



(11) **EP 1 431 436 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
14.02.2007 Bulletin 2007/07

(51) Int Cl.:
D06B 23/10 *(2006.01)* **D06B 23/20** *(2006.01)*

(21) Application number: **03425718.8**

(22) Date of filing: **04.11.2003**

(54) **Machine for dyeing textile materials**

Maschine zum Färben von Textilmaterialien

Machine de teinture des matières textiles

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

(30) Priority: **20.12.2002 IT FI20020253**

(43) Date of publication of application:
23.06.2004 Bulletin 2004/26

(73) Proprietor: **Tecnorama S.r.l.**
59100 Prato (IT)

(72) Inventor: **Scatizzi, Mario**
51030 Pistoia (IT)

(74) Representative: **Strasser, Wolfgang**
Patentanwälte
Strohschänk, Uri, Strasser & Keilitz
Innere Wiener Strasse 8
81667 München (DE)

(56) References cited:
EP-A- 0 897 031 EP-A- 1 174 535
EP-A- 1 288 364 US-A- 6 105 636

- **PATENT ABSTRACTS OF JAPAN** vol. 015, no. 337
(C-0862), 27 August 1991 (1991-08-27) -& JP 03
130459 A (NISSEN CORP), 4 June 1991
(1991-06-04)
- **PATENT ABSTRACTS OF JAPAN** vol. 017, no. 243
(C-1058), 17 May 1993 (1993-05-17) -& JP 04
370266 A (SUMITOMO CHEM CO LTD), 22
December 1992 (1992-12-22)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 431 436 B1

Description

[0001] The present invention refers to a machine for carrying out dyeing operations on textile materials.

[0002] Dyeing machines are known to comprise a platform onto which more vessels are positioned in a preset order, said vessels being able to contain predetermined amounts of products which contribute to form, suitably metered, dyeing baths within suitable tanks. Inside each tank a basket is manually inserted which contains the material to be dyed, the same basket being taken out, also manually, after a preset time.

[0003] EP 1174535 discloses an apparatus for the automated preparation of solutions comprising a platform upon which containers for solid and liquid products can be positioned and a carriage movable onto said platform. The apparatus also comprises means, associated to said carriage, for moving the containers of liquid products and for moving and actuating the containers of solid products.

[0004] EP 0897031 discloses an apparatus for dyeing textile materials comprising mean within a first station for the drawing and metering of dyeing solutions and for the admission thereof into corresponding containers intended to feed one or more chambers for dyeing the materials disposed inside baskets. Said baskets are able to be connected in a stable but removable way to corresponding stirrer means located in correspondence of the chambers in a second station, said containers being hydraulically connected with the respective materials-dyeing chambers.

[0005] JP3130459 discloses a device for carrying fiber to be treated, in particular to enable the shortening of conveying time by positioning the center shaft of a turning arm on the central axis of arrangement of a treating machine group and carrying out the motion of a chuck device attached to the arm along a radial direction to the treating machine on the same arc line.

[0006] The US Patent No. 6105636 describes a machine comprising a horizontal platform upon which the vessels containing the basic products and the means associated with a movable carriage located above said platform, are positioned according to a program to remove the products from said vessels and meter the same products within other containers inside which the solutions to be delivered to the dyeing tanks are formed.

[0007] The existing machines, although able to automate in part the dyeing cycle, require the intervention of an operator for completing the cycle.

[0008] The main object of the present invention is to eliminate or at least greatly reduce the above drawback.

[0009] This result has been achieved, according to the invention, by adopting the idea of making a machine having the characteristics disclosed in claim 1. Further characteristics being set forth in the dependent claims.

[0010] The present invention makes it possible to significantly raise the automation level of the dyeing cycle, thus releasing the operators from exacting operations, such as the loading of material-holding baskets into the

dyeing tanks and, respectively, the unloading thereof from the same tanks, so as to reduce the risk related to possible errors in handling the baskets, and increase the safety and reliability of the cycle.

[0011] These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Fig. 1A is a schematic plan view of a machine according to the invention;
- Fig. 1B is a schematic side view of the machine of Fig. 1;
- Fig. 2 shows the carriage with the means for metering the products and the means for grasping the material-holding means;
- Fig. 3 is a schematic view in diametral section of a material-holding basket;
- Figs. 4A-4F show schematically a sequence of the operating steps relating to the loading of baskets into the tanks;
- Figs. 5A-5E show schematically a sequence of the operating steps relating to the metering of baskets within the dyeing tanks;
- Fig. 6 shows schematically a vessel with a corresponding pipette;
- Fig. 7 is a schematic view in diametral section of a tank;
- Fig. 8 is a block diagram of the programmable system for operating the machine;
- Fig. 9 shows schematically a further embodiment of the carriage (5);
- Figs. 10A-10D show schematically a sequence of steps relating to the use of the means for the removal and delivery of powdered substances.

[0012] Reduced to its basic structure, and reference being made to Figs. 1-5E of the accompanying drawings, a machine according to the invention comprises a stationary structure (1) with a platform (10) on which more vessels (2) are positioned in correspondence of preset locations, each vessel (2) being provided for containing a liquid product that contributes to form a dyeing bath, as described later on.

Associated with the same structure (1) are more dyeing tanks (3) also disposed in correspondence of preset locations.

Moreover, the said structure (1) exhibits an area (11) on which, in correspondence of preset locations, more material-holding baskets (4) are positioned.

[0013] According to the example shown in Fig. 1A, the vessels (2) and baskets (4) are on opposite sides with respect to the tanks (3), and the structure (1) is made of one body having a development mostly longitudinal.

Associated with each vessel (2) is a corresponding pipette (20), in much the same way as described in the

above mentioned US Patent No. 6105636 to which reference can be made for further details: each pipette (20) comprises a needle (21) which is to result at right angle within the liquid of the respective vessel (2), a plunger (22) allowing the liquid drawn therefrom to be delivered through the needle (21) and exhibiting a hold portion (23) with peripheral collar-like surface (24) allowing plugging the vessel when the pipette is inserted therein.

[0014] Each tank (3) may be, for example, of a type comprising a cylindrical chamber (30) wherein a material-holding basket (4) is to be disposed. Mounted inside said chamber (30) is a blade impeller (36) driven into rotation about its longitudinal axis (coinciding with the longitudinal axis of the tank) by an electric motor (32) which is engaged to said impeller via a magnetic transmission (33, 34): the rotation of the flange (35) borne by the motor (32) and wherein the magnets (33) are positioned, is cause for the rotation of the impeller (36) located inside the chamber (30). Disposed in the base of the impeller (36) and engaged solid thereto are the magnets (34) coupled to magnets (33). The tanks are provided with electric resistors (37) able to heat the dyeing bath which forms therein, cooling chambers (38) through which water or other cooling fluid (A) is made to run, and with a section (39) for discharging the bath. Finally, disposed on each tank (3) is a lid (300) able to be moved in closing and respectively opening position by means of corresponding actuators (not shown for the sake of clarity in the figures of the attached drawings). Indicated by (31) is a bath limiter, that is, a body centrally disposed in the tank to reduce the volume available for the bath, thereby reducing the required amount thereof for use.

[0015] Each material-holding basket (4) comprises a perforated tubular body (40) on the outer surface of which the material (M) to be dyed is disposed, and on the base of which a rim (41) is formed to allow the hold thereof, as will be described later.

