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(54) Apparatus for transporting bags for bag forming and filling machines

(57) Apparatus comprising one station (F) for forming the bag (1), one station (R) for filling the bag with the material (2), provided with fixed bag gripping means (112,112a), one station (S) for sealing the mouth (1a) of the bag and one apparatus for transporting the bags from

one station to the other station (F,R,S) in a feeding direction (X-X), said apparatus comprising two pairs of the arms (510,1510) which are symmetrically arranged with respect to the direction (X-X) of feeding of the bag and each carry respective pairs of means (514) for gripping the sides (1c) of the bag (1).

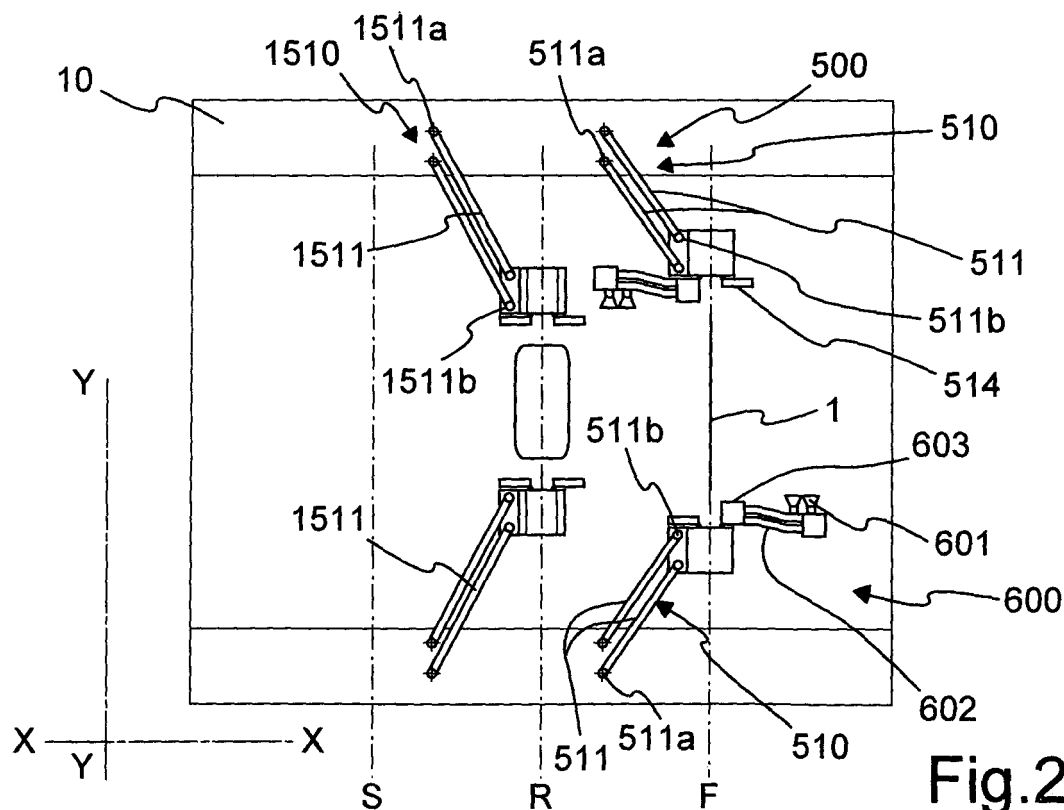


Fig.2

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Description

[0001] The present invention relates to a transporting apparatus for bag filling machines.

[0002] It is known that, in the technical sector relating to the packaging of bulk material, there exists the need to arrange said material inside bags which must be filled with a given and certain quantity of material and then sealed.

[0003] It is also known that, for this purpose, automatic bag filling machines have been developed, an example of these consisting of so-called forming/filling/sealing (FFS) machines which are able to perform at high speed the cycle consisting of forming and filling of the bag and final sealing of the bag mouth.

[0004] The resultant final product is a filled and sealed bag which must be able to be handled with great ease during the subsequent transportation, storage and distribution operations.

[0005] Transportation of the bag from one station to another of the FFS machines is performed by means of special devices able to perform a rectilinear or oscillating movement and equipped with grippers for gripping the bag, which are opened and closed in sequence in order to grip the bag in one station and transport it, releasing it at the next station.

