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(54) **Basket, machine and plant for dyeing textile materials**

(57) System with a machine for dyeing textile materials, of a type comprising a tank (10) inside which the dyeing of the materials (M) held in a basket (7) takes place and which is associated with means for the preparation and supply of a corresponding dyeing bath. The

machine comprises a baskets-holding structure (5) able to be positioned within the relevant tank (10) and respectively removed therefrom; the said baskets-holding structure (5) intended for supporting a materials-holding basket (7) removably disposed thereon.

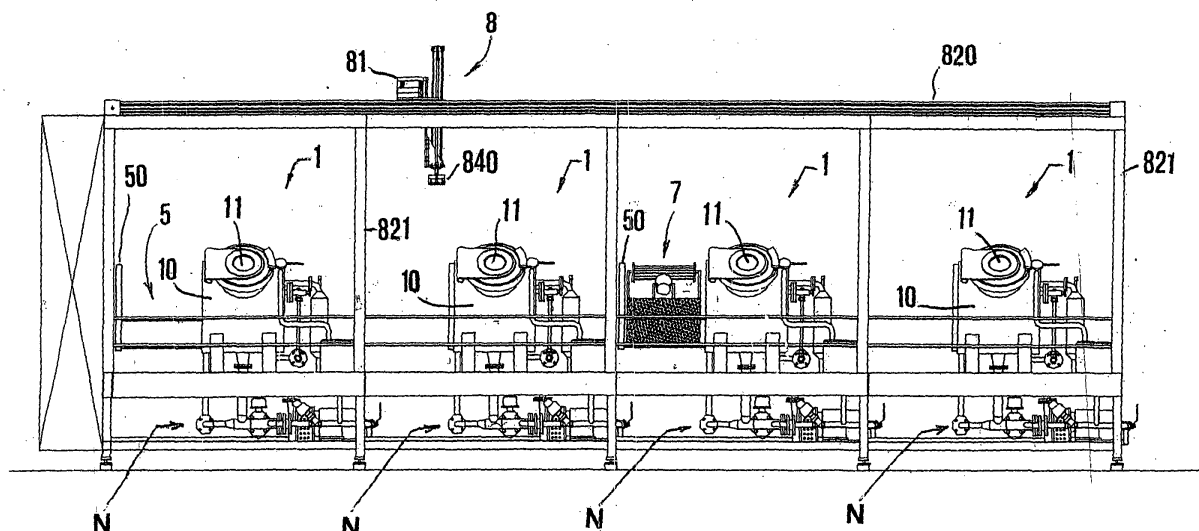


Fig. 2A

Description

[0001] The present invention refers to a basket, a machine and a plant for dyeing textile materials.

[0002] The dyeing of textiles, both of fabric and knit type, is known to be carried out by means of special machines. Among these machines, there are some of so-called "overflow" or "jet" type in jargon, in which the material is loop treated, that is, sewn end-to-end to form a ring which is caused to move within a dyeing bath. The loading and unloading of the material to be treated, as well as the end-to-end sewing, are carried out by hand directly in correspondence of the machine, so that, prior to start a dyeing cycle with a machine, it is necessary to wait for the completion of the previous cycle, and then unloading the dyed material in order to load the material to be dyed. This implies excessive stand-by periods, which are incompatible with the present production requirements, and results all the more reductive for the economy of the process when considering that a plant for dyeing textile materials usually comprises a plurality of such machines. Moreover, to avoid even longer delays when more machines have to be loaded or unloaded at the same time, it is necessary to rely on a great number of operators, which further contributes to rise the production costs.

[0003] The main object of this invention is to eliminate or at least greatly reduce the above drawbacks.

[0004] This result has been achieved, according to the invention, by adopting the idea of making a basket, a machine and a plant having the characteristics disclosed in independent claims. Further characteristics of the present invention being set forth in the dependent claims.

[0005] The advantages deriving from the present invention lie essentially in the fact that it is possible to drastically reduce the production costs owing to the significant reduction of dead times and number of operators; that it is possible to automate the operation cycle; that the contacts of the operators with harmful or dangerous materials, such as chemical and colouring products necessary for the dyeing, are considerably reduced; that a machine and a plant according to the invention are relatively easy to make and reliable also after a prolonged service life.

[0006] 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. 1 is a schematic representation of a plant according to the present invention;
- Fig. 2A shows an enlarged detail of the drawing in Fig. 1;
- Fig. 2B is a side view of the detail shown in Fig. 2A;
- Fig. 2C is a plan view of the detail shown in Fig. 2A;

- Fig. 3A is a schematic side view of a machine of the plant of Fig. 1 with a basket positioned on the respective baskets-holding structure being removed from the machine's tank, that is, with the machine being open;
- Fig. 3B is a schematic plan view of the machine of Fig. 3A;
- Fig. 3C is a schematic front view of the machine of Fig. 3A;
- Figs. 4A and 4B show two possible operating conditions of the machine of Fig. 3A;
- Figs. 4B and 4D are two plan views of the machine illustrated in Fig. 4A and, respectively, in Fig. 4B;
- Figs. 5A-5F show, schematically, a sequence of operations for driving any one of the materials-holding baskets according to the invention;
- Fig. 6A is a schematic side view of materials-holding basket for a machine according to the invention;
- Fig. 6B is a schematic plan view of the basket of Fig. 6A;
- Fig. 6C is a schematic side view of a materials-holding basket according to a further embodiment, that is, with an injection nozzle and a racer which are mounted on the side opposite with respect to that where the same elements are mounted in the basket of Fig. 6A;
- Fig. 7 shows a view similar to that of Fig. 2B, with some parts removed to make others more evident;
- Figs. 8A and 8B show a schematic side view of the arm for driving the materials-holding baskets in two different operating conditions;
- Fig. 8C is a schematic front view of the arm shown in Figs. 8A and 8B;
- Fig. 9 shows schematically an operating step in which the mechanical arm is moved close to a basket, and a similar operating step in which the basket is disengaged from the mechanical arm;
- Fig. 10 shows schematically an operating step in which a basket is grasped by the mechanical arm; and
- Fig. 11 is a block diagram of the programmable operation system.

Reduced to its basic structure, and reference being made to the figures of the attached drawings, a plant according to the present invention comprises means (MD) for preparing colouring substances - also of different chemical composition, nature and quantity of chemicals being used - to be fed to a plurality of dyeing machines (1) connected to said means (MD) through a piping (2) having a plurality of branches (3) each of which is intended to feed a corresponding machine (1) and is connected to the piping (2) via a respective solenoid valve (4). In the exemplifying scheme of Fig. 1, the said branches (3) are in number of four, likewise the machines (1) intended to receive the solutions prepared and delivered by the means (MD), the latter being of a type known to those skilled in the art. For example,

the means (MD) for preparing the colouring substances and delivering them to the machines (1) can be of the type disclosed in the US Patent 6588464 or in the US Patent 5642940. As an alternative, the means for preparing the solutions can be manual means, that is, of the type commonly used in this sector for preparing and metering the solutions by hand, although this would imply a reduction of the whole level of automation of the system.

The said machines (1) are of kier type, with a tank (10) of essentially cylindrical shape, into which a solution prepared by said means (MD) is introduced via a corresponding branch (3) of said piping (2), a porthole (11) being provided in said tank to allow visual inspection thereof. Moreover, the tank (10) of each machine (1) is intended to receive and hold a preset amount of water for a corresponding dyeing bath. Schematically represented in the figures of the accompanying drawings are means (N) - for the supply of water and for the discharge, recirculation and possible heating of the dyeing bath - which are associated with each machine (1) of the plant. The said means (N) are of a type known to those skilled in the art and, will not therefore be described in greater details.

Projecting downwards from a side of the tank (10) of each machine (1) is a pair of shafts (55) parallel to each other - that is, oriented parallel to the longitudinal axis of the tank (10) - and of preset length, which are associated with a corresponding electric motor (56) via a belt-and-gear drive (57) which drive them into contemporary and opposite rotation. The said drive (57) is of a type commonly used to move simultaneously two shafts by only one driving member and will not therefore be described in greater detail. The function of said shafts (55) will be explained later on in the present description. Projecting inwardly on the same side of tank (10) is a duct (58) associated with said means (N) and disposed centrally further down with respect to said shafts (55). The function of said duct (58) will also result evident from the present description herebelow.

[0007] Each of said machines (1) is provided with a baskets-holding structure (5) associated with two corresponding linear actuators (6) which drives it into motion from and to the relevant tank (10) to allow the positioning thereof outside or respectively inside said tank. More in particular, the said baskets-holding structure (5) is developed and dimensioned in such a way as to be fully introduced within the tank (10), and is provided with a front section (50) having the two actuators (6) engaged on opposite sides thereof, which acts as a tank (10)-closing element when the same structure is introduced thoroughly therein. On the opposite side, each of said actuators (6) is engaged to a stationary part of the ma-

chine (1). Moreover, each of said structures (5) exhibits two longitudinal bars (51) having "V" profile and intended to make up a bearing element for the feet (74) of baskets (7) within which the material (M) to be dyed is disposed. The motion of the structure (5) associated with the actuators (6) is facilitated by the presence of two wheels (52) fixed to the lower side of the front section (50) and intended to roll onto a horizontal plane below (53). Moreover, on the inner wall of front section (50) of each of said baskets-holding structures (5), two cradle-like supports (54) are mounted on diametrically opposite sides with respect to the vertical plane of symmetry (S) of the same front section (50). The said supports (55) are at such a height as to allow any of them to support one end of the axis (75) of rotation of the racer (70) carried by any basket (7) being made to rest by its respective feet (74) onto the said supporting bars (51). Moreover, the said supports (55) are advantageously in number of two to allow using, without difficulty, both the baskets (7) with right-hand racer (70) (that is, of the type illustrated in Fig. 6A) and the baskets (7) with left-hand racer (70) (that is, of the type illustrated in Fig. 6C).

[0008] Referring now to the schemes of Figs. 2A and 2C of the accompanying drawings, the first machine (1) on the left is in stand-by condition, waiting for a basket (7), and thus with relevant baskets-holding structure (5) being drawn out, the second machine (1) is in working condition likewise the fourth, and the third one is waiting for the removal of the basket (7) carried by the relevant baskets-holding structure.

[0009] The said baskets (7) comprise, according to the example illustrated in the figures of the accompanying drawings, a sheet-structure with two side panels (72) having a substantially triangular profile with horizontal base, between which a perforated cradle (73) is disposed whose height is less than that of the side panels (72). Provided in correspondence of each of the two vertexes at the base of each of said side panels (72) is a foot (74). Each of the baskets (7) comprises also a racer (70) whose axis is borne, above the cradle (73), by said side panels (72). More particularly, the axis (75) of racer (70) is supported, projecting on both sides, by two lateral appendixes (76) of side panels (72), so as to cause the axis (75) to protrude on each side from a corresponding appendix (76) by a predetermined extent. The ends of axis (75) projecting from the side panels (72) are shaped as power takeoffs.

