any desired value of a screen located below the lower branch of said endless conveyor chain, a relatively small quantity of fibers being fed for the action of each of said brushes via receptacles carried by said chain, one receptacle per brush, a part of the fibers supplied being allowed to pass through the links of said chain on to the screen, said measured quantity of fibers being supplied by a dosing device independent of the distributor proper actuated by a power-driven variable speed reduction device, means being provided for regulation and/or controlling the operation of said dosing device as a function of the speed of said conveyor chain.

The present invention relates to a method and apparatus for the distribution of natural or synthetic textile fibers and for all non-woven products for flocking machines, together with the products obtained by the said methods and by means of the said apparatus forming the objects of the invention.

The method and the apparatus forming the objects of the present invention provide an effective, uniform and rapid distribution, thus resulting in considerable gain of time, material and labour.

It is an object of the invention to obtain uniformity of distribution in the sense of the width, that is to say at right angles to the direction of forward movement of the support, and to obtain the same density of fibers on the two widths.

It is a further object of the invention to obtain uniformity of distribution in time, for any length of fiber.

It is also an object of the invention to reduce to a minimum any action of the operator of the machine during the course of working, to correct any excess or shortage of fibers.

It is a further object of the invention to provide a distributor which permits effective separation of the fibers during operation in order to prevent the fibers packing into lumps; and this especially for fibers of low denier.

It is an object of the invention to provide a distributor which enables the fibers to be kept perfectly straight without twisting—and in particular fibers of long length and small denier—so as to obtain a high distribution density over the whole flocking field.

It is still another object of the invention to permit rapid changing of the length and/or the denier of the fibers.

It is an additional object of the invention to permit rapid maintenance work on the entire distribution device.

It is finally an object of the invention to provide a distributor which permits perpendicular application of the fibers in the adhesive, for example by an electrostatic device.

One of the characteristic features of the invention concerns means for applying successively, with a certain pressure and elastically, a certain number of brushes against the screen, the brushes being uniformly spaced apart from each other.

According to a further characteristic feature of the invention, the brushes are inclined with respect to the vertical in a direction opposite to that of their forward movement along the screen.

According to a further characteristic feature of the invention, the fibers are supplied in small measured quantities in such manner that each of the brushes is fed separately.

Other characteristic features and advantages of the method and apparatus in accordance with the invention will become evident in the description which follows below, with reference to the accompanying drawings and given by way of example and not in any limitative sense.

In the drawings:

FIG. 1 shows diagrammatically an assembly of devices and elements which define the method and apparatus forming the objects of the invention,

FIG. 2 relates to a detail on enlarged scale of the assembly of FIG. 1,

FIGS. 3 to 7 illustrate various examples of the co-operation of distributor brushes with the distributor screen, and

FIG. 8 is a modified version of the assembly of FIG. 1.

Referring now to FIG. 1, the fibers F are fed in the direction of the arrow f_1 through a supply conduit **26** into a hopper **21**. From the hopper **21**, the fibers are directed in measured quantities to a distributor D by a dosing device **27**. This dosing device comprises for example a shaft **28** mounted in the lower part of the hopper and open towards the distributor D, the shaft **28** carrying radial blades **29** spaced uniformly apart.

The fibers in the space *e* between two successive blades are conveyed during rotation of device **27** in the direction of the arrow f_2 about the shaft **28**, to a position such that from the blades they fall freely into one of the receptacles **25** of the distributor D.

The distributor D comprises essentially the following elements:

A motor-driven variable-speed reduction gear **17**, the speed of which can be regulated at will according to the requirements of manufacture, drives a pulley **13** through the intermediary of a transmission device **18**. This pulley **13** actuates the driving member **24** of an endless conveyor chain **20** constituted by links **21** coupled to each other by articulations **22**. Each link returns to its initial position on the member **24** by passing over a freely rotating element **24'**, the dimensions of which are identical with those of the element **24**.

Each of the links **21** is provided at its central portion with a brush **11** fixed by means of brush-carriers **12**. The brush-carrier comprises for example uprights **33**, between which are clamped brushes **35** of nylon hair **36**, for example of a diameter of .070–.090 and a length of about 100 mm.

