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(54) **Decorating means**

(57) Decorating means for decorating flat elements, in particular ceramic tiles (2), which allows the wear to be reduced and the productivity to be improved by limiting consumption of glaze, comprises a tubular sleeve (3) provided with openings (7) through which a flowing decorating product, such as ceramic powdery glaze, may pass, said openings (7) being arranged so as to form a decoration on a flat element (2) underlying said sleeve (3) and is characterised in that said sleeve (3) is made of rigid material, such as plastic material or metal; an apparatus for decorating ceramic supports (15) comprises flexographic belt decorating means (18) arranged to form a loop and suitable for transferring on the surface of said supports (15) decorating fluid means according to a preestablished drawing, said fluid decorating means being initially contained into cavities of said flexographic belt decorating means (18), conveyor means (16) suitable for moving said supports (15) along an advancing direction (F2) so as to cause said supports (15) to interact with said flexographic belt decorating means (18), actuating means (19) suitable for rotating said flexographic belt decorating means (18) around an axis perpendicular to said advancing direction (F2), pressing means (22) arranged internally to said flexographic belt decorating means (18) and suitable for promoting transferring of said decorating fluid means to said supports (15).

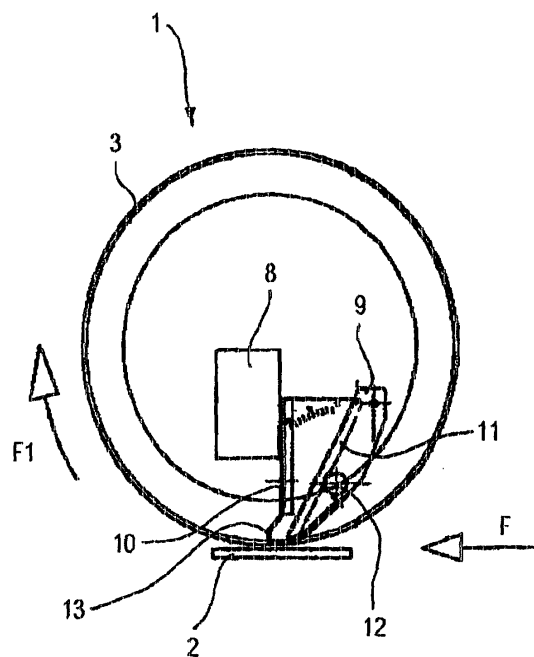


Fig. 1

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Description

[0001] The invention relates to decorating means for decorating flat elements and an apparatus for decorating ceramic supports, particularly ceramic supports shaped as special components.

[0002] The decorating means according to the invention comprises a tubular sleeve provided with openings through which a flowing decorating product may pass, the openings being arranged so as to form a decoration on a flat element underlying said sleeve. Known decorating means comprises silk-screen machines, each of which having a printing head in which a drum silk-screen - made of tissue - is mounted, through openings arranged for forming a decorating pattern being obtained in said drum silk-screen.

[0003] A certain amount of decorating glaze is brought to the internal surface of the silk-screen in a position placed immediately upstream a doctor blade internally supported to the silk-screen, so that said doctor blade may press the glaze through the openings of the silk-screen and carry out the desired decoration of the underlying tile.

[0004] In particular, in silk-screen machines, of the so-called "wet" type, i.e. machines in which use of damp glaze having a substantially liquid consistency is provided, the silk-screen, arranged above the tiles to be decorated, is brought in contact with the tiles, whereas in the silk-screen machines, of the so called "dry" type, i.e. machines using dry powdery glaze, the silk-screen is arranged above the tiles to be decorated but is not in contact with said tiles.

[0005] In dry silk-screen machines, owing to the high fluidity of the powdery glaze and the soft structure of the silk-screen, a portion of the glaze is inclined to pass between the contact region of the doctor blade and the internal surface of the silk-screen as an effect of a dragging motion given by the silk-screen to the particles of glaze lying in contact with said silk-screen.

[0006] Since the glaze which goes beyond the doctor blade and remains inside the silk-screen has to be removed, sucking means is provided which clears this no more usable portion of powdery glaze.

[0007] Furthermore, since the doctor blade - during working of the machine - crawls on the internal surface of the silk-screen, said doctor blade contributes, during the time, to remarkably wear the silk-screen, which makes necessary to substitute the silk-screen quite regularly.

[0008] Special components are usually meant as ceramic supports having quite complex and not substantially flat shape, unlike the usual tiles; said special components may include, as an example, finishing elements for steps provided with a toric profiled edge and called, therefore, "torelli".

[0009] For decorating said variously shaped supports wet silk-screen machines are known arranged for depositing on said supports a layer of glaze according to

a pre-established drawing printed on the printing silk-screens with which said silk-screen machine are provided.

[0010] These machines use flat silk-screens and are further provided with spreader means suitable for transferring the glaze to pre-established areas of the ceramic supports through the meshes of the silk-screen.