[0016] Acting on said structure (1) is a motor-driven carriage (5), supported by the same structure via corresponding guides (50, 51) developed parallel and across thereto, the said carriage being associated with:

- means (6) for grasping, handling and activating the pipettes (20);
- means (7) for grasping and handling the baskets (4).

[0017] The said means (6) are of a type described in the US Patent No. 6105636, that is, they comprise a gripper (60) able to engage the portion (23) of the pipettes (20), an element (61) associable with the plunger (22) so as to be driven into translation upwardly (liquid suction step) or downwardly (step of delivering the liquid previously sucked up) under control of a corresponding actuator (62), and an actuator (63) with vertical axis with which a shelf (64) is connected for the support of the actuator (62), of element (61) and of gripper (60).

[0018] The said means (7) are positioned on the side opposite to carriage (5), with respect to the means (6),

and comprise an actuator (70) having vertical axis and a gripper (71) associated with said actuator. The two jaws of the gripper (71) have an end portion (72) suitably shaped so as to present a step (73) on the side facing upwards to allow hooking the baskets (4) from the inside thereof, in correspondence of the rim (41).

[0019] The said carriage (5), being mounted on the said guides (50, 51), can be moved, by the means (6, 7) associated therewith, to any useful point of the structure (1), that is, in correspondence of any vessel (2), any tank (3) and any basket (4).

[0020] Described below with reference to Figs. 4A-5E of the attached drawings, is a possible operating cycle of the present machine.

The carriage (5) is moved as far as to result in correspondence of the region which receives the baskets (4), so as to dispose the gripper (71) in line with the selected basket, that is, with the basket which supports the material to be treated, after which the gripper (71) is lowered and activated to engage the selected basket (Fig. 4A); then the gripper is lifted (Fig. 4B) and the carriage (5) is moved as far as to result in correspondence of the tank (3), so as to dispose the basket engaged by the gripper (71) in line with the selected tank (4) (Fig. 4C). Thereafter, the gripper (71) is lowered, so as to dispose the basket within the stand-by tank below, and deactivated, so as to release the basket and thus lifting the same gripper (Fig. 4E) to allow closing the tank inside which, after the closing thereof, the material is subjected to the dyeing operation in the bath previously formed therein. After a preset time has elapsed, a reverse sequence of motions will draw the carriage (5) again out of the tank, that is, to a preset storage location.

[0021] As far as the formation of the dyeing bath previously formed in the tanks (3) is concerned - and wherein a corresponding amount of water is also introduced via conduits (not shown in the attached drawings) according to the programmed bath recipes - the procedure is as follows. The carriage (5) is moved as far as to result in correspondence of the region which receives the vessels (2), so as to dispose the gripper (60) in line with the pipette (20) of the selected vessel, that is, of the vessel containing the product for the tank which is to be fed with, after which the gripper (60) is lowered to engage the body (23) of the pipette and to allow the element (61) to be hooked to the pipette's plunger (22): the lifting of the plunger (22) for a travel of preset length determining the aspiration of a corresponding amount of liquid from the vessel (2). The gripper (60) is lifted so as to draw the pipette fully out of the vessel (2), as shown in Fig. 5A, and the carriage is moved as far as to result in correspondence of the tanks (3) so as to dispose the pipette in line with the tank which has to receive the liquid (Fig. 5B). Then the pipette is lowered (Fig. 5C) and the element (61) causes the pipette's plunger (22) to be lowered as programmed, so that the tank below will receive the preset batch of the selected liquid. Upon completion of this delivery step, the carriage (5) moves back as far as to result in correspond-

ence of the vessel, in order to position again the pipette relative thereto (Figs. 5D, 5E) or, if so programmed, moves as far as to result in correspondence of another tank (3) to let in a preset batch of the same liquid.

[0022] The carriage (5), the means (6) for taking out and metering the products, the means (7) for handling the baskets (4), the actuators for opening/closing the lids of the tanks (3), the motors (32), the resistors (37 and the valves associated with the outlets (39) of the tanks, are all controlled by a programmable electronic central unit (U) provided with a memory wherein there are stored, besides the positions of each vessel (2), of each tank (3) and each basket (4), also the recipes of the baths to be formed in each of the tanks (the said recipes being in terms of, for example, amount of water, amount or batches of liquids drawn from the vessels (2) and of tank's operating temperature). Such a programmable unit is of a type known to those skilled in the art and, will not, therefore, be described in greater details.

[0023] With reference to the example of Fig. 9, the said carriage (5) can also support means (8) for taking out and delivering powdered substances to be introduced, in preset batches, into the target tanks (3), according to a predetermined work program. For example, the said means (8) may be of the type described in the document IT-FI/2000/A/153 (corresponding to EP-A-1174535) to which reference can be made for further details: the means (8) for the removal and handling of the containers (C) for solid substances are supported by a shelf-like structure (80) associated with the carriage (5), on the side opposite to said means (6). Such means (8) comprise gripper means with four jaws (81) (in the figures only two jaws being shown) activated by corresponding pneumatic actuators (82) by means of a system of levers hinged to each other and to a tubular skirt (83) borne by the shelf (80) and acting also as a support for the actuators (82). The said jaws (81), when disposed in closing condition (as shown in Figs. 10C and 10D), clamp the containers (C) selected by the program. The said skirt (83) ends up with a cylindrical bush (84) having such diameter and height as to allow the positioning thereof onto the neck of containers (C). Moreover, inside the tubular skirt (83) a shaft (85) is disposed in association with a corresponding electric motor (850) and ending with a power takeoff (86). The latter is inside the said bush (84) and allows the actuation of metering means which the containers (C) for solid substances are provided with. The shelf (80) sustaining the gripper means (8) is engaged to a corresponding pneumatic actuator with vertical axis (87). Formed externally to said actuator (87) are straight vertical guides (800) for a guided upward and downward slide of the same shelf (80) relative to the platform of structure (1) on which the containers (C) are located at corresponding and preset positions.

The containers (C) exhibit an inner chamber (88) for containing the solid substances (for example, in the form of powders or crystals) and comprise an inner delivery device. The said delivery device comprises a vertical rod

(89) passing midway across said chamber (88) and to which a scraper (890) is engaged. The free, upper end (891) of the rod (89) is suitably shaped to fit into the power takeoff (86) of the unit (8). In correspondence of the lower base of the chamber (88), the said containers (C) exhibit an outlet section for the substances held therein.

[0024] When provided by the program, the carriage (5) transfers the means (8) as far as to result in correspondence of the selected container (C) (Fig. 10), then the means (8) are lowered to determine the coupling of the power takeoff (86) of the unit (8) with the end (891) of rod the (89) located inside the container (C) (Fig. 10B), and the jaws (81) tighten on the neck of container (C) (Fig. 10C). Afterwards, the unit (8) is transferred by the carriage (5) as far as to result in correspondence of the selected tank (3) (Fig. 10D) and the motor (850) is started to determine the exit, in a preset amount, of the substances held in the container (C), that is, the introduction of such substances into the stand-by tank (3) located below.