The brush-carriers **12** are rigidly fixed on angle members **34** integral with the links **21**. The brushes **11** are inclined at equal angles, preferably from 15° to 20°, with respect to the vertical *n*, in the direction opposite to the forward movement of the chain f_4, f'_4.

The brushes **35** are arranged between the edges **31** of the receptacles **25**. In principle, one receptacle is provided for each brush. Each of the receptacles **25** is mounted astride two links and is made of such material and in such manner as to be able to adapt itself elastically

to the positions taken-up by the links **21** during their forward movement (in the direction of the arrows f_4, f'_4, for example). The edges **31** of the receptacles **25** are elastic and inclined with respect to the bottom plates **32**. The optimum inclination in the position of application of the brushes on the screen, shown in FIG. 4, is equal to an angle β of approximately 120°, in order to maintain the fibers at the height of the hair of the brushes so as to prevent "packing" of the fibers. On the other hand, the edges should not apply any pressure on the inactive brushes, that is to say those moving forward in the direction of the arrow f_4 (see FIG. 1).

The operation is as follows:

The fibers are deposited by the dosing device **27** in successive receptacles **25**. The speed of rotation of the variable speed motor reduction gear **17** is regulated in order to ensure precise and uniform dosing. The fibers F deposited on the receptacle **25** are carried by the conveyor chain **20** in the direction of the arrow f_4 so as to pass between the walls of the tank **30** and the said receptacles before being brought against the screen **15**. In the case of electrostatic flocking, the tank **30** and also the transmission device **18** are of insulating material.

On reaching the screen, part of the fibers contained in a receptacle **25** falls through the screen **15**. The part of the fibers remaining on the screen is guided towards the brushes **35**, by the edge **31** of the receptacle **25**. The edge **31** will always be at a distance h from the screen. This distance h is chosen so as to permit the correct operation of the device.

A small homogeneous roll B is formed along the brush over the whole width of the distributor and it disintegrates rapidly by rolling between the hairs **36** of the brush; the fibers B' can therefore pass through the screen **15**. Since the quantity of fibers F deposited in each receptacle **25** is relatively small, the packing of the fibers before and at the moment of passage over the screen is prevented; the time of passage of the fibers in the distributor D is short. The properties of the fibers are therefore not adversely affected, especially their straightness, their moisture condition, possible coating, etc.

As the conveyor chain is not rigid but permits the pivotal movement of each link **21** about the articulations **22**, it always applies the brushes **11** against the screen **15** by its own weight, irrespective of the flatness or general shape of the said screen.

During the forward movement of a receptacle **25** and its corresponding brush **11** along the screen **15** in the direction of the arrow f'_4, the disintegrating action of the fibers described above continues uniformly, another receptacle and its brush following immediately after the first, and so on. The useful length of the screen is obviously chosen so as to obtain a uniform and effective distribution for all possibilities of manufacture to be envisaged.

The fibers F' fall through the electrostatic grid **19** by which they are charged before reaching the support **40**, moving forward in the direction of the arrow f_6 as a function of the distribution.

The advantages of the method and the apparatus employed in carrying it into effect are numerous:

A single distribution device is sufficient to ensure the distribution over a very great length.

The forward speed of the brushes is 15 to 45 m./min., according to the manufacture.

The uniformity of distribution in width is excellent, irrespective of the length and the denier of the fibers and the quantity distributed. This distributor can effect distribution of non-woven coverings up to 40 grams per square metre.

Due to the large contact surface of the brushes on the screen, a very low lateral speed of the brushes, of the order of 10 to 30 m. per minute, is amply sufficient for a very good distribution. Now, at these speeds, due to the inclination of the brushes of 15 to 20° with respect to the screen, flocks of large length (15 to 20 m./m.) which had a tendency to "pack" in a conventional distributor remain perfectly disintegrated. This distributor, even when supplied with uncarded flock, permits the disintegration of the balls which are broken-up by the hairs of the brushes on the screen.

This distributor has a low flock capacity, located for the greater part between the brushes and not inside the tank; the mechanical forces are small; there is no possibility of "packing"; the fibers retain their straightness and are neither deformed nor twisted.