[0011] Since special components comprise sections of curved surface, the spreader means partially deforms the silk-screens for causing the silk-screens to adhere to such surfaces so allowing the special component to be decorated in any part thereof.

[0012] Such machines has the drawback that the cloth of the silk-screen, which has originally a plane configuration, does not allow sufficiently exact decorations to be obtained, if it is forced to assume a curvilinear contour. In fact, smears and faulty transferring of the glaze to the supports frequently takes place, with consequent many rejected items.

[0013] In order to obtain ceramic supports with decorations provided with an acceptable degree of accuracy, the advancing speed of the supports, in such machines, has to be very low, which remarkably penalises the productivity, without allowing however supports with decorations of extremely high aesthetic quality to be obtained.

[0014] For decorating ceramic special components a manual system is as well known for applying decals on already formed and fired ceramic supports, in which the decals are singularly applied on such ceramic supports; then, the assembly of support and decal is fired in a kiln for permanently fixing the decoration to the support.

[0015] Before being applied on the ceramic supports, the decals have to be dipped in water for being cleared from sheets with which they are provided, said sheets acting as support and protection for the decals.

[0016] The decals cleared from the respective support sheets are extremely delicate and need to be handled with high care.

[0017] This decorating system, even if allows satisfying aesthetic results to be obtained, has the drawback of involving remarkable waste of time and need of manpower.

[0018] Devices are further known, for decorating flat ceramic supports, for example tiles, provided with a flexographic roller carrying on the external surface thereof the drawing which has been reproduced on the supports.

[0019] On the surface of the roller a plurality of cavities is obtained suitable for receiving a certain amount of ceramic glaze and for transferring said ceramic glaze on the supports, so obtaining decorations provided with high definition degree. A pressing element, arranged internally to the roller so as to press said roller against the ceramic supports, promotes transferring of the glaze from the surface of the roller to the upper surface of the ceramic supports.

[0020] These types of devices has the drawback that they may not be used for decorating ceramic supports

having profiled portions, such as the above-mentioned special components, since the pressing elements with which said devices are provided exert a uniform pressure on any point of the flexographic roller with which said pressing elements come in contact, which prevents the flexographic roller from conforming according to the contour of the supports, so making impossible the decoration of the special components in any part of the extension thereof and in particular in the regions of profiled surface.

[0021] A further drawback of such devices is that the flexographic rollers with which said devices are provided are fixed to supporting frames, usually of circular shape, which limit the deformability thereof so making very difficult, or even impossible, decorating supports shaped as ceramic special components.

[0022] An object of the invention is to improve the known decorating means for decorating flat elements.

[0023] A further object of the invention is to reduce the glaze waste in dry silk-screen machines for decorating ceramic tiles.

[0024] A still further object is to reduce the wear of the decorating means in dry silk-screen machines for decorating ceramic tiles.

[0025] Still a further object of the present invention is to improve the known apparatuses for decorating ceramic supports shaped as special components.

[0026] A further object of the invention is to obtain an apparatus for decorating ceramic special components in a simple way and with low need of manpower.

[0027] A still further object of the invention is to obtain an apparatus for decorating ceramic special components in an aesthetically very accurate manner and with high productivity. In a first aspect of the invention, decorating means for decorating flat elements, in particular ceramic tiles, is provided, comprising a tubular sleeve provided with openings through which a flowing decorating product may pass, said openings being arranged so as to form a decoration on a flat element underlying said sleeve, characterised in that said sleeve is made of rigid material.

[0028] Particularly satisfying experimental results have been obtained with the sleeve made of plastic material, such as methacrylate, or plexiglas, since it is possible to carry out the through openings using the known technology of boring by means of a low power laser beam.

[0029] However, it is possible to use also metallic sleeves, or sleeves made of other rigid materials of relatively small thickness.

[0030] This allows undesired leakages of powdery glaze between the doctor blade and the internal surface of the sleeve to be substantially prevented, since the stiffness of the sleeve allows a better seal against the leaks of glaze to be obtained.

[0031] Furthermore, the stiffness of the sleeve gives a particularly resistant structure to the decorating means, suitable for being subjected to a high number of

working cycles without wearing.

[0032] In a second aspect of the invention, an apparatus for decorating ceramic supports is provided, comprising flexographic belt decorating means arranged to form a loop and suitable for transferring on the surface of said supports flowing decorating means according to a pre-established pattern, said fluid decorating means being initially contained in cavities of said flexographic belt decorating means, conveyor means suitable for moving said supports along an advancing direction for causing said supports to interact with said flexographic belt decorating means, actuating means suitable for rotating said flexographic belt decorating means around an axis perpendicular to said advancing direction, pressing means arranged internally to said flexographic belt decorating means and suitable for promoting transferring of said fluid decorating means to said supports.