[0010] Each of said appendixes (76) forms a preset angle (δ) to the median vertical axis of the respective side panels (72), so that the racer (70) results offset with respect to the two side panels (72). The latter, in addition, support a nozzle for the injection or circulation of the dyeing bath (77) by means of two pipes (78) disposed on opposite sides with respect to the nozzle (77) and each leading, on one side, to the nozzle (77) and having, on the opposite side, a sleeve (99) centrally protruding, on the external side of the respective supporting side panel, further down with respect to the axis (75) of

racer (70). The nozzle (77) results on the opposite side of the racer (70) relative to the side panels (72), so that, if the nozzle (77) is on the right, the racer (70) is on the left, and vice versa. The said pipes (78) are in number of two in order to feed the dyeing bath to the nozzle (77), in a manner to be described later on, indifferently from the right or left side of the basket (7). When using the pipe (78) positioned on the right of nozzle (78), the one on the left can be closed up, and vice versa, this to avoid having liquid in the "inactive" pipe, that is, in the pipe which is not connected with the system for the circulation of the dyeing bath. In practice, each basket (7) is provided with all the elements necessary for supporting the material (such as the racer 70 and relevant axis 75) and for circulating the dyeing bath onto the material to be dyed (such as the nozzle 77).

[0011] For each basket (7), the material is disposed to form a ring, closed by an end-to-end seam, over the racer (70) and made to pass through the nozzle (77), in the same way as provided for the conventional dyeing systems. However, contrary to what is provided by the traditional systems, this operation is carried out when the basket (7) is parked, that is, out of the tank of machine (1) to which is intended for. Similarly, the removal of dyed material from each basket (7) is carried out after the basket (7) has been removed from the tank of machine (1) in which the dyeing has been performed. The dyeing takes place inside the machines (1), with the baskets (7) disposed inside the relevant tanks (10), that is, with the basket-holders (5) inside the tanks.

[0012] Likewise the conventional dyeing systems, the material (M) being dyed moves driven by the racer (77) along an annular trajectory by passing internally of nozzle (70) to the inside of the cradle and over the racer (77).

[0013] Each of the baskets (7) is intended for being picked up, moved and successively released, by a mechanical arm (8) which is associated with respective driving means which allow the positioning thereof in correspondence of a preset plurality of locations of the plant. More precisely, as best described later on, the said arm (8) is intended for picking up, one at a time, the baskets (7) from a parking region subdivided into two areas sideway of the machines (1), disposing them in correspondence of the basket-holders (5) and removing them therefrom when necessary.

[0014] The parking condition of the baskets (7) is advantageously provided by means of a structure (9) having more bars (91) with "V" profile for the feet (74) of baskets (7) to rest thereon, the said bars (91) being disposed by the two sides of the machines (1) and oriented parallel to the same machines (1). The latter, therefore, result inside the two areas into which the parking of baskets (7) is subdivided.

[0015] Said mechanical arm (8) is made up, according the example represented in the figures of the attached drawings, of an operating cylinder whose skirt (800) is solid to a carriage (81) slidingly mounted on a straight

guide (810) which, in turn, rests on two belts (820) orthogonal thereto and supported by fixed elements at a preset and identical height with respect to the parking region of the baskets (7): the said belts (820) being supported - spaced apart by a preset extent so as to result on the two opposite sides of said parking region - by a plurality of fixed metal uprights (821) disposed around said region. The said carriage (81) is associated with a corresponding transmission driven by an electric motor (80) to allow moving it bidirectionally along a guide (810).

[0016] Moreover, said guide (810) is fixed, on both sides, to the said belts (820), the latter being associated with a corresponding electric motor (400), only visible in Fig. 2C, to allow the two-way motion thereof along with carriage (81) in the direction of belts (820). Mounted on the lower end of the rod (830) of said operating cylinder is a fork (840) whose arms are provided with a device (850) for clamping and subsequently releasing the baskets (7). Since the device for clamping and releasing the baskets (7) is mounted on the fork (840), - which is in turn supported by the rod (830) of the operating cylinder (8), and the latter can be driven both along the guide (810) and along the guides (820), that is, both to the right and to the left as well as downwards with reference to the drawing of Fig. 2C, - by combining the motion of cylinder (8) in the plane virtually defined by the set of guides (810, 820) above the said parking region for baskets (7), with the motion of extraction or withdrawal of rod (830) of cylinder (8), it results possible to dispose the baskets (7) gripping/releasing device (850) to any point of the space above the baskets (7) as well the machines (1) which, as previously indicated, lie between the parked baskets (7). The said device (850) comprises, according to the example illustrated in Figs. 8A-8C of the accompanying drawings, a pairs of actuators (one for each of the two fork's arms) orthogonally disposed to the fork and orthogonally oriented to the same arms, the rods (855) of the said actuators, when pulled out (see Fig. 8A) delimiting, in cooperation with the upper part of the fork, two corresponding closed lateral ports (856) and, when retracted (see Fig. 8B) resulting external to the space delimited by the two arms of the fork. Each of said actuators (850) is mounted solid to a corresponding arm of the fork (840): the said arm being suitably provided with a transverse hole (857) to allow the rod (855) of the actuator (850) to go therethrough when driven out. The width (f) of the fork (840) is equal to the distance between the two side panels (72) of each basket (7). The distance (g) between the inner walls of the two arms of the fork (840) is slightly greater than the external diameter of sleeves (99) which project from the appendixes (76) of the two side panels of baskets (7).

[0017] When a basket is to be removed from its parking spot to be disposed in a predetermined basket-holder (5) of a machine (1), the carriage (81) is positioned in correspondence of the selected basket (7) (Fig. 5A) and, afterwards, the rod (830) of cylinder (8) is pulled

out (Fig. 5B) as far as to move the arms of the fork (840) astride of said sleeves (99), as schematically represented in Fig. 9. At this point, the rods (855) of actuators (850) are pulled out, as schematically represented in Fig. 10, so that the said sleeves (99) will result inside the said ports (856) with the rods (855) of actuators (850) below the same sleeves (99). Accordingly, the rod (830) of actuator (8) is lifted (Fig. 5C), thereby determining the corresponding lifting of the basket (7), and the carriage (81) is brought in correspondence of the selected machine (1) (Fig. 5D). Thereafter, the rod (830) of cylinder (8) is again pulled out (Fig. 5E), thus determining the lowering of the basket (7) until the relevant feet (74) are in contact with the bearing elements (51) exhibited by the basket-holder (5) of the machine (1) on which the basket (7) of the selected machine must be made to rest. Finally, the rods (855) of actuators (850) are retracted, so that the basket (7) is released, and the rod (830) of actuator (8) is retracted (Fig. 5F) and made suitable again for operation. A reverse sequence is operated when the basket (7) must be removed from a basket-holder (5) and positioned to a preset point of the baskets-parking region. It is understood that, both when a basket-holder (5) must receive a basket (7) and when a basket (7) is to be moved away from a basket-holder (5), the same basket-holder is in a position of extraction from the tank (10) of the respective tank (1). When any basket (7) is made to rest with its feet (74) onto the bars (51) of the selected baskets-holding structure (5), one end of the axis (75) of the relevant racer (70) results resting on one of the two cradle supports (54) exhibited by the inner wall of the front section (50) of structure (5). The other end, or power takeoff, of said axis (75) being engaged (once the structure is moved by the actuators 6 - with a horizontal translation movement - fully inside of the respective tank 10) by one of the two internal shafts (55) of tank (10) which shaft, by being associated with the motor (56), drives said axis into rotation. The power takeoff of said axis (75) is engaged by one or the other of the two shafts (55), depending whether the basket (7) has the racer (70) on the right or on the left. Similarly, when the basket (7) is moved into the tank (10), the duct (58) results inserted into a corresponding sleeve (99). When dyeing the material (M), as the racer (70) rotates being driven by the shaft (55) engaging the power takeoff (75), the dyeing bath is pumped through the duct (58), so that the same bath goes through the nozzle and comes in contact with the material (M). Upon completion of the dyeing, the motor (56) and the dyeing bath-feeding pump are stopped and, after completing the removal of the bath from the tank (10) by the means (N), the basket-holder (5) is extracted with a horizontal translation movement opposite to that for the introduction thereof into the tank (10), and the basket (7) with the dyed material (M) is picked up by the mechanical arm (8) to be positioned in a corresponding and preset point of the baskets-parking region.

[0018] It will be appreciated that each of baskets (7)

can be removed by any point of the baskets-parking region in order to be positioned on the basket-holder (5) of any of the machines (1) and vice versa.

[0019] Advantageously, in order to eliminate or minimize the dead times, the baskets (7) are in a number higher than that of the machines (1).

[0020] The operations above described can be automated by using a programmable electronic unit (UE) having associated therewith the means (MD), means (N), solenoid valves (4), actuators (6), actuator (8), actuator (8)-driving means, and actuators (850), that is, all the active, electronically operable and controllable components of the plant. The said unit (UE) is of a type known to those skilled in the art and, therefore, is not described herein in greater details.

[0021] In practice, the construction details may vary in any equivalent way as far as the shape, dimensions, elements disposition, nature of the used materials are concerned, without nevertheless departing from the scope of the adopted solution idea and, thereby, remaining within the limits of the protection granted to the present patent for industrial invention.

Claims

1. Plant for dyeing textile materials, comprising a plurality of machines (1) each of which is provided with a tank (10) able to receive the materials (M) to be dyed, and means (MD, N, 2, 3) for preparing and supplying a plurality of dyeing baths to be introduced into the tanks (10) of said machines (1), **characterized in that** it comprises:

- a plurality of material-holding baskets (7) each of which is positionable at a known and preset point of the plant, that is, in correspondence of any of said machines (1) and of any preset point of a basket-parking region;
- means (5, 8) for driving each of said baskets (7) between a corresponding point of said parking region and any of said machines (1) and vice versa.