The screen **15** mounted on slides **16** permits the size of link to be rapidly changed, which gives great possibilities of adaptation and for changing the length of fibers; the cleaning of the tank is facilitated.

In applications intended for a non-woven surface, it is only necessary to neutralize the electrostatic grids in order to obtain a flat deposit on a non-adhesive support, to spray with a binder solution and then to compress the whole. The advantage of a device of this kind is that it makes it possible to obtain a perpendicular distribution of the velours type, and a flat tangled distribution of the non-woven type (felt, etc.).

However, the construction of the receptacles **25** intended to be arranged on the links **21** of the chain **20** so as to be able to be elastically adapted to the positions taken-up by the said links is relatively complicated and expensive. In addition, it is frequently advantageous for a part of the fibers to be able to pass freely through the links of the chain so as to fall on and through the screen **15**, and especially those fibers which have collected on and between the links during the course of their forward movement.

FIGS. 3 to 7 illustrate constructions of this kind, by way of example.

In all these figures, there has been shown the portion of the chain **20** carrying the brushes **11** and receptacles **25** when the brushes are applied against the screen **15**, the chain moving in the direction of the arrow f'_4.

In FIG. 3, receptacles **25** are arranged in such manner that each link **29** carries a receptacle, the bottom **32** of which extends from the brush **11** up to a distance s from the articulation **22** between this link and that preceding. Each receptacle comprises edges **31** and **31'**. The bottom **32** is fixed by any desired means on the corresponding link, either directly or at a distance e from the link so as to permit recovery of the fibers and/or easy and effective maintenance of the chain.

The edge **31** forms an angle β of 100° to 120° with the bottom and in such manner that this edge is substantially parallel to the axis of the brush **11**. The edge terminates at a height h above the screen **15**, such that for any position of the link with respect to the screen, effective disintegration of the fibers is obtained. The edge **31'** forms with the bottom **32** an angle γ, the value of which is chosen so as to permit the said edge **31'** to terminate at about the same height h from the screen as the edge **31**, while leaving a passage p for the fibers F towards the screen **15**.

FIG. 4 shows an alternative form of the device illustrated in FIG. 3. In this form of construction of the receptacle **25**, the edge **31'** is arranged at right angles with respect to the bottom **32** and thus permits a larger section of passage p available for the fibers F.

In the alternative form shown in FIG. 5, the edge **31'** is entirely eliminated, this solution being particularly economical and effective for certain manufactures.

FIG. 6 shows a form of construction in which a receptacle **25'** is associated with the receptacle **25** identical with that described with reference to FIG. 5. This receptacle **25'** is arranged on the side opposite to the direction f'_4 of movement of the chain **20**. Receptacle **25'** is provided with a bottom **32'** and an edge **31'** on the brush side forming a right angle with the bottom **31'**, and

the receptacle 25' is open on the articulation side 22 of the link 21 of the chain 20.

The two free-boards of the bottoms 31 and 31' of the parts 25 and 25' of the receptacle are arranged at the same distance *s* from each side of the articulation 22 between two links, leaving a section of passage *p*.

FIG. 7 shows another form of construction of a receptacle comprising two parts 25 and 25' having edges 31' and 31'' which form a right angle with the bottoms 32 and 32'. These edges are arranged on each side of the articulation 22, between two links, and leave a passage *p*, no edge being provided on the brush side.

The forms of construction of the receptacles shown in FIGS. 3 to 7 are only described by way of examples. FIG. 8 shows by way of example, the application of a receptacle 25 in accordance with FIG. 3 to a device permitting the application of the method according to the invention.

Single receptacles 25 made of ordinary sheet steel for example, are mounted on the links 21 so as to permit a passage *p* for the fibers F.

The utilization of receptacles in accordance with the invention further enables the dosing device to be mounted at any desired place above the conveyor chain 20.

The method and the apparatus described in the foregoing text and illustrated in the drawing are only examples and variations and modifications of the method and apparatus described and shown remain within the scope of the invention.

What I claim is:

1. A method for the distribution of natural, artificial and synthetic textile fibers for all non-woven products, said method comprising advancing a plurality of brushes in spaced relation on a screen, positioning the brushes so that they elastically contact the screen with substantially constant pressure, advancing discrete quantities of fiber together with the brushes and independently thereof, and feeding the fiber to the brushes as they pass on the screen so that the fiber is caused to pass through the screen by the action of the brushes.