[0033] In a preferred version, the flexographic belt decorating means is made of elastomeric material provided with high deformability, such as silicone rubber.

[0034] In a further preferred version, the pressing means comprises surfaces suitable for coupling with variously shaped profiled portions of ceramic supports, such as the surfaces of the special components, so allowing such supports to be perfectly decorated even in the areas which are normally difficult to be reached.

[0035] Owing to this aspect of the invention, it is possible to obtain a new apparatus for decorating ceramic supports which allows not only ceramic supports of substantially flat shape, as the usual tiles, but also ceramic supports provided with profiled portions, such as the ceramic special components, to be decorated with aesthetically high satisfying results.

[0036] In a preferred version, the pressing means comprises roller means provided with a groove suitable for being shapingly coupled to the profiled portion of said supports so causing the glaze to be perfectly transferred from the flexographic belt decorating means to the supports in any part thereof.

[0037] In a further advantageous version, the pressing means comprises roller means made of easily deformable material and, therefore, suitable for conforming according to said profiled portion, so pressing on said profiled portion the flexographic belt decorating means for promoting transferring of the fluid decorating means.

[0038] In a further advantageous version, the pressing means comprises a plurality of wheels freely rotatable around axes perpendicular to the advancing direction of the ceramic supports and arranged at mutually angularly staggered positions so as to substantially angularly cover the whole profile of the ceramic supports for causing the flexographic belt decorating means to adhere to said ceramic supports.

[0039] In a further preferred version, the actuating means comprises driving roller means and driven roller means, between which the flexographic belt decorating means is tightened; the driving roller means and driven

roller means is provided, at the ends thereof, with gear-wheels suitable for engaging respective toothed belts coupled to the internal surface of the flexographic belt decorating means.

[0040] In a still further preferred version, the actuating means comprises driving roller means and driven roller means, between which the flexographic belt decorating means is tightened; the driving roller means and driven roller means is provided, at the ends thereof, with a plurality of peg means, radially extending from the surface of the driving roller means and the driven roller means and suitable for engaging respective holes obtained in the end portions of the flexographic belt decorating means.

[0041] In a still further advantageous version, the driving roller means, or the driven roller means, also acts as contrast means for a doctor blade arranged for removing from the external surface of the flexographic belt decorating means the exceeding amount of fluid decorating means.

[0042] Owing to this aspect of the invention, it is possible to obtain an apparatus for decorating ceramic supports of the type of the special components suitable for transferring the fluid decorating means to any portion of the supports with high definition degree of the image so obtained. Furthermore, it is possible to obtain an apparatus of simple manufacturing and operation, which is provided with high productivity.

[0043] The invention may be better understood and carried out with reference to the attached drawings, which show some exemplifying but not restrictive embodiments thereof, in which:

Figure 1 is a very sketched side view of the decorating means in a working position;

Figure 2 is a partially sectioned longitudinal view of the decorating means;

Figure 3 is a sketched side view of an apparatus according to the invention;

Figure 4 is a section taken along plane IV-IV of Figure 3 showing pressing means, obtained according to a preferred version, said pressing means pressing the flexographic belt decorating means for causing said flexographic belt decorating means to interact with a ceramic support;

Figure 5 is a section like Figure 4 showing pressing means of an apparatus according to the invention obtained according to a further preferred version;

Figure 6 is a front view of pressing means of an apparatus according to the invention obtained according to a further preferred version;

Figure 7 is a section taken along a vertical plane showing the actuating means, in a preferred version;

Figure 8 is a section like Figure 7 showing the actuating means in a further preferred version.

[0044] As shown in Figure 1, a printing head 1 of a

decorating machine for decorating ceramic tiles 2 moving on a conveying line, not shown, along a horizontal direction shown by the arrow F, comprises a tubular, cylindrical sleeve 3, having longitudinal ends secured to flanges 4 which may be coupled with rotating means of a standard silk-screen machine of known type and therefore not shown.

[0045] The sleeve 3 may have a working central section 5 having thickness thinner than the remaining end regions, or a uniform thickness through the entire axial extension thereof.

[0046] The central working section 5 comprises a decorating region 6, having a plane extension corresponding to the surface of the tiles 2 to be decorated, the decorating region 6 comprising a plurality of through holes 7 distributed according to the decorating pattern to be transferred on the surface of the tiles 2 to be decorated.

[0047] The decorating pattern may have the most various shape and extension, for example for defining a figurative or abstract pattern on the tiles 2, for example a pattern of veins for imitating the effect of natural stones.

[0048] A same sleeve 3 may have only one decorating region 6, or even more regions 6, as a function of the ratio between the diameter of the sleeve 3 and the extension of each tile 2 along the direction F.