Claims

1. Machine for dyeing textiles, comprising a structure (1) able to receive a plurality of containers or vessels (2; C) holding substances which contribute to form dyeing baths within a plurality of suitable dyeing tanks (3), said plurality of dyeing tanks (3) and a plurality of material-holding baskets (4) being located at corresponding and preset positions a motor-driven carriage (5) being associated with said structure (1) and supporting means (6, 8) for removing and subsequently delivering the substances held within said vessels (2; C), **characterized in that** said carriage (5) supports further means (7) for grasping and handling said material-holding baskets (4).
2. Machine according to claim 1, **characterized in that** said means (7) for grasping and handling said material-holding baskets (4) comprise a gripper (71) associated with an actuator (70) with vertical axis.
3. Machine according to claim 1, **characterized in that**, on said structure (1), said vessels or containers (2) are on the side opposite to baskets (4) with respect to the tanks (3).
4. Machine according to one or more preceding claims, **characterized in that** said structure (1) is made up of one body having a development mostly longitudinal.
5. Machine according to one or more preceding claims, **characterized in that** said mean (6, 8) for removing and subsequently delivering substances, are means for removing and delivering liquid substances.
6. Machine according to one or more preceding claims

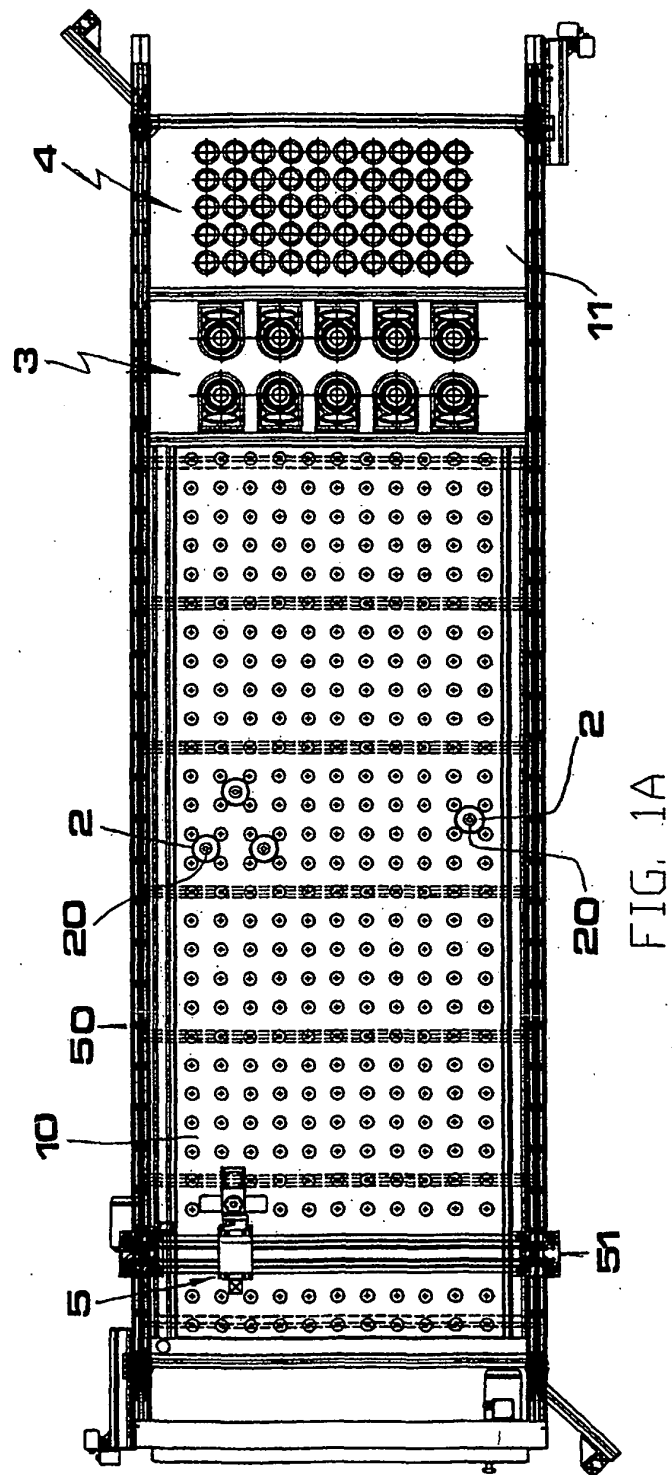
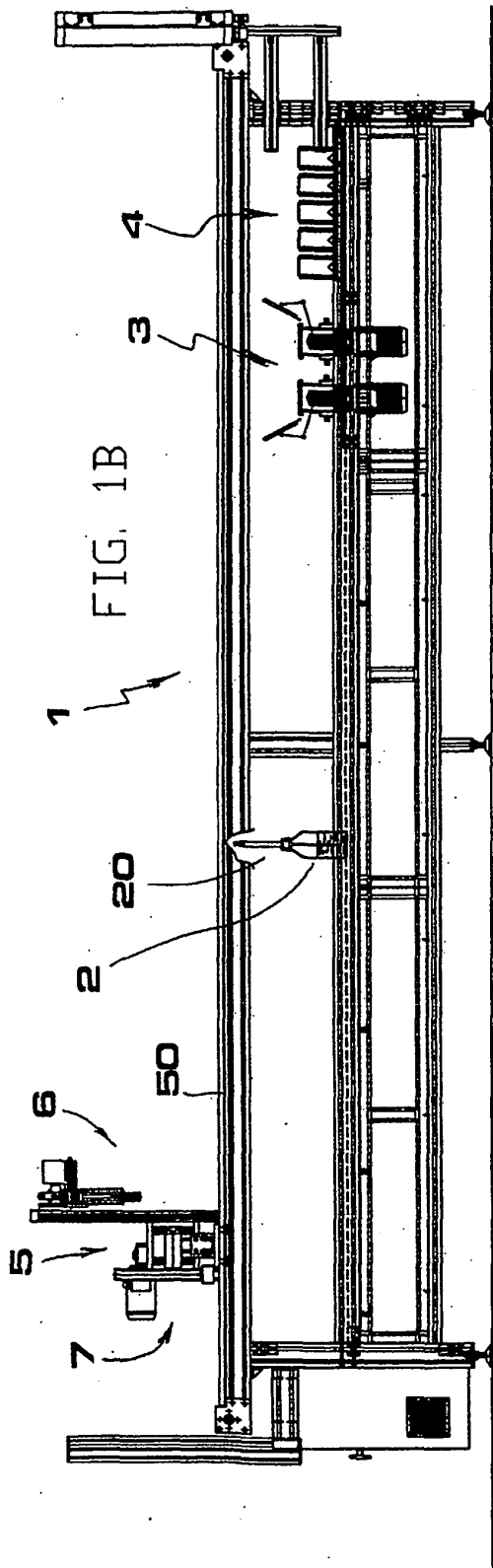
1-4, **characterized in that** said means (6, 8) for removing and subsequently delivering substances, are means for removing and delivering solid substances.

