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(54) **Process and apparatus for facing a manufactured article through powder coating**

Verfahren und Vorrichtung zur Beschichtung eines Artikels mittels Pulverbeschichtung

Procédé et appareil pour revêtir un article par poudrage

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Description

[0001] The present invention relates to an enhancing or facing process for a manufactured article through powder coating and to an apparatus for carrying out the same. The term "manufactured article" is to be understood for all purposes of the present specification as comprising any metal article, e.g. section bars, metal sheets, to which coating powder can be applied according to any suitable industrial method.

[0002] Facing processes by means of powder coating are currently employed for decorating metal section bars as an imitation of a wood grain, to be used particularly for obtaining window or door casings and frames.

[0003] After being suitably prepared for powder coating, metal section bars undergo a working cycle comprising the following operative steps: initially a first powder coating layer or primer is laid out on the section bar; then partial polymerisation of the first coating layer takes place; successively a second powder coating layer different in colour or tonality from the underlying layer is applied according to a predetermined graphical configuration and finally baking is effected to completely polymerise both the first and the second coating layers.

[0004] The above-described coating process, although affected by some drawbacks that drastically limit its industrial applications, in so far as both mass production and total costs of the final manufactured article are concerned. The most critical step for such a working cycle turns out to be the application of the second coating layer, i.e. of the decorative layer, which task often committed to the experience and ability of qualified personnel capable of reproducing specific graphical configurations, e.g. a fake wood grain, on any metallic and non-metallic support, by working manually and making use of conventional tools, e.g. brushes and paintbrushes.

[0005] From the above, it be easily understood that it impossible to carry out an industrial process comprising a completely manual operation, in that the latter results in an unavoidable economically unbearable bottle-neck that heavily slows down the entire production cycle.

[0006] Attempts made to transform the facing process for manufactured articles from a substantially manual process to an automatized one, although, on the one hand, they made it possible to speed up the production cycle, on the other, they showed to fall short of giving satisfactory results as to quality in terms of wood resemblance, as they would require permanent manual intervention by specialized personnel downstream of the working cycle.

[0007] The main object of the present invention is to provide a facing or enhancing process for manufactured articles through powder coating to eliminate or substantially reduce the above mentioned drawbacks affecting conventional coating techniques.

[0008] An important object of the present invention is to make it possible that by means of the above-said process fake wood grain coating with a very high degree of wood resemblance is obtained in such short times as to

be suitable for use in a completely automated working cycle and to do without any manual operation by specialized personnel.

[0009] Another object of the present invention is that by means of the above-said process it is possible to obtain a fake wood grain coating on manufactured articles at highly competitive costs owing both to an increase in productivity for the whole coating plant and a reduction of costs of specialized labour.

[0010] A still further object of the present invention is that the above-said process is applicable to both vertical and horizontal coating plants.

[0011] Not a last object of the present invention is to provide a vertical fake wood coating apparatus which makes it possible to obtain production levels equivalent to those of standard monocolour coating plants, while ensuring high quality aesthetic results at the same time, in terms of resemblance to a desired wood grain.

[0012] According to a first aspect of the present invention there is provided a process for facing or enhancing at least one manufactured article by means of powder coating according to claim 1.

[0013] Conveniently, the said process comprises controlling the said roller to perform linear displacements in the longitudinal direction of the or each manufactured article and to rotate around its own axis with a speed of rotation corresponding to a rolling peripheral velocity of said roller lower than its linear displacement velocity, in order to cause the said roller to roll and slide on the or each manufactured article.

[0014] According to another aspect of the present invention there is provided an apparatus according to claim 4 for carrying out the said process.

[0015] Advantageously, said support and handling means comprise at least one lever pivoted to a respective cursor element and suitable for performing controlled angular movements with respect thereto and at least one linear actuator having one end thereof articulated to its respective cursor element and its other end linked to its respective lever and being suitable for controlling said controlled angular movements of said lever to shift its respective roller between said working position and said rest position.

[0016] Further aspects and advantages of the present invention will better appear in the following detailed description of some currently preferred embodiments, given by way of non limiting examples with reference to the accompanying drawings, in which :

Figure 1 is a block-diagram showing the sequence of the working stations of a fake wood coating plant, according to the invention;

Figure 2 shows a front view of an apparatus according to the invention;

Figure 3 shows a side view on an enlarged scale of the mobile unit of the apparatus of Figure 2;

Figure 4 is a cross-section view of the mobile unit taken along line IV-IV of Figure 3;

Figure 5 shows a top view of a layer in resiliently deformable material with its surface in bas-relief used as a matrix in the rolling process;

Figure 6 is a cross-section view of the layer of Figure 5 taken along line VI-VI;

Figure 7 shows a top view of a second embodiment of the layer of Figure 5;

Figure 8 shows a cross-section view of the layer of Figure 7 taken along line VIII-VIII;

Figure 9 shows a perspective view of a portion of a manufactured article enhanced or faced through the plant of Figure 1;

Figure 10 shows a diagrammatic view on a reduced scale of the mobile unit of Figure 3 with its roller and brushes while working;

Figure 11 shows a diagrammatic view of the mobile unit of Figure 10 with roller and brushes at rest; and Figure 12 is a diagrammatic view of the mobile unit of Figure 10 with roller at rest and brushes in a working phase.

[0017] In the accompanying drawings similar or same parts or components have been identified with the same reference numerals.

[0018] With reference first to Figure 1, a plant 1 which is dedicated to imitation wood powder coating according to the invention, as shown by a block diagram and identified with reference number 1, can operate according to a working cycle comprising two or three stages depending upon whether two or three coating layers, respectively, are provided for the manufactured article to be decorated.

[0019] Plant 1, designed to carry out a two-stage working cycle, preferably comprises a first coating station 3 for applying a first powder coating layer, a fixing station 4 arranged downstream of the first coating station 3 and suitable for causing partial polymerisation of the first coating layer, a second powder coating station 5 for laying a second powder coating layer and a working station 6 for the final baking of both the first and the second coating layers.

[0020] Between the second coating station 5 and the final baking station 6, an apparatus 7 is provided, in which the process for enhancing manufactured articles 2 can take place. Such a process comprises causing the manufactured article to undergo a rolling treatment, thereby obtaining, on the second coating layer not yet fixed and uniformly distributed on the manufactured article 2, a drawing or pattern as an imitation of wood grain.

[0021] As shown in Figures 2, 3 and 4, apparatus 7 preferably comprises a frame 8 comprising a base 9, a pair of side uprights 10 and 12 rising from base 9 and defining an intermediate vertically extending working area 13, and an upper crosspiece 14 supported by the side uprights 10 and 12 and arranged to delimit zone 13 at the upper end thereof.

[0022] More particularly, as can be seen in Figure the working area 13 of apparatus 7 is crossed by an overhead

conveyor 15 designed to support the manufactured article 2 in a vertical position and to convey it through the various working stations of plant 1. Advantageously, conveyor 15 is equidistant from the two side uprights 10 and 12 so that manufacture 2 is caused to follow, in use, a trajectory coinciding with the x-x center line of working area 13.

[0023] Moreover, side uprights 10 and 12 are provided with vertical guides 16 and 17 facing the working area 13, along which guides a respective mobile unit 18a and 18b is arranged to slide between a top and a bottom dead center, so as to be displaced, in use, close to the top end and the bottom end, respectively, of the manufactured article 2 in vertical trim.

[0024] As is better shown in Figure 3, mobile unit 18a and likewise mobile unit 18b preferably comprises a carriage 19 having a body 21 endowed with rollers or wheels 23 for rolling engagement with its respective vertical guide 17 and top 24 and bottom 25 end portions which are integral with body 21 and project therefrom towards working area 13.

[0025] To the bottom portion 25 of carriage 19 a fork 27 is secured, e. g. by means of bolts 26, which comprises a pair of side shoulders 28 arranged to support, at the free ends thereof, an oscillating pivot 29 acting as a linking element for a pair of levers 30 with respect to the carriage 19.

[0026] Each lever 30, having one longitudinal end 31 pivoted to the oscillating pivot 29 and its other longitudinal end 32 articulated to a shaft 33 whose rotation axis y-y supports a roller 34, is controlled, in use, so as to perform controlled angular movements around oscillating pivot 29, by a linear actuator 35, whereby shifting roller 34 between a working position, at which its lateral surface 36 is in contact with manufactured article 2 to be enhance or faced (see Figure 3), and a rest position, at which roller 34 is withdrawn from manufactured article 2 (as shown in Figure 2).