[0049] Inside the sleeve 3 there is arranged a supporting bar 8 to which a container 9 is fixed having form of hopper inside which powdery glaze for decorating the tiles 2 is contained. A duct - not shown - ends into the container 9; an amount of ceramic glaze corresponding to the glaze distributed on the tiles 2 is poured through said duct.

[0050] The container 9 is delimited by lateral walls arranged approximately at the longitudinal ends of the sleeve 3, by a fixed front wall 10 and by a rear wall 11 whose position may be angularly adjusted around an axis 12. The front wall 10 ends downwardly with a doctor blade 13 defining with the lower edge of the back wall 11 an outlet of the container 9 through which the powdery glaze is put in contact with the sleeve 3 and comes out from the openings 7, when said openings 7 are present, or is kept into the container 9 in the regions of the sleeve 3 which are not provided with openings.

[0051] The sleeve 3 is rotated around the longitudinal axis thereof in a direction F1 concurrent with the advancing direction F of the tiles 2.

[0052] Therefore, a tile 2, being advanced under the sleeve 3 along the direction F in the working region 5 of said sleeve 3 without touching said sleeve 3, is loaded with powdery glaze only in the regions forming the decorating pattern of said tile.

[0053] Therefore it is obvious that sucking means provided downstream the doctor blade 13 for removing the exceeding glaze is no more necessary - as it happens in the known devices - since, as the sleeve 5 of rigid material is adopted, no leakage of glaze takes place between the doctor blade 13 and the sleeve 3.

[0054] With reference to Figure 3, an apparatus 14 is

shown for decorating ceramic special components 15, provided with at least a profiled portion 15a (Figure 4), said ceramic special components 15 being advanced along a transferring line 16, provided with belts 17, in the direction indicated by the arrow F2.

[0055] The apparatus 14 comprises a printing belt 18 having the external surface 18a engraved so as to obtain on said external surface 18a a plurality of cavities arranged according to a pre-established pattern and suitable for decorating the supports 15 interacting with said printing belt 18 by transferring on said supports a ceramic glaze. The belt 18 consists of a material impermeable to the glaze and elastically deformable, in particular said belt 18 may be made of silicone rubber. Said cavities may be obtained on the external surface 18a of the belt 18 engraving said external surface 18a by means of a laser beam, said cavities having, therefore, pre-established position and geometry.

[0056] The belt 18 is rotated by actuating means 19 so as to be synchronised with the advancing speed of the supports 15 along the transferring line 16; thereby a rolling contact without friction is obtained between the belt 18 and the supports 15, which allows the glaze to be perfectly transferred to the supports 15 for obtaining decorations provided with a high degree of definition and free from defects or flaws.

[0057] The actuating means 19 comprises a driving roller 20 and an idle roller 21 around which the belt 28 is closed so as to form a loop.

[0058] Internally to the belt 18, pressing means 22 is arranged suitable for promoting transferring of the ceramic glaze from the cavities of the belt 18 to the supports 15; such pressing means causes the belt 18 to adhere to the surface of the supports 15 at any point thereof and in particular at the profiled portion 15a.

[0059] The position of the pressing means 22 with respect to the supports 15 may be vertically adjusted translating the pressing means 22 along to the direction of the arrow F3, which allows the intensity of the force with which the belt 18 is pressed on the supports 15 to be varied, so allowing the printing conditions to be adjusted for obtaining the desired result.

[0060] The apparatus 14 further comprises feeding means 23 suitable for distributing a layer of ceramic glaze on the belt 18; doctor blade means 24 is associated with the feeding means 23, suitable for allowing the cavities of the belt 18 to be properly filled and for removing from the external surface 18a of the belt 18 exceeding glaze and possible particles which would be able to dirty the belt 18, deteriorating the printing quality on the supports 15. The feeding means 23 and the doctor blade means 24 are arranged near the driving roller 20 so that the driving roller 20 acts as a contrast element for the doctor blade means 24, providing stiffness to the belt 18 wound thereon.

[0061] With reference to Figure 5, the pressing means 22 comprises a plurality of wheels 25 freely rotatable around axes perpendicular to the advancing direction

F2 of the ceramic supports 15 and arranged at mutually angularly staggered positions so as to substantially angularly cover the entire profile of the ceramic supports 15.

[0062] With reference to Figure 4, pressing means 22 is shown obtained according to another version, comprising a roller 26 supported idle to rotate, around an axis perpendicular to the advancing direction F2 of the supports 15 on the transferring line 16, to supporting parts - not shown - of the apparatus 14.

[0063] The roller 26 comprises a groove 27 suitable for being shapingly coupled to the profiled portion 15a of the supports 15; the belt 18 is then caused to perfectly adhere to the supports 15 obtaining in any part of said supports 15 a qualitatively highly valuable decoration.

[0064] With reference to Figure 6, pressing means is shown, obtained according to another version, comprising a further roller 28 supported idle to rotate, around an axis perpendicular to the advancing direction F2 of the supports 15 on the transferring line 16, to supporting parts - not shown - of the apparatus 14.