2. Plant according to claim 1, **characterized in that** the said baskets (7)-driving means comprise:

a baskets-holding structure (5) solid to each of said machines (1) and associated with respective means (6) disposed and acting between each machine (1) and the respective baskets-holding structure (5) to dispose the latter inside the relevant tank (10) and respectively outside said tank;

- a device (8) for lowering and lifting said baskets (7): the said device (8) being movable above said baskets (7)-parking region

- and said machines (1);
- means (840, 850, 855) associated with said baskets-lowering and lifting device (8), for gripping and respectively releasing the baskets.
3. Plant according to claims 1 and 2, **characterized in that** the said structure (5) is provided with a section (50) intended for frontally closing the tank (10) of the respective machine (1) when the structure (5) is disposed thereinside.
 4. Plant according to claims 1 and 2, **characterized in that** the said structure (5) is provided with bars (51) for supporting the baskets (7).
 5. Plant according to one or more preceding claims, wherein each of said baskets (7) is provided with a racer (70) carried by a corresponding axis (75) and with a nozzle (77) for the injection and recirculation of the dyeing bath, **characterized in that** the said baskets-holding structure (5) and the tank (10) of each dyeing machine (1) are provided with means (54, 55) for supporting and driving said axis (75) and with means (58) for feeding the dyeing bath to said nozzle (77).
 6. Plant according to one or more preceding claims, **characterized in that** the said baskets-holding structure (5) is provided with wheels (52) resting on a horizontal plane (53).
 7. Plant according to one or more preceding claims, **characterized in that** the said baskets (7)-parking region is subdivided into two areas sideway of the said machines (1).
 8. Plant according to one or more preceding claims, **characterized in that** the number of said baskets (7) is higher than that of said machines (1).
 9. Machine for dyeing textile materials, of a type comprising a tank (10) inside which the dyeing of the materials (M) held in a basket (7) takes place, and which is associated with means for the preparation and supply of a corresponding dyeing bath, **characterized in that** it comprises a baskets-holding structure (5) able to be positioned within the respective tank (10) and respectively removed therefrom; the said baskets-holding structure (5) intended for supporting a materials-holding basket (7) removably disposed thereon.
 10. Machine according to claim 9, **characterized in that** the said structure (5) is provided with a section (50) intended for frontally closing the respective tank (10) when the structure (5) is disposed thereinside.
 11. Machine according to claim 9, **characterized in that** the said structure (5) is provided with bars (51) for supporting the baskets (7).
 12. Machine according to claim 9, wherein each of said baskets (7) is provided with a racer (70) carried by a corresponding axis (75) and with a nozzle (77) for the injection and recirculation of the dyeing bath, **characterized in that** the said baskets-holding structure (5) and the said tank (10) are provided with means (54, 55) for supporting and driving said axis (75) and with means (58) for feeding the dyeing bath to said nozzle (77).
 13. Machine according to claim 9, **characterized in that** the said baskets-holding structure (5) is provided with wheels (52) resting on a horizontal plane (53).
 14. Basket for holding textile materials (M) to be dyed, **characterized in that** it comprises a racer (70) provided with a respective axis of rotation (75), a nozzle (77) associated with means for feeding a dyeing bath and a structure (72, 73) for supporting said racer (70) and said nozzle (77), the said structure (72, 73) being provided with feet (74) to allow them to rest onto a structure (5, 51) in operating condition inside the tank (10) of a dyeing machine (1), and to rest onto a supporting structure (9, 91) in stand-by or parking condition outside of said machine (1).
 15. Materials-holding basket according to claim 14, **characterized in that** it comprises a sheet structure with two side panels (72) having a substantially triangular profile with horizontal base between which a perforated cradle (73) is disposed whose height is less than that of the side panels (72), that a foot (74) is provided in correspondence of each of the two vertexes at the base of each of said side panels (72), that said axis (75) is supported, above said cradle (73), by the said side panels (72) so that each side of the axis (75) will result projecting, by a preset extent, from a corresponding appendix (76) exhibited by each of said side panels (72), that the ends of the axis (75) projecting from the side panels (72) are shaped as power takeoffs, that each of said appendixes (76) forms a preset angle (δ) to the vertical middle axis of the respective side panel (72) so that the racer (70) results offset with respect to the two side panels (72), that the said side panels (72) support the said nozzle for the injection and recirculation of the dyeing bath (77) by means of two pipes (78) disposed on opposite sides with respect to the nozzle (77) and each of which, on one side, leads to the nozzle (77) and, on the opposite side, presents a sleeve (99) complementary projecting on the outer side of the respective supporting side panel (72) further down with respect to the axis (75).

of racer (70), that the said nozzle (77) results on the opposite side of the racer with respect to the side panels (72), so that if the nozzle (77) is on the right, the racer (70) is on the left, and vice versa.

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16. Materials-holding basket according to claim 15, **characterized in that** only one of said pipes (78) is active, that is, utilized, when the basket is in operative condition inside the said machine (1).

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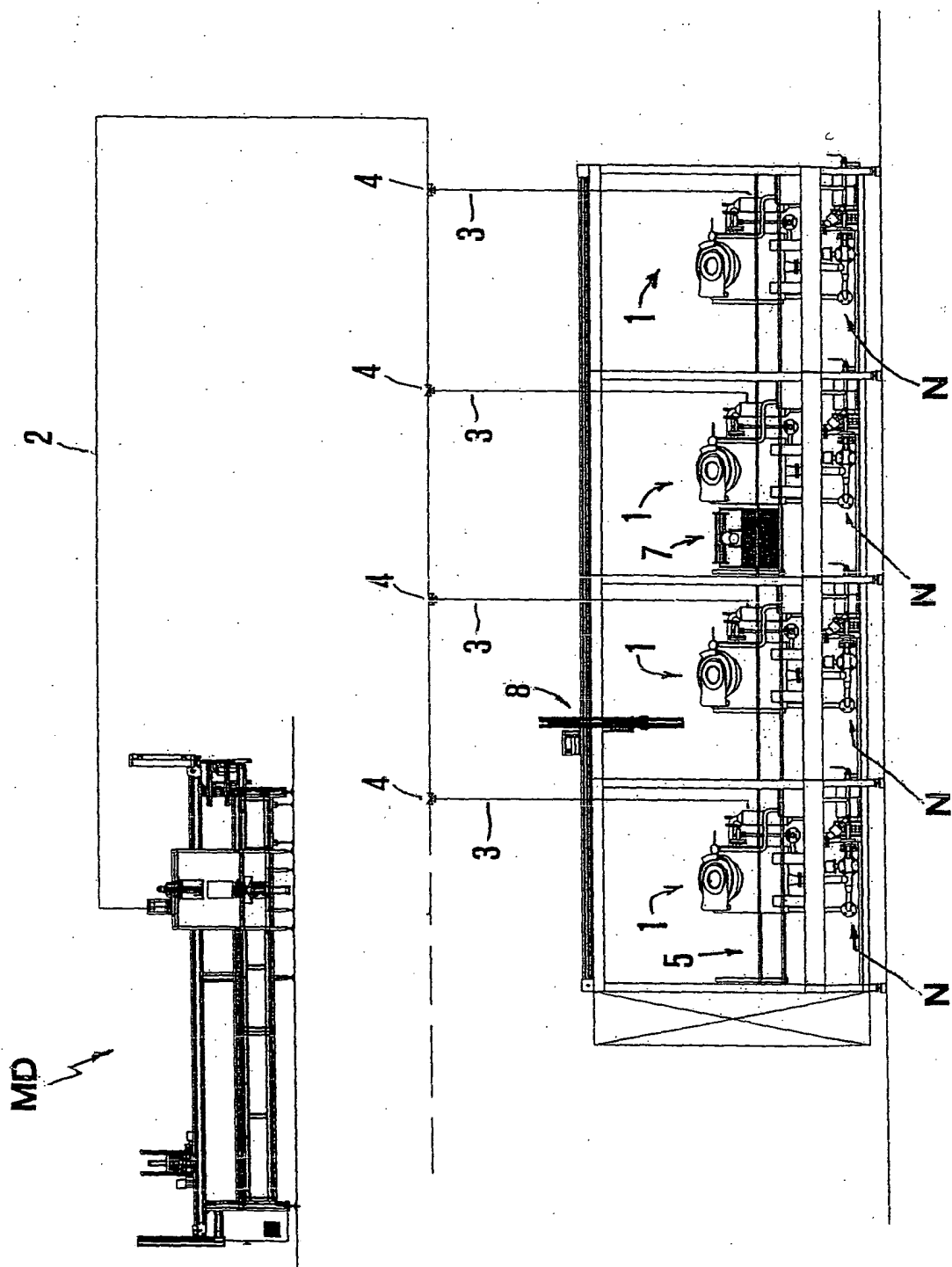


