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(11) **EP 1 147 892 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.10.2001 Bulletin 2001/43

(51) Int Cl.7: **B41F 17/22**

(21) Application number: **01106793.1**

(22) Date of filing: **19.03.2001**

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

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(30) Priority: **21.03.2000 IT MO000052**

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(54) **Machine and method for printing containers**

(57) A machine for printing containers comprises a printing unit (8) suitable for interacting with containers (7, 7a) to be printed, said containers (7, 7a) being grasped by respective support means (32, 36); the printing unit (8) comprises a printing roller (16) externally provided with cavities suitable for containing fluid printing means to be transferred by contact to regions of external

surface of said containers (7, 7a).

A method for printing containers comprises arranging containers (7, 7a) to be printed on support means (32, 36), bringing the external surface of said containers in contact with printing means (8) for printing said external surface, said containers (7, 7a) are brought in contact with said printing means by advancing said containers (7, 7a) along a pre-established path.

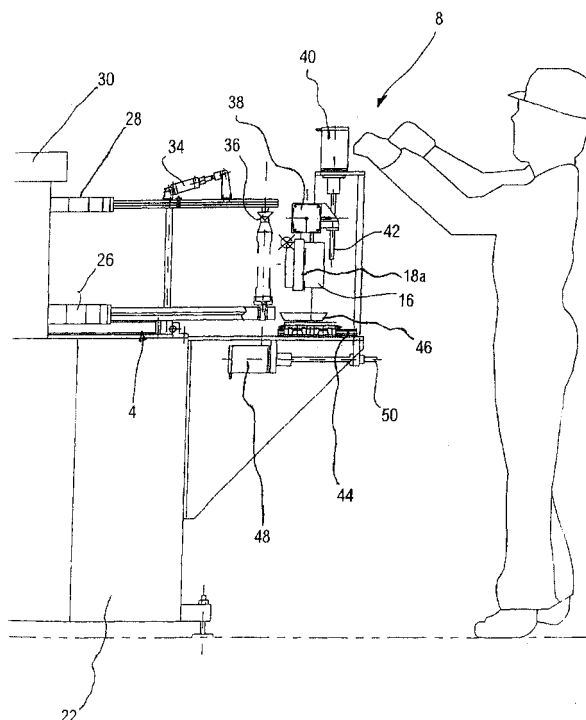


Fig. 5

Description

[0001] The invention relates to a machine for printing the external surface of containers in general, for example bottles, or phials, made of glass, plastic or other material.

[0002] Prior art comprises silk-screen decorating machines for decorating containers provided with a flat screen under which the containers to be decorated are sequentially carried.

[0003] If the containers have a curved lateral surface, both the containers and the screen are supported by members suitable for causing each container to move along a path corresponding to a portion of the extension of the lateral surface of the container while the container is kept tangent to the screen, so that a doctor blade, sliding on the opposite side of the screen, may progressively transfer the ink on the above-mentioned lateral surface through open meshes of the screen defining a desired pattern to be printed.

[0004] However, the above mentioned silk-screen machines are mechanically very complex and then expensive; furthermore, said machines are hardly adjustable, since quite long executing times and high skilled labour are required; furthermore, in case of failures - due to their complexity - said machines may be hardly repaired.

[0005] An object of the present invention is to remarkably simplify printing systems on containers in general.

[0006] According to a first aspect of the present invention, a machine for printing containers is provided, comprising a printing unit suitable for interacting with containers to be printed, said containers being grasped by respective support means, characterized in that, said printing unit comprises a printing roller externally provided with cavities suitable for containing fluid printing means to be transferred by contact to regions of external surface of said containers.

[0007] According to a further aspect of the present invention a method for printing containers is provided, comprising arranging containers to be printed on support means, bringing the external surface of said containers in contact with printing means for printing said external surface, characterized in that, said containers are brought in contact with said printing means by advancing said containers along a pre-established path.

[0008] Since a printing roller is used in the printing unit the construction of the machine is simplified, as the surface of the containers may be printed simply by contact, without using screens or doctor blades which have to be actuated by complex mechanisms.

[0009] The invention can be better understood and carried out with reference to the enclosed drawings, which show an exemplifying and not restrictive embodiment thereof, in which:

Figure 1 is a sketched top view of a machine for printing containers;

Figure 2 is a sketched partial and enlarged top view of the machine of Figure 1, showing a heating station for heating containers, a printing station for printing containers and a drying station for drying the printed containers, during printing of a container having a partially elliptic lateral surface;

Figure 3 is a view like Figure 2, relative to a container having a cylindrical external surface;

Figure 4 is an enlarged, sketched section taken along the plane IV-IV of Figure 1;

Figure 5 is a sketched section taken along the plane V-V of Figure 1;

Figure 6 is a sketched section taken along the plane VI-VI of Figure 1.