[0065] The further roller 15 is made of soft material and, therefore, is suitable for being deformed according to the profile of the supports 15 for pressing the roller means against the supports 15 therefore allowing printing with a good quality even in the areas where printing involves greater difficulties, such as the profiled portion 15a of the supports 15.

[0066] With reference to Figure 7, the actuating means 19 comprises the driving roller 20 and a driven roller, not shown, between which the belt 18 is tightened. Such driving roller 20 and driven roller are provided, at the ends thereof, with gearwheels 29 engaged by respective toothed belts 30 fixed to the internal surface 18b of the belt 18.

[0067] As shown in Figure 8, in another version of the actuating means 19, the driving roller means 20 and driven roller means, not shown, comprise, at the end regions thereof, a plurality of peg means 31, radially extending from the surface of the driving roller means 20 and the driven roller means and suitable for engaging respective holes 32 obtained in the end portions of the belt 18.

Claims

1. Decorating means for decorating flat elements, in particular ceramic tiles (2), comprising a tubular sleeve (3) provided with openings (7) through which a flowing decorating product may pass, said openings (7) being arranged so as to form a decoration on a flat element (2) underlying said sleeve (3), **characterised in that** said sleeve (3) is made of rigid material.
2. Decorating means for decorating flat elements according to claim 1, wherein said rigid material com-

- prises a plastic material.
3. Decorating means for decorating flat elements according to claim 2, wherein said plastic material comprises methacrylate, or plexiglas. 5
 4. Decorating means for decorating flat elements according to claim 1, wherein said rigid material comprises metal. 10
 5. Decorating means for decorating flat elements according to any one of the preceding claims, wherein said sleeve (3) comprises a central working region (5) in which a decorating region (6) for decorating the elements (2) to be decorated is obtained. 15
 6. Decorating means for decorating flat elements according to any one of the preceding claims, wherein said sleeve is coupled to end flanges (4) for inserting said sleeve into a printing head of a silk-screen machine. 20
 7. Apparatus for decorating ceramic supports (15), comprising flexographic belt decorating means (18) arranged to form a loop and suitable for transferring on the surface of said supports (15) fluid decorating means according to a pre-established pattern, said fluid decorating means being initially contained into cavities of said flexographic belt decorating means (18), conveyor means (16) suitable for moving said supports (15) along an advancing direction (F2) for causing said supports (15) to interact with said flexographic belt decorating means (18), actuating means (19) suitable for rotating said flexographic belt decorating means (18) around an axis perpendicular to said advancing direction (F2), pressing means (22) arranged internally to said flexographic belt decorating means (18) and suitable for promoting transferring of said fluid decorating means to said supports (15). 25
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 8. Apparatus according to claim 7, wherein said pressing means (22) comprises roller means (26) provided with groove means (27) suitable for being shapingly coupled with profiled portions (15a) of said supports (15) for promoting transferring of said fluid decorating means from said flexographic belt decorating means (18) to said supports (15). 45
 9. Apparatus according to claim 7, wherein said pressing means (22) comprises roller means (28) made of easily deformable material and suitable for conforming according to profiled portions (15a) of said supports (15) pressing on said profiled portions (15a) said flexographic belt decorating means (18) for promoting transferring of said fluid decorating means from said flexographic belt decorating means (18) to said supports (15). 50
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 10. Apparatus according to claim 7, wherein said pressing means (22) comprises a plurality of rolling elements (25) freely rotatable around axes perpendicular to said advancing direction (F2) and arranged at mutually angularly staggered positions so as to substantially angularly cover the entire profile of said ceramic support (15) for causing said flexographic belt decorating means (18) to adhere to said support (15) while said fluid decorating means is transferred to said supports (15).
 11. Apparatus according to any one of claims 7 to 11, wherein said actuating means (19) comprises driving roller means (20) and driven roller means (21) between which said flexographic belt decorating means is tightened (18).
 12. Apparatus according to claim 11, wherein said driving roller means (20) and said driven roller means (21) comprises pushing means (29, 30; 31, 32) for pushing said flexographic belt decorating means (18).
 13. Apparatus according to claim 12, wherein said pushing means comprises gearwheel means (29) obtained in end regions of said driving roller means (20) and said driven roller means (21) and suitable for engaging respective toothed belt means (30) coupled to said flexographic belt decorating means (18).
 14. Apparatus according to claim 12, wherein said pushing means comprises a plurality of peg means (31) radially extending from said driving roller means (20) and said driven roller means (21) and suitable for engaging respective hole means (32) obtained in end portions of said flexographic belt decorating means (18).
 15. Apparatus according to any one of claims 7 to 14, and further comprising doctor blade means (24) suitable for controlling the amount of said fluid decorating means which has to be deposited on said flexographic belt decorating means (18).
 16. Apparatus according to claim 15, as appended to one of claims 11 to 14, wherein said driving roller means (20) operates as contrast means for said doctor blade means (24).
 17. Apparatus according to claim 15, when depending from any of claims 11 to 14, wherein said driven roller means (8) operates as contrast means for said doctor blade means (11).
 18. Apparatus according to any of claims 7 to 17, wherein said flexographic belt decorating means (18) is made of elastomeric material provided with

high deformability.