Fig. 1

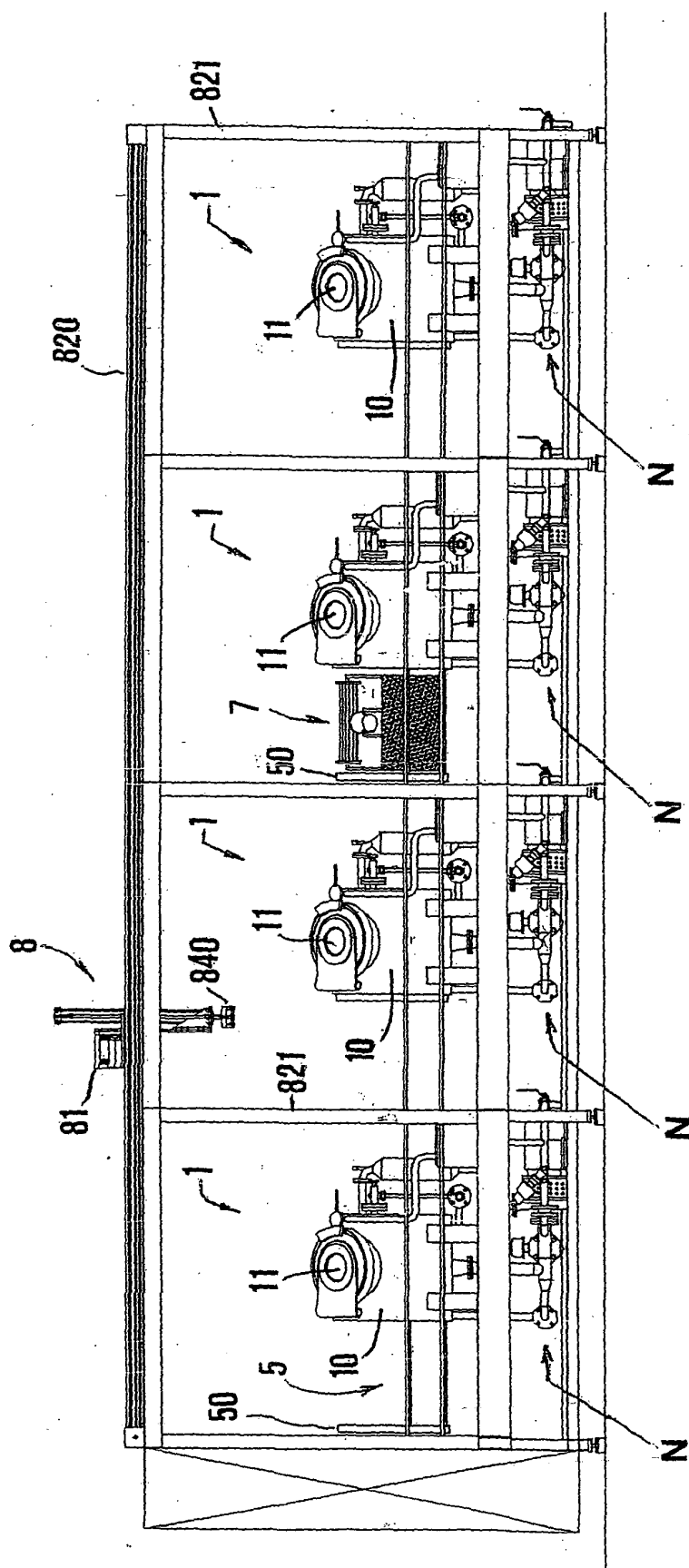


Fig. 2A

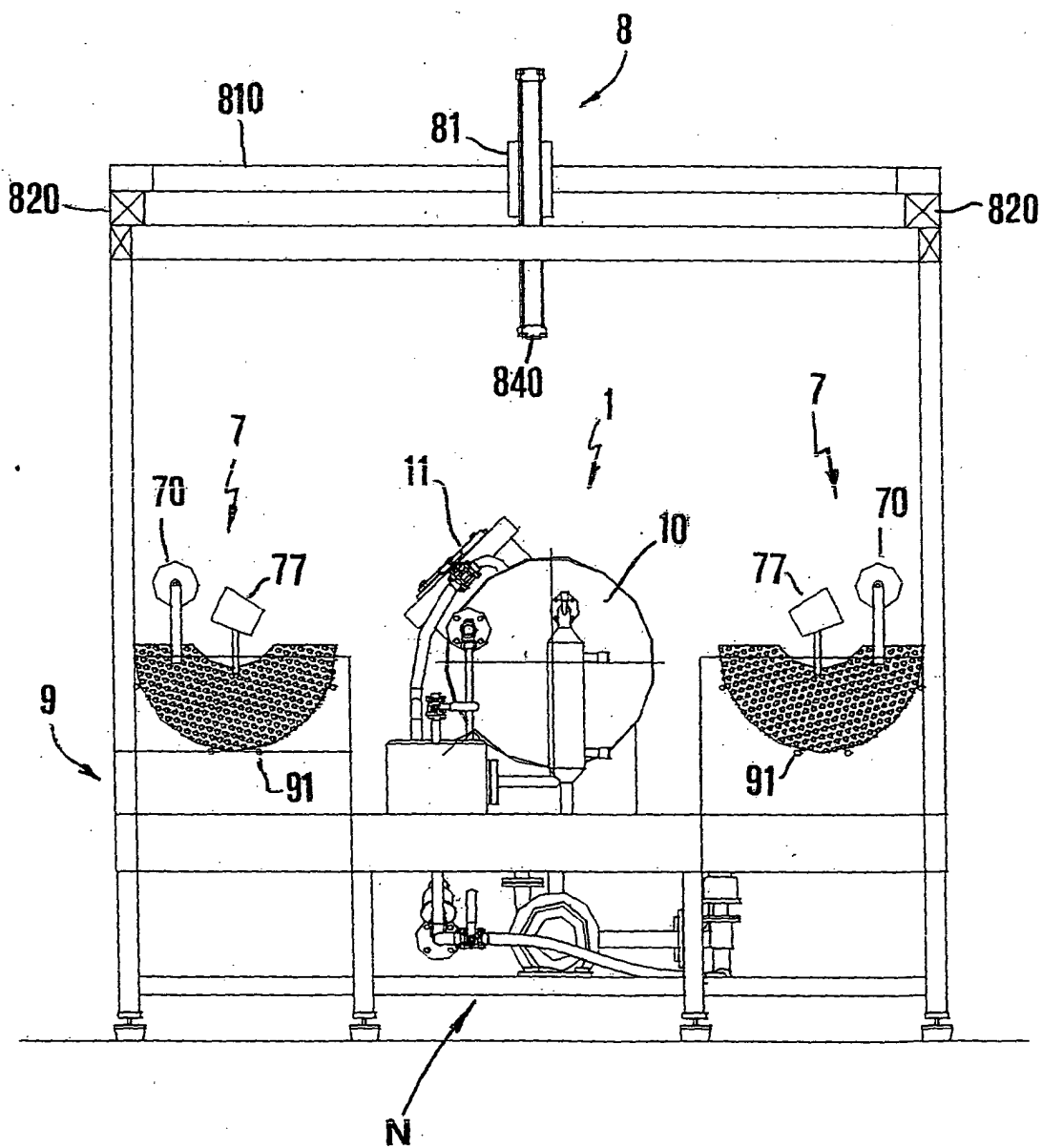


Fig. 2B

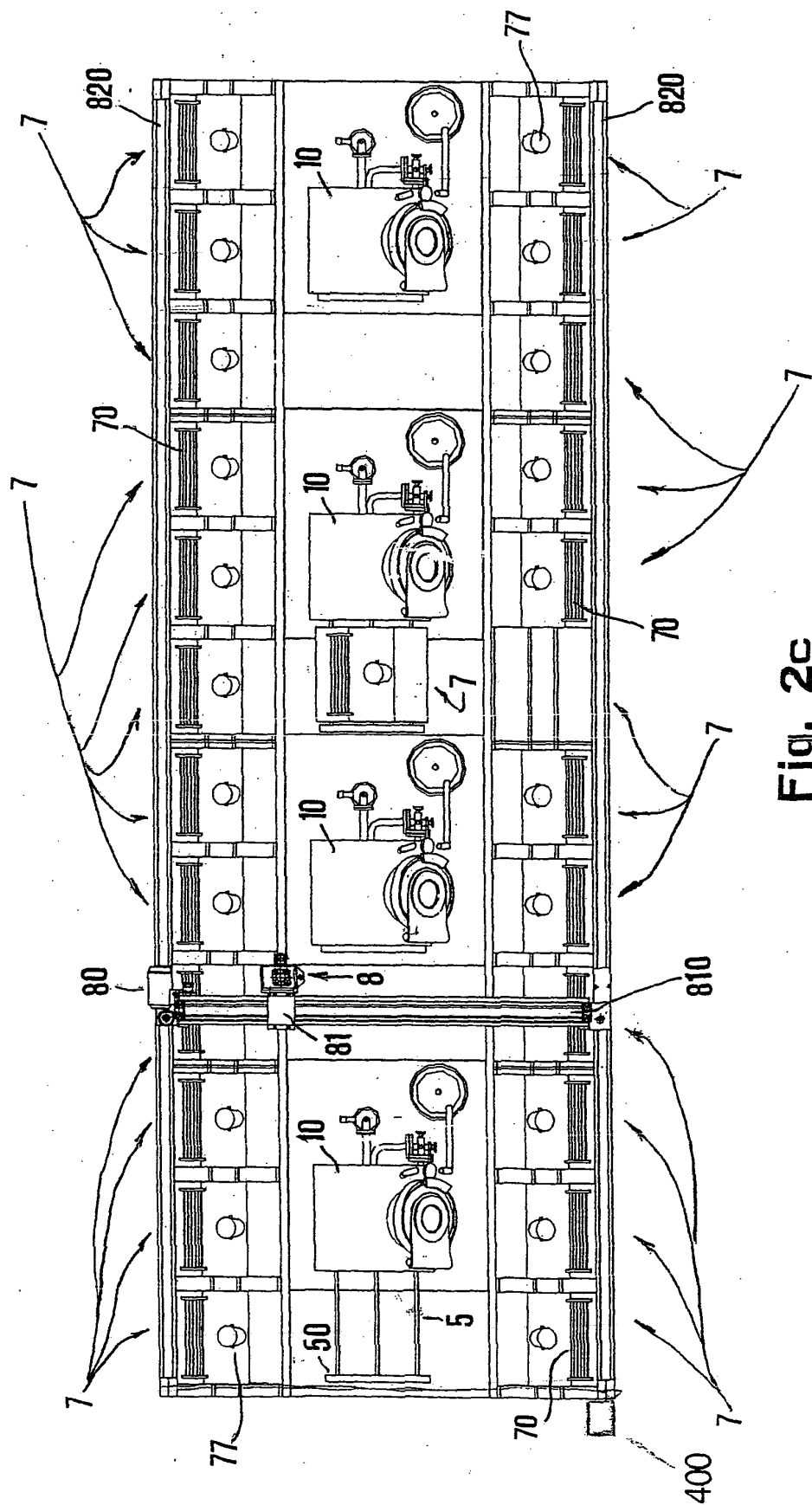


Fig. 2c

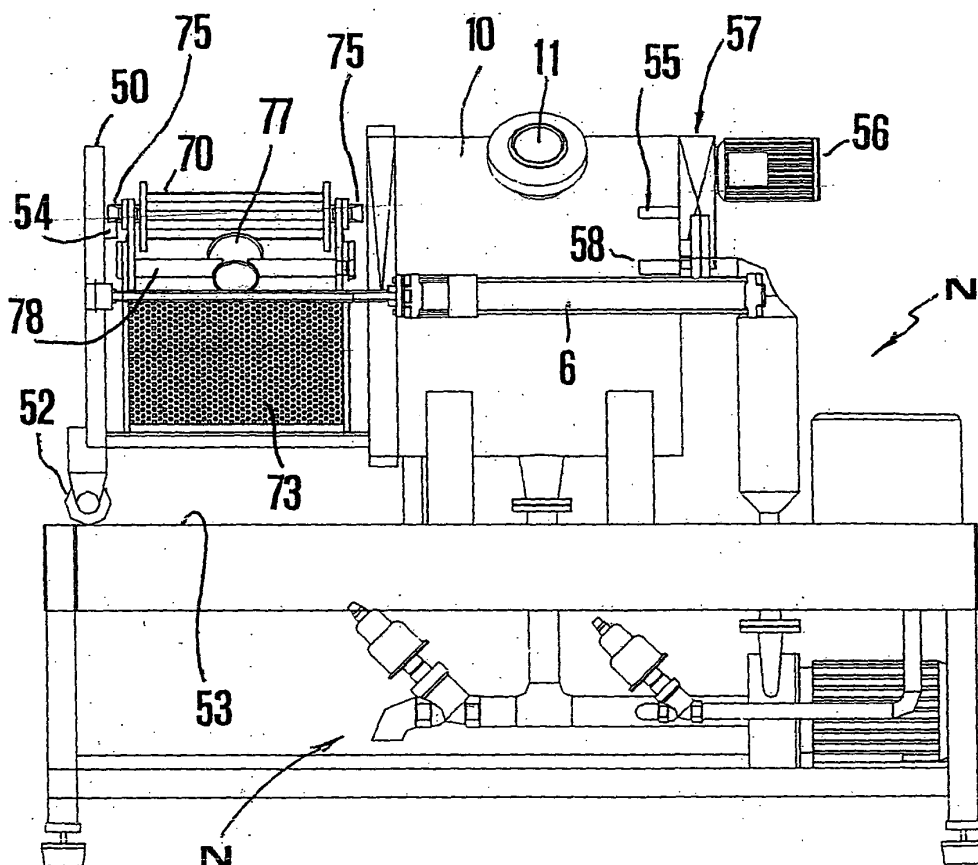


Fig. 3A