[0010] As shown in Figure 1, a machine 1 comprises a carousel structure 2 suitable for being indexed at angular steps around a vertical axis Z and comprising a plurality of support arms 4 radially arranged and mutually spaced by an angle of 15°.

[0011] On the circumference of the carousel structure 2, at the stop regions of the end of each arm 4, five operating units 12 are sequentially arranged each comprising a heating station 6 for heating the containers 7 supported at the end of each arm 4, a printing station 8 for printing the containers 7 and a drying station 10 for drying the printed containers.

[0012] Each of the various operating units 12 may be designed for printing one colour, so that the overall pattern printed on the containers 7 may comprise five colours.

[0013] Furthermore the various operating units may be prearranged for printing different faces of a same container 7, so that up to five different faces of a same container 7 may be printed.

[0014] The containers 7 are sequentially advanced by the arms 4 to the stations 6, 8, 10 of the various operating units 12 while the arms 4 are angularly indexed of an angle of 15° in the direction shown by the arrow F.

[0015] Upstream the first operating unit 12, one or more loading stations 14 are provided arranged for receiving, manually or automatically, on the arms 4 containers 7 to be printed.

[0016] Downstream the last operating unit 12, one or more unloading stations 16 are provided arranged for removing, manually or automatically, from the arms 4 the containers 7 already printed.

[0017] A filling station 18 for filling the printed containers 7 may be provided upstream the first unloading station 16.

[0018] As shown in Figures 2 and 3, each heating station 6 for heating the containers to be printed comprises heating means 14 suitable for modifying the molecular structure of the containers 7, if the containers are made of plastic material, and for preparing said container 7 to receive printing means, such as ink or glaze, in the following printing station 8 in such a way as to prevent said ink or glaze from being detached subsequently from the

container 7.

[0019] Each printing station 8 comprises a printing roller 16 having an axis parallel to the axis of the container 7 facing the roller 16, that is vertical, the printing roller being provided on its outer surface with small cavities (not shown) into which the printing means is confined by the action of a doctor blade 18a, kept adjacent to an outer generatrix of the printing roller 16, which removes the exceeding amount of the printing means poured in a region 19 immediately upstream the doctor blade with respect to the rotating direction F1 of the printing roller 16.

[0020] Each drying station 10 comprises drying means 20, for example UV lamp drying means, arranged for drying the printing means distributed on the surface of the container 7 in the printing station 8 arranged immediately upstream.

[0021] It is noted that, if the containers 7 have external surfaces to be printed comprising an oval or elliptic section 11, the containers 7 are not rotated around their respective longitudinal vertical axis, as it will be better described below.

[0022] On the other hand, as shown with particular reference to Figure 3, if a container 7a has a cylindrical external surface which has to be printed on the whole circumferential extension thereof, the container 7a is rotated around a longitudinal vertical axis thereof according to a direction shown by the arrow F2, opposite to the rotating direction F1 of the printing roller 16.

[0023] With reference to Figure 4, heating means 14 of the heating station 6 is shown, said heating means 14 being mounted on a slide 21 supported by a bed 22 of the machine 1 and actuated to slide in radial direction through motorized means 24 for allowing the heating means 14 to be adjustably positioned with respect to the external surface of the containers 7, 7a to be printed.

[0024] The arms 4 comprise lower portions 26 connected to a central hub 30 and upper portions 28 vertically adjustable with respect to the hub 30. The lower portions 26 end with lower cradle means 32 suitable for receiving a bottom lower end of the containers 7, 7a and suitable for being rotated by a respective motor, not represented.

[0025] The upper portions are actuatable by means of operating cylinders 34 so as to be able to engage and disengage, with a tip 36 with which they are provided at the end facing the containers 7, 7a, a neck portion of the containers 7, 7a.

[0026] With reference to Figure 5, a printing station 8 comprises more in detail a motor 38 for rotating the printing roller 16 vertically adjustable by means of an adjusting motor 40 and a respective adjusting screw 42. The assembly of printing roller 16 and respective members of actuation 38 and adjustment 40, 42 is mounted on a slide 44 which comprises at the upper side a collecting tank 46 for collecting the exceeding printing means, the slide 46 being radially actuatable by means of a motor 48 and a respective adjusting screw 50. Therefore the

printing roller 16 may be moved close and away with respect to the container 7, 7a.

[0027] With reference to Figure 6, the drying means 20 of a drying station 10, similarly to the heating means 14 and the printing roller 16, is supported by a radial slide 21' which is actuated by a motor 24' through a screw 25'.

