(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 994 209 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.04.2000 Bulletin 2000/16

(51) Int. Cl.[7]: **D06B 3/26**, D06C 19/00

(21) Application number: **98124108.6**

(22) Date of filing: **18.12.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **17.09.1998 IT TO980793**

(71) Applicant: **FLAINOX S.r.l.**
I-13010 Quaregna (Biella) (IT)

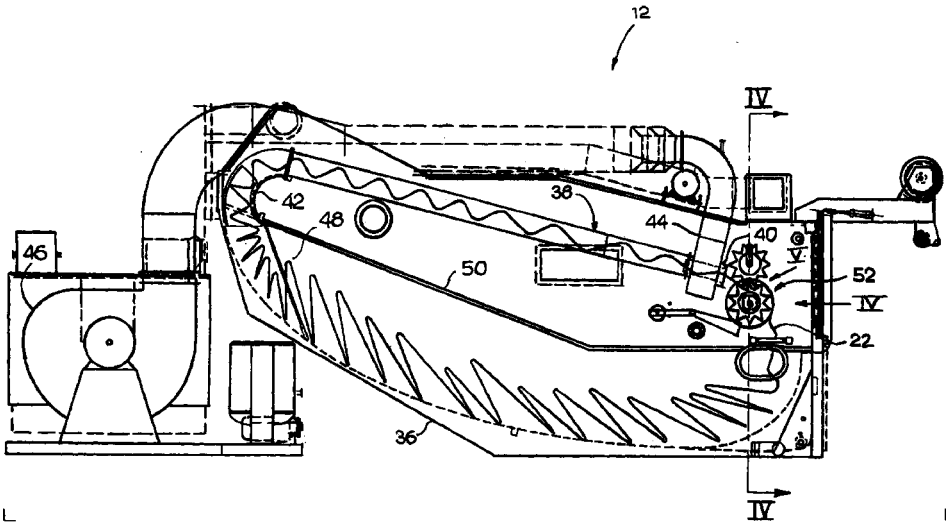
(72) Inventor: **Bozzo, Giovanni**
13854 Quaregna (Biella) (IT)

(74) Representative:
Marchitelli, Mauro et al
Buzzi, Notaro & Antonielli d'Oulx
Corso Fiume 6
10133 Torino (IT)

(54) A method and a machine for finishing of fabrics

(57) A method for finishing of fabrics, in which at least one fabric strand (22) is inserted into a pneumatic conveying pipe (38) supplied with a high speed air flow, so as to drag said strand (22) from a first to a second end of a tank (36) in which said strand (22) collects in a series of movable laps. Said fabric strand (22) is slowed down upstream of said conveying pipe (38), so that the fabric strand (22) advances in the conveying pipe (38) at a speed substantially lower than the speed at which it would be dragged by said air flow in the absence of said slowing down.

Fig_3



EP 0 994 209 A1

Description

[0001] The present invention relates to a method and a machine for finishing fabrics in strand form.

[0002] More specifically, the invention refers to finishing treatments in which at least one strand of fabric is inserted into a pneumatic conveying pipe which is supplied with a high speed air flow, so as to drag the strand from a first to a second end of a tank in which the fabric strand collects in a series of movable laps. From EP-A-0215745 and EP-A-0312509 finishing treatments are known in which a pneumatic conveying pipe is used for projecting with high speed the fabric strand against a grill-shaped wall placed in front of the exit of the conveying pipe. In accordance with what has been disclosed in these documents, the treatment is obtained by a virtue of a violent impact of the fabric against the grill, the pneumatic pipe being only a means for dragging the fabric at high speed.

[0003] The object of the present invention is to provide an improved method and machine which increase the efficiency of the treatment. A further object of the present invention is to provide a finishing system which can operate continuously.

[0004] According to the present invention, these objects are achieved by a method and a machine having the features forming the subject of the claims.

[0005] The present invention is essentially based on the idea of slowing down the fabric strand upstream of the pneumatic conveying pipe, so that the fabric strand advances in the conveying pipe with a substantially lower speed with respect to the speed at which the strand would be dragged by the air flow in the absence of such slowing down.

[0006] The treatment of the strand is not obtained by an action of violent projection of the fabric against a wall as provided by the prior art but, on the contrary, by shaking the fabric into the conveying pipe. Such shaking is obtained by virtue of the fact that the fabric advances with a very low controlled speed, for instance of about 50 m/1' whereas the air flow in the absence of the slowing down of the fabric would tend to drag the fabric at a substantially greater speed, for instance of about 800 m/1'. The difference between the speed of the air flow and the speed of advance of the fabric generates a continuos shaking of the fabric which determines an intense and effective action of softening of the fibers.

[0007] Since the fabric advances in the finishing machine according to the invention with a very slow speed with respect to the traditional systems, it is possible to carry out a continuos treatment with fabric supplied from and collected on rolls since the time of permanence of the fabric in the finishing machine is sufficient for obtaining a complete treatment.