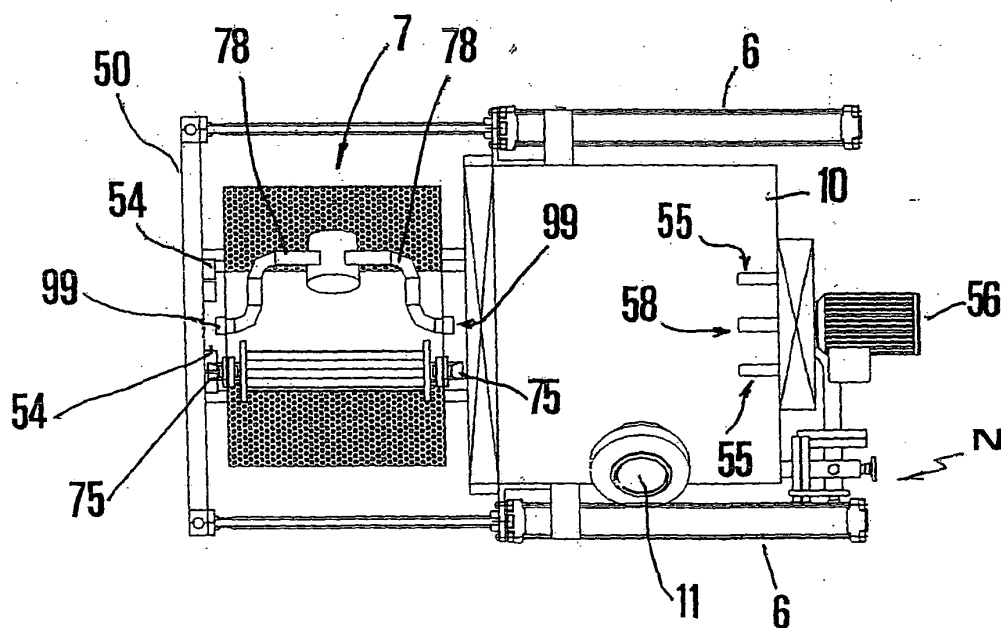


Fig. 3B

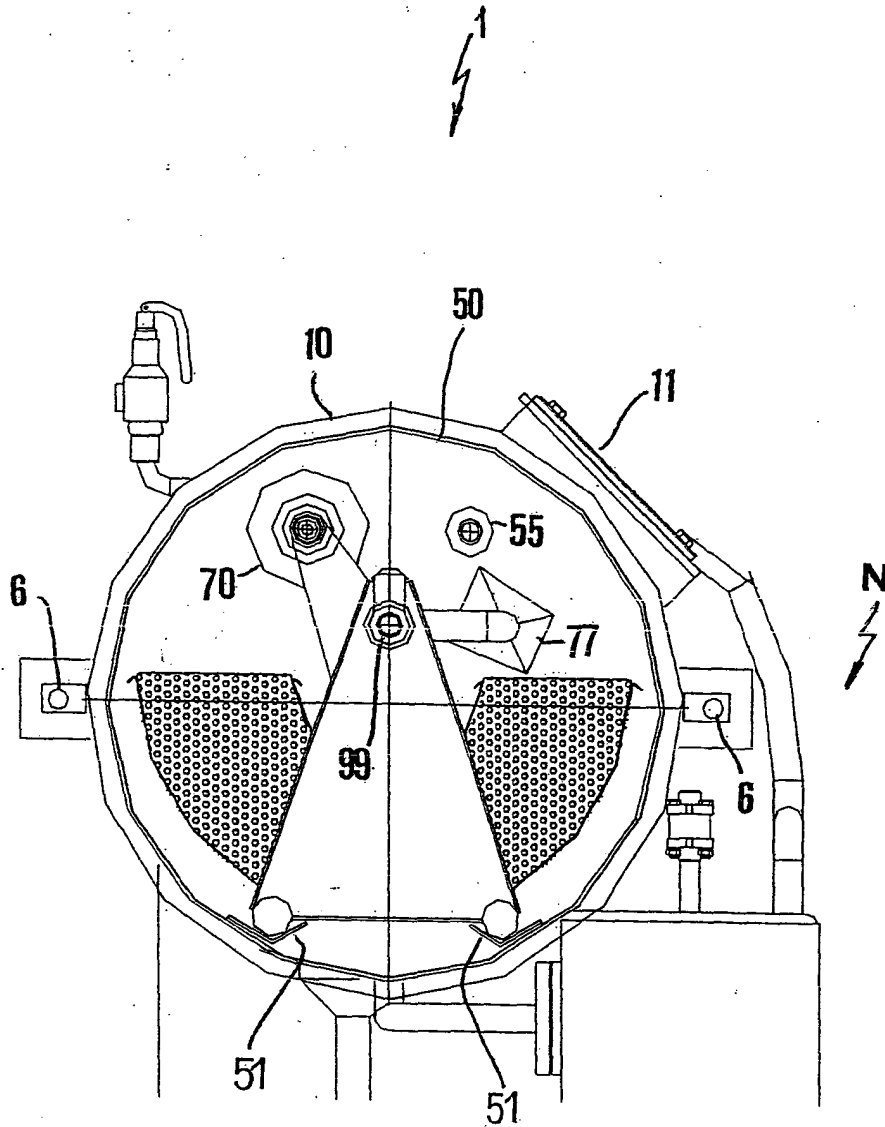
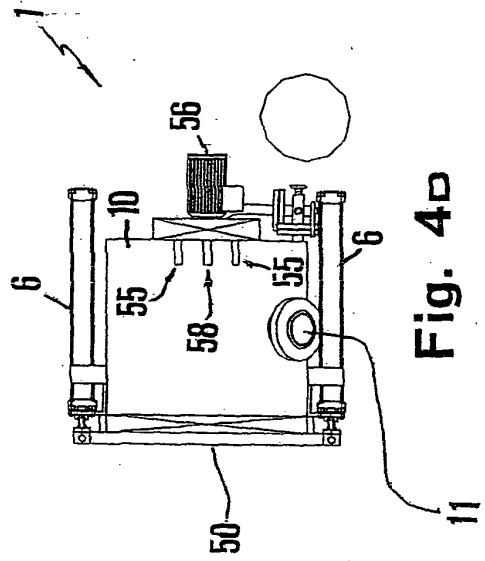
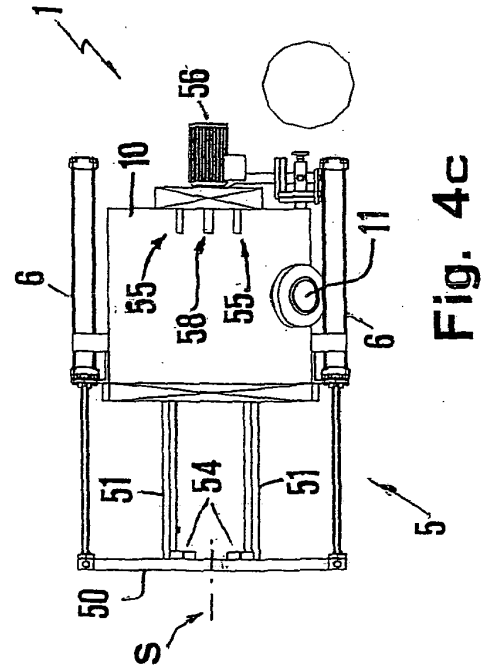
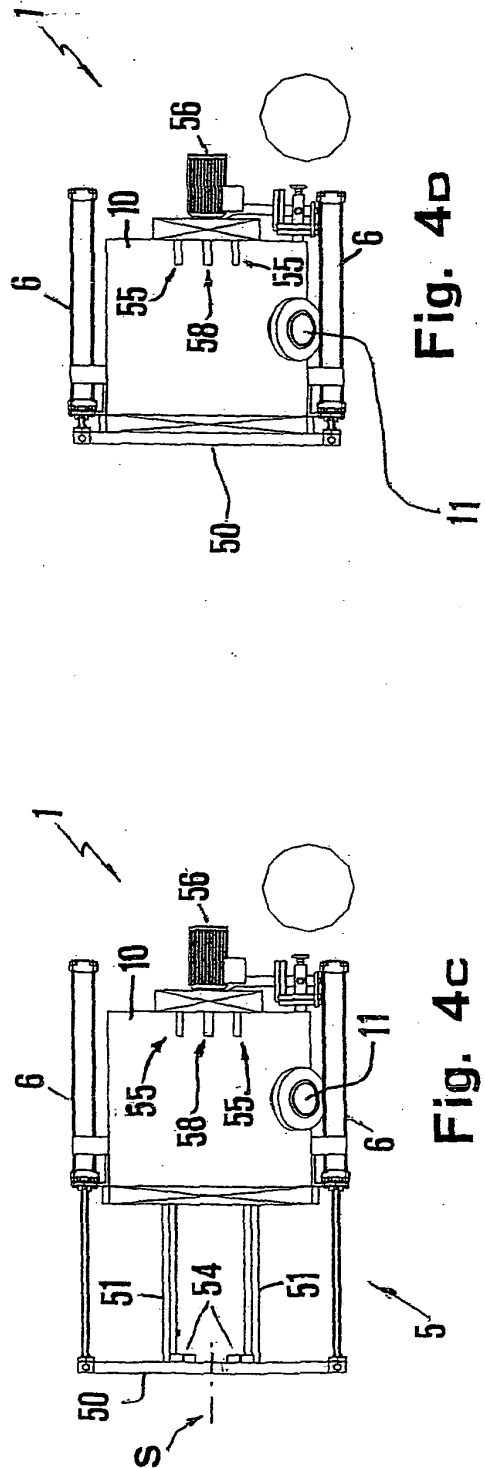
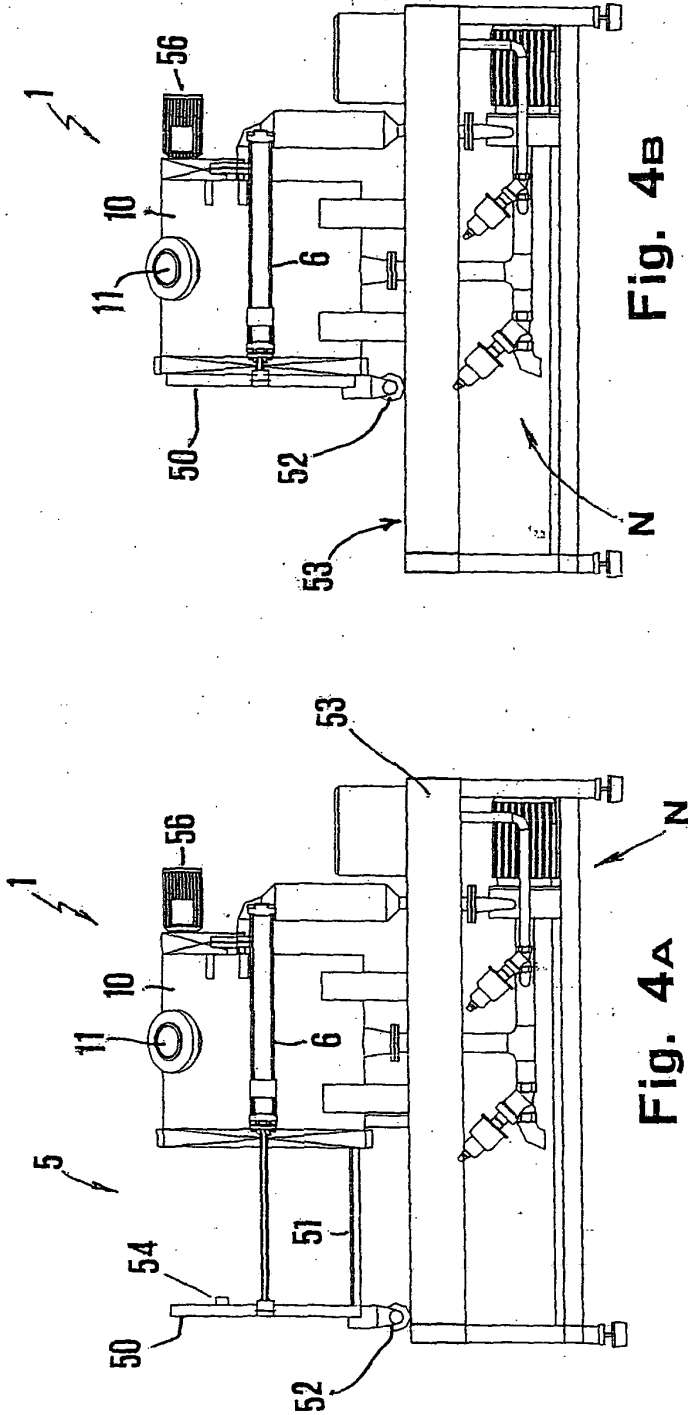