[0028] The machine 1 may work according to two distinct cycles, a continuous cycle and a step-by-step cycle.

[0029] During working with continuous cycle, suitable for containers of rectangular, elliptic and square shape, the carousel 2 is continuously moved around the axis Z, the container 7 is blocked on the cradle 32 and therefore the printing roller 16 is permanently in motion, but it is synchronised with the movement of the container 7, 7a so that, when the container 7, 7a approaches the printing roller 16, the printing roller 16 may tangentially couple with the external surface of the container 7, 7a so printing said surface.

[0030] For keeping the printing roller 16 tangent to the container 7, 7a, the printing roller 16 may be moved, if necessary, along the slide 44 by actuating the motor 48, or through a pneumatic cylinder or a pressure spring, or other equivalent systems.

[0031] During working with step-by-step cycle, suitable for cylindrical containers, the carousel 2 is indexed along the direction of the arrow F and stops the container 7 in the printing station 8 in which the container is rotated around a longitudinal axis thereof according to the direction F2, while the printing roller, kept in tangential contact with the container 7, rotates in a opposite direction according to the direction F1.

Claims

1. Machine for printing containers, comprising a printing unit (8) suitable for interacting with containers (7, 7a) to be printed, said containers (7, 7a) being grasped by respective support means (32, 36), **characterized in that**, said printing unit (8) comprises a printing roller (16) externally provided with cavities suitable for containing fluid printing means to be transferred by contact to regions of external surface of said containers (7, 7a).

2. Machine according to claim 1, wherein said support means (32, 36) is fixed to the free end of arm means (4) extending from a central hub (30) of said machine and is suitable to be rotated around a vertical axis (Z).

3. Machine according to claim 2, wherein said arm means (4) comprises a lower portion (26) of each arm and said support means (32, 36) comprises lower support means (32) suitable for receiving a bottom lower portion of each container (7, 7a).

4. Machine according to claim 2, or 3, wherein said arm means (4) comprises an upper portion (28) and said support means comprises tip means (36) suitable for being introduced into an inlet portion of said containers (7, 7a).

5. Machine according to one of the preceding claims and further comprising actuating means for rotating said containers (7, 7a) around a longitudinal axis thereof.

6. Machine according to one of the preceding claims, wherein said printing roller (16) is coupled with a slide (44) movable in radial direction.

7. Machine according to claim 6, wherein position-adjusting means (40, 42) is supported to said slide (44), arranged for vertically adjusting the position of said printing roller (16).

8. Machine according to one of the preceding claims, wherein said printing roller (16) is rotated around a longitudinal axis thereof through suitable actuating means (38).

9. Machine according to one of the preceding claims, wherein said printing roller (16) is caused to cooperate with a doctor blade (18) suitable for removing an exceeding amount of printing means.

10. Machine according to one of the preceding claims, and further comprising, upstream said printing unit (8), a heating unit (6) for heating the containers (7, 7a).

11. Machine according to one of the preceding claims, and further comprising a drying unit (10) arranged for drying the printed containers (7, 7a).

12. Machine according to claim 10, or 11, wherein said heating unit (6), or said drying unit (10) are movable on a respective slide (21, 21') movable in radial direction.

13. Machine according to one of the preceding claims, and comprising in succession, along a rotation direction (F) of said arms (4), at least: a heating unit (6), a printing unit (8) and a drying unit (10).

14. Machine according to claim 13, and further comprising a loading station (14) for loading containers (7, 7a) to be printed.

15. Machine according to one of claims 13, or 14, and further comprising an unloading station (16) for unloading the printed containers (7, 7a).

16. Machine according to claim 15, wherein up-

stream said unloading station (16) a filling station (18) for filling the printed containers (7, 7a) is provided.

17. Method for printing containers comprising arranging containers to be printed (7, 7a) on support means (32, 36), bringing the external surface of said containers in contact with printing means (8) for printing said external surface, **characterized in that** said containers (7, 7a) are brought in contact with said printing means by advancing said containers (7, 7a) along a pre-established path.

18. Method according to claim 17, wherein said containers (7, 7a) are continuously advanced along said pre-established path.

19. Method according to claim 17, wherein said containers are indexed along said pre-established path.

19. Method according to claim 17, or 18, wherein said pre-established path is a circular path.

20. Method according to one of claims 17 to 19, wherein said printing means (8) is rolling printing means.

21. Method according to one of claims 17 to 20, wherein said rolling means (16) is rotated around an axis thereof synchronously with said containers (7, 7a).