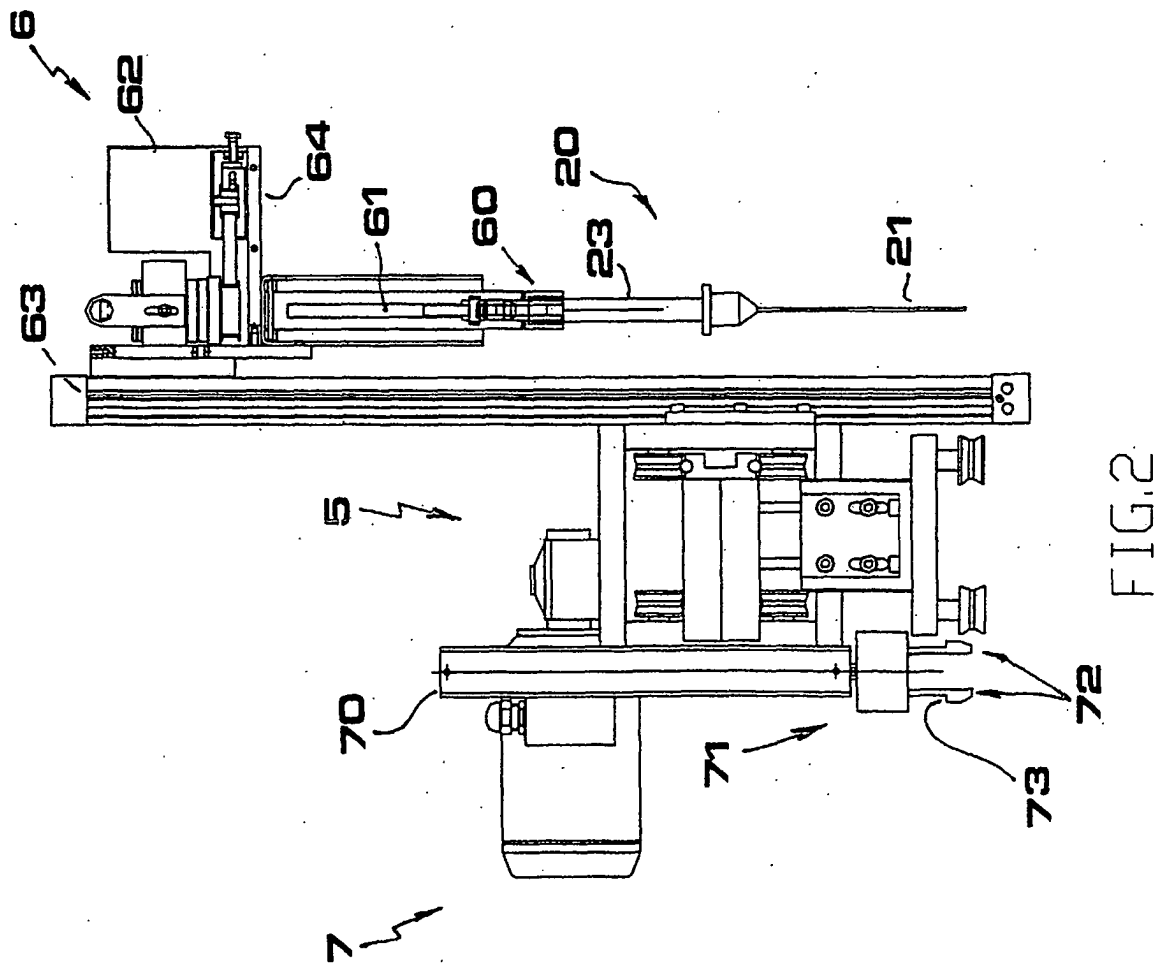
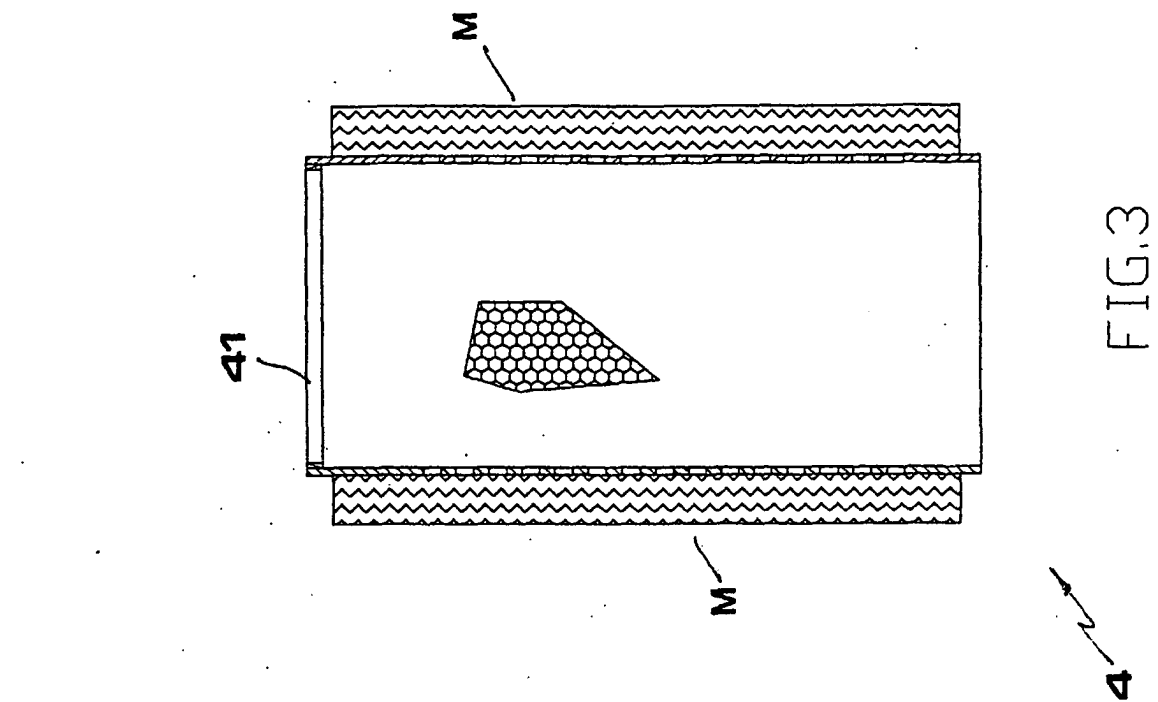
Patentansprüche

1. Maschine zum Färben von Textilien, die eine Struktur (1) umfasst, die in der Lage ist, eine Vielzahl von Behältern oder Gefäßen (2; C) aufzunehmen, die Substanzen enthalten, die dazu beitragen, Färbebäder in einer Vielzahl von geeigneten Färbetanks (3) zu bilden, wobei diese Vielzahl von Färbetanks (3) und eine Vielzahl von Material enthaltenden Körben (4) an entsprechenden und vorgegebenen Stellen eines motorbetriebenen Schlittens (5) angeordnet sind, der der Struktur (1) zugeordnet ist, und Einrichtungen (6, 8) zum Entnehmen und nachfolgenden Abgeben der Substanzen trägt, die in besagten Gefäßen (2; C) enthalten sind, **dadurch gekennzeichnet, dass** der Schlitten (5) weiterhin Einrichtungen (7) zum Ergreifen und Handhaben der Material enthaltenden Körbe (4) umfasst.
2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Einrichtungen (7) zum Ergreifen und Handhaben der Material enthaltenden Körbe (4) einen Greifer (71) umfassen, dem eine Betätigungsvorrichtung (70) mit vertikaler Achse zugeordnet ist.
3. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sich auf der Struktur (1) die Gefäße oder Behälter (2) auf der Seite befinden, die bezüglich der Tanks (3) den Körben (4) gegenüber liegt.
4. Maschine nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Struktur (1) aus einem Körper besteht, der sich im wesentlichen in einer Längsrichtung erstreckt.
5. Maschine nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Einrichtungen (6, 8) zum Entnehmen und nachfolgenden Abgeben von Substanzen Einrichtungen zum Entnehmen und Abgeben von flüssigen Substanzen sind.
6. Maschine nach einem oder mehreren der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Einrichtungen (6, 8) zum Entnehmen und nachfolgenden Abgeben von Substanzen Einrichtungen zum Entnehmen und Abgeben von festen Substanzen sind.