[0027] Linear actuator 35 can comprise, e.g. by a piston-and-cylinder unit mounted on the carriage 19, the cylinder 37 being pivoted to the bottom end portion 25, whereas the free end 38 of its piston 39 is articulated to its respective lever 30 at a linking pivot 40 located at a predetermined distance from oscillating pivot 29 of lever 30, thereby converting, in use, the back and fro movements of piston 39 with respect to cylinder 37 into closer to, and away from, movements, respectively, of roller 34 with respect to the manufactured article 2.

[0028] Advantageously, roller 34 is bound to rotate integral with shaft 33 that is caused to rotate, in use, by a motor 44 and controlled by an encoder (not shown in the drawings), both being arranged coaxially with axis y-y.

[0029] Moreover, to the longitudinal ends of shaft 33, on the side opposite to roller 34, two arms 42 are fixed and designed to support a horizontal pivot 45, which in turn bears a plurality of sucking means 49 suitable for removing the coating powder gathered on lateral surface 36 of roller 34 during the rolling treatment carried out on

manufactured article 2.

[0030] As shown in Figure 3, and in particular in Figure 4, sucking means 49 comprise a series of suction orifices 50 in communication with a suction tube 51 and suitable for removing the coating powder retained during the rolling treatment, by lateral surface 36 of roller 34 and to convey it through sucking tube 51 towards a suitable storage and disposal reservoir (not shown in the Figures).

[0031] The use of suction means 49 is fundamental to ensure proper cleaning of lateral surface 36 of roller 34, since the same is advantageously in bas-relief according to a desired original that is to be reproduced on the surface 11 to be enhanced or faced of manufactured article 2.

[0032] As shown in Figures 5 to 8, on the lateral surface 36 of roller 34 a coating layer 52 of resiliently deformable material can be applied, having a working face 53 having a sequence of peaks 54 and recesses 56, suitably formed in it depending upon the graphical result meant to be obtained on the manufactured article 2.

[0033] As a matter of fact, when one wishes to reproduce a grain 55 which is an imitation of a specific type of wood on the surface 11 to be enhanced of manufactured article 2, on the working face 53 of coating layer 52 peaks 54 and recesses 56 are formed which extend randomly substantially in longitudinal direction of the coating layer 52 (see Figures 5 and 6). Once coating layer 52 has been laid, as described above, on roller 34, while the latter was rolling on the manufactured article 2 at a peripheral speed equal to the displacement speed of the moving carriage 19, working face 53 adheres only at its peaks 54 to the surface 11 to be decorated, on which a uniform powder coating layer has been previously laid. In this way, coating powder is locally removed, i.e. only at the peaks 54, thereby precisely reproducing onto it the drawing formed on working face 53.

[0034] Figures 7 and 8, instead, show a coating layer 52 with its working face 53 having a sequence of peaks 54 and recesses 56 shaped as concentric semicircles, by means of which it is possible to obtain, by causing roller 34 to roll and slide on the manufactured article 2, such a coating powder distribution on the surface to be decorated 11, as to reproduce a plurality of knots 57 as an imitation of a wood grain (as shown in Figure 9).

[0035] Advantageously, both mobile units 18a and 18b can comprise one or more brushes 22 fixedly mounted on their respective oscillating pivot 29 and integral in rotation therewith, and a motor 66 suitable for moving brushes 22 to a desired position in order to cause them to work, in use, with a correct inclination of their bristles sliding against the surface 11 to be enhanced of manufactured article 2.

[0036] The operation of the apparatus 7 is illustrated in Figures 10 and 11 showing the carriage 19 while being displaced forward, and meanwhile rolling and brushing operations of the surface 11 to be enhanced are carried out, and while being displaced backwards, respectively, with roller 34 and brushes 22 of the carriage 19 being at rest.

[0037] The forward stroke starts, preferably, when carriage 19 is at its top dead center. The roller 34 is then brought in contact with the surface 11 to be decorated by means of an angular movement of levers 30 controlled by piston-cylinder unit 35 about the oscillating pivot 29.

[0038] Should one wish to effect rolling by making roller 34 to roll onto the manufactured article 2, in combination with a downwards linear shift obtained by causing carriage 19 slide along its respective vertical guide 17, motor 44 is controlled to cause, in use, roller 34 to rotate about its own axis y-y, so as to obtain a rolling peripheral speed at the contact line between roller 34 and manufactured article 2 equal to the vertical displacement speed of carriage 19.

[0039] Rolling with no sliding of the roller 34 on manufactured article 2 makes it possible for the working face 53 of coating layer 52 to adhere without sliding to the face 11 to be decorated and for the coating powder previously uniformly deposited on the surface 11 to be decorated to be retained at the peaks 54, thereby leaving a mark exactly reproducing the original drawing provided on working face 53.

[0040] In order to obtain, instead, rolling with sliding of the roller 34 on the manufactured article 2, it is sufficient that motor 44 causes roller 34 to rotate about axis y-y, so that its peripheral rolling velocity is slower than the vertical displacement velocity of carriage 19. In this case, the mark obtained on the face 11 to be decorated does not exactly reproduce the original provided on the working face 53 of coating layer 52, but a distorted image thereof suitable for reproducing knots 57 of a desired wood grain.

[0041] As shown in Figure 9, apparatus 7 is suitable for providing an imitation wood coating on a manufactured article 2, having both veins 55 and knots 57, typical of a milled wooden surface.

[0042] Such a result can be obtained by combining the rolling treatment by means of roller 34 with a brushing treatment by means of fixed brushes 22 provided with bristles sliding, in use, on the surface 11 to be decorated.

[0043] A two working stage plant 1 can effect brushing treatment and rolling treatment simultaneously by arranging, during the forward displacement of carriage 19, the brushes 22 in contact with the surface 11 to be decorated, while roller 34 is already in its working position. When carriage 19 reaches the bottom dead center, brushes 22 are caused to stop by a control unit (not shown in the Figures) at an angular position detected by an encoder (not shown in the drawings), at which position the bristles of brushes 22 are no longer in contact with manufactured article 2, and are held in that position during the entire return displacement of carriage 19.

[0044] To obtain grains 55 on the surface 11 to be decorated, apparatus 7 can include comb members (not shown in the Figures), instead of brushes 22, which comb members are mounted on a respective carriage 19 to effect with it an alternate straight movement. Each comb member comprises a plurality of tines of flexible material,

which are spaced at a uniform or irregular pitch, have their free ends sharpened or flattened and are suitable for sliding, in use, on a manufactured article 2.

[0045] The powder coating process, the plant and the apparatus for carrying out the same as described above are susceptible to numerous modifications and variations within the scope of the claims.

[0046] Thus, for example, as shown in Figure 1, plant 1 can operate according to a three coating stage working cycle that can be carried out by providing, between the above described apparatus 7 and the final baking station 6, a fixing station 60 suitable for causing partial polymerisation of the second coating layer just treated, a third coating centre 61 arranged to apply a third powder coating layer having colour, tonality and/or organoleptic properties different from those of the underlying second layer, and a second apparatus 7 designed obtain a wood imitation in the third just laid coating.

[0047] With such a plant 1 it is then possible to obtain wood grains 55 and knots 57 in two separate phases and on two different coating layers, with the advantage of distinguishing one from the other by providing powder coatings of different colour or tonality.

[0048] Preferably, wooden grains 55 are obtained in the first apparatus 7 through a brushing or a rolling treatment with no bristles sliding on the second coating layer just laid on the manufactured article 2.

[0049] In order to carry out the brushing treatment, apparatus 7 is set as shown in Figure 12, in which roller 34 is moved away from the surface 11 to be decorated and brushes 22 are brought into their working position and caused to shift in a vertical direction by the carriage 19 along a respective guide 17, thereby sliding on the surface 11 to be decorated in order to remove part of the second coating layer to obtain a plurality of grains 55 on it.

[0050] In the second case, indeed, grains 55 are obtained by roller 34 rolling on the manufactured article 2, on which roller a coating layer 52, as shown in Figure 5, is laid.

[0051] Once fixing of the second coating layer thus treated has been effected and the third powder coating layer has been laid, the rolling and sliding treatment takes place at the second apparatus 7 and a coating layer 52, as shown in Figure 7, is applied to roller 34 for that purpose.

[0052] In practice, materials as well as dimensions can be various according to requirements.