Fig. 3c



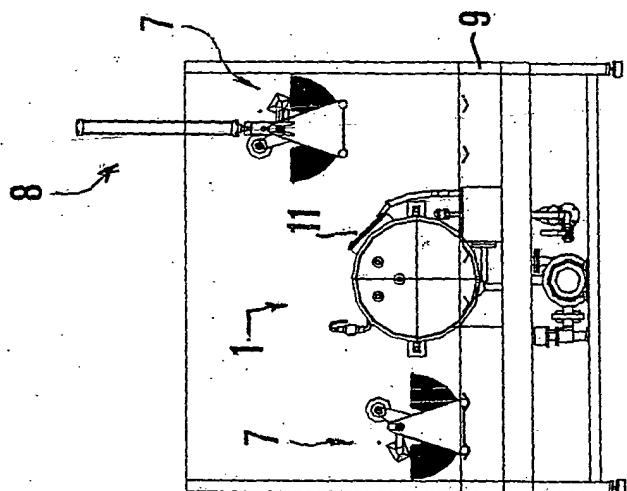


Fig. 5c

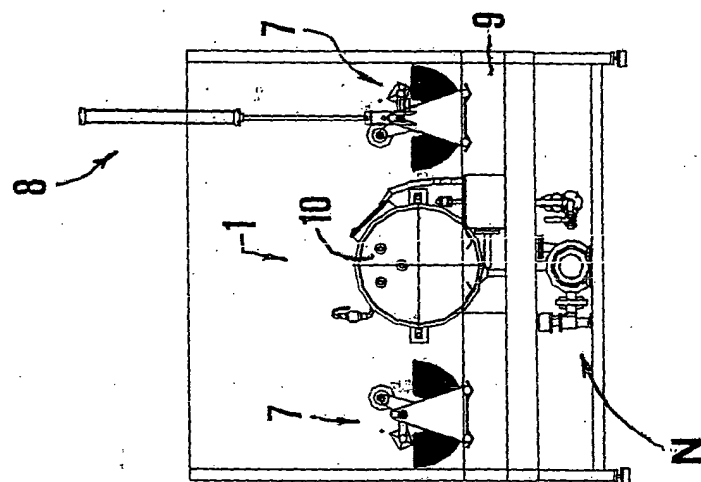


Fig. 5b

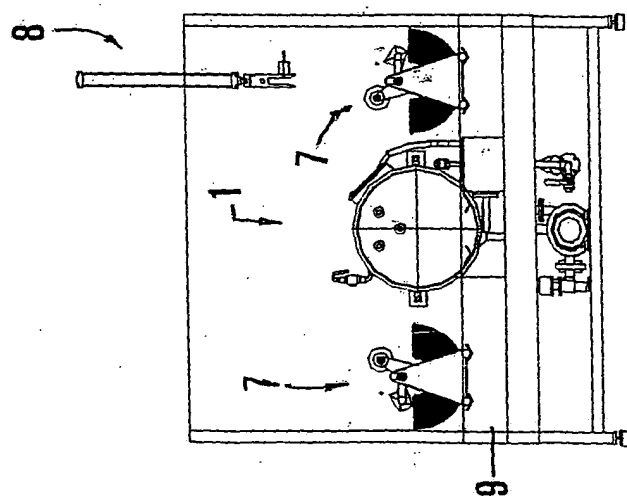


Fig. 5a

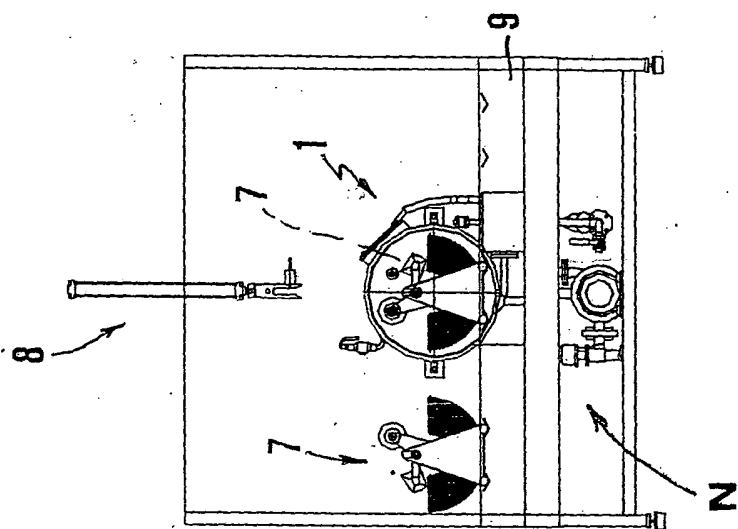


Fig. 5F

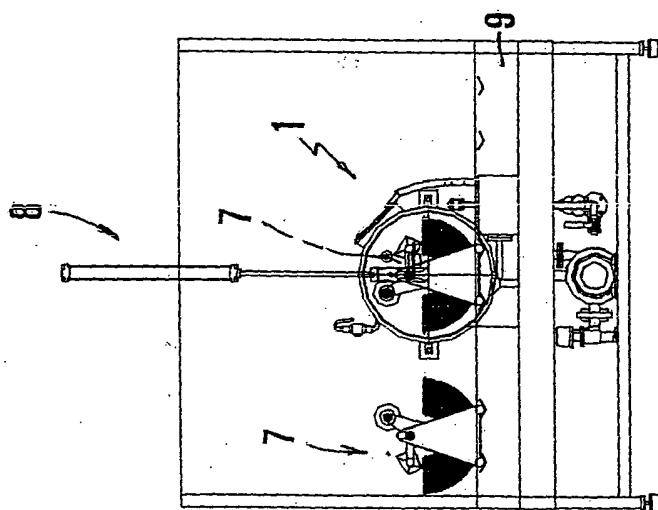


Fig. 5E