Revendications

1. Machine de teinture des matières textiles, comprenant une structure (1) apte à loger une pluralité de récipients (2 ; C) pour substances qui concourent à former des bains de teinture dans une pluralité des vasques de teinture opportunes (3), ladite pluralité de vasques de teinture (3) et une pluralité de paniers porte-matériaux (4) étant positionnés dans des correspondantes positions connues et prédéterminées, à ladite structure (1) étant associé un chariot motorisé (5) et des moyens (6 ; 8) de support pour prélever et successivement débiter des substances contenues dans lesdits récipients (2 ; C), **caractérisée en ce que** ledit chariot (5) supporte des autres moyens (7) de prélèvement et de mise en mouvement desdits paniers porte-matériaux (4).
2. Machine selon la revendication 1 **caractérisée en ce que** lesdits moyens (7) de prélèvement et de mise en mouvement desdits paniers porte-matériaux (4) comprennent une pince (71) asservie à un réalisateur (70) avec axe vertical.
3. Machine selon la revendication 1 **caractérisée en ce que** sur ladite structure (1) lesdits récipients (2) sont opposé aux paniers (4) par rapport aux vasques (3).
4. Machine selon une ou plusieurs des revendications précédentes **caractérisée en ce que** ladite structure (1) est en un corps unique à développement essentiellement longitudinal.
5. Machine selon une ou plusieurs des revendications précédentes **caractérisée en ce que** lesdits moyens (6,8) de prélèvement et débit successif des substances sont des moyens pour le prélèvement et le débit de substances liquides.
6. Machine selon une ou plusieurs des revendications de 1 à 4 **caractérisée en ce que** lesdits moyens (6,8) de prélèvement et débit successif des substances sont des moyens pour le prélèvement et le débit de substances solides.





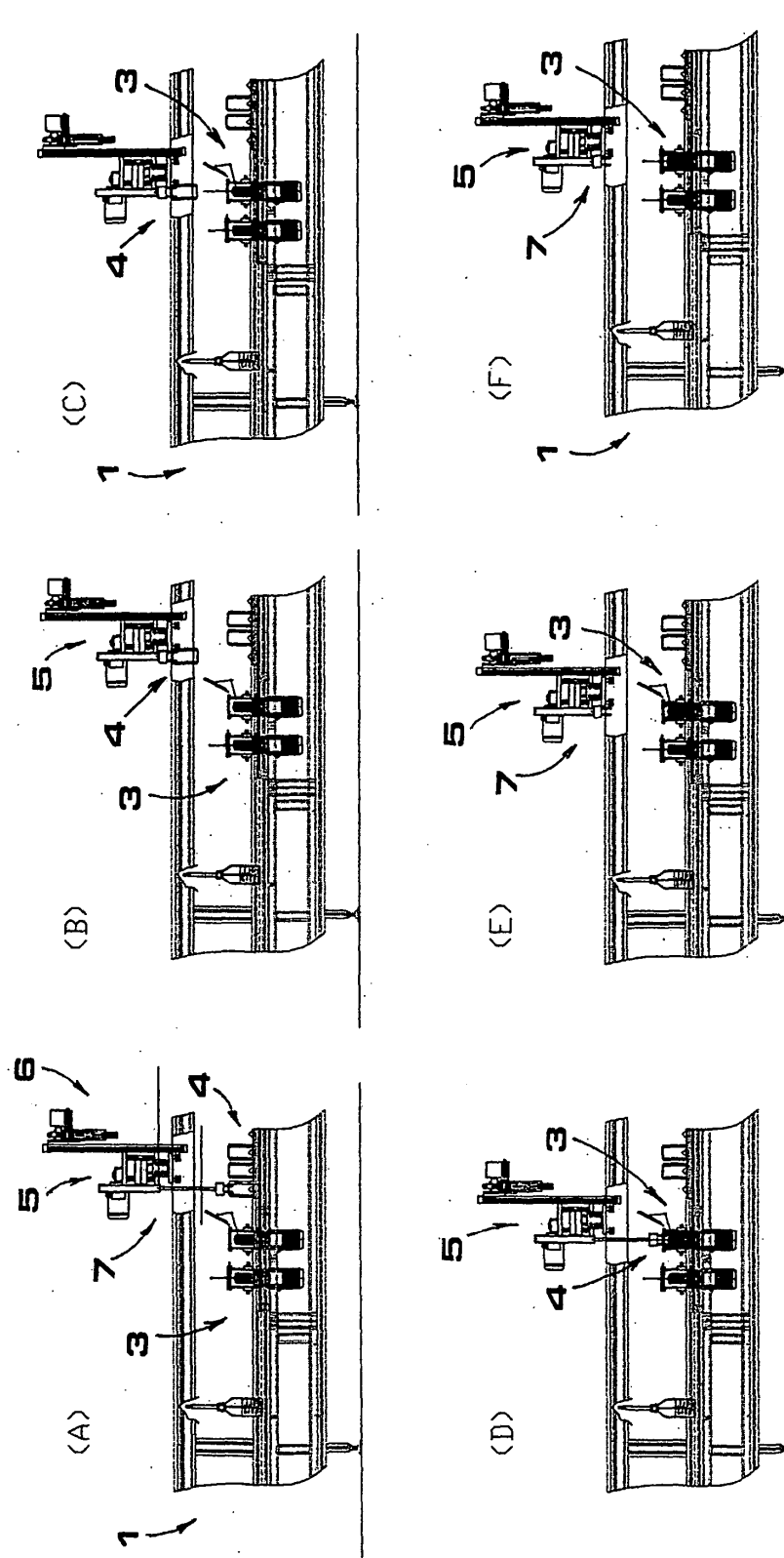
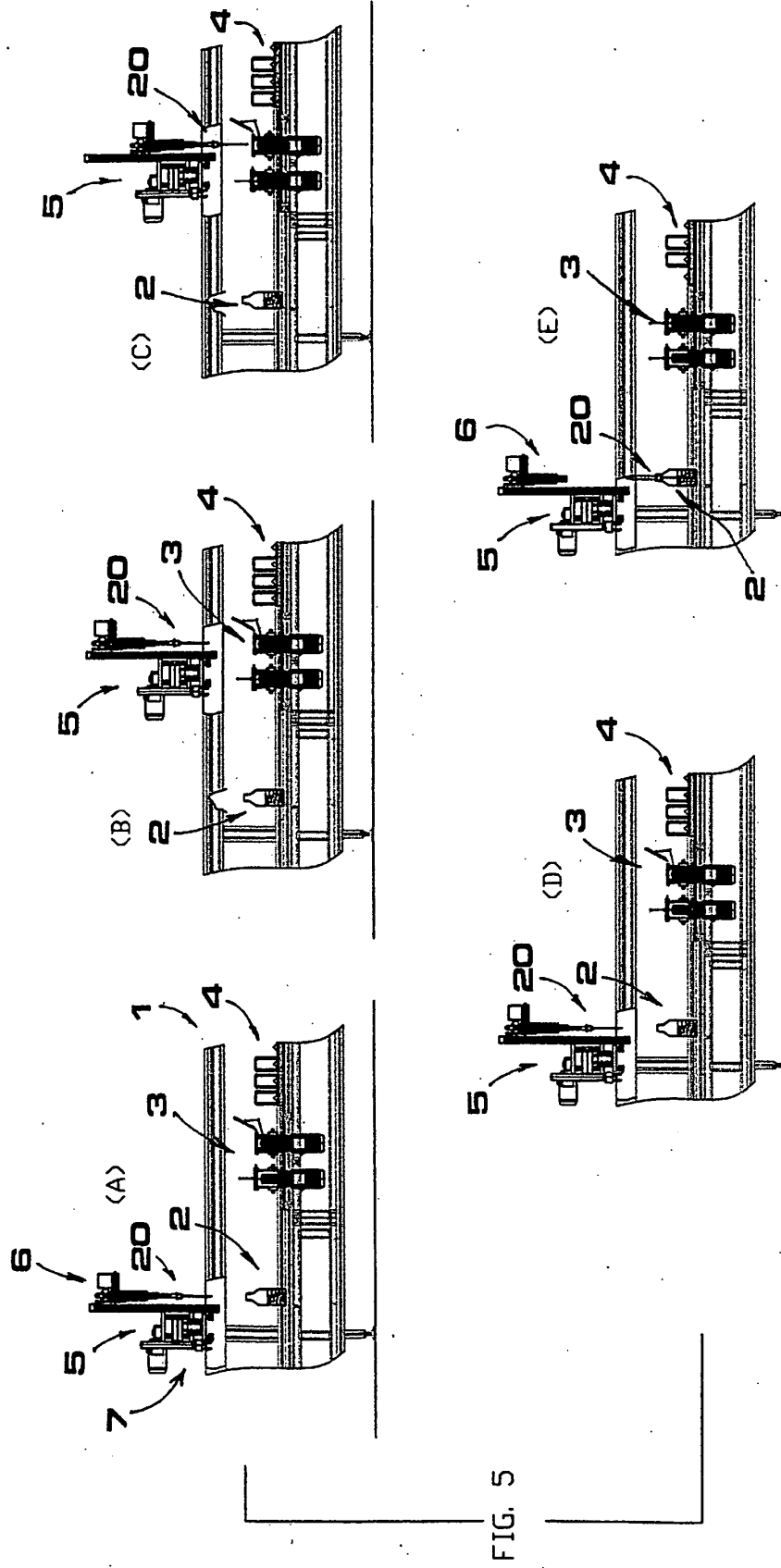