[0006] Although performing their function, these devices of the known type, however, are unable to achieve the machine speeds (number of bags/minute) currently required, since, before being able to return to the starting station, the transportation device is required to wait for opening of the bag, at the filling station, in order to be able to release the bag to the associated fixed grippers provided for this purpose at the filling hopper mouth.

[0007] The technical problem which is posed, therefore, is that of providing a bag transportation apparatus for forming/filling/sealing machines, able to solve the problems of the prior art in order to increase the hourly production output of the machine without modifying its structure.

[0008] In connection with this problem it is also required that this device should have small dimensions, be easy and inexpensive to produce and assemble and be able to be easily installed also on ready existing machines and incorporated in production lines without the need for special adaptation.

[0009] These results are achieved according to the present invention by a transportation apparatus for machines for filling bags with bulk material, comprising at least one station for forming the bag, at least one station for filling the bag with the material, provided with fixed bag gripping means, at least one station for sealing the mouth of the bag and at least one apparatus for transporting the bags from one station to the other station in a feeding direction, comprising two pairs of the arms which are symmetrically arranged with respect to the direction of feeding of the bag and each carry respective pairs of means for gripping the sides of the bag, said

pairs of arms being formed by levers which are kinematically connected together in a pantograph arrangement, the first pair of levers being able to travel along a curved trajectory from a point where the gripping means are situated at a maximum relative distance to a point where the same gripping means are situated at a minimum relative distance, along the outward and return path from one station to the other, the second pair of arms being able to travel along a curved trajectory from a point where the grippers are situated at a minimum relative distance to a point where the same grippers are situated at a maximum relative distance and vice versa along the outward and return path from one station to the other.

[0010] Further details may be obtained from the following description of a non-limiting example of embodiment of the object of the present invention, provided with reference to the accompanying drawings in which:

- Figure 1 shows a schematic side view of a machine according to the present invention;
- Figure 2 shows a schematic cross-section along the surface plane II-II of Fig. 1 of the machine shown in Fig. 1;
- Figures 3 to 4 show a view similar to that of Fig. 2 and a cross-section along the plane indicated by III-III in Figure 1, respectively, during the bag forming step;
- Figures 5 and 6 show a view and a cross-section similar to that of Figs. 3-4 of the bag during filling; and
- Figures 7 and 8 show cross-sections similar to those of Fig. 2 illustrating, respectively, the step involving gripping of a filled bag and a bag to be filled with transportation of the said bags to the next working station.

[0011] As schematically shown in Figures 1 and 2 and with reference to two reference axes, identified conventionally and solely for the sake of convenience of the description as longitudinal axis X-X and transverse axis Y-Y, a non-limiting illustrative example of a machine for filling bags 1 with bulk material 2 may be of the forming/filling type which comprises essentially at least three working stations, i.e.:

- a station F for forming the bag 1 from a tubular material 101 unwound from a reel 101a; in this station sealing of the bottom 1b of the bag and cutting to size of the tubular material which results in formation of the mouth 1a of the bag 1 is performed;
- a station R for filling the bag with material 2 supplied by the filling apparatus 200, for example consisting of a hopper provided with an associated bagtying device 210 having walls 211 which can be opened/closed (Fig. 6);
- a station S for sealing the mouth 1a of the bag.

[0012] Pairs of fixed grippers 112 which are suitably designed with dimensions for supporting the weight of a

fully loaded bag and can be operated by means of respective actuators 112a are also provided in the filling station (Fig. 6).

[0013] Transportation of the bag from one station to the other is performed by means of an apparatus 500 (Fig. 2) comprising a first pair 510 of arms formed by levers 511 which are kinematically connected together in a pantograph arrangement and having a first end 511a hinged with the fixed structure 10 of the machine; the other end 511b of each lever is connected, by means of hinging pins, to a flange 513 (Fig. 6) supporting grippers 514 for gripping the side edge 1c of the bag, which can be operated so as to open/close by means of corresponding actuators 514a.

[0014] In this way the rotation of the pair of levers 511 about the fixed pivot 511a does not alter the alignment of the pair of grippers 514 with the transverse axis Y-Y.

[0015] Said first pair of arms 510 also comprises devices 600 for gripping and opening the walls 1d of the bag 1 (Figs. 2-3) essentially comprising suckers 601 connected to pantograph arms 602 hinged on an associated vertical shaft 603 joined to the respective gripper 514 attached to the arms 511, said suckers also being connected to means (not shown) for forming a vacuum able to ensure gripping of the walls 1d of the bag (Fig. 4).