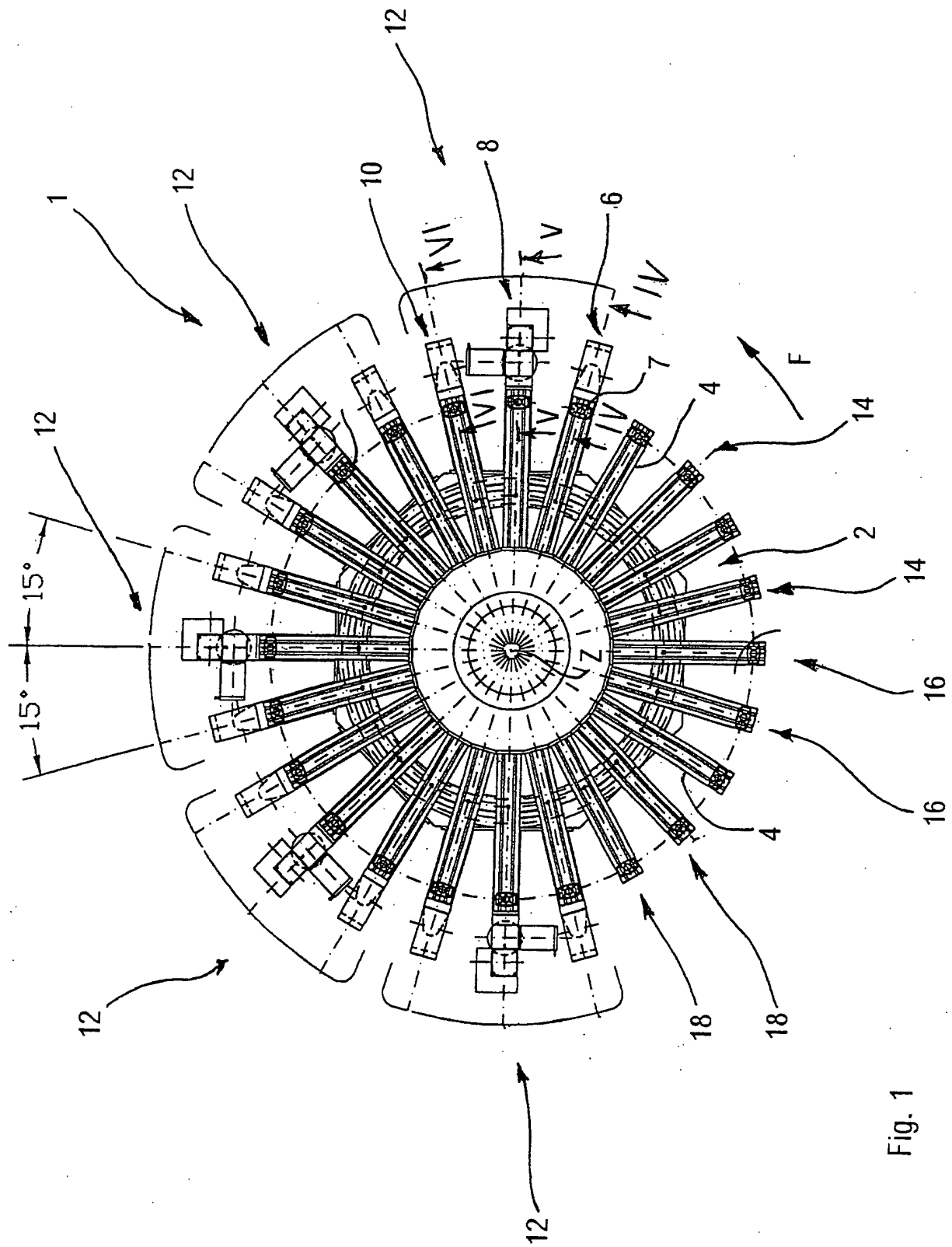


Fig. 1