FIG. 4



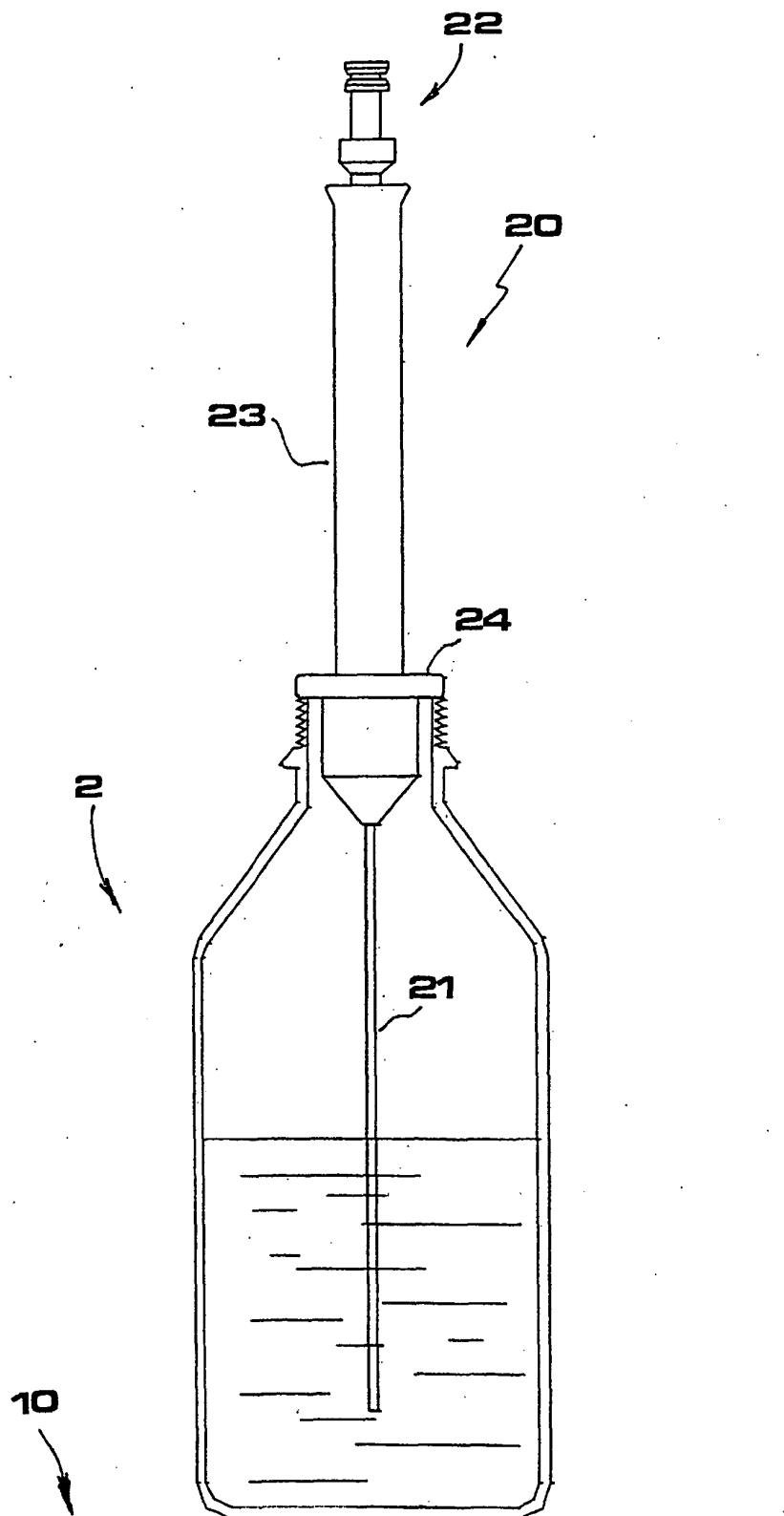


FIG. 6

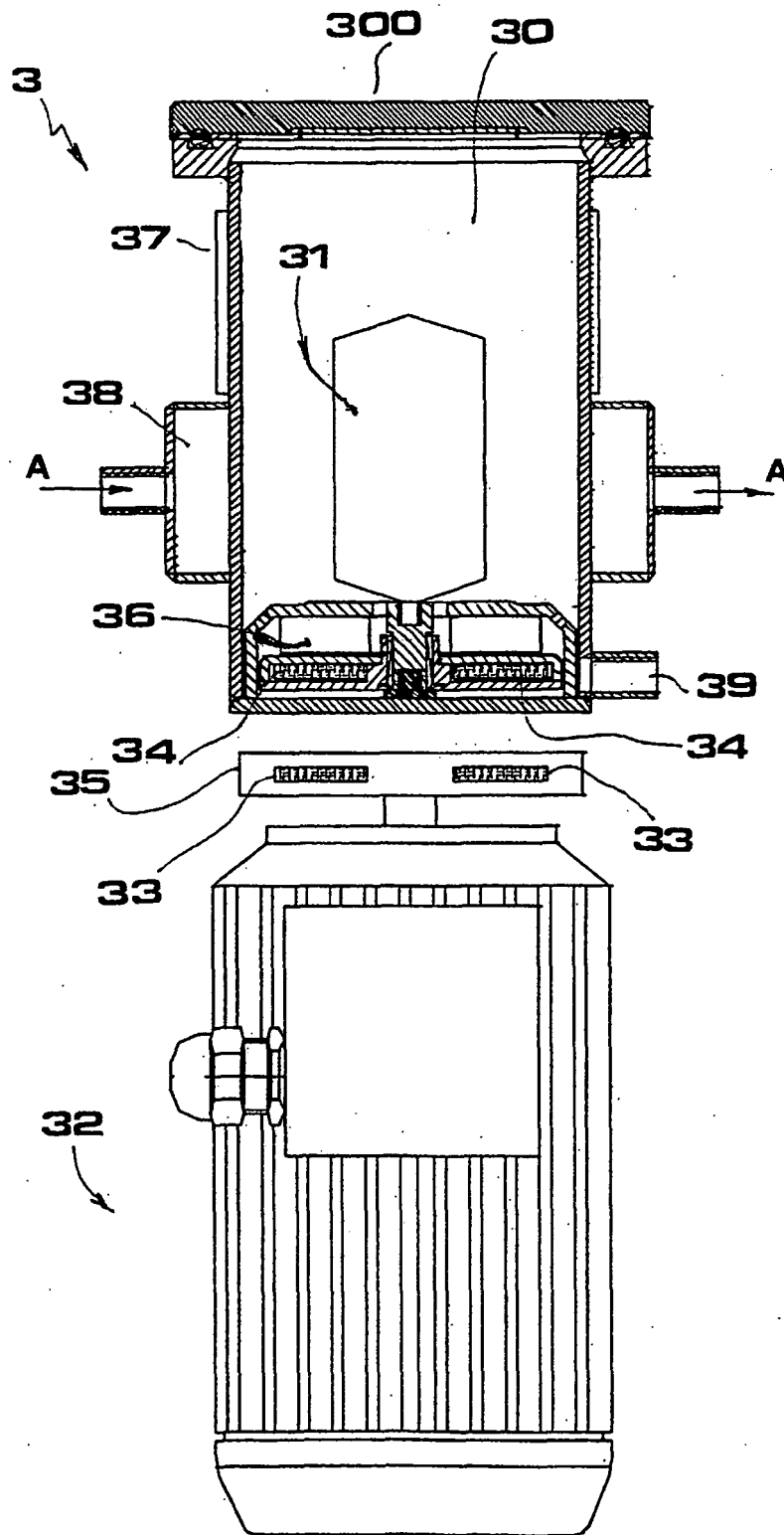


FIG. 7

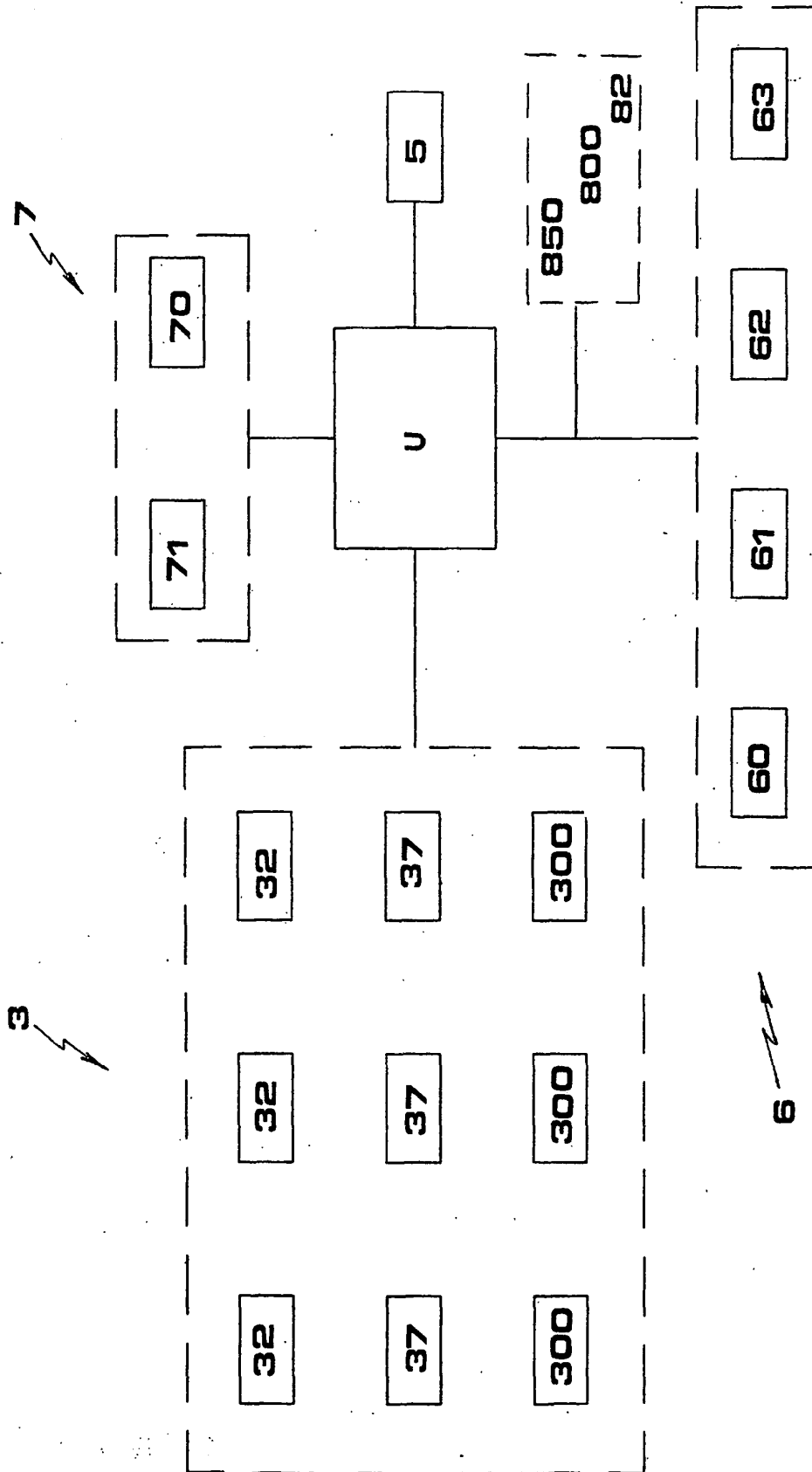