Claims

1. A process for facing or enhancing at least one metal section bar (2) as an imitation of a wood grain by means of powder coating comprising laying a first powder coating layer, fixing said first coating layer by partially curing it, laying a second powder coating layer having color, tonality or organoleptic properties different from those of said first coating layer and

final baking of said first and said second coating layers, said process comprising, after laying said second coating layer and before final baking, the step of causing relative displacement between the section bar (2) and a couple of rollers (34) having their lateral surface in bas-relief, thereby reproducing on the section bar (2) a desired decoration, **characterized in that** said section bar (2) is transported suspended with its upper end to an overhead conveyor (15) designed to support it in a vertical position and to convey it through various working stations along the center line of the working area (13), said rollers (34) being placed on opposing sides of said section bar (2), said rollers (34) further performing simultaneously linear displacements from one end to the other end of said opposing sides of said section bar (2) and rotating about their own axis with a speed of rotation corresponding to a rolling peripheral velocity substantially lower than their linear displacement velocity, so that said rollers (34) roll and slide on said opposing sides of said section bar (2) to obtain thereon a reproduction of knots of a desired wood grain by distorting the mark provided on said lateral surface of said rollers (34).

2. A process as claimed in claim 1, **characterised in that**, after said second coating layer has been laid and before said rolling treatment, it comprises:

- a brushing treatment for said second coating layer by means of at least one brush (22) with bristles sliding on said section bar (2);
- fixing of said second coating layer;
- laying of a third powder coating layer having color, tonality and/or organoleptic properties different from those of said second coating layer, and
- rolling treatment for the said third paint layer.

3. A process as claimed in claim 1, **characterized in that**, after said second paint layer has been laid, it comprises:

- a first rolling treatment by means of a roller (34) having lateral high- or bas-relief surface including a multiplicity of substantially parallel engravings or grooves, thereby producing an imitation of wood grain on said section bar (2);
- fixing of said second coating layer;
- laying of a third powder coating layer,
- a second rolling and sliding treatment by means of a roller (34) having lateral surface provided with a plurality of concentric high- or bas-relief semicircles suitable for producing a multiplicity of knots as an imitation of a wood grain on said section bar (2).

4. A plant (1) for carrying out the process as claimed

in any preceding claim, comprising a first powder coating centre (3) to lay a first powder coating layer, a fixing centre (4) for said first coating layer downstream of said first coating centre, a second powder coating centre (5) designed to apply a second powder coating layer and a working station (6) designed to provide final baking of said first and said second coating layers, and an apparatus (7) arranged between said second powder coating centre (5) and said final baking station (6) and suitable for providing a rolling and/or brushing treatment on the surfaces of said section bar (2), thereby producing a desired decoration thereon, **characterized in that** said apparatus (7) comprises: an overhead conveyor (15) designed to support said section bar (2) in a vertical position and to sequentially transfer it throughout the various working stations of a power coating plant (1) along the center line of the working area (13); a support frame (8) located at a predetermined distance from said overhead conveyor (15); a couple of cursor elements (18a,18b) slidably mounted on said support frame (8), thereby being simultaneously shiftable under control, between one end and the other end of opposing sides of said section bar (2), a couple of rollers (34) placed on said opposing sides of said section bar (2), borne by a respective cursor element (18a,18b) and having a lateral high- or bas-relief surface that reproduces a desired pattern and is suitable for reproducing it on said section bar (2), said rollers (34) are able to rotate about their own axis with a speed of rotation corresponding to a rolling peripheral velocity substantially lower than their linear displacement velocity, so that said rollers (34) are able to roll and slide on said opposing sides of said section bar (2) to obtain thereon a reproduction of knots of a desired wood grain by distorting the mark provided on the lateral surface of said rollers (34), said rollers (34) further being arranged to be displaced between a working position, where they are in contact with said opposing sides of said section bar (2) to be enhanced, and a rest position, where they are withdrawn from said opposing sides of said section bar (2), driving means arranged to cause said rollers (34) to be controllably rotated about their own axis; and support and handling means for said rollers (34) movably mounted on a respective cursor element (18a,18b) and designed to displace the respective roller (34) between said rest position and said working position.

5. An apparatus as claimed in claim 4, **characterized in that** said support and handling means comprises at least one lever (30) pivoted on a respective cursor element (18a,18b) and designed to perform controlled angular movements with reference thereto and at least one linear actuator (35) having one end thereof articulated to its respective cursor element (18a,18b) and its other end articulated to its respec-

tive lever (30) and arranged to control said controlled angular movements of said lever (30) thereby displacing its respective roller (34) between said working position and said rest position.

6. An apparatus as claimed in claim 5, **characterized in that** said linear actuator (35) comprises a piston-cylinder unit.
7. An apparatus as claimed in any claim 4 to 6, **characterized in that** said frame (8) comprises guide means (16,17) for the or each cursor element (18a,18b) having rolling means (29) engaging with its respective guide means (16,17)
8. An apparatus as claimed in claim 7, **characterized in that** the or each cursor element (18a,18b) comprises a carriage (19).
9. An apparatus as claimed in any claim 4 to 8, **characterized in that** it comprises at least one brush (22) carried by the or each cursor element (18a,18b) and checking and control means for the or each brush (22) designed to alternate a working phase, where the or each brush (22) slides with its bristles said section bar (2), and a rest phase, where the or each brush (22) is in a position such as to prevent interference with said section bar (2) to be enhanced.
10. An apparatus as claimed in claim 9, **characterized in that** the or each brush (22) is mounted on a respective cursor element (18a,18b) and is caused to move to a working position by rotating about a pivot (29) having a substantially horizontal axis and, while in its rest phase, to move away to a predetermined angular position, in which its bristles do not engage with said section bar (2).
11. An apparatus as claimed in claim 9 or 10, **characterized in that** the or each brush (22) is interchangeable and that it comprises support means for the or each brush (22) on its respective cursor element (18a,18b).
12. An apparatus as claimed in any claim 9 to 11, **characterized in that** said checking and control means comprises a motor (66) arranged to cause its respective brush (22) to rotate about its respective pivot (29), and an encoder electrically connected to said motor (66) and designed to control the angular position of the or each brush (22) both during working and rest phase.

Revendications

1. Un procédé pour dresser ou renforcer au moins un profilé (2) en métal en guise d'imitation d'un relarga-

ge de bois au moyen d'une enduction en poudre comprenant l'application d'une première couche d'enduction en poudre, le fixage de ladite première couche d'enduction en la durcissant partiellement, l'application d'une seconde couche d'enduction en poudre dont la couleur, le ton ou les propriétés organoleptiques sont différents par rapport à ceux de la première couche d'enduction et la cuisson finale desdites première et seconde couche d'enduction, ledit procédé comprenant, après l'application de ladite seconde couche d'enduction et avant la cuisson finale, la phase d'entraîner un déplacement relatif entre le profilé (2) et une paire de rouleaux (34) ayant leur surface latérale en bas-relief, ce qui permet de reproduire sur le profilé (2) une décoration souhaitée, **caractérisé en ce que** ledit profilé (2) est transporté suspendu avec son extrémité supérieure vers un transporteur aérien (15) conçu pour le soutenir dans une position verticale et pour le transporter à travers plusieurs postes de travail le long la ligne centrale de la zone de travail (13), lesdits rouleaux (34) étant aménagés des côtés opposés dudit profilé (2), lesdits rouleaux (34) effectuant aussi simultanément des déplacements linéaires d'une extrémité vers l'autre extrémité desdits côtés opposés dudit profilé (2) et tournant autour de leur propre axe à une vitesse de rotation correspondant à une vitesse de roulement périphérique sensiblement inférieure à leur vitesse de déplacement linéaire, de sorte que lesdits rouleaux (34) roulent et glissent sur lesdits côtés opposés dudit profilé (2) pour obtenir sur ce dernier une reproduction de noeuds d'un relargage de bois souhaité en déformant l'estampille dans ladite surface latérale desdits rouleaux (34).

2. Un procédé selon la revendication 1, **caractérisé en ce qu'**après avoir appliqué ladite seconde couche d'enduction et avant ledit traitement de roulement, il comprend :

- un traitement de brossage pour ladite seconde couche d'enduction au moyen d'au moins une brosse (22) avec des poils glissant sur ledit profilé (2),
- fixage de ladite seconde couche d'enduction,
- application d'une troisième couche d'enduction en poudre dont la couleur, le ton et/ou les propriétés organoleptiques sont différents de ceux de ladite seconde couche d'enduction, et
- traitement de roulement pour ladite troisième couche de vernis.