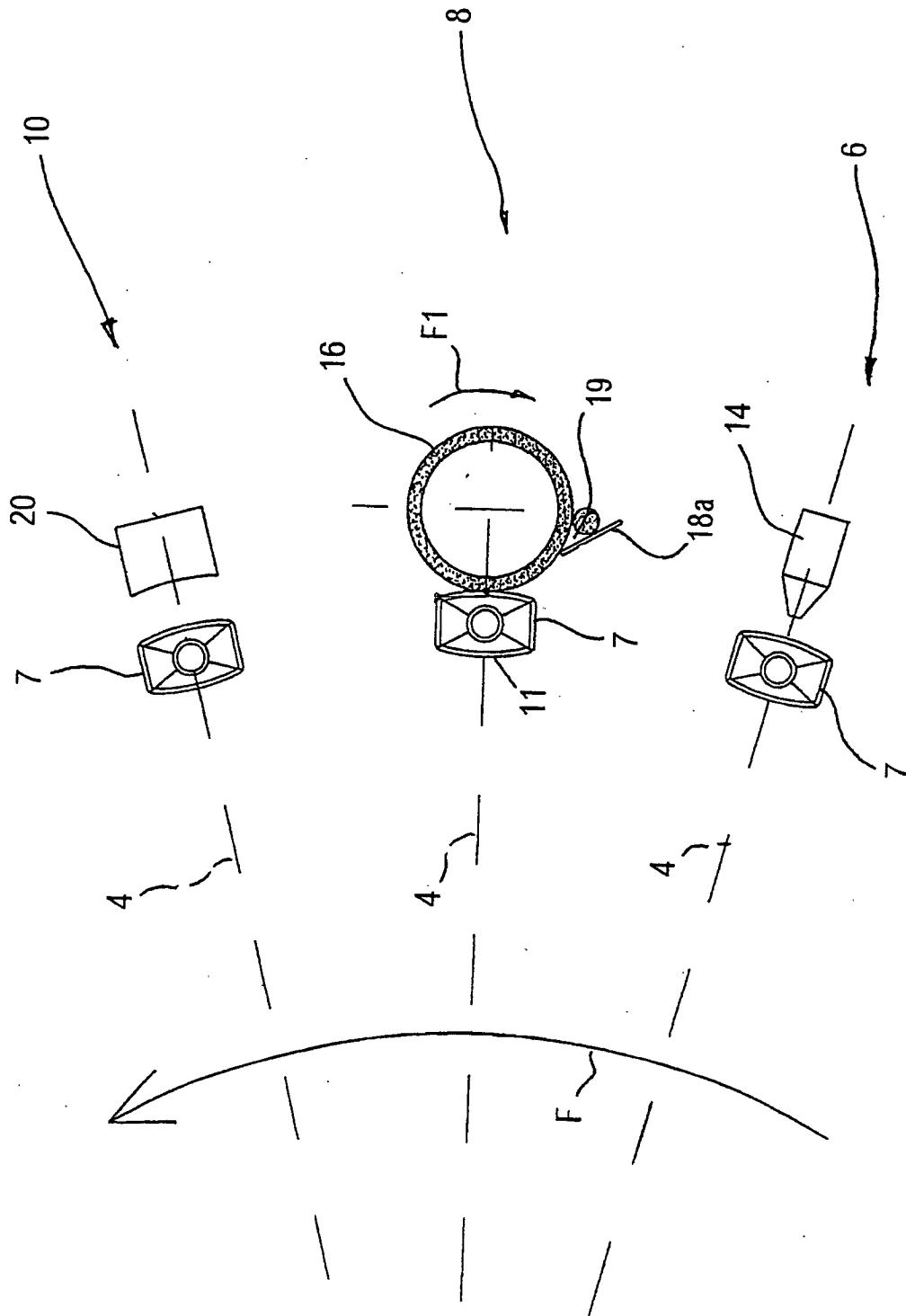


Fig. 2