[0016] As shown, the transportation apparatus also comprises a second pair of arms 1510 identical to the first pair, but without the said devices 600 for gripping and opening the walls 1d of the bag.

[0017] Said second pair has levers 1511 in turn hinged with the fixed structure 10 of the machine in a position downstream of the first pair 510 in the direction of feeding of the bag and is independent of the first pair with which it is synchronized during programming of the machine cycle.

[0018] With the configuration described above and with reference to Figures 3 to 8 which show the operating sequence of the machine, operation of the transportation cycle is as follows:

- the two pairs of arms 510, 1510 are rotated so as to arrange the gripping grippers 512 in the forming station F and filling station R; at the start of the cycle both the said gripping grippers 512 and the arms 602 carrying the suckers 601 of the first pair are open, namely are substantially aligned parallel to the longitudinal direction X-X (Fig. 2);
- during the next step (Fig. 3) both the grippers 603 for gripping the bag 1 and the arms 602 carrying the suckers 601 are closed so as to cause engagement together of the sucker 601/wall 1d of the bag;
- subsequently (Figs. 5-6) the two pairs of arms 510 and 1510 are rotationally operated so as to bring them opposite the filling station R and sealing station S;
- during this step (Fig. 5) the arms 511 of the first pair 510 follow a curved trajectory T which brings the opposite grippers 514 from a position T1 where they

are situated at a maximum relative distance, corresponding to the configuration where the walls 1d are pulled and hence the mouth 1a of the bag is closed, to a position T2 where they are at a minimum relative distance so as to allow the movement of the sides 1c of the bag and therefore opening of the mouth 1a thereof; this opening is assisted by rotation of the arms 602 carrying the suckers 601 which, during the travel of the bag from the forming station F to the filling station R, pass from a position V1 (Fig. 3) where they are at a minimum relative distance in the longitudinal direction X-X, corresponding to the bag being closed, to a position V2 (Fig. 5) where they are at a maximum relative distance, corresponding to the bag mouth being open;

- during the abovementioned travel of the first pair of arms 510, the second pair of arms 1510 follows a similar trajectory, moving from a position T2 where the corresponding grippers are situated at a minimum relative distance (station R) to a position T3 where they are situated at a maximum relative distance which, during the second rotation, shown in Figures 7 and 8, causes the pulling, in opposite directions, of the two sides 1c of the bag, already filled, with consequent closing of the mouth 1a which may be sealed by corresponding sealing means present in the sealing station S and conventional per se and therefore not described in detail.

[0019] The figures do not show all the means for actuating and controlling the movement of the various parts of the machine which, being conventional per se, are within the competence of a person skilled in the art and do not require a detailed description.

[0020] It is therefore clear how the transportation apparatus according to the invention, based on the combination of the independent action of the pairs of arms 510 and 1510 which transport the bag and the arms 602 which carry the suckers 601 for opening the mouth 1a of the said bag, allow the mouth of the bag to be opened during its travel from the forming station F to the filling station R, without the need to wait for gripping by the fixed grippers 112 arranged in the latter.

[0021] This allows the arms carrying the suckers to be opened as soon as the bag has reached the filling station R and has been consigned to the corresponding fixed grippers and cause the return, immediately, of the pair of arms 510 in order to grip a new bag 1 already formed.

[0022] The time gained during the outward and return travel between the forming and filling station results in a considerable increase in the hourly production output compared to machines of the known type, which have:

- either the opening movement, but not the independence of the transportation grippers;
- or vice versa have the independence of the transportation grippers, but are unable to open the bag when passing from one station to the other.