[0008] Characteristics and advantages of the present invention will become clear in the course of the detailed description which follows, given purely by way of non-limiting example, with reference to the attached drawings, in which:

- figure 1 is a schematic lateral view of a continuos treatment system using a finishing machine according to the present invention,
- figure 2 is a plan view of the system of figure 1,
- figure 3 is a schematic cross-sectional view taken along the line III-III of figure 2,
- figure 4 is a cross-sectional view taken along the line IV-IV of figure 3,
- figures 5 and 6 are lateral views in greater scale of the part indicated by the arrow V in figure 3,
- figure 7 is a view in greater scale of the detail indicated by the arrow VII in figure 6, and
- figure 8 is a cross-sectional view taken along the line VIII-VIII of figure 7.

[0009] With reference to figures 1 and 2, a continuos system for finishing fabrics is indicated 10.

[0010] The system 10 comprises as a main element a finishing machine 12 which will be disclosed in detail in the following. The system 10 further comprises a feeding station 14 and a collecting station 16. In the feeding station 14 a roll 18 of fabric to be treated is carried in a freely rotatable manner by a support 20. The fabric 22 coming from the roll 18 forms a strand which advances into the finishing machine 12 where it is subjected to a finishing treatment. A strand 22' of treated fabric (shown in broken lines in figures 1 and 2) comes out from the machine 12 and passes through a strand opener 24 including, in a way per se known, a rotating sleeve 26. Cylinders 28 with herringbone scorings complete the opening of the strand. The opened fabric is then collected on a roll 30 which is free to rotate on a support 32 arranged in the collecting station 16. The roll 30 is rotated with a constant surface speed by a motor-driven roll 34 pressed on the outer surface of the roll under formation. In the collecting station 16 a second support 32' with an associated motor-driven roll 34' is preferably provided. Therefore, it is possible to start collecting the fabric on a new roll as soon as the previous roll has been completed, without the need to stop the system.

[0011] With reference to figure 3, the finishing machine 12 comprises a closed tank 36 in which is provided at least one pneumatic conveying pipe 38 extending from a first to a second end of the tank 36. Generally, the machine 12 will be provided with two or more conveying pipes 36 arranged side by side. The number and the relative disposition of the pneumatic conveying pipes 38 can be varied depending on the specific needs. The pneumatic conveying pipe 38 has an inlet section 40 and an outlet section 42. The inlet section 40 is connected to a pipe 44 for supplying a high speed air flow coming from a fan 46 placed outside the tank 36. The air flow can be heated or not and its speed can be adjusted by varying the speed of rotation of the fan 46. If the machine 12 is provided with a plurality of convey-

ing pipes 38, as it is normally the case, they are preferably connected in parallel to each other to the same fan 46. The outlet section 42 of the pneumatic conveying pipe 38 has an arcuate shape which terminates tangent to the bottom wall of the tank 36 and opens into a folding chamber 48. If several conveying pipes 38 are provided, the tank 38 will have longitudinal walls 50 which form a plurality of side by side folding chambers.

[0012] Upstream of the pneumatic conveying pipe 38 is placed a feeding device 52 which draws the fabric strand 22 from the folding chamber 38 and sends it to the inlet section 40 of the conveying pipe. The purpose of the feeding device 52 is to advance the strand 22 at a speed substantially lower than the speed at which the fabric strand 22 would be dragged by the air flow in the absence of the slowing dawn carried out by the feeding device 52. During the operation, the feeding device 52 advances the fabric strand 22 at a speed variable for instance from 20 to 60 m/1' whereas the dragging air flow would tend to drag the fabric, in the absence of a slowing down, to a speed variable from 800 to 1000 m/1'. In practice, the fabric strand is braked by the feeding device 52. Consequently, it is subjected into the conveying pipe 38 to an intense shaking action which continuously opens and closes the strand. It is this shaking action produced by the air flow which carries out the finishing treatment on the fabric by producing a softening of the fibers which gives a particularly good quality to the surface of the fabric.

[0013] The fabric which comes out from the outlet section 42 of the pneumatic conveying pipe 38 collects in the folding chamber 48 in a series of movable laps. From the folding chamber 48 the fabric strand can be sent to a further pneumatic conveying pipe placed side by side to the first one. In the example shown in figure 2, the machine 12 is provided with three conveying pipes placed side by side. The fabric strand runs subsequently through the three pipes and when it comes out from the last pipe the treatment is over. The strand coming out from the folding chamber 48 associated to the last pipe is sent to the outlet of the machine and to the collecting station 16.

[0014] Although the finishing machine 12 according to the present invention is particularly advantageous for a continuos treatment with both feeding and collection on a roll, it can also be used for discontinuous treatments, wherein each conveying pipe 38 and the folding chamber 48 associated thereto receive a respective fabric strand with head and tail sewn to each other. As an alternative, the machine 12 could also operate in a discontinuous manner but with only one fabric strand whose head end tail are sewn to each other, which runs subsequently through all the conveying pipes of the machine 12.

[0015] The feeding device 52 can be formed in different ways provided that it is able to slow down the advance of the fabric strand through the conveying pipe 38. In the following a preferred embodiment of the feeding device 52 will be disclosed, which however does not limit the present invention.