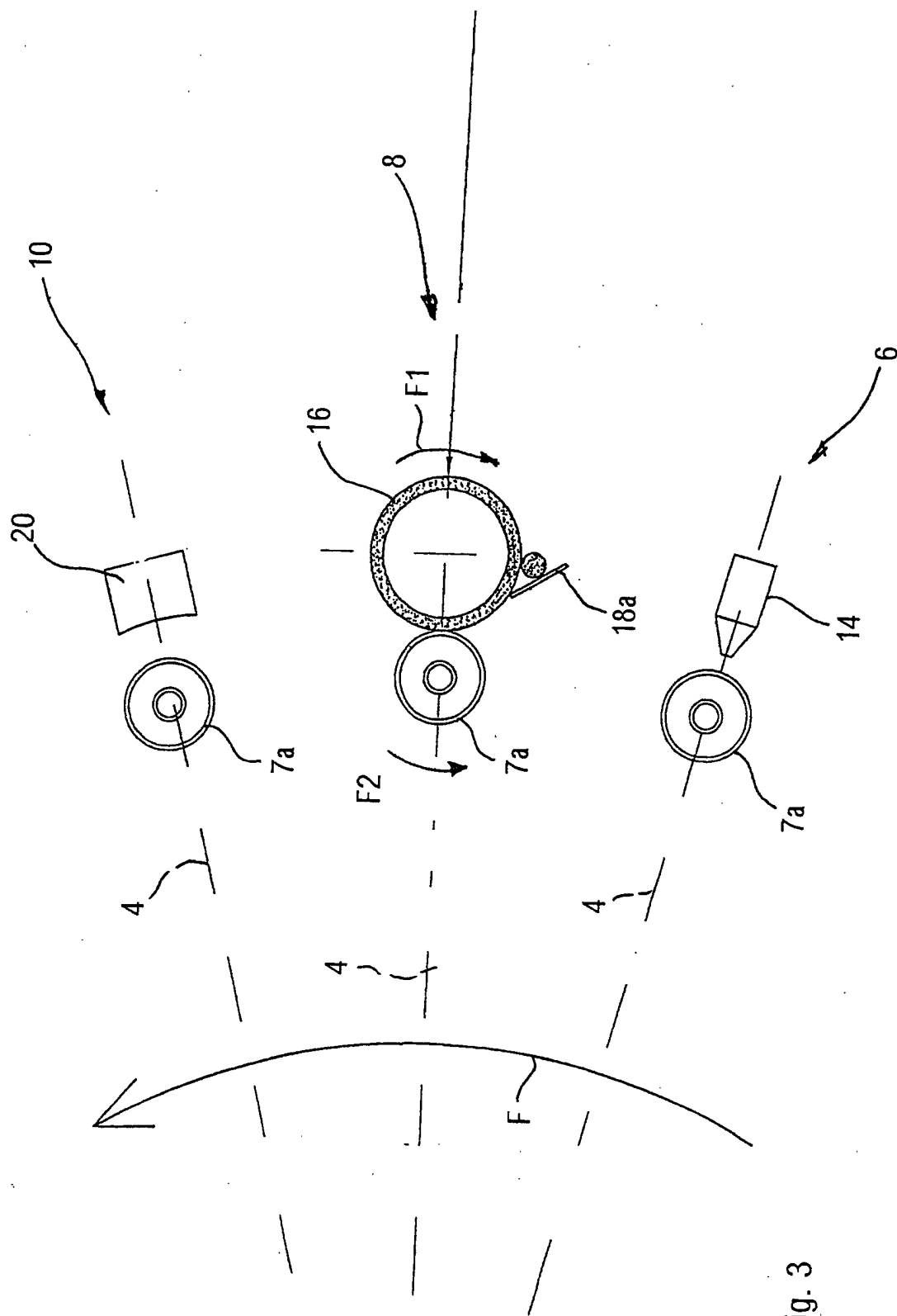


Fig. 3

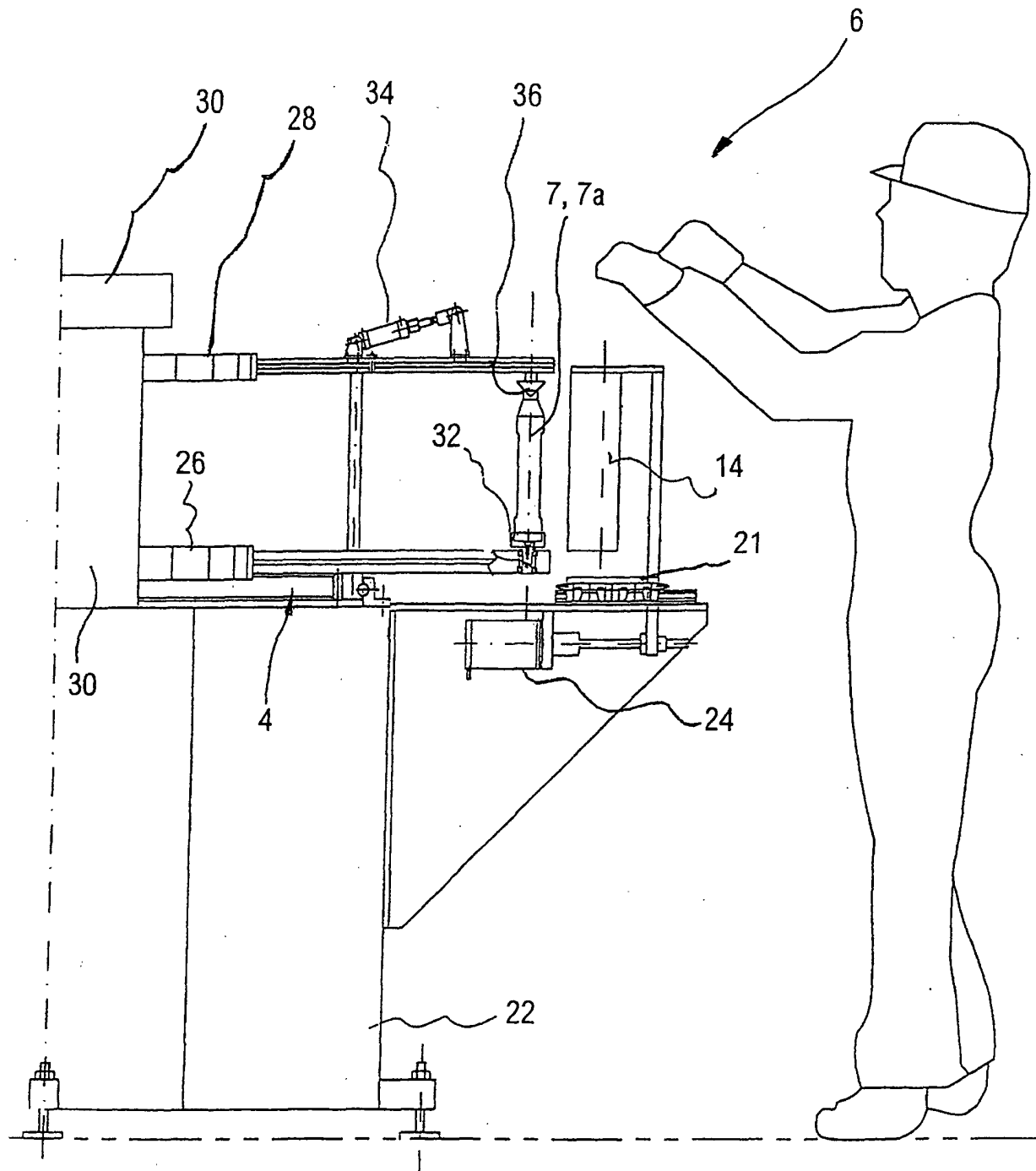