Claims

1. Transportation apparatus for machines for filling bags (1) with bulk material (2), comprising at least one station (F) for forming the bag (1), at least one station (R) for filling the bag with the material (2), provided with fixed bag gripping means (112,112a), at least one station (S) for sealing the mouth (1a) of the bag and at least one apparatus for transporting the bags from one station to the other station (F,R,S) in a feeding direction (X-X), **characterized in that** it comprises two pairs of the arms (510,1510) which are symmetrically arranged with respect to the direction (X-X) of feeding of the bag and each carry respective pairs of means (514) for gripping the sides (1c) of the bag (1), said pairs of arms (510,1510) being formed by levers (511,1511) which are kinematically connected together in a pantograph arrangement, the first pair of levers (511) being able to travel along a curved trajectory (T) from a point (T1) where the gripping means (514) are situated at a maximum relative distance to a point (T2) where the same gripping means (514) are situated at a minimum relative distance, along the outward and return path from one station (F) to the other station (R), the second pair of arms (1550) being able to travel along a curved trajectory (T) from a point (T2) where the grippers (514) are situated at a minimum relative distance to a point (T3) where the same grippers (514) are situated at a maximum relative distance and vice versa along the outward and return path from one station (R) to the other station (S).
2. Apparatus according to Claim 1, **characterized in that** the first pair of arms (510) which perform transportation of the bag from the forming station (F) to the filling station (R) is provided with respective levers (602) supporting means (601) for gripping the opposite walls (1d) of the bag (1), said support levers (602) being able to pass from a condition where they are at a minimum relative distance (V1) with respect to the bag (1) into a condition where they are at a maximum relative distance (V2), during the travel from the forming station (F) to the filling station (R).
3. Apparatus according to Claim 2, **characterized in that** said levers (602) supporting the means (601) for gripping the walls (1d) of the bag are able to be arranged in a position substantially aligned with the direction (X-X) of feeding of the bag at the end of the outward travel from the forming station (F) to the filling station (R) so as to allow the return of the first pair of arms (510) of the transportation apparatus.
4. Apparatus according to Claim 2, **characterized in that** said levers (602) supporting the means (601) for gripping the walls (1d) have a pantograph structure.
5. Apparatus according to Claim 1, **characterized in that** a first end (511a,1511a) of said pairs of arms (510,1510) is hinged with the fixed structure (10) of the machine.
6. Apparatus according to Claim 1, **characterized in that** the second end (511b,1511b) of said pair of arms (510,1510) carry said means (514) for gripping the sides.
7. Apparatus according to Claim 1, **characterized in that** said gripping means (514) consist of gripping members.
8. Apparatus according to Claim 7, **characterized in that** said grippers (514) are attached to a flange (513,1513) hinged with the said free ends (511b,1511b) of the levers (511,1511).
9. Apparatus according to Claim 2, **characterized in that** said means for gripping the walls (1d) of the bag (1) consist of suckers (601).
10. Apparatus according to Claim 9, **characterized in that** said suckers (601) are associated with devices for forming a vacuum inside them.
11. Apparatus according to Claim 1, **characterized in that** it comprises means for synchronising the movements of the two pairs of arms (510,1510) and the levers (602) supporting the gripping means (601).
12. Machine for filling bags (1) with bulk material (2), comprising at least one station (F) for forming the bag (1), at least one station (R) for filling the bag with the material (2) and provided with fixed means (112,112a) for gripping the bag, at least one station (S) for sealing the mouth (1a) of the bag and at least one apparatus for transporting the bags from one station to the other station (F,R,S) in a feeding direction (X-X), **characterized in that** said transportation apparatus comprises two pairs of arms (510,1510) symmetrically arranged with respect to the direction of feeding (X-X) of the bag and carrying respective pairs of means (514) for gripping the sides (1c) of the bag (1), said pairs of arms (510,1510) being formed by levers (511,1511) kinematically connected together in a pantograph arrangement, said first pair of levers (511) being able to follow a curved trajectory (T) from a point (T1) where the gripping means (514) are situated at a maximum relative distance to a point (T2) where the said gripping means (514) are situated at a minimum relative distance, along the outward and return path from one station (F) to the other station (R), said second pair of arms (1550) being able to follow a curved trajectory (T) from a point (T2) where the grippers (514) are situated at a minimum relative distance to a point (T3)

where the same grippers (514) are situated at a maximum relative distance along the outward and return path from one station (R) to the other station (S).

that it comprises means for synchronising the movements of the two pairs of arms (510,1510) and the levers (602) supporting the gripping means (601).