[0016] With reference to figures 4 to 6, the feeding device 52 comprises a pair of cylinders 54, 56 with axes parallel to each other, which extend substantially for the whole width of the machine 12. Preferably, the two cylinders have matching outer profiles, for instance star-shaped. The lower cylinder 54 is rotated by an electric motor 58 (see figure 5) by means of a belt or chain 60. The upper cylinder 56 is movable with respect to the lower cylinder 54 between a lowered position shown in figure 5 and a raised position shown in figure 6. In the lowered configuration, the star-shaped profiles of the cylinders 54 and 56 are not in reciprocal contact. Therefore, the upper cylinder 56 is not driven in rotation by the mechanical contact with the lower cylinder 54. A transmission including a toothed belt 52 cooperating with two toothed pulleys 64, 66 fixed respectively to the lower cylinder 54 and to the upper cylinder 56 is provided for driving in rotation the upper cylinder 56 with a speed synchronous with respect to the speed of rotation of the lower cylinder 54. The toothed belt 62 is also wound on a pair of idle transmission pulleys 68 carried by a pair of arms 72 articulated about a fixed axis 73. The outer ends of the arms 72 are articulated to a second pair of arms 74 articulated to a pneumatic or elastic tightening element 76 which exerts on the arms 74 a force in the direction indicated by the arrow 78.

[0017] As shown in greater detail in figures 7 and 8, the upper cylinder 56 is fixed to a shaft 80, each end of which is slidably mounted into a vertical slot 82 formed in a stationary support plate 84. Each end of the shaft 80 is rotatably carried by a plate 84 (figure 8) carried by a cross member 86 which can be moved in a vertical direction by means of a pair of actuators 88. When the actuators are extended, the upper cylinder 56 is in a raised position and the feeding device 52 is inoperative. In this configuration it is possible to easily pass the fabric between the cylinders 54, 56 for inserting the fabric in the conveying pipe 38. When the actuators 8 are lowered, the upper cylinders 56 gets closer to the lower cylinder 54. Slackening of the belt 62 is compensated by the downward movement of the transmission pulley 68 under the force produced by the tightening element 76. The toothed belt 62 ensures that the cylinders 54 and 56 rotate with concordant and synchronous speed even without a direct mechanical contact between the surfaces of the cylinders, for preventing damages to the fabric. The shape of the cylinders 54, 56 permits to obtain an efficient grasp on the fabrics strand without subjecting the strand to a strong compression force which could produce permanent signs especially on delicate fabrics.

[0018] As it has been mentioned above, the device 52 could be replace by any other system adapted to brake the fabric strand for enabling the strand to advance at a controlled speed in the conveying pipe 38.

Claims

1. A method for finishing of fabrics, wherein at least one fabric strand (22) is inserted into a pneumatic conveying pipe (38) supplied with a high speed air flow, so as to drag said strand (22) from a first to a second end of a tank (36) in which said strand (22) collects in a series of movable laps, characterized in that said fabric strand (22) is slowed down upstream of said conveying pipe (38), so that the fabric strand (22) advances in the conveying pipe (38) at a substantially lower speed with respect to the speed at which it would be dragged by said air flow in the absence of said slowing down.

2. A method according to claim 1, characterized in that the fabric strand (22) is slowed down by passing said strand (22) between a pair of counter-rotating cylinders (54, 56).

3. A method according to claim 2, characterized in that said counter-rotating cylinders (54, 56) are forced to rotate at a controlled speed.

4. A method according to claim 1, characterized in that a continuos fabric strand (22) coming from a roll (18) is treated by passing the strand with controlled speed through said pneumatic conveying pipe (38) and is subsequently opened and collected on a roll (30).

5. A machine for finishing fabric in strand form, comprising:

   - a tank (36) in which at least one strand (22) of fabric to be treated collects in series of movable laps,
   - at least one pneumatic conveying pipe (38) supplied with a high speed air flow for dragging the fabric strand (22) from a first to a second end of said tank (36), and
   - means (52) for feeding at least one fabric strand (22) to an inlet section (40) of said conveying pipe (38),
     characterized in that said feeding means (52) are provided for slowing down the advance of said fabric strand (22) to a speed substantially lower than the speed at which the fabric would be dragged by said air flow in the absence of said slowing down.

6. A machine according to claim 5, characterized in that said feeding means (52) comprises a pair of counter-rotating cylinders (54, 56) which are forced to rotate at a controlled speed.

7. A machine according to claim 6, characterized in that said cylinders (54, 56) have respective outer surfaces with profiles at least partially matching with each other.

8. A machine according to claim 7, characterized in that in operation said cylinders (54, 56) are maintained in a relative position in which there is no contact between the respective outer surfaces.

9. A continuos system for finishing fabric, characterized in that it comprises a station (14) for feeding fabric from a roll, a station (16) for collecting fabrics on a roll and a machine for finishing fabric in strand form according to one or more of the preceding claims.