Fig. 4

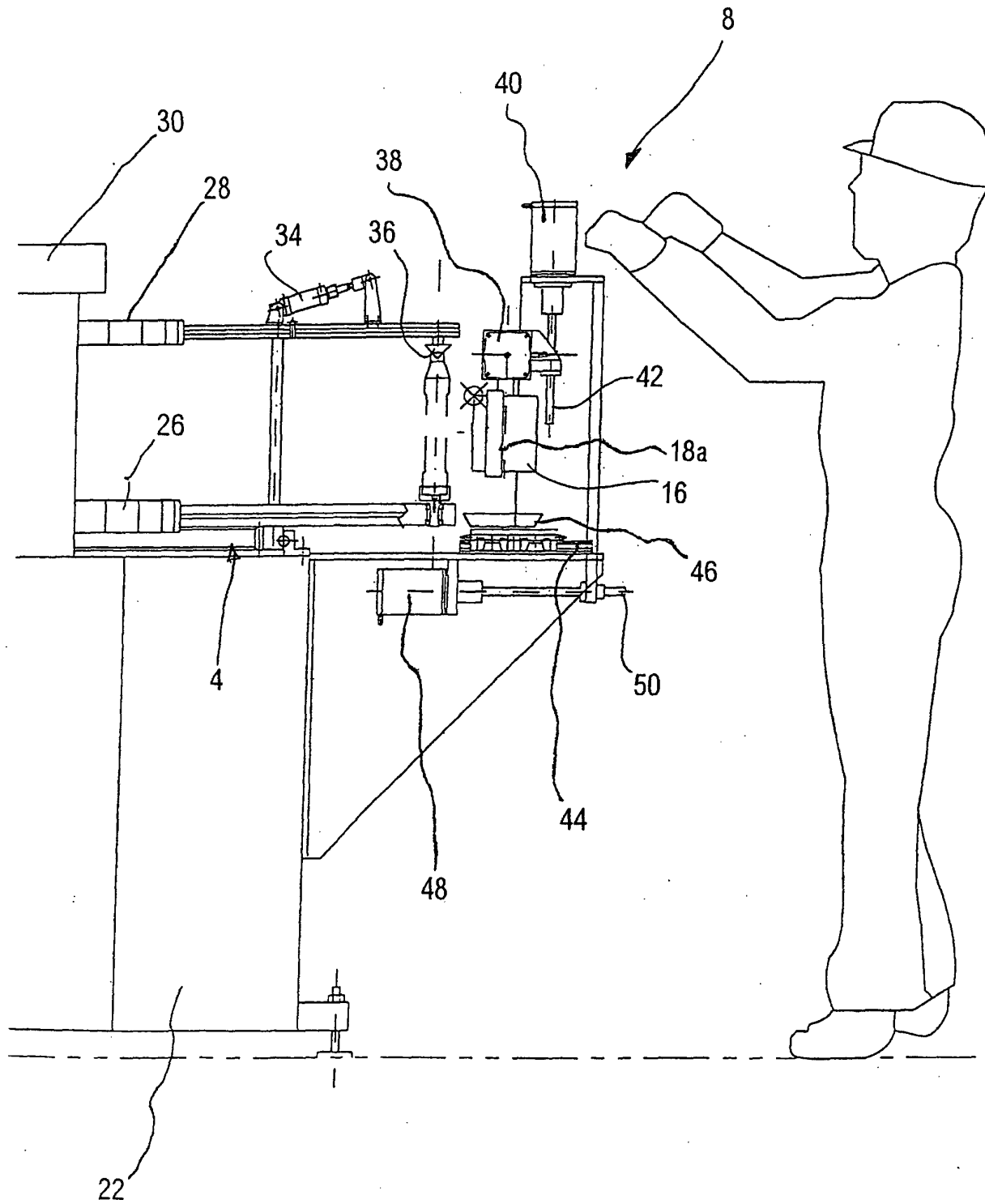