3. Un procédé selon la revendication 1, **caractérisé en ce qu'**après avoir appliqué ladite seconde couche de vernis, il comprend :

- un premier traitement de roulement au moyen d'un rouleau (34) ayant une surface latérale en

haut- ou en bas-relief comprenant une multiplicité de gravures ou de cannelures sensiblement parallèles, ce qui permet de créer une imitation de relargage de bois sur ledit profilé (2),

- fixage de ladite seconde couche d'enduction,
- application d'une troisième couche d'enduction en poudre,
- un second traitement de roulement et de glissement au moyen d'un rouleau (34) dont la surface latérale présente une pluralité de demi-cercles concentriques en haut- ou en bas-relief aptes à produire une multiplicité de noeuds en guise d'imitation de relargage de bois sur ledit profilé (2).

4. Une installation (1) pour exécuter le procédé selon l'une quelconque des revendications précédentes, comprenant un premier centre d'enduction en poudre (3) pour appliquer une première couche d'enduction en poudre, un centre de fixage (4) pour ladite première couche d'enduction en aval dudit premier centre d'enduction, un second centre d'enduction en poudre (5) conçu pour appliquer une seconde couche d'enduction en poudre et un poste de travail (6) conçu pour assurer la cuisson finale desdites première et seconde couche d'enduction, et un appareil (7) aménagé entre ledit second centre d'enduction en poudre (5) et ledit poste de cuisson finale (6) et apte à assurer un traitement de roulement et/ou de brossage dans les surfaces dudit profilé (2), ce qui permet d'y produire une décoration souhaitée, **caractérisée en ce que** ledit appareil (7) comprend : un transporteur aérien (15) conçu pour soutenir ledit profilé (2) dans une position verticale et pour le transférer successivement à travers les différents postes de travail d'une installation d'enduction en poudre (1) le long la ligne centrale du poste de travail (13) ; un cadre de soutien (8) situé à une distance prédéterminée dudit transporteur aérien (15), une paire d'éléments curseurs (18a, 18b), monté coulissants sur ledit cadre de soutien (8), ce qui leur permet d'être déplaçables sous contrôle, entre une extrémité et l'autre extrémité des côtés opposés dudit profilé (2), une paire de rouleaux (34) aménagés sur lesdits côtés opposés dudit profilé (2), soutenus par un élément curseur respectif (18a, 18b) et ayant une surface latérale en haut- ou en bas-relief qui reproduit un modèle souhaité et qui est apte à le reproduire sur ledit profilé (2), lesdits rouleaux (34) sont à même de tourner autour de leur propre axe à une vitesse de rotation correspondant à une vitesse de roulement périphérique sensiblement inférieure à leur vitesse de déplacement linéaire, de sorte que lesdits rouleaux (34) soient à même de rouler et de glisser sur lesdits côtés opposés dudit profilé (2) pour obtenir sur ce dernier une reproduction de noeuds d'un relargage de bois souhaité en déjetant l'estampille pratiqué sur la surface latérale desdits rouleaux (34),

lesdits rouleaux (34) étant également aménagés pour être déplacés entre une position de travail, où ils sont au contact desdits côtés opposés dudit profilé (2) à renforcer, et une position de repos, où ils sont rétractés desdits côtés opposés dudit profilé (2), des moyens de guidage aménagés pour faire en sorte que lesdits rouleaux (34) soient tournés d'une façon contrôlable autour de leur propre axe ; et des moyens de soutien et de manipulation pour lesdits rouleaux (34) montés mobiles sur un élément curseur respectif (18a, 18b) et conçus pour déplacer le rouleau respectif (34) entre ladite position de repos et ladite position de travail.

5. Un appareil selon la revendication 4, **caractérisé en ce que** lesdits moyens de support et de manipulation comprennent au moins un levier tournés sur un élément curseur respectif (18a, 18b) et conçu pour accomplir des mouvements angulaires contrôlés par rapport à ceci et au moins un actionneur linéaire (35) ayant une propre extrémité articulée à son élément curseur respectif (18a, 18b), son autre extrémité articulée à son levier respectif (30), et aménagé pour contrôler lesdits mouvements angulaires contrôlés dudit levier (30), ce qui permet de déplacer son rouleau respectif (34) entre ladite position de travail et ladite position de repos.
6. Un appareil selon la revendication 5, **caractérisé en ce que** ledit actionneur linéaire (35) comprend une unité piston-cylindre.
7. Un appareil selon l'une quelconque des revendications 4 à 6, **caractérisé en ce que** ledit cadre (8) comprend des moyens de guidage (16, 17) pour le ou chaque élément curseur (18a, 18b) ayant un moyen de roulement (23) s'emboîtant avec ses moyens de guidage respectifs (16, 17).
8. Un appareil selon la revendication 7, **caractérisé en ce que** le ou chaque élément curseur (18a, 18b) comprend un chariot (19).
9. Un appareil selon l'une quelconque des revendications 4 à 8, **caractérisé en ce qu'il** comprend au moins une brosse (22) transportée par le ou chaque élément curseur (18a, 18b) et des moyens de vérification et de contrôle pour la ou chaque brosse (22) conçue pour alterner une phase de travail, où la ou chaque brosse (22) glisse avec ses poils le long dudit profilé (2), et une phase de repos, où la ou chaque brosse (22) est dans une position qui empêche toute interférence avec ledit profilé à renforcer (2).
10. Un appareil selon la revendication 9, **caractérisé en ce que** la ou chaque brosse (22) est montée sur un élément curseur respectif (18a, 18b) et qu'elle est, laissée atteindre une position de travail en la

faisant tourner autour d'un pivot (29) ayant un axe sensiblement horizontal, et qu'elle pendant sa phase de repos est laissée s'éloigner jusqu'à une position angulaire prédéterminée, où ses poils ne s'emboîtent pas dans ledit profilé (2).

11. Un appareil selon la revendication 9 ou 10, **caractérisé en ce que** la ou chaque brosse (22) est interchangeable et qu'elle comprend des moyens de soutien pour la ou chaque brosse (22) sur son élément curseur respectif (18a, 18b).
12. Un appareil selon l'une quelconque des revendications 9 à 11, **caractérisé en ce que** lesdits moyens de vérification et de contrôle comprennent un moteur (66) aménagé de façon à laisser tourner sa brosse respective (22) autour de son pivot respectif (29), et un codeur branché électriquement au dit moteur (66) et conçu pour contrôler la position angulaire de la ou chaque brosse (22) aussi bien pendant la phase de travail que pendant la phase de repos.

Patentansprüche

1. Ein Verfahren zur Verkleidung bzw. Weiterentwicklung zumindest eines Flacheisenstabes (2) zur Nachahmung einer Holzmaserung, zusammengesetzt aus einer Einrichtung zur Pulverbeschichtung, bestehend aus dem Auftragen einer ersten Pulverbeschichtung, aus dem Fixieren der besagten ersten Pulverbeschichtung durch teilweises Aushärten, aus dem Auftragen einer zweiten Pulverbeschichtung mit gegenüber der ersten Pulverbeschichtung verschiedenen Farb- und Tonalitätseigenschaften sowie verschiedenen organoleptischen Eigenschaften und des thermischen schlußendlichen Backens der besagten ersten und zweiten Pulverbeschichtung, wobei besagtes Verfahren daraus besteht, nach dem Auftragen der ersten Pulverbeschichtung und vor dem thermischen schlußendlichen Backen, eine relative Verschiebung zwischen dem Flacheisenstab (2) und zwei Walzen (34) hervorzurufen, wobei deren seitliche Oberfläche aus einem Basrelief besteht, wodurch die gewünschte Verzierung auf den Flacheisenstab (2) aufgetragen wird, **dadurch gekennzeichnet, dass** besagter Flacheisenstab (2) an dessen oberem Ende zu einem oberen Förderapparat (15) geleitet wird, um ihn in einer senkrechten Stellung zu halten und ihn durch verschiedene Werkstationen entlang der Mittellinie des Arbeitsbereichs (13) zu führen, wobei besagte Walzen (34) an den gegenüberliegenden Seiten des besagten Flacheisenstabs (2) angebracht sind, gleichzeitig lineare Verschiebungen von einem zum anderen Ende der besagten gegenüberliegenden Seiten des besagten Flacheisenstabs (2) ausüben und sich mit einer Drehungsgeschwindigkeit um ihre eigene Achse

se drehen, welche einer Umkreisdrehungsgeschwindigkeit entspricht, die grundsätzlich geringer ist als deren lineare Verschiebungsgeschwindigkeit, sodass besagte Walzen (34) auf den besagten gegenüberliegenden Seiten des besagten Flacheisenstabs (2) walzen und gleiten, um darauf einen Abzug von Knoten einer gewünschten Holzmaserung zu erhalten, indem die Zeichnung der besagten seitlichen Oberflächen der besagten Walzen (34) verformt wird.