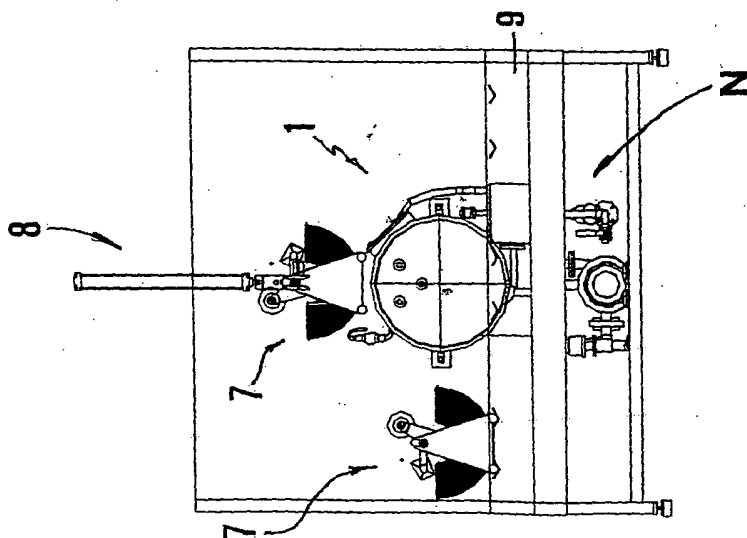


Fig. 5D

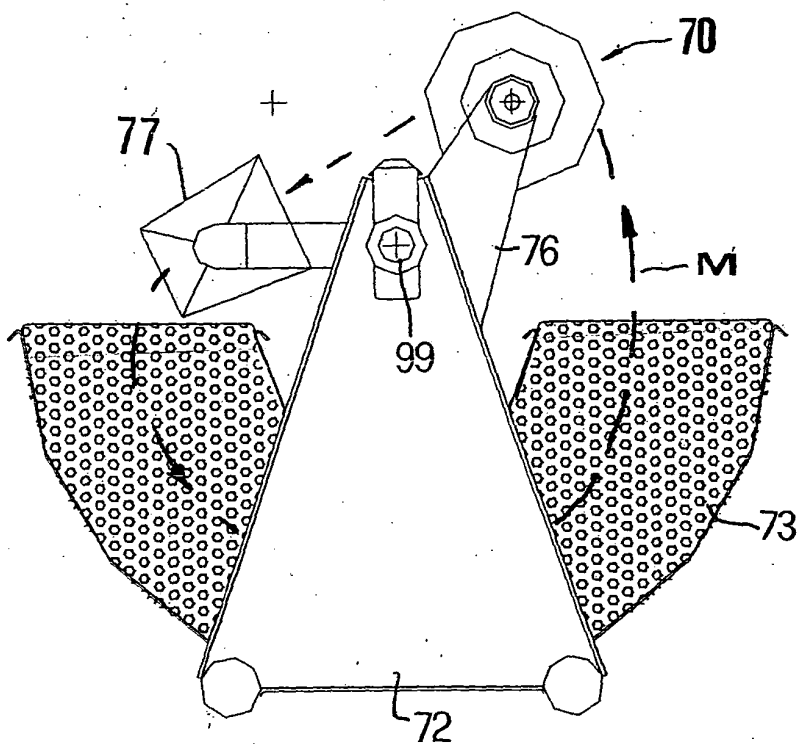


Fig. 6A

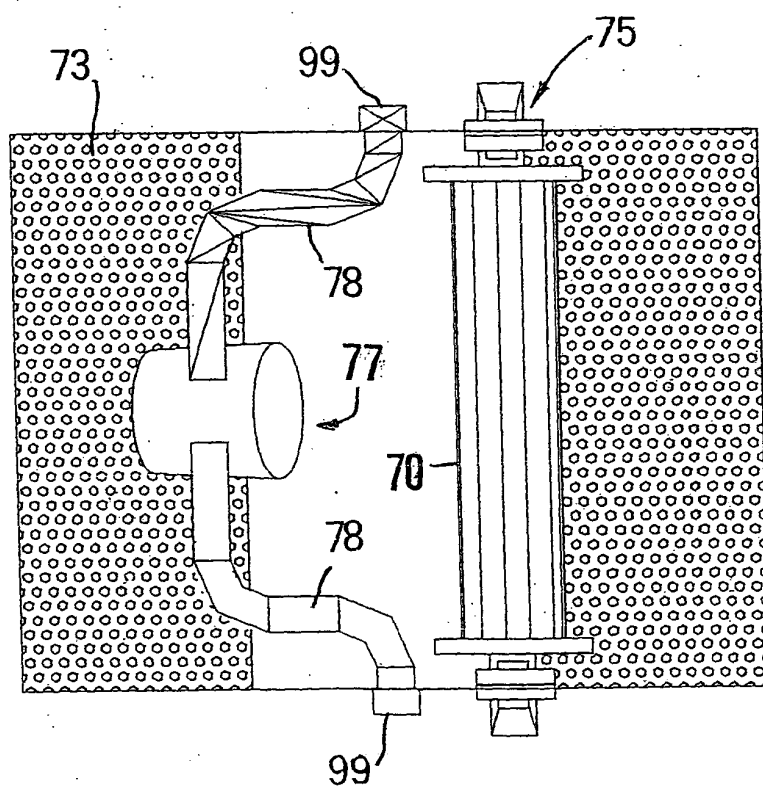


Fig. 6B

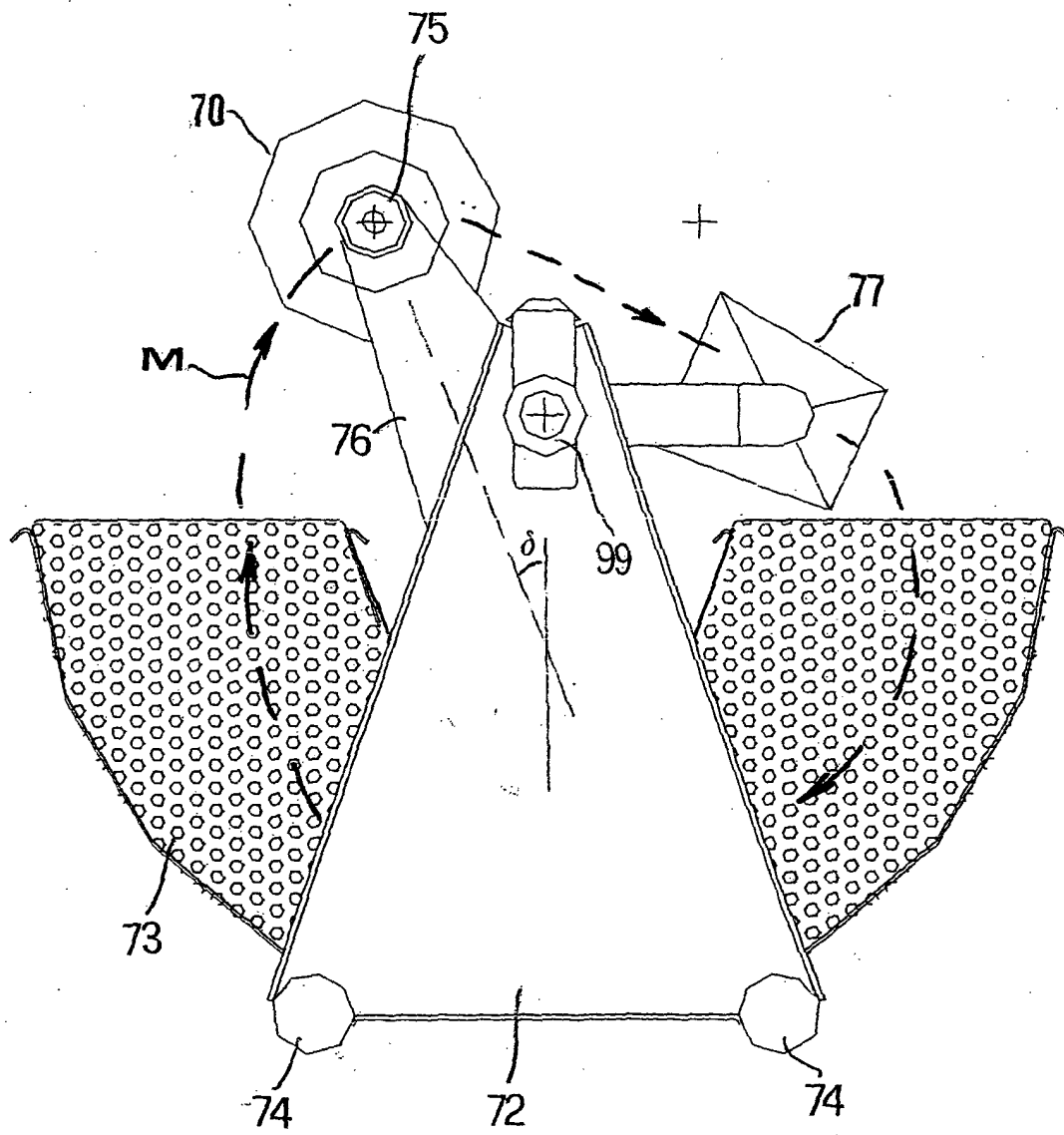


Fig. 6c

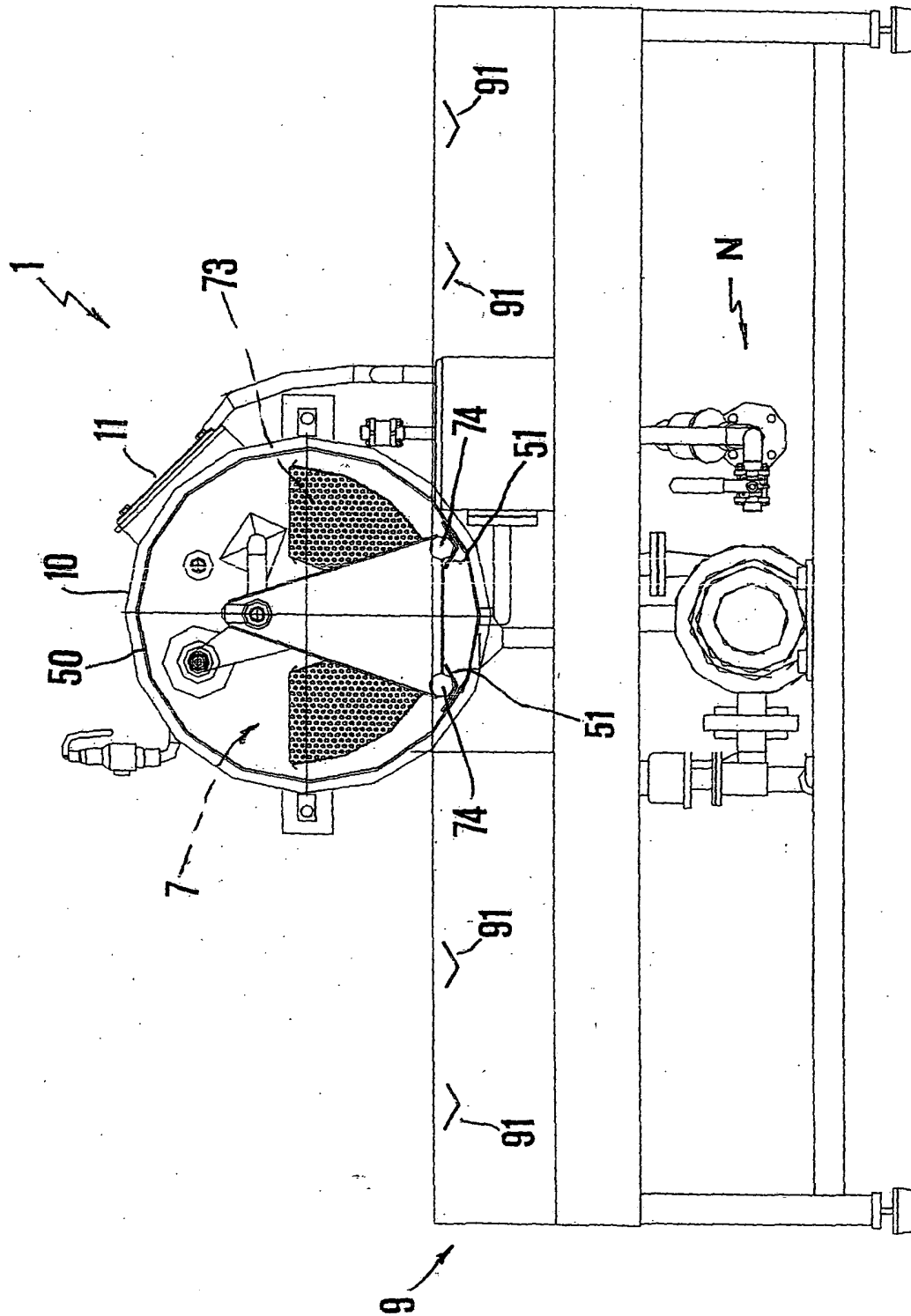


Fig. 7

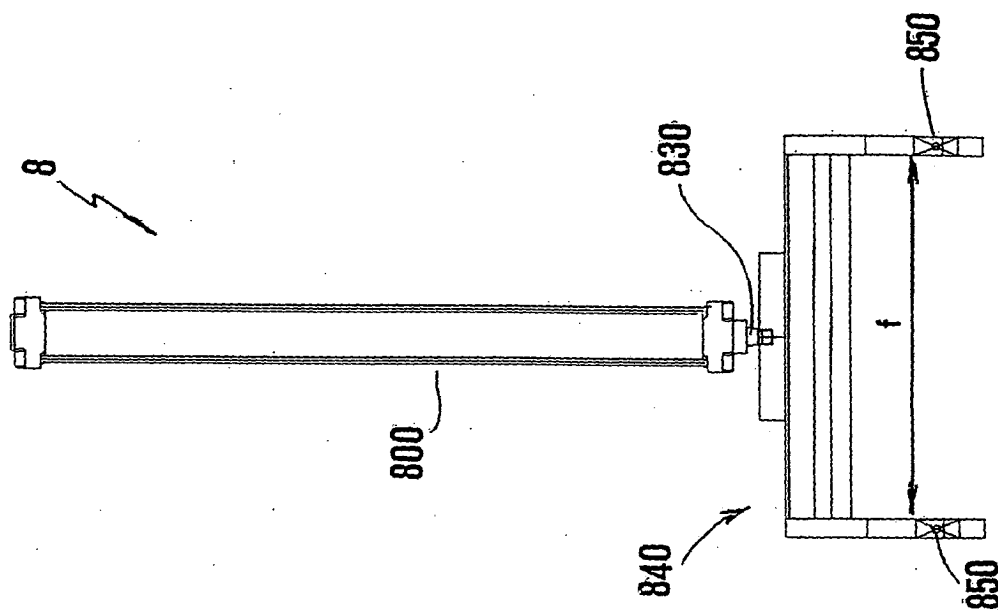