19. Apparatus according to claim 18, wherein said elastomeric material is a silicone rubber.

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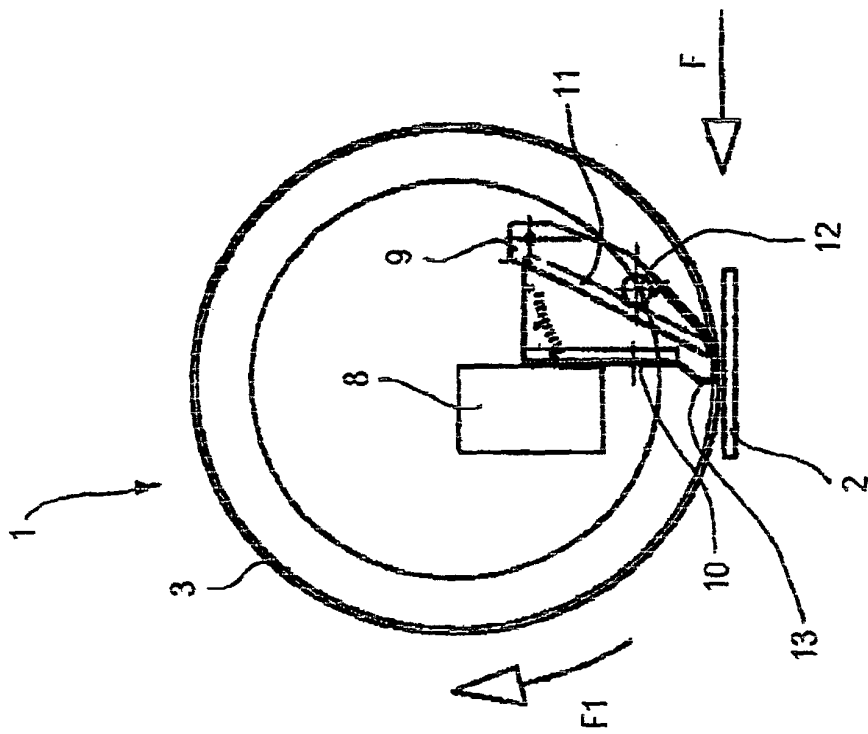