13. Machine according to Claim 12, **characterized in that** the first pair of arms (510) which performs the transportation of the bag from the forming station (F) to the filling station (R) is provided with respective levers (602) supporting means (601) for gripping the opposite walls (1d) of the bag (1), said support levers (602) being able to pass from a condition where they are situated at a minimum relative distance (V1) with respect to the bag (1) to a condition where they are situated at a maximum relative distance (V2), during travel from the forming station (F) to the filling station (R). 5
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14. Machine according to Claim 13, **characterized in that** said levers (602) supporting the means (601) for gripping the walls (1d) of the bag are able to be arranged in a position substantially aligned in the direction of feeding (X-X) of the bag at the end of the outward travel from the forming station (F) to the filling station (R) so as to allow the return of the first pair of arms (510) of the transportation apparatus. 20
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15. Machine according to Claim 13, **characterized in that** said levers (602) supporting the means (601) for gripping the walls (1d) have a pantograph structure. 30
16. Machine according to Claim 12, **characterized in that** a first end (511a,1511a) of said pair of arms (510,1510) is hinged with the fixed structure (10) of the machine. 35
17. Machine according to Claim 12, **characterized in that** the second end (511b,1511b) of the said pair of arms (510,1510) carry said gripping means (514). 40
18. Machine according to Claim 12, **characterized in that** the said gripping means (514) consist of gripping members.
19. Machine according to Claim 18, **characterized in that** said grippers (514) are attached to a flange (513,1513) hinged with said free ends (511b,1511b) of the levers (511,1511). 45
20. Machine according to Claim 13, **characterized in that** said means for gripping the walls (1d) of the bag (1) consist of suckers (601). 50
21. Machine according to Claim 20, **characterized in that** said suckers (601) are associated with devices for forming a vacuum inside them. 55
22. Machine according to Claim 12, **characterized in**