Fig. 8c

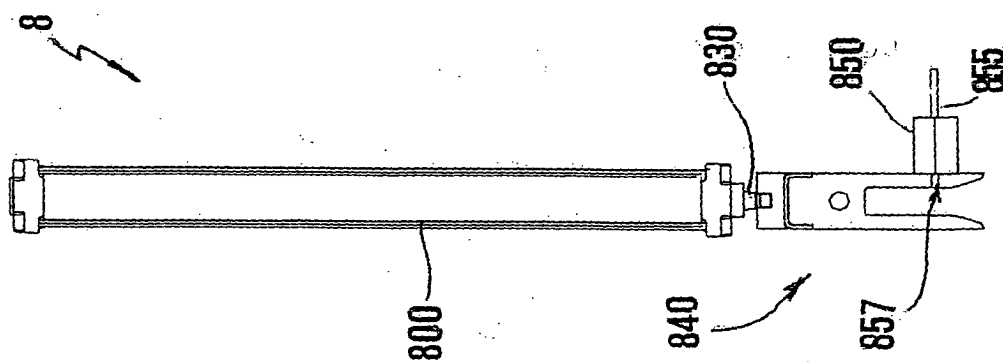


Fig. 8b

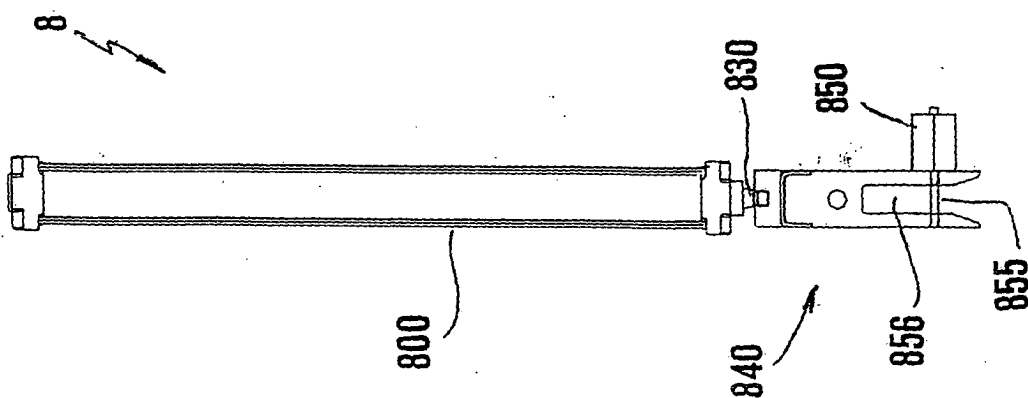


Fig. 8a

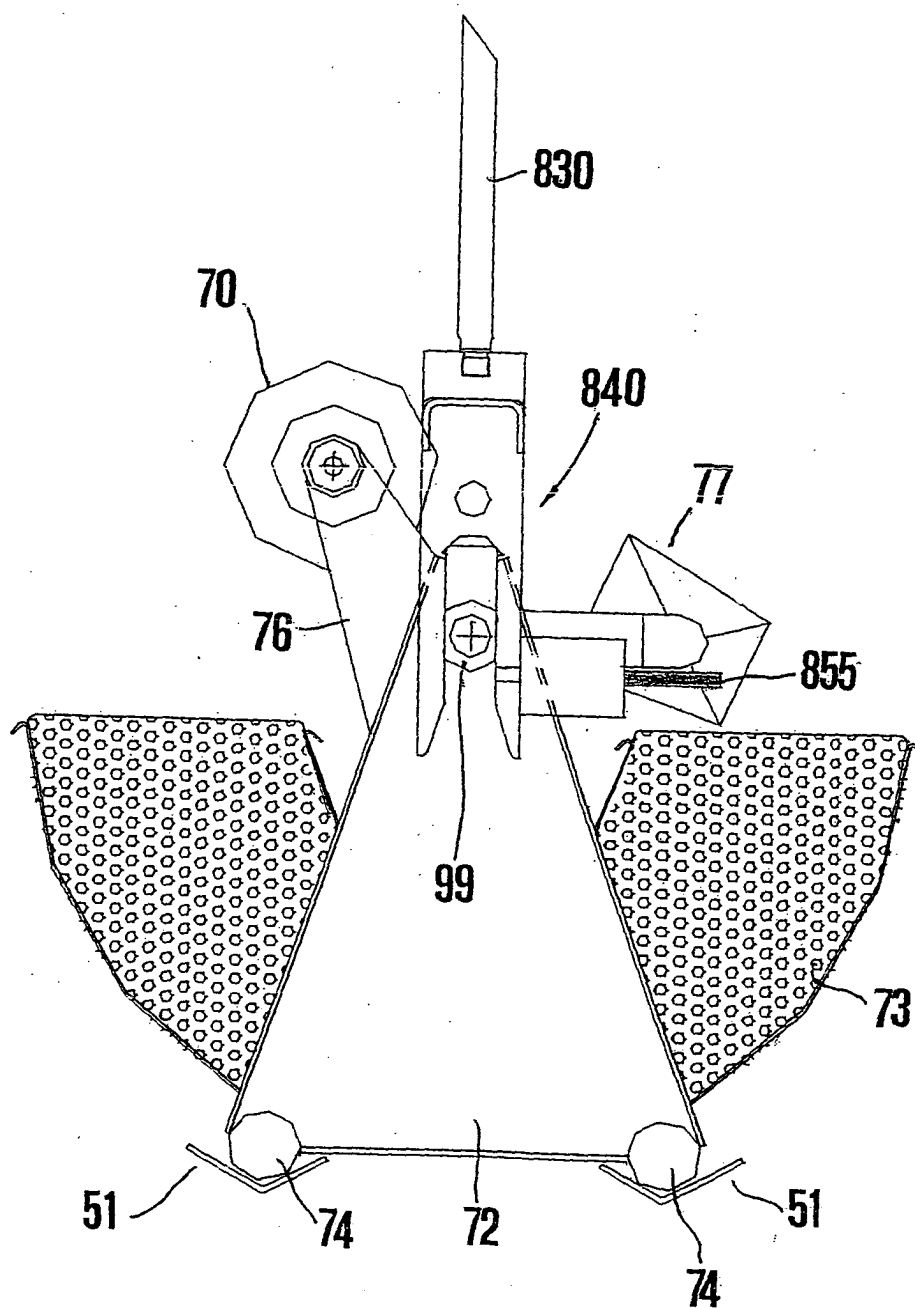


Fig. 9

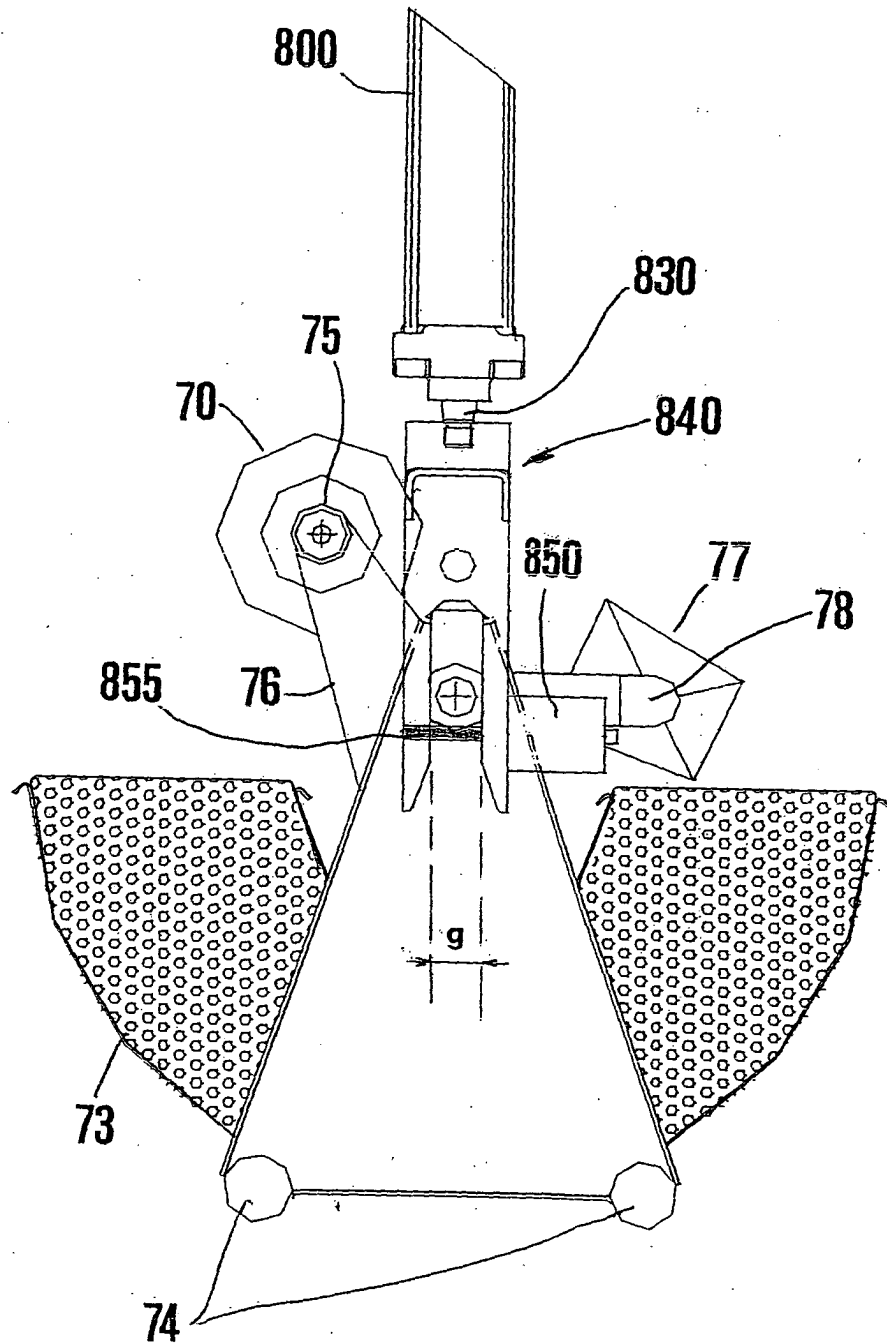


Fig. 10

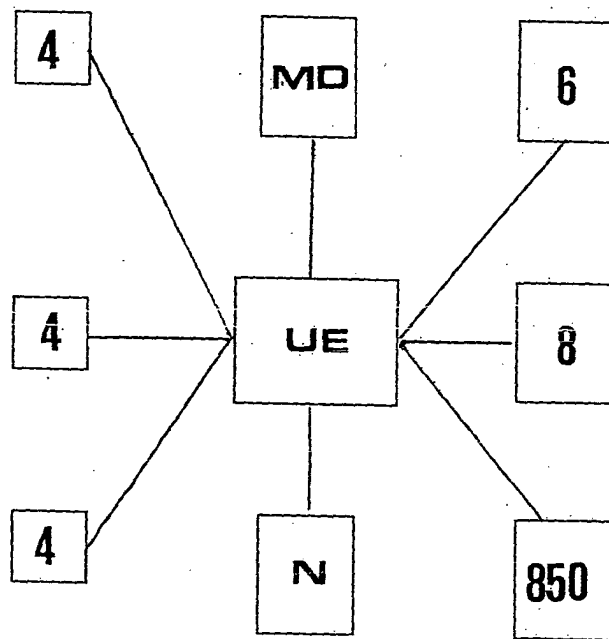


Fig.11