Fig. 1

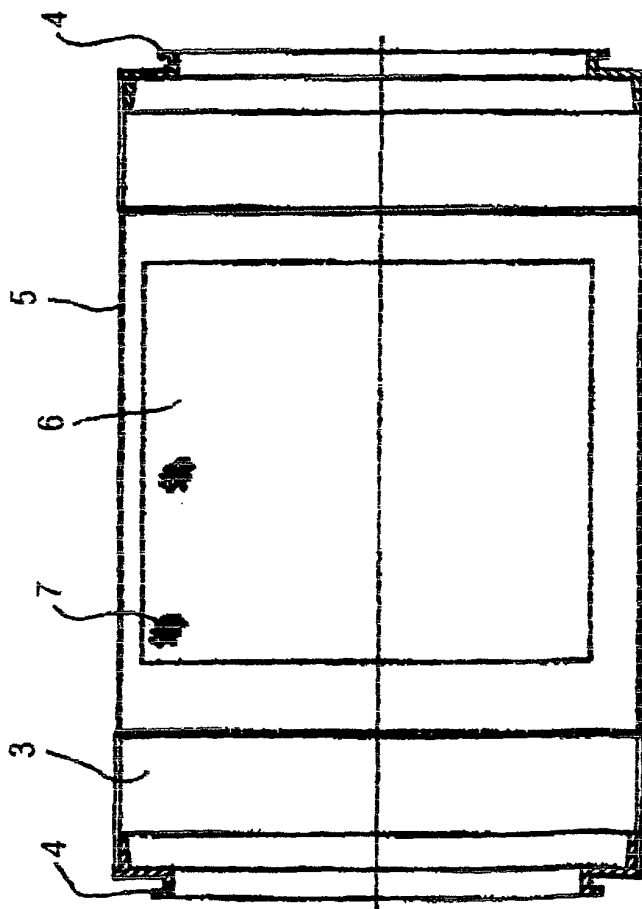


Fig. 2

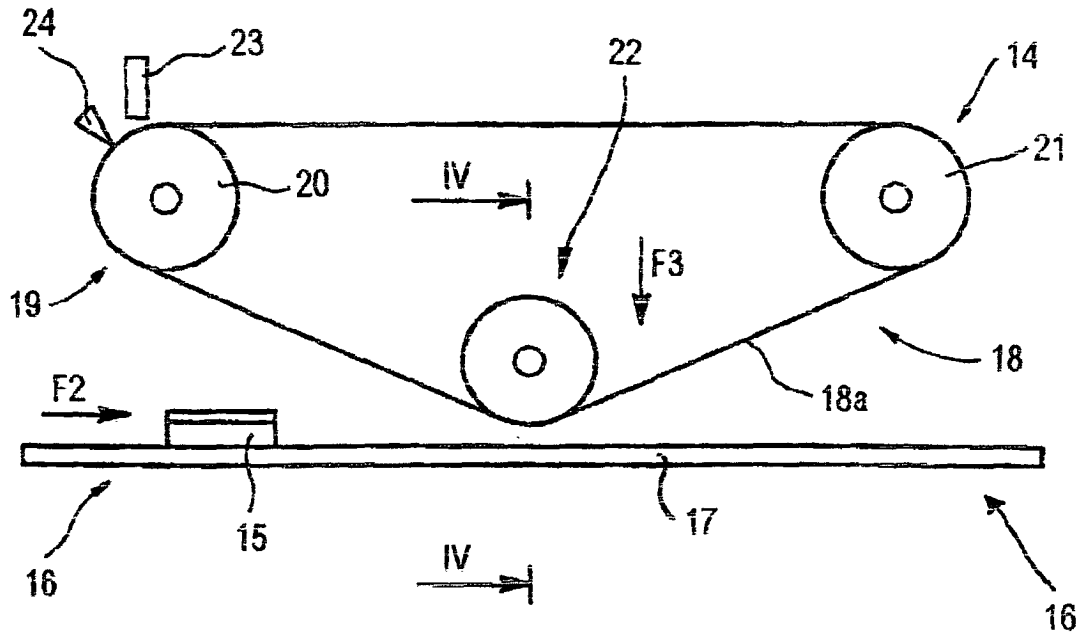


Fig. 3

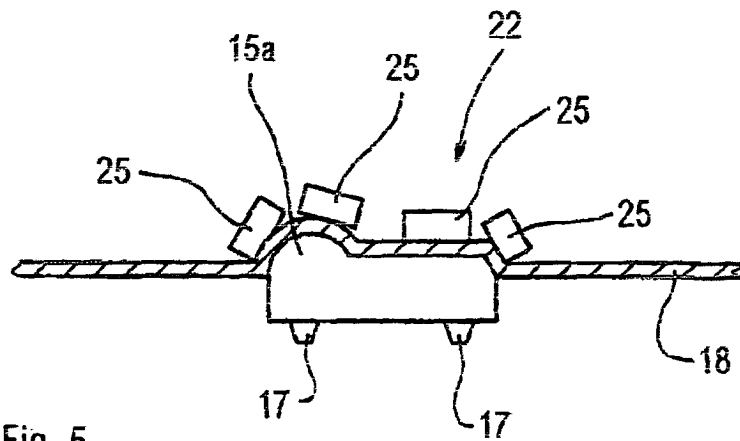
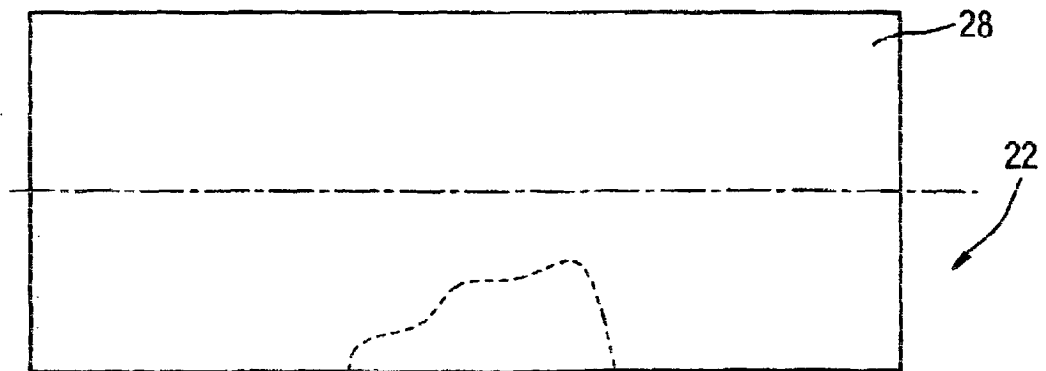
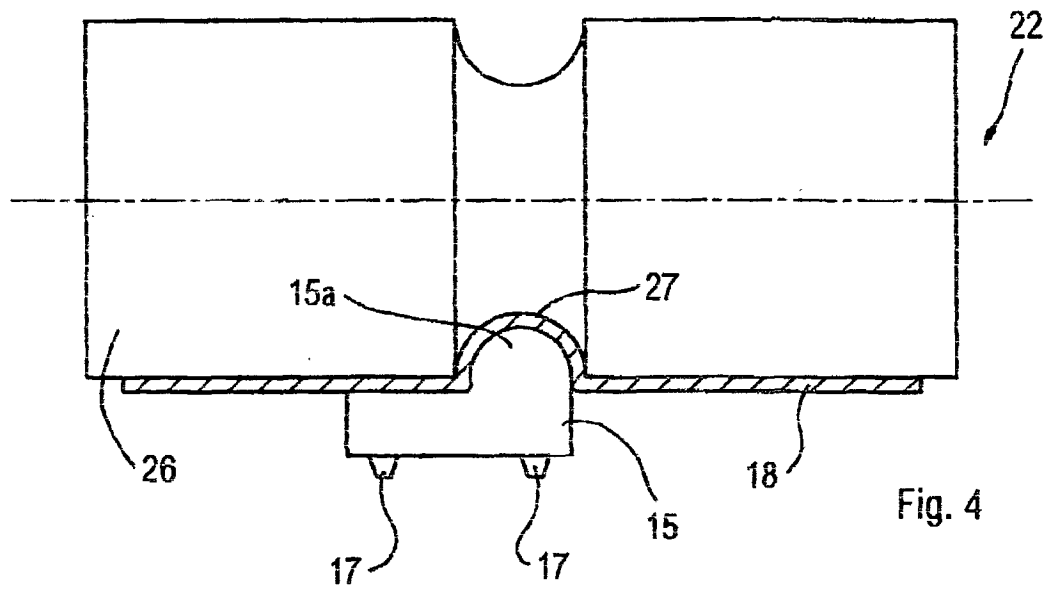