FIG. 8

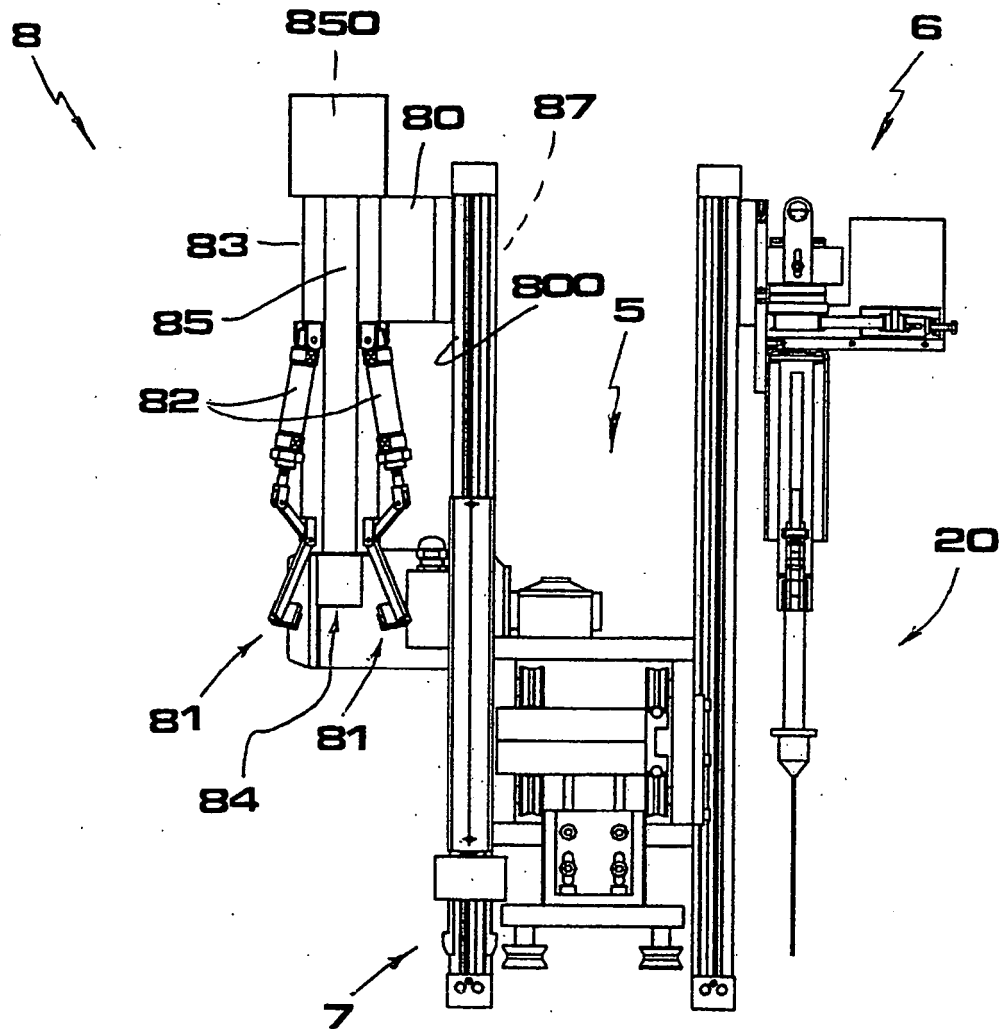


FIG. 9

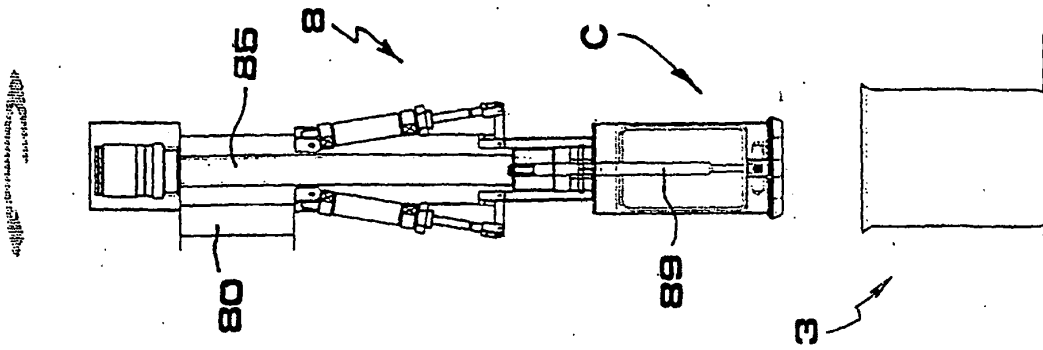


FIG. 10D