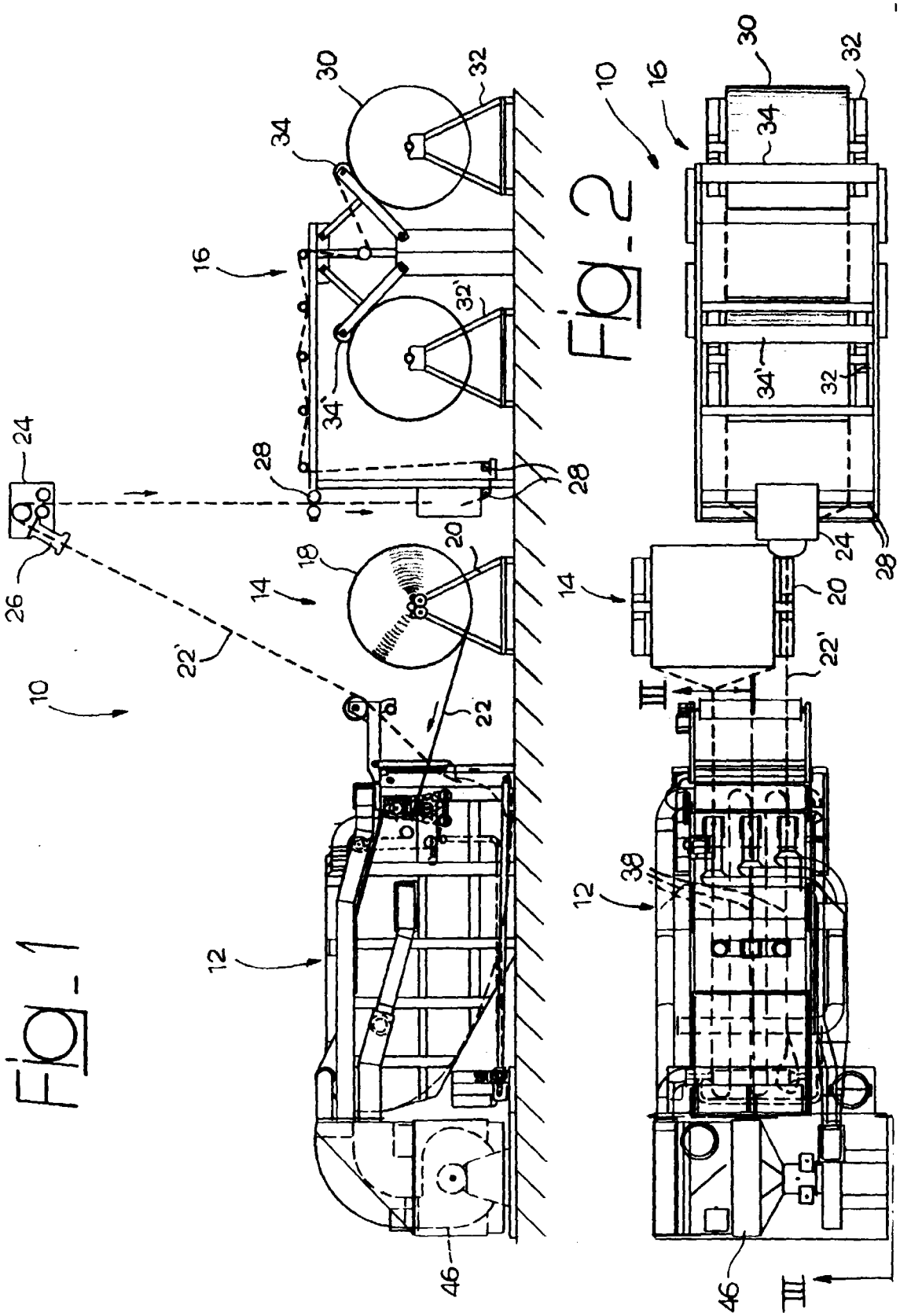

10
12
14
16
18
20
22
22'
24
26
28
30
32
32'
34
34'
46

Fig. 1

10
12
14
16
20
22'
24
28
30
32
34
34'
38
46
III
III

Fig. 2

Fig.3

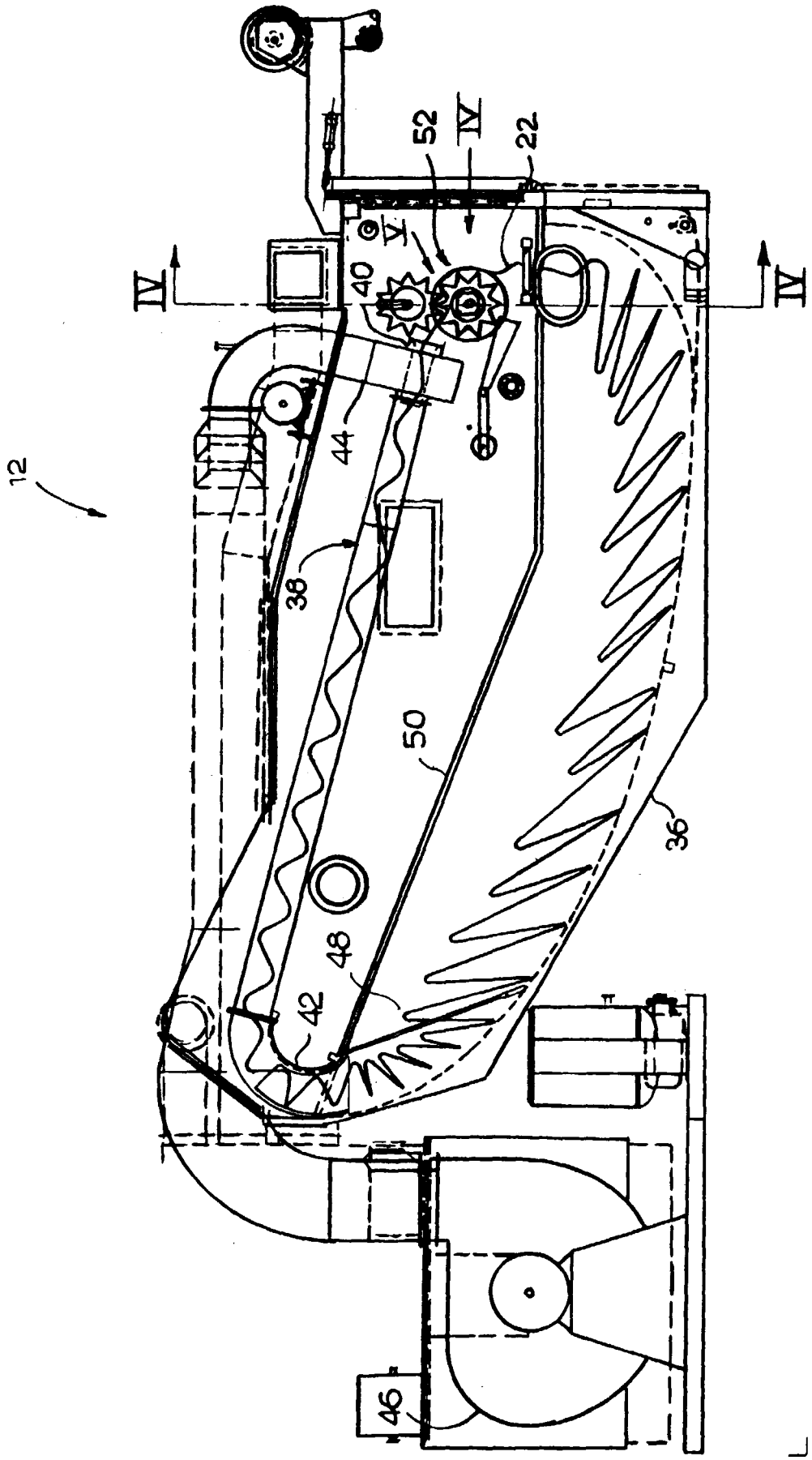


Fig_4

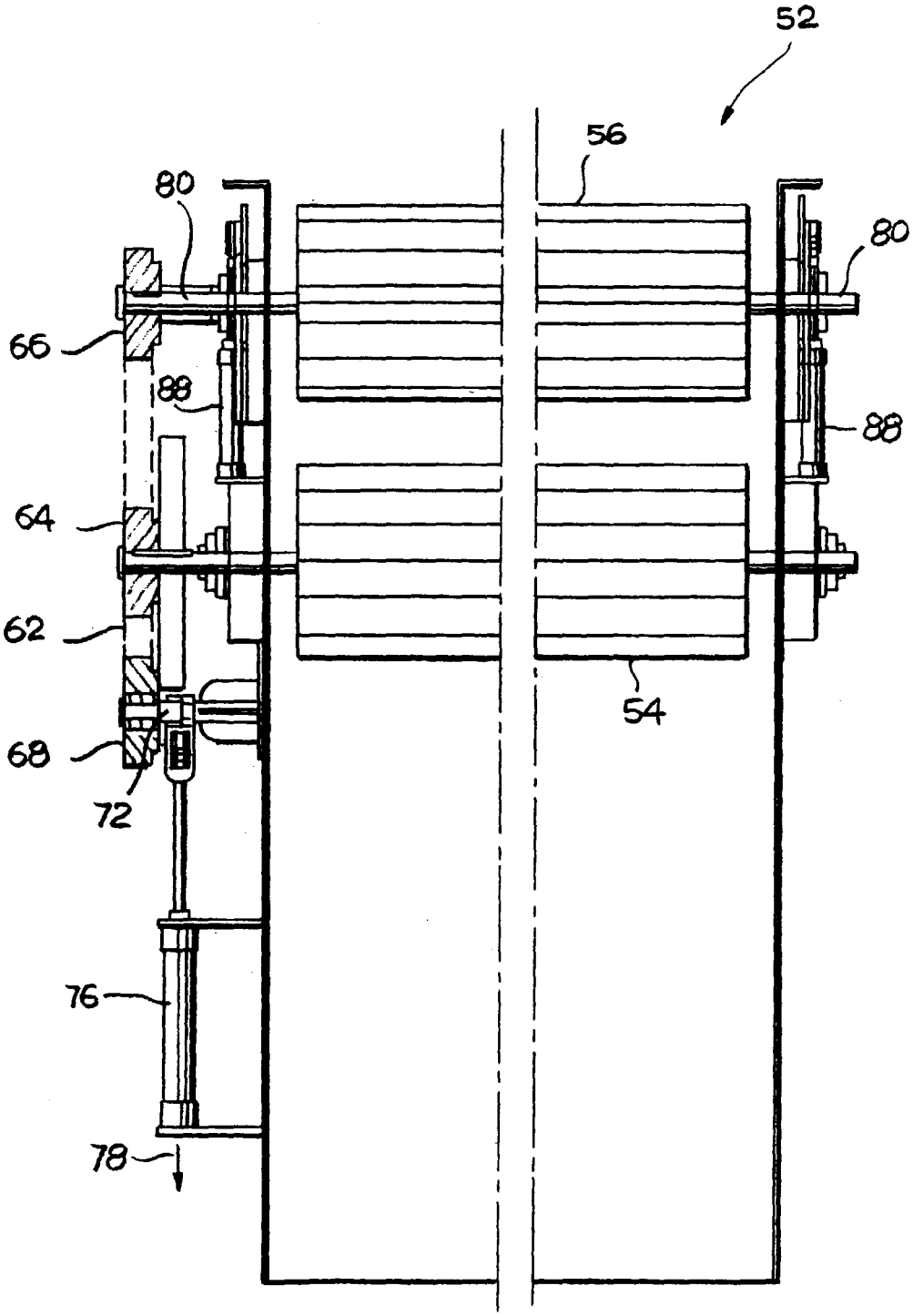


Fig. 5