2. Ein Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** es nach dem Auftragen der besagten zweiten Pulverbeschichtung und vor der Walzbehandlung vorsieht:

- eine Bürstbehandlung der besagten zweiten Pulverbeschichtung durch zumindest eine Bürste (22), deren Borsten auf besagtem Flacheisenstab (2) gleiten;
- das Fixieren der besagten zweiten Pulverbeschichtung;
- das Auftragen einer dritten Pulverbeschichtung mit gegenüber der zweiten Pulverbeschichtung verschiedenen Farb- und Tonalitätseigenschaften und/oder verschiedenen organoleptischen Eigenschaften und
- eine Walzbehandlung der besagten dritten Pulverbeschichtung.

3. Ein Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** es nach dem Auftragen der besagten zweiten Pulverbeschichtung vorsieht:

- eine erste Walzbehandlung durch eine Walze (34) mit einer seitlichen Bas- oder Hochreliefoberfläche, welche eine Vielzahl von grundsätzlich parallelen Gravuren oder Rillen aufweisen, wobei eine Holzmaserung auf besagtem Flacheisenstab (2) nachgeahmt wird;
- das Fixieren der besagten zweiten Pulverbeschichtung;
- das Auftragen einer dritten Pulverbeschichtung;
- eine zweite Walz- und Gleitbehandlung durch eine Walze (34) mit einer seitlichen Oberfläche mit einer Vielzahl von konzentrischen Hoch- oder Basreliefhalbkreisen, geeignet um eine Vielzahl von Knoten zur Nachahmung einer Holzmaserung auf besagtem Flacheisenstab (2) zu erhalten.

4. Eine Anlage (1) zur Ausführung des Verfahrens gemäß allen vorhergehenden Ansprüchen, bestehend aus einem ersten Pulverbeschichtungszentrum (3) zur Auftragung einer ersten Pulverbeschichtung, einem Fixierungszentrum (4) für besagte erste Pulverbeschichtung stromabwärts des besagten Pulverbe-

schichtungszentrums, einem zweiten Pulverbeschichtungszentrum (5) zur Auftragung einer zweiten Pulverbeschichtung und einer Arbeitsstation (6) zum thermischen schließenden Backen der besagten ersten und zweiten Pulverbeschichtungen und einem Apparat (7) zwischen dem besagten zweiten Pulverbeschichtungszentrum (5) und der besagten Station zum thermischen schließenden Backen (6) zur Walz- und/oder Bürstbehandlung der Oberflächen des besagten Flacheisenstabs (2), wodurch dabei eine erwünschte Verzierung erzeugt wird, **dadurch gekennzeichnet, dass** besagter Apparat (7) folgende Merkmale aufweist: einen oberen Förderapparat (15) zur Stützung des besagten Flacheisenstabs (2) in einer senkrechten Stellung und zur darauffolgenden Förderung durch die verschiedenen Werkstätten einer Pulverbeschichtungsanlage (1) entlang der Zentrallinie des Arbeitsbereichs (13); einen Stützrahmen (8) mit einem vorbestimmten Abstand zum oberen Förderapparat (15); zwei Läuferelemente (18a, 18b) verschiebbar an besagtem Stützrahmen (8) angebracht, wodurch sie gleichzeitig zwischen dem einen und dem anderen Ende der gegenüberliegenden Seiten des Flacheisenstabs (2) unter Kontrolle verschiebbar sind; zwei an den gegenüberliegenden Seiten des besagten Flacheisenstabs (2) angebrachte Walzen (34), welche von einem jeweiligen Läuferelement (18a, 18b) getragen sind und eine seitliche Hochrelief- oder Basreliefoberfläche aufweisen, welche ein gewünschtes Muster erzeugt und dazu geeignet ist, es auf dem Flacheisenstab (2) zu vervielfältigen, wobei besagte Walzen im Stande sind, sich mit einer Drehungsgeschwindigkeit um ihre eigene Achse zu drehen, welche einer Umkreisdrehungsgeschwindigkeit entspricht, die grundsätzlich geringer ist als deren lineare Verschiebungsgeschwindigkeit, sodass besagte Walzen (34) auf den besagten gegenüberliegenden Seiten des besagten Flacheisenstabs (2) walzen und gleiten, um darauf einen Abzug von Knoten einer gewünschten Holzmaserung zu erhalten, indem die Zeichnung der seitlichen Oberflächen der Walzen (34) verformt wird, wobei besagte Walzen (34) zur Verschiebung zwischen einer Werkposition vorgesehen sind, wo sie mit den besagten gegenüberliegenden Seiten des weiterzuentwickelnden Flacheisenstabs (2) in Kontakt sind, und einer Restposition, wo sie von den besagten gegenüberliegenden Seiten des Flacheisenstabs (2) abgezogen werden; Fördermittel zur kontrollierten Drehung der Walzen (34) um deren eigene Achse; und Stütz- und Handhabungsmittel für besagte Walzen (34), welche beweglich an einem jeweiligen Läuferelement (18a, 18b) angebracht sind, zur Verschiebung der jeweiligen Walze (34) zwischen besagter Restposition und besagter Arbeitsposition.

5. Eine Anlage gemäß Anspruch 4, **dadurch gekenn-**

- zeichnet, dass** besagtes Stütz- und Handhabungsmittel aus zumindest einem Hebel (30) besteht, welcher an einem jeweiligen Läuferelement (18a, 18b) drehgelenkig angebracht ist, zur Ausführung kontrollierter daraufbezogener Winkelbewegungen und zumindest einem Linear-stellantrieb (35), wobei ein Ende davon mit dessen jeweiligem Läuferelement (18a, 18b) mit Gelenk verbunden ist und das andere Ende mit dessen jeweiligem Hebel (30) mit Gelenk verbunden ist, der zur Kontrolle der besagten kontrollierten Winkelbewegungen des besagten Hebels (30) angebracht ist, wobei deren jeweilige Walze (34) zwischen besagter Arbeitsposition und besagter Restposition verschoben wird.
6. Eine Anlage gemäß Anspruch 5, **dadurch gekennzeichnet, dass** besagter Linear-Stellantrieb (35) eine Kolbenzylindereinheit aufweist.
7. Eine Anlage gemäß irgendeinem der Ansprüche 4 bis 6, **dadurch gekennzeichnet, dass** besagter Rahmen (8) Führungsmittel (16, 17) für das oder jedes Läuferelement (18a, 18b) aufweist, welche Walzmittel (23) besitzen, die mit deren jeweiligen Führungsmitteln ineinander greifen.
8. Eine Anlage gemäß Anspruch 7, **dadurch gekennzeichnet, dass** das oder jedes Läuferelement (18a, 18b) ein Laufwerk (19) aufweist.
9. Eine Anlage gemäß irgendeinem der Ansprüche 4 bis 8, **dadurch gekennzeichnet, dass** sie zumindest eine Bürste (22) aufweist, welche von dem oder jedem Läuferelement (18a, 18b) getragen wird, und Überprüfungs- und Kontrollmittel für die oder jede Bürste (22) zur Abwechslung zwischen einer Arbeitsphase, wo die oder jede Bürste (22) mit deren Borsten über den Flacheisenstab (2) gleiten, und einer Restphase, wo die oder jede Bürste (22) so angebracht ist, dass eine Einwirkung auf den Flacheisenstab (2) vermieden wird.
10. Eine Anlage gemäß Anspruch 9, **dadurch gekennzeichnet, dass** die oder jede Bürste (22) an einem jeweiligen Läuferelement (18a, 18b) angebracht ist und zu einer Arbeitsposition bewegt wird, indem sie sich um einen Drehzapfen (29) mit einer grundsätzlich waagrechten Achse dreht, und während der Restphase in eine vorbestimmte Winkelstellung entfernt wird, in welcher deren Borsten nicht auf den Flacheisenstab (2) ineinander greifen.
11. Eine Anlage gemäß den Ansprüchen 9 oder 10, **dadurch gekennzeichnet, dass** die oder jede Bürste (22) austauschbar ist und dass sie Stützmittel beinhaltet für die oder jede Bürste (22) an deren jeweiligem Läuferelement (18a, 18b).
12. Eine Anlage gemäß irgendeinem der Ansprüche 9 bis 11, **dadurch gekennzeichnet, dass** besagte Überprüfungs- und Kontrollmittel einen Motor (66) beinhalten zur Drehung derer jeweiliger Bürste (22) um deren jeweiligen Drehzapfen (29) sowie einen an besagtem Motor (66) elektrisch angeschlossenen Codierer zur Kontrolle der Winkelstellung der oder jeder Bürste (22) sowohl während der Arbeits- als auch während der Restphase.