Fig. 5



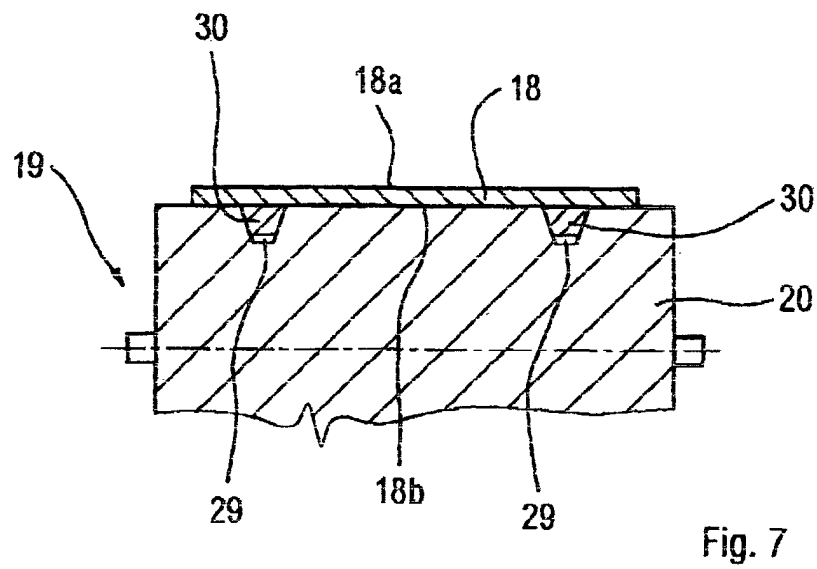


Fig. 7

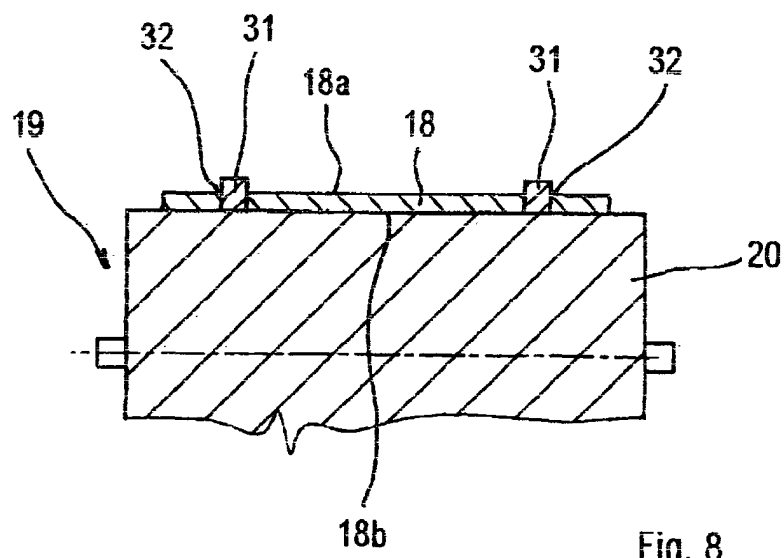


Fig. 8