Fig. 5

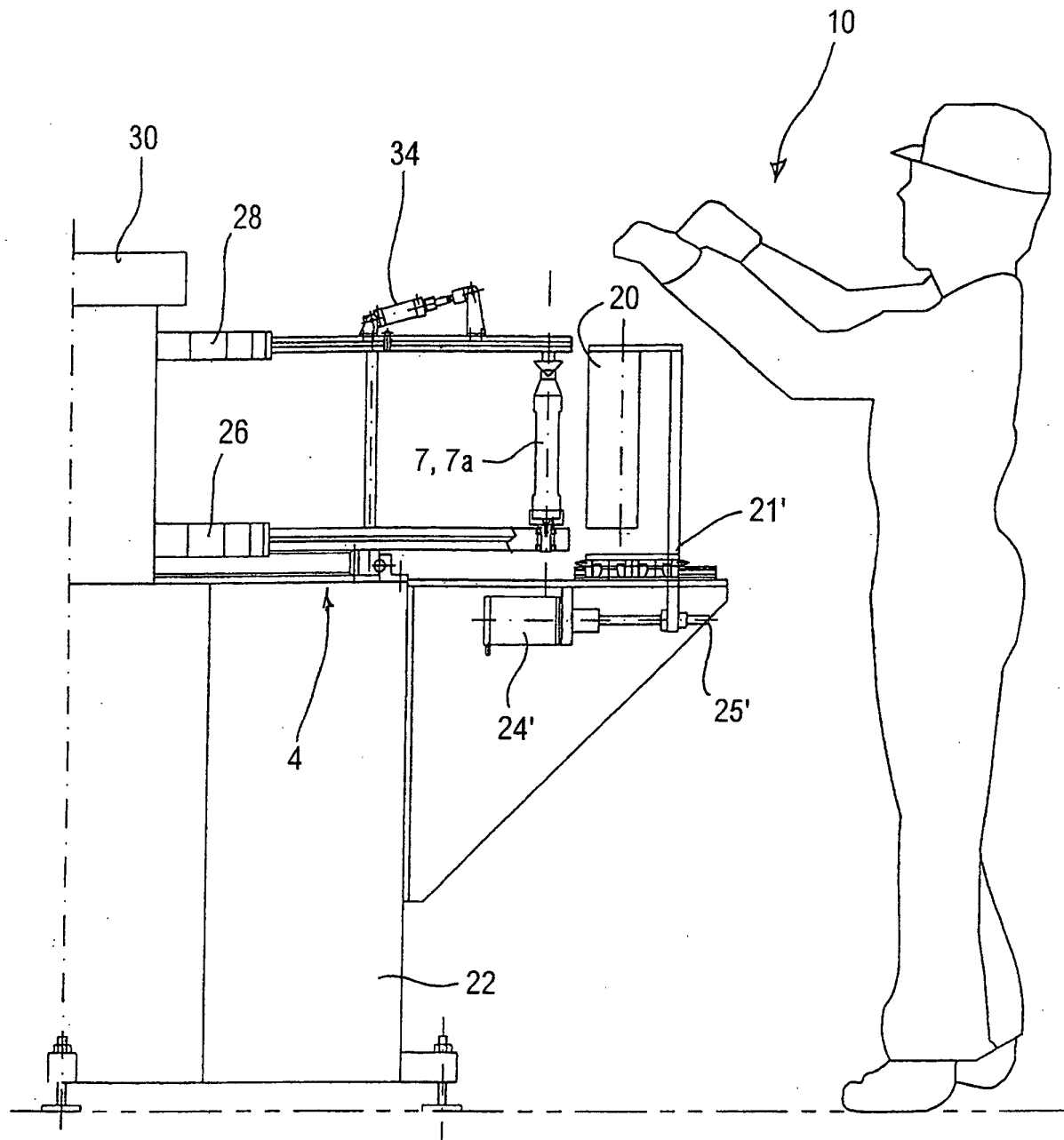


Fig. 6