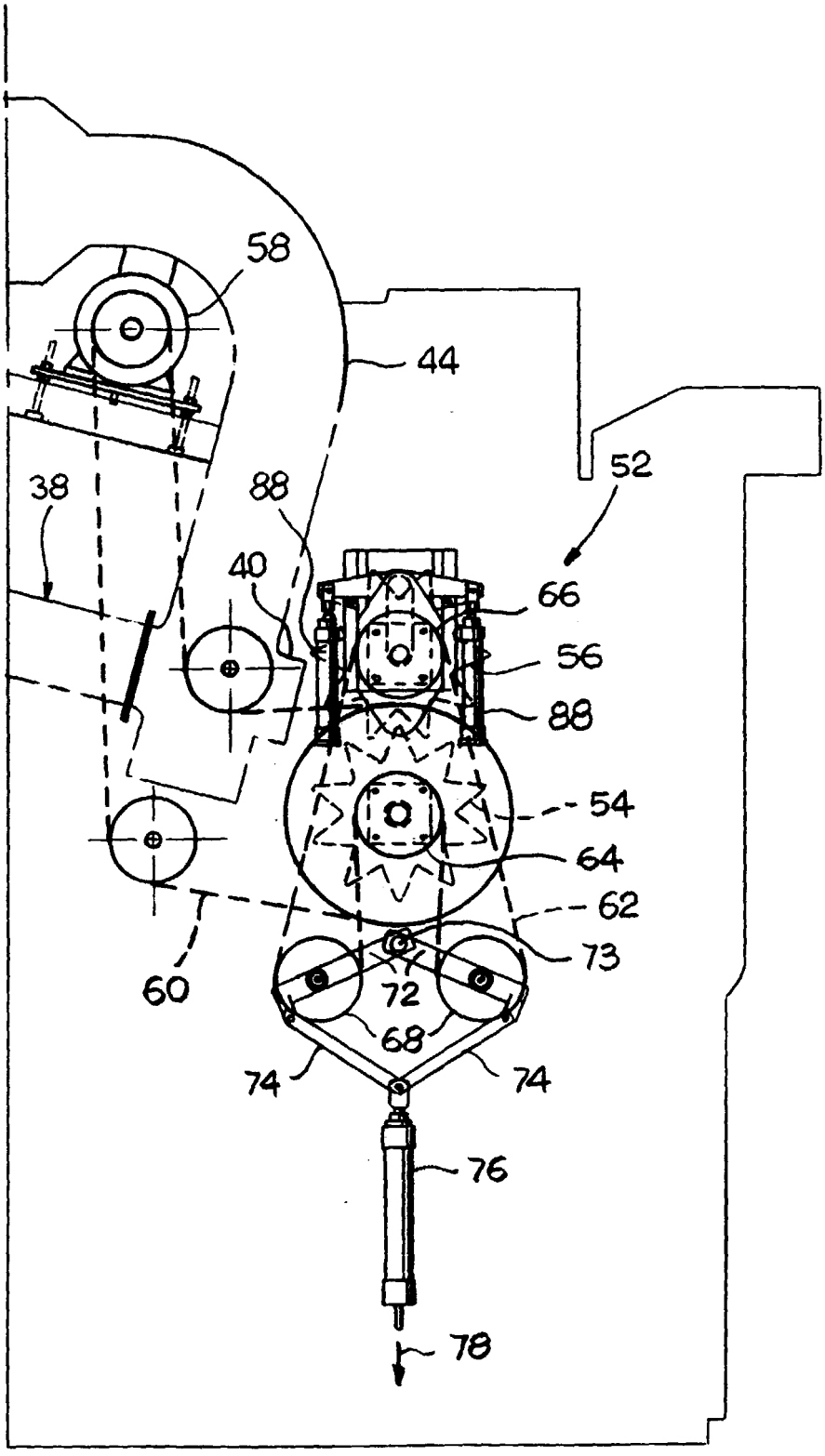


Fig.6

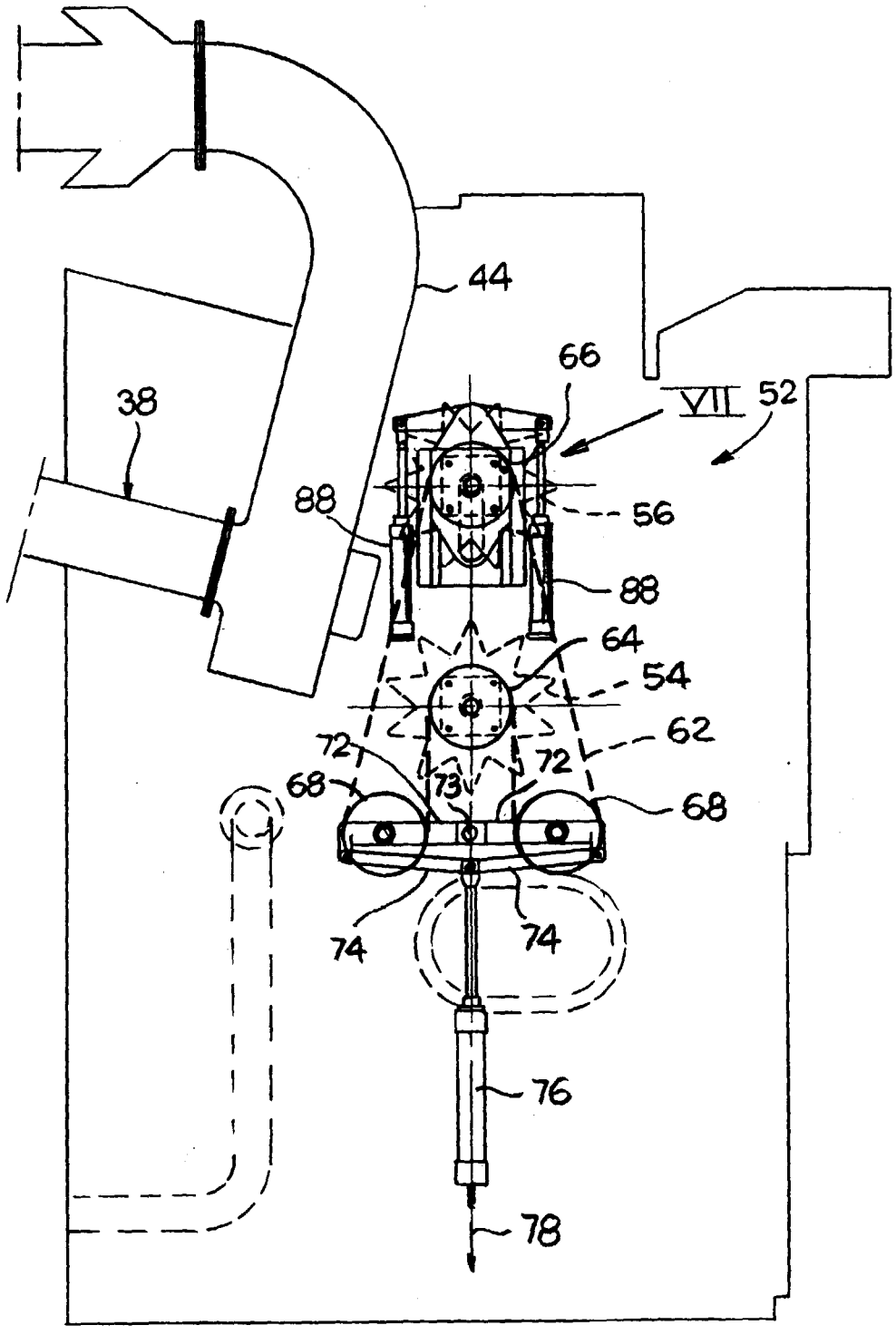


Fig. 7

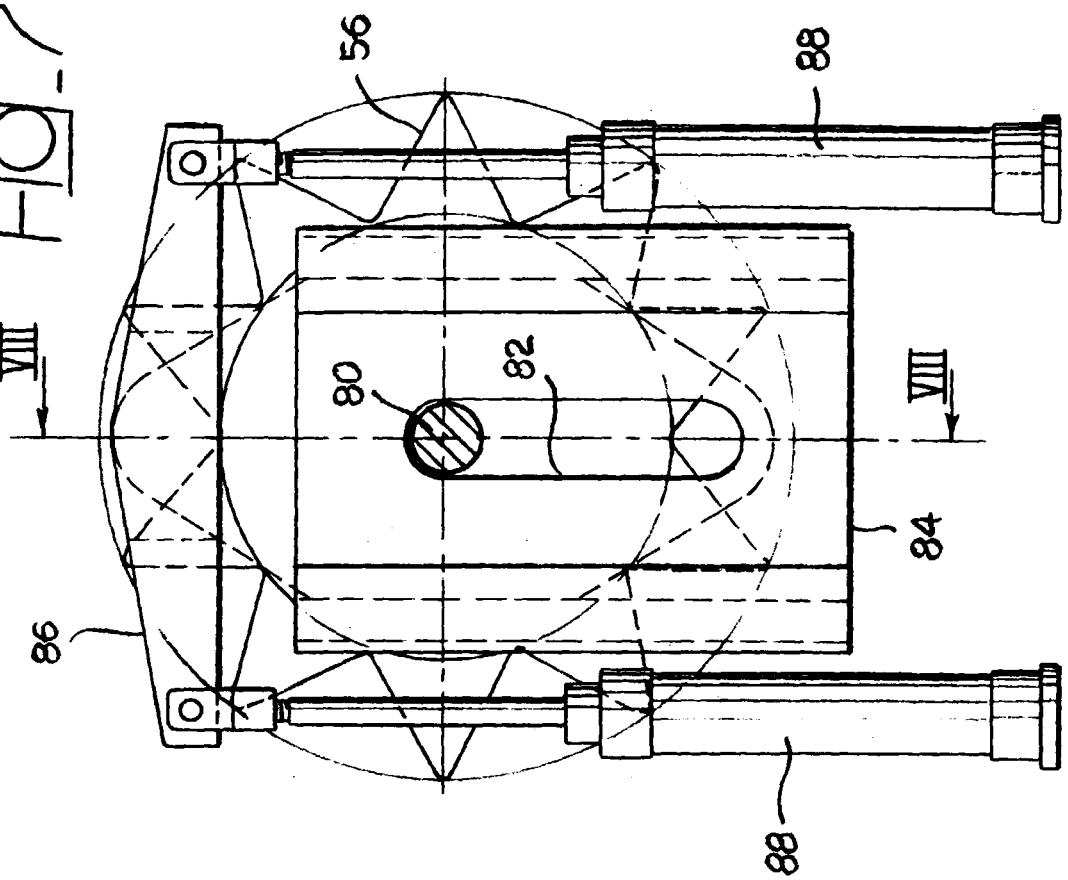
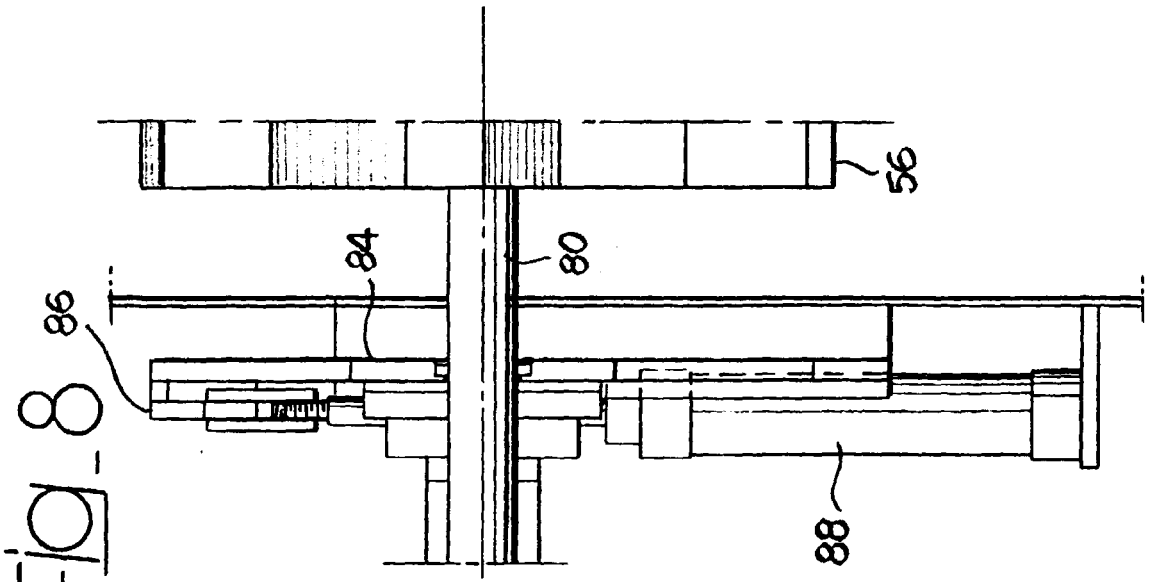


Fig. 8



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 12 4108

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
D,X	EP 0 215 745 A (OFFICINA MECCANICA BIANCALANI & C.) 25 March 1987 (1987-03-25) * claim 1; figure 1 * * page 5, line 23 - page 6, line 5 *	1-3,5,6	D06B3/26 D06C19/00
A	US 3 330 134 A (W.T. CARPENTER) 11 July 1967 (1967-07-11) * figure 1 *	9	
A	US 4 055 003 A (G.H. SACK) 25 October 1977 (1977-10-25)		

TECHNICAL FIELDS SEARCHED

D06B
D06C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 July 1999	Goodall, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 12 4108

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-07-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0215745 A	25-03-1987	CN 1018464 B	30-09-1992
		PT 83249 A,B	01-09-1986
		US 4766743 A	30-08-1988
US 3330134 A	11-07-1967	NONE	
US 4055003 A	25-10-1977	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82