Fig. 1

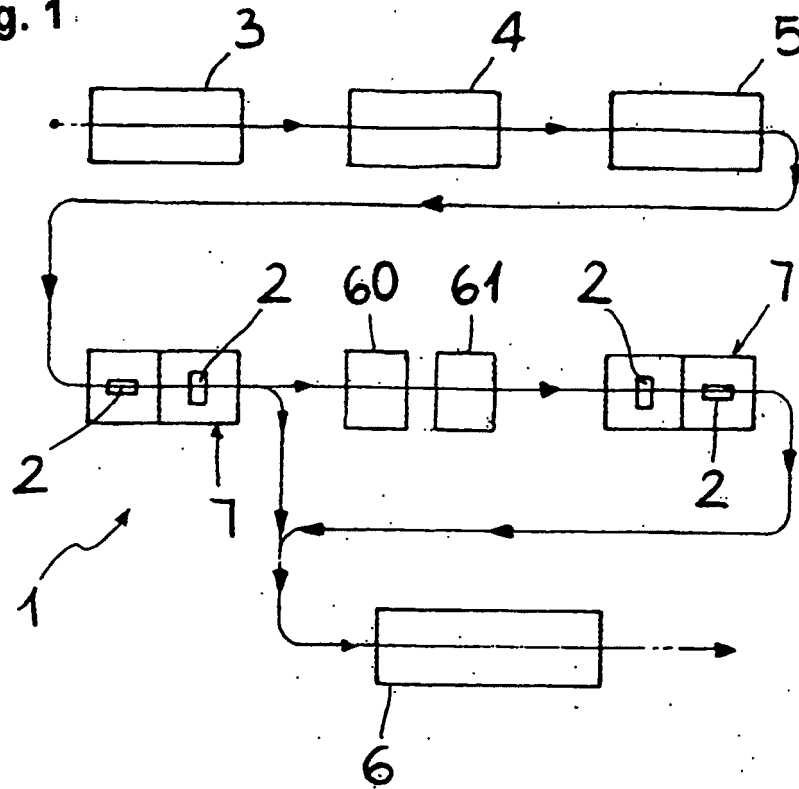
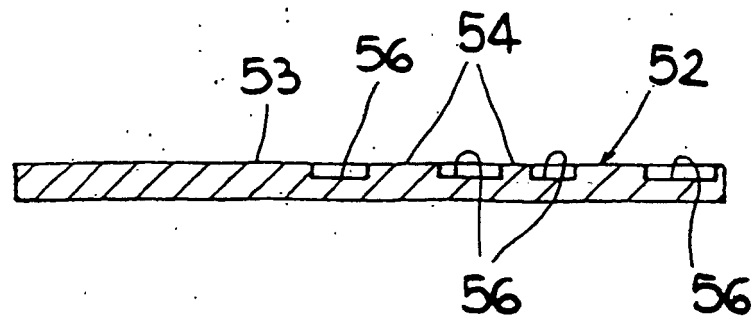