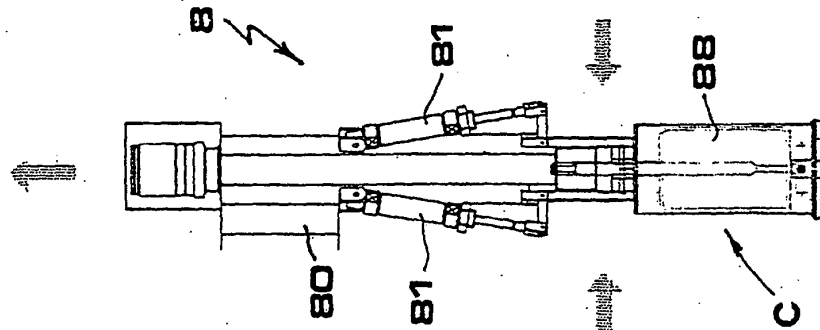


FIG. 10C

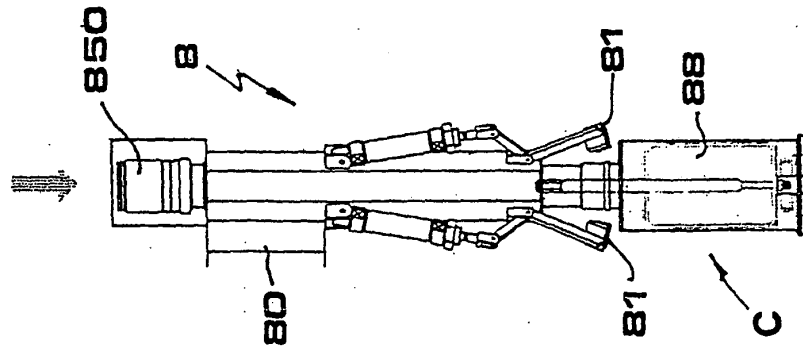


FIG. 10B

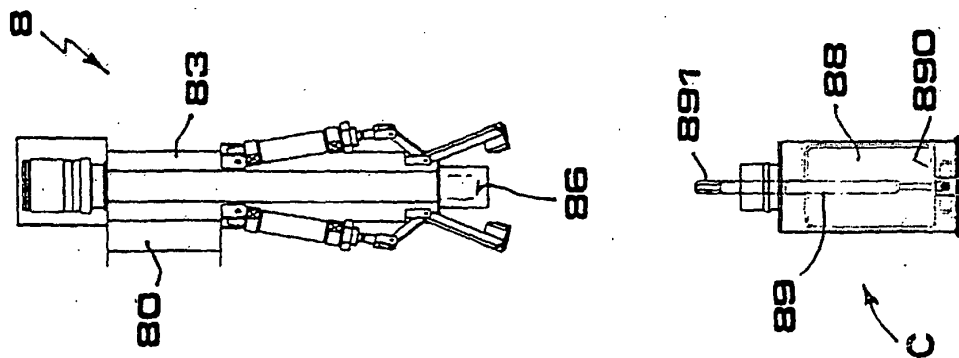


FIG. 10A