2. A method as claimed in claim 1 further comprising feeding fiber directly onto the screen for passage through the screen under the action of the brushes in supplementation to the advancing discrete quantities of fiber.

3. A method as claimed in claim 1 wherein the brushes are formed to extend over the entire width of the screen and are inclined rearwardly and downwards relative to the direction of advancement.

4. Apparatus for the distribution of natural, artificial or synthetic fibers of all non-woven products, said apparatus comprising a screen for the passage therethrough of fibers, a distributor device including conveyor receptacles for advancing discrete quantities of fiber along said screen and a plurality of inter-spaced brushes elastically in contact with the screen, said brushes being coupled to said distributor device for movement therewith to receive a respective discrete quantity of advancing fiber therefrom and cause the fiber to pass through the screen.

5. Apparatus as claimed in claim 4 comprising dosing means for supplying said discrete quantities of fiber to said distributor device.

6. Apparatus as claimed in claim 5, in which said distributor device comprises an endless conveyor chain carrying said plurality of brushes and said conveyor receptacles for receiving the discrete quantities of fibers supplied by said dosing means, and means for driving the chain in relation to the operation of the dosing means.

7. Apparatus as claimed in claim 6, in which each said brush is inclined at an angle of 15° to 20° with respect to the vertical and in a direction opposite to that of the forward movement of said chain.

8. Apparatus as claimed in claim 6, in which said conveyor receptacles are mounted on said chain, one receptacle being provided for each said brush.

9. Apparatus as claimed in claim 8, in which each said receptacle is constituted by a bottom and elastic sides inclined at about 120° with respect to the bottom, the length of said sides being such as to permit the brushes to project beyond the sides of said receptacles.

10. Apparatus as claimed in claim 8, in which each said receptacle extends from the corresponding brush to a certain distance from the articulation between one link of said conveyor chain and the next adjacent link of said chain.

11. Apparatus as claimed in claim 8, in which said receptacle is provided with a side adjacent its brush inclined at an angle such that said side is substantially parallel to the fixing axis of said brush.

12. Apparatus as claimed in claim 8, in which said receptacle is provided with a side adjacent its brush and a second opposite side, said second side forming an obtuse angle with the bottom of said receptacle.

13. Apparatus as claimed in claim 8, in which said receptacle is provided with a side adjacent its brush and a second opposite side, said second side forming a right angle with the bottom of said receptacle.

14. Apparatus as claimed in claim 10, in which each said receptacle is formed in two parts, one part being disposed on a link of said chain in front of the corresponding brush and the other on the previous link of said chain disposed at the rear of said brush, each of said two parts of the receptacle being provided with a side adjacent the brush.

15. Apparatus as claimed in claim 10, in which each said receptacle is formed in two parts, one part being disposed on a link of said chain in front of the corresponding brush and the other on the previous link of said chain disposed at the rear of said brush, each of the two parts of said receptacle being provided with a side adjacent the articulation between the two chain links carrying the two parts of said receptacle.

16. Apparatus as claimed in claim 10, in which said receptacles are fixed at a certain distance apart from and parallel to the links of said conveyor chain.

17. Apparatus as claimed in claim 10, in which said receptacles are fixed directly on the links of said chain.

18. Apparatus as claimed in claim 6, in which said conveyor chain comprises a plurality of interconnected links, each of which carries a brush in its central portion.

19. Apparatus for the distribution of natural, artificial or synthetic fibers for all non-woven products, said apparatus comprising a dosing device mounted at the outlet of a fiber supply hopper, a distributor for receiving fiber from said dosing device, said distributor comprising an endless conveyor chain including interconnected links, said chain having upper and lower branches, a screen located below the lower branch of said chain, a brush carried by each link of the chain and inclined with respect to the vertical in a direction opposite to that of the forward movement of said chain, and receptacles mounted on said chain, one receptacle per brush, for conveying measured quantities of fibers supplied by said dosing device and depositing the fibers onto the screen whereat the fibers are subjected to the action of the following brushes, and a power driven variable speed reduction device for driving said chain in relation with said dosing device.

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