Fig. 6



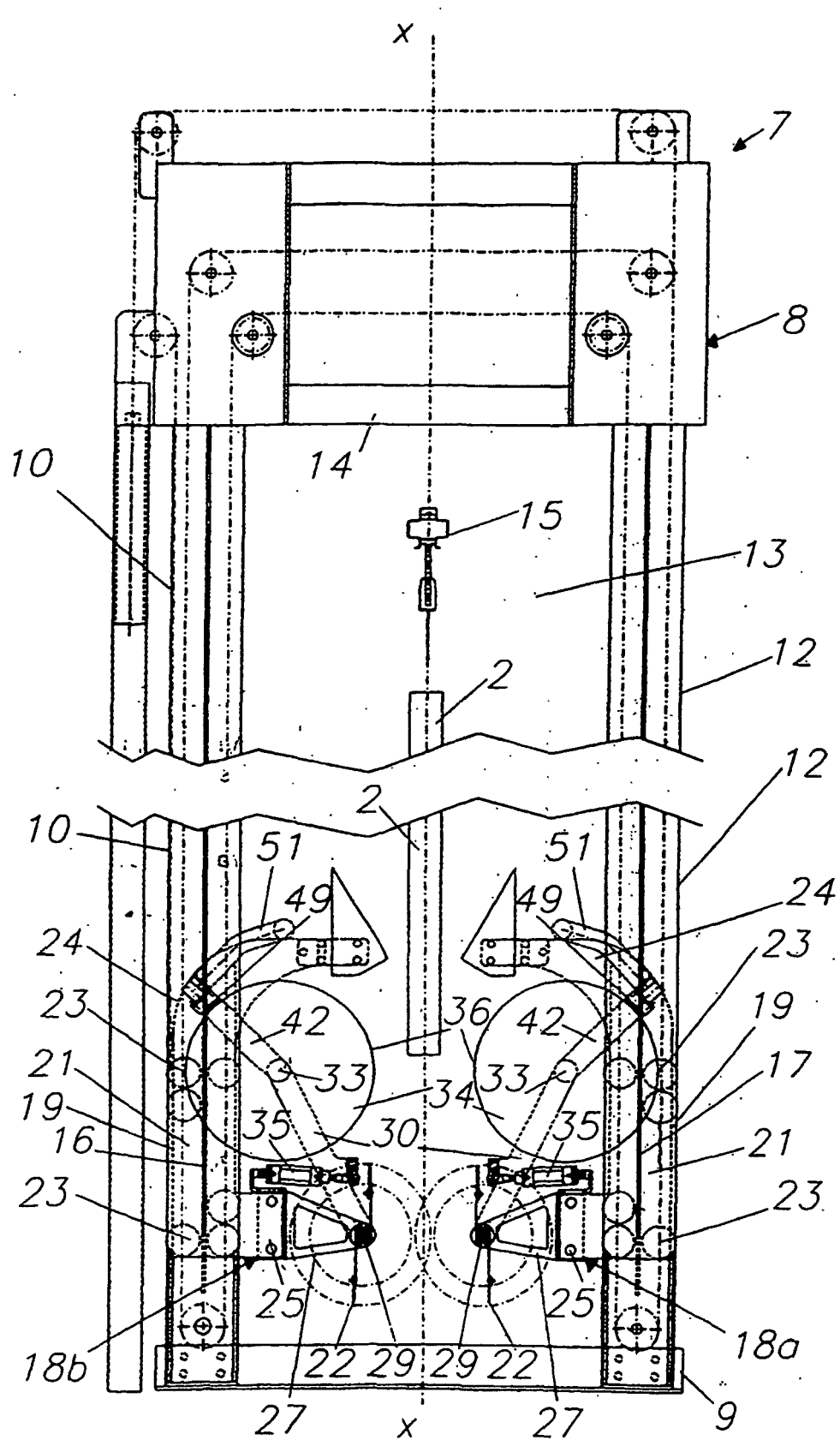


Fig. 2

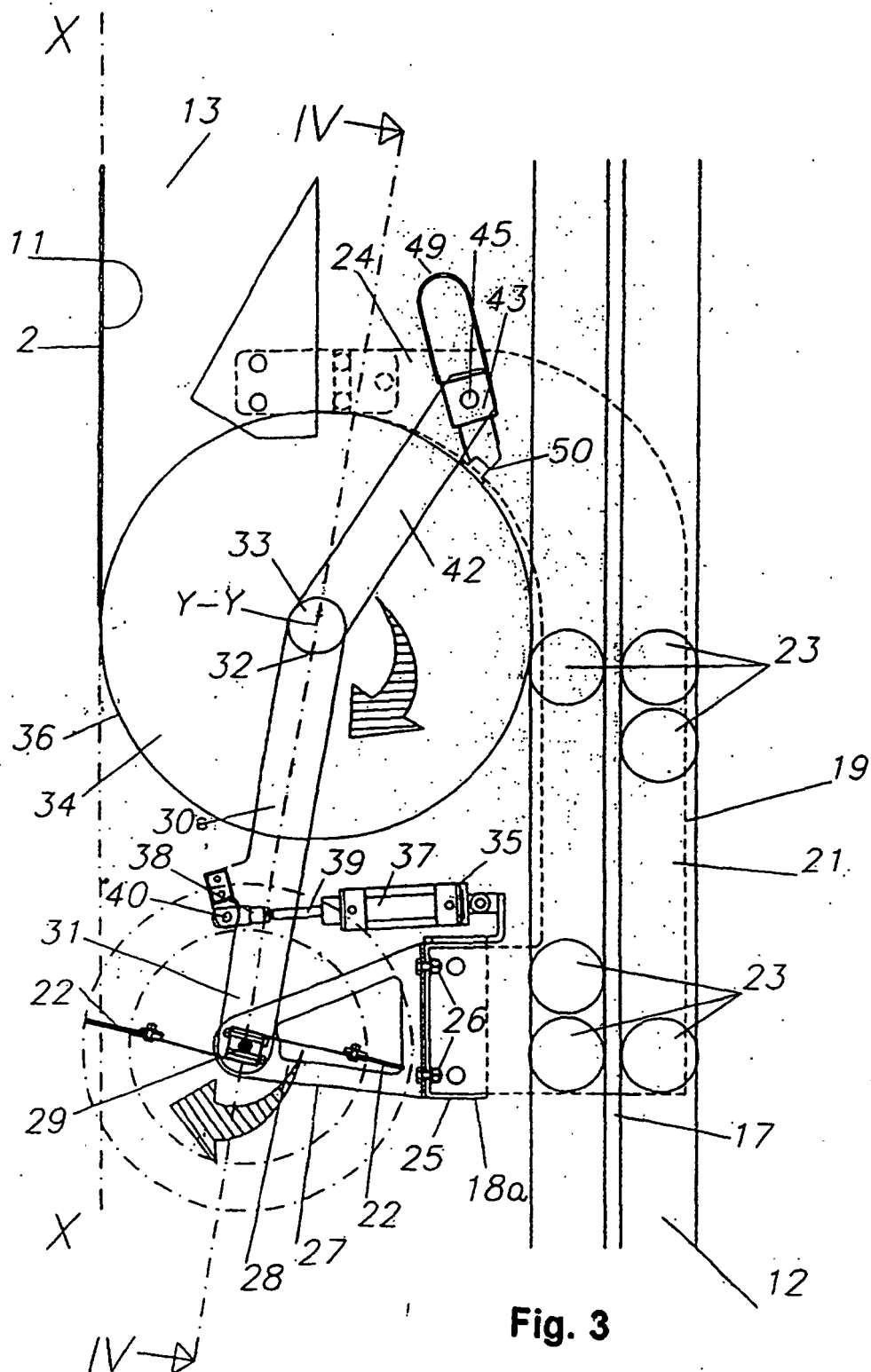


Fig. 3

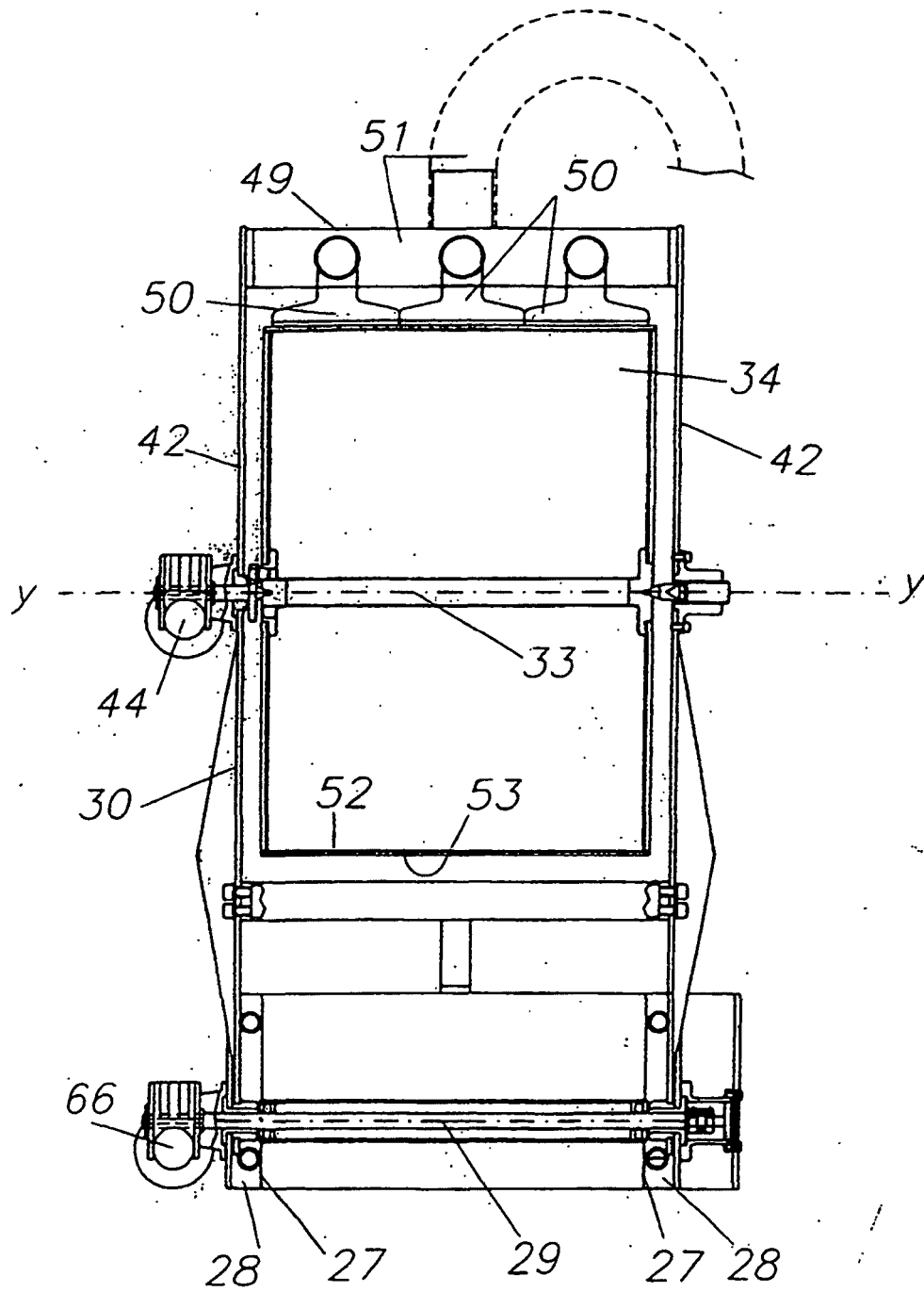
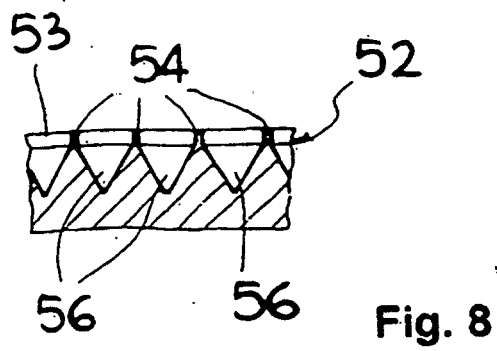
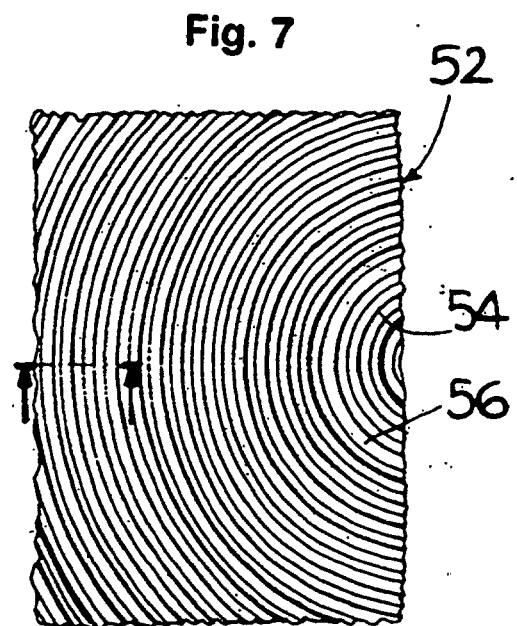
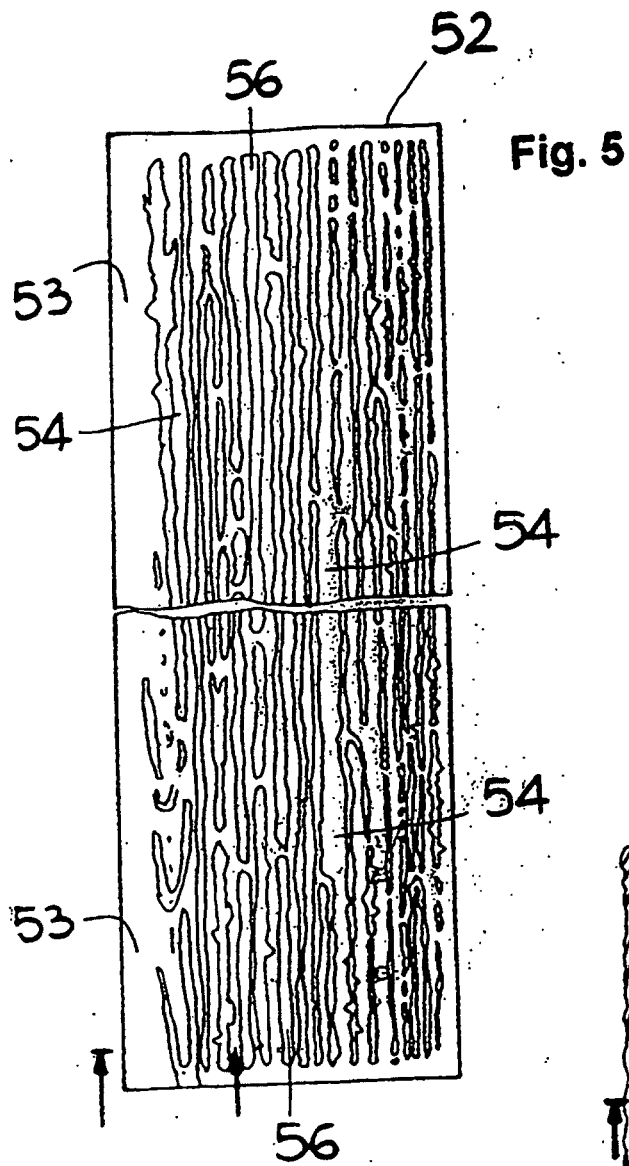
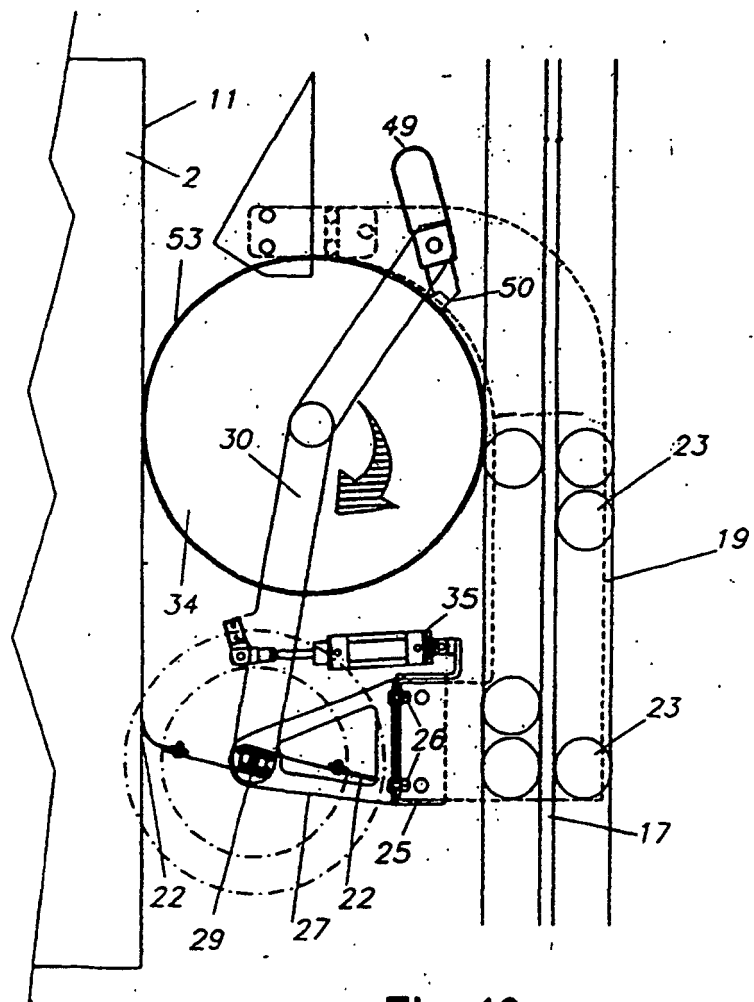
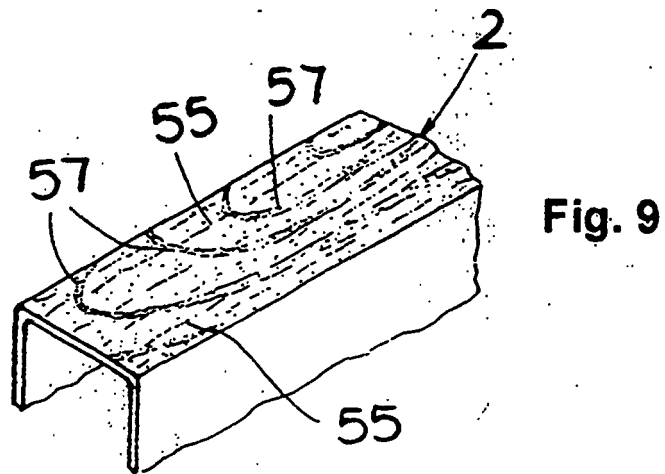