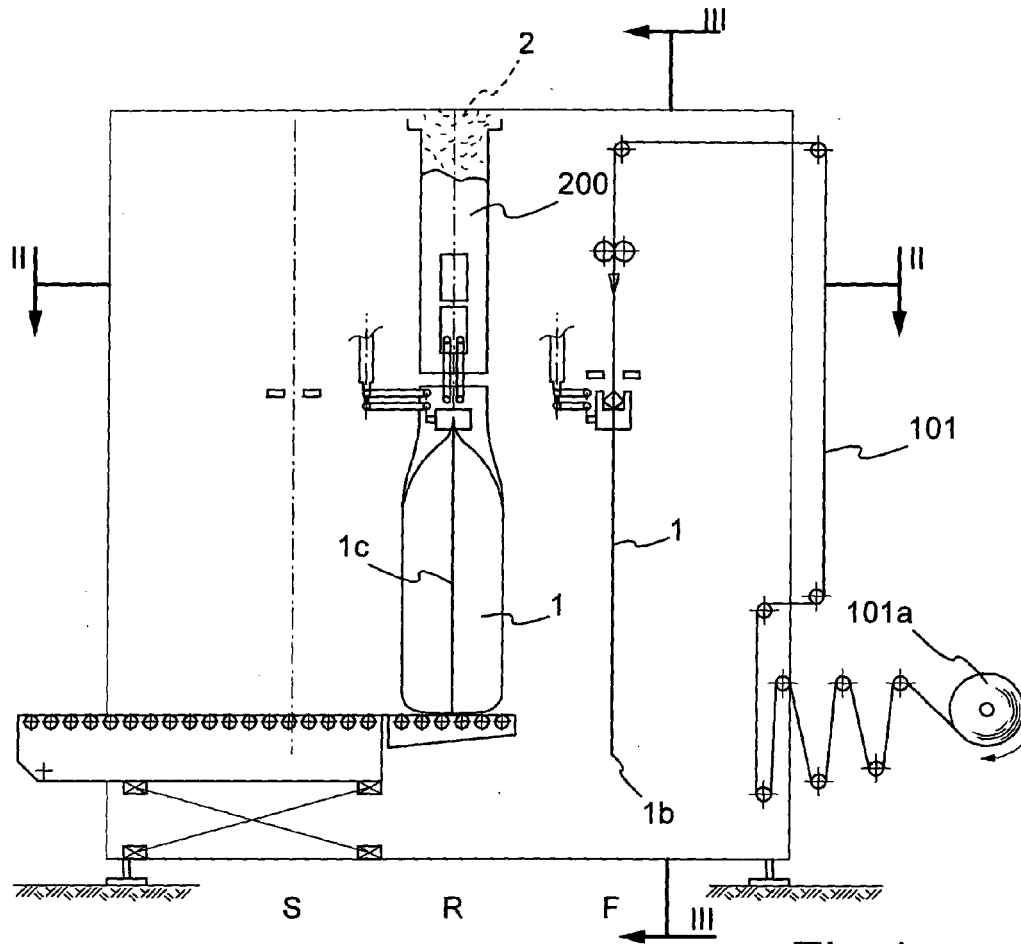


Fig.1

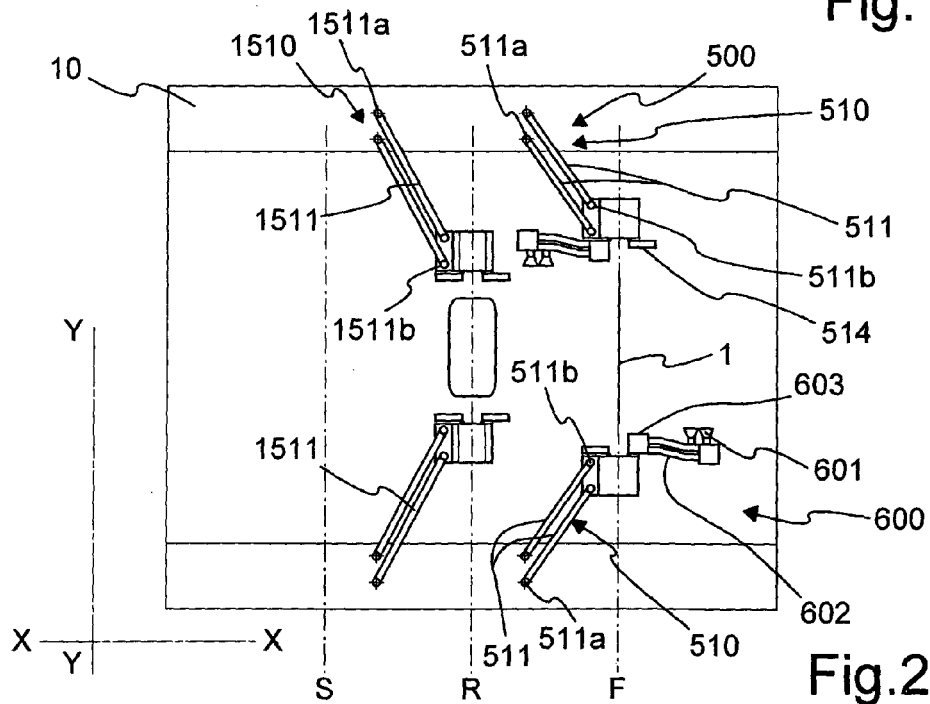
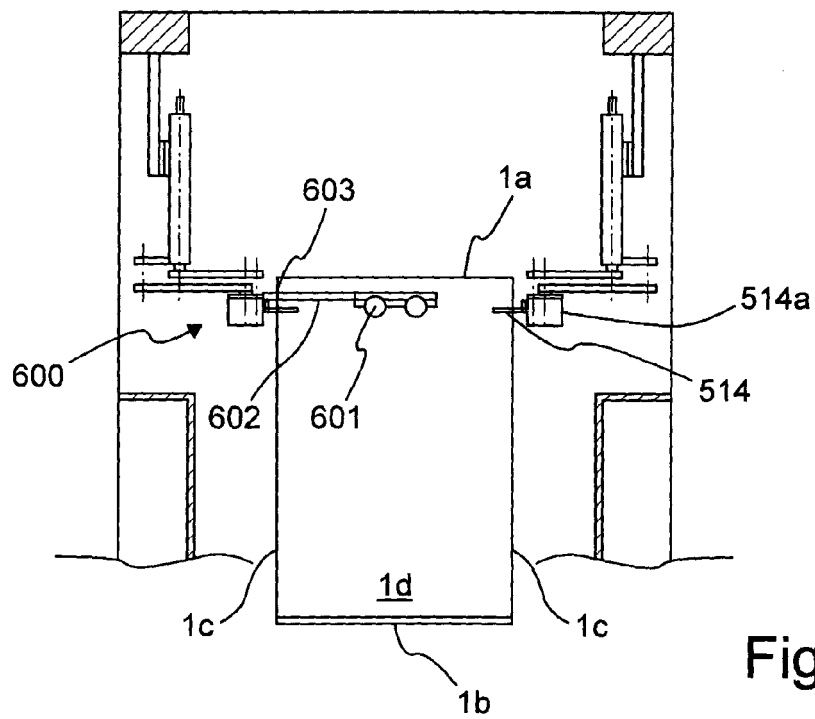
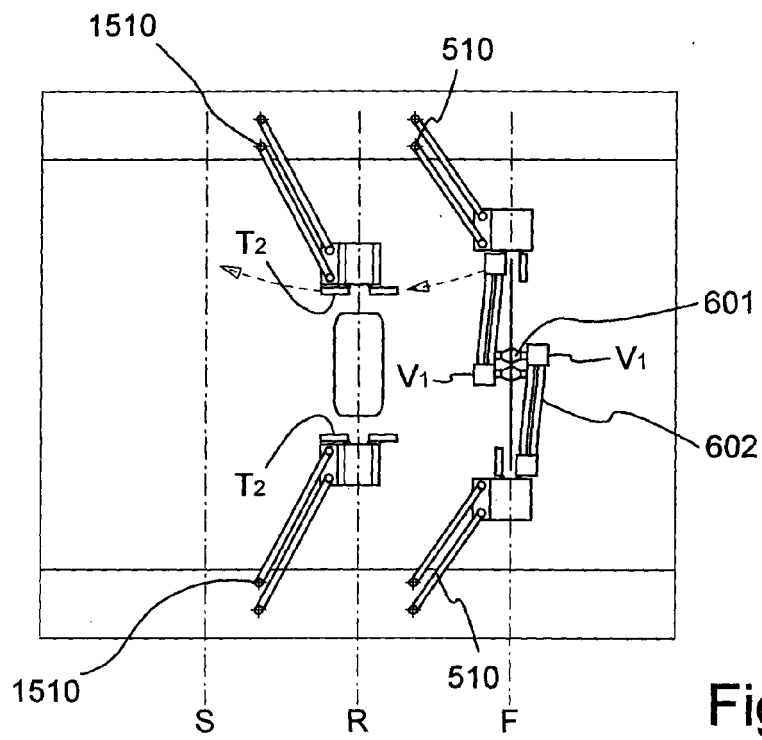