Fig. 4





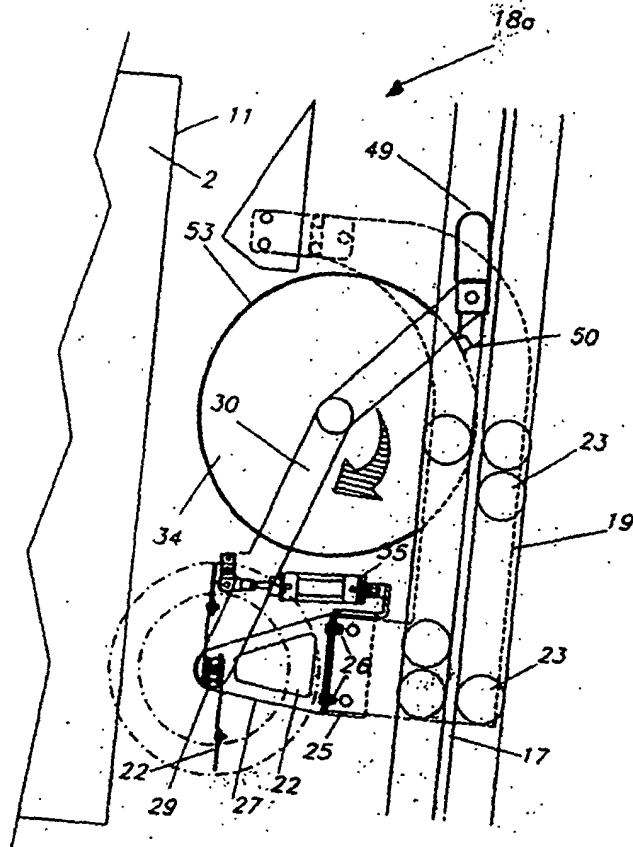


Fig. 11

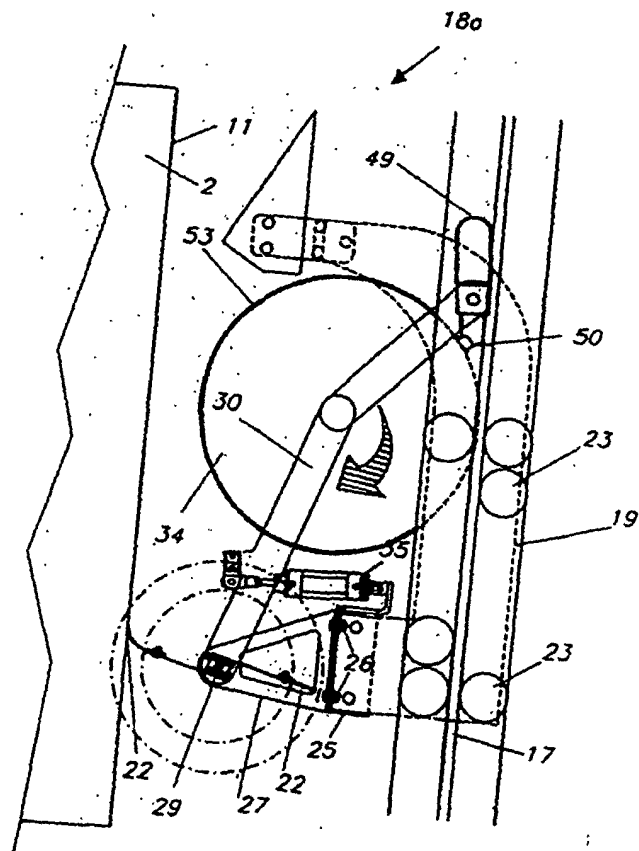


Fig. 12