Fig.2



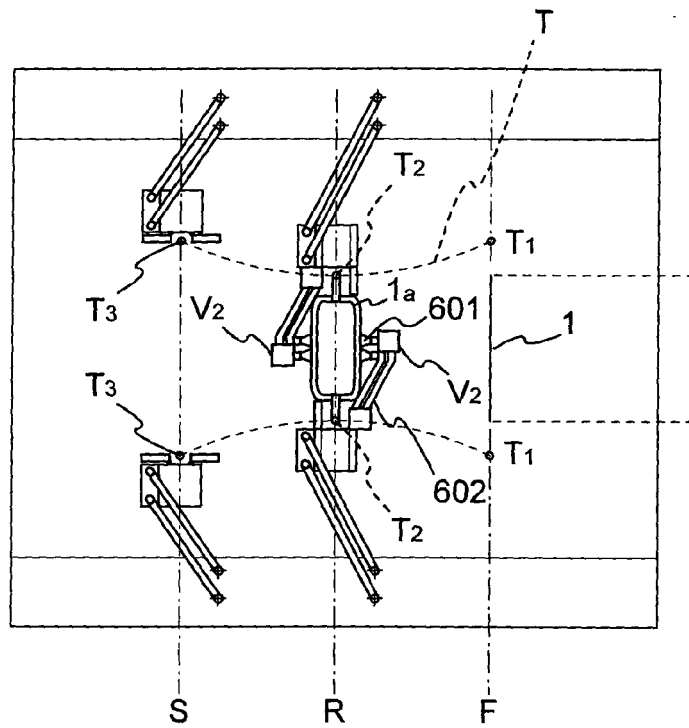


Fig.5

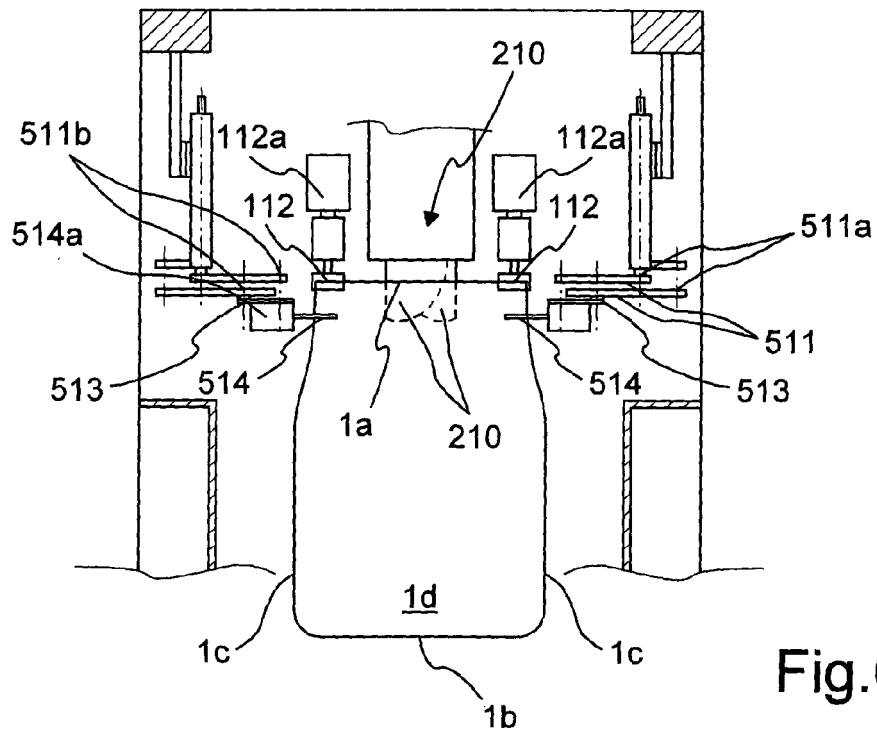


Fig.6

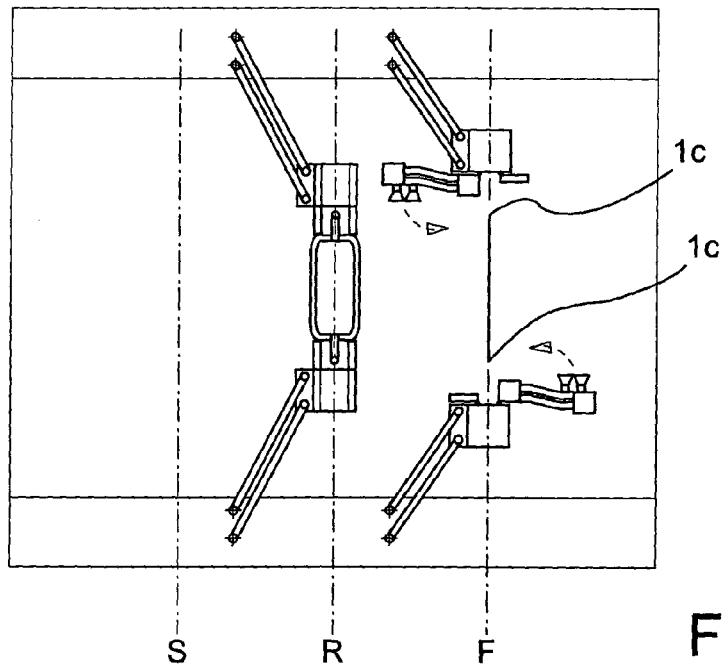


Fig.7

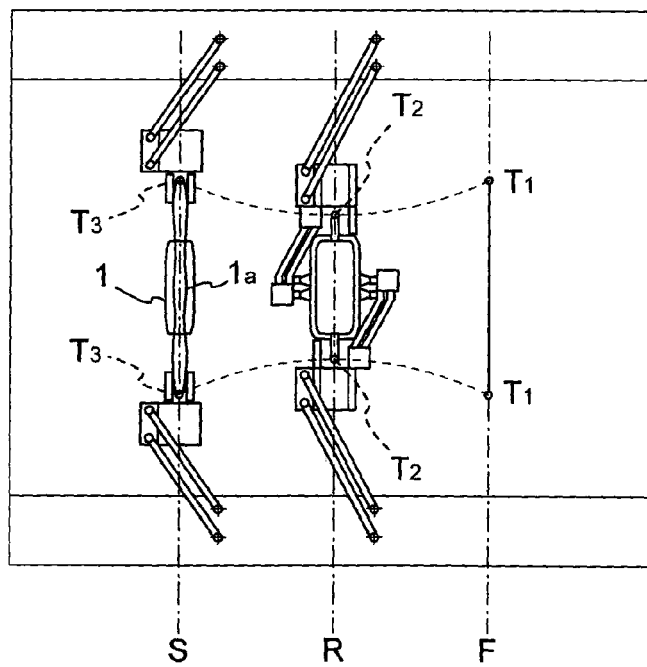


Fig.8



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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 July 2006	Examiner Vigilante, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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