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DESCRIPTION

Field of the invention

[0001] The present invention generally addresses surface treatments of articles of manufacture, and particularly relates to a machine for spraying paints or powders onto the surfaces of such articles.

Background art

[0002] In the treatment of articles made of concrete or other natural or artificial stone materials, protective products have long been known to be sprayed onto the outer surfaces of such articles.

[0003] The products to be sprayed may include paints designed to impart a particular aesthetic effect or protective products such as anticorrosion and antioxidant agents in liquid or powder form, or mixtures thereof.

[0004] Spraying is carried out by an operator in a cabin in which the article is placed, using conventional manual equipment, such as compressed-air spray guns.

[0005] A first drawback of this process is that it is not automated, and requires very long processing times in a particularly harmful work environment.

[0006] Furthermore, these articles are often very large, and their movement inside the cabin before, during and after spraying is particularly complex, if not impossible.

[0007] In an attempt to at least partially obviate such drawbacks, machines have been developed for automated spraying of paints or powders onto the surface of articles of slabs made of concrete or stone materials.

[0008] Chinese patent CN201907357 discloses a machine for spraying concrete slabs comprising a tilting plate for supporting the slabs and a crossbeam moving above the plane along appropriate longitudinal guides. A carriage is mounted to the beam and is adapted to support a spray head having a respective nozzle for delivering a jet of paint onto the slab being processed.

[0009] A first drawback of this prior art arrangement is that the structure comprises a mechanism for pivoting the slab supporting plate that is rather complex, to prevent or limit the movement of the spray head resulting from the combination of the movements of the beam and the carriage.

[0010] A further drawback is that the spray head and the nozzle are mounted to the carriage with a very small degree of freedom.

[0011] These drawbacks are amongst the factors that hinder or prevent uniform spraying of concrete articles or slabs having non-straight profiles and comprising curvilinear, concave or recessed portions.

[0012] Another drawback is that the support plate cannot hold very large articles and/or slabs, and loading and unloading thereof are very complex, due to the presence of the longitudinal guides.

[0013] A further drawback is that the support plate can only hold one slab at a time for spraying, whereby the machine can only partially reduce the overall processing times.

[0014] Finally, no means are provided in this prior art machine for sucking up paints and powders dispersed in the environment, or for drying the paints or liquid products once the latter are applied to the surfaces of the articles.

[0015] EP2631041 discloses a machine for spraying paints or powders onto articles, which comprises a supporting frame with transverse guide means and a spray head slidably supported on the guide means. The head is mounted to a slidably supported post on a carriage, in a respective vertical direction.

[0016] A first drawback of this arrangement is that this machine requires very long processing times for uniform spraying of paints all over the surface of the article.

[0017] A further drawback is that the machine does not allow spraying of more than one article at a time and has a low efficiency.

[0018] Documents JP506223, GB2483892, US2005/188920, US5630876, US2588125, FR2813539, US4872417, US2009/120249 and EP2090374 disclose further machines or plants for spraying paints or powders onto surfaces of articles of manufacture.

Disclosure of the invention

[0019] The object of the present invention is to solve the above mentioned technical problem and obviate the above discussed drawbacks, by providing a machine for spraying paints and powders onto surfaces of articles, that is highly efficient and relatively cost-effective.

[0020] A particular object of the present invention is to provide a machine of the aforementioned type that can uniformly spray paints or powders over the entire surface of the article, even when the latter has a large size, such as in the case of highway or viaduct beams.

[0021] A particular object of the present invention is to provide a machine of the aforementioned type that can uniformly spray paints or powders over the entire surface of the article, even when the latter has a large size, such as in the case of highway or viaduct beams.

[0022] Yet another object of the present invention is to provide a machine of the aforementioned type, that allows spraying of more than one article at a time.

[0023] A further object of the present invention is to provide a machine for spraying paints or powders onto the surfaces of articles that can reduce the overall processing times.

[0024] Another object of the present invention is to provide a machine that can suck up the paints dispersed in the environment and dry them once they have been sprayed onto the articles.

[0025] These and other objects, as better explained below, are fulfilled by a machine for spraying paints or powders onto the surfaces of articles as defined in claim 1.

[0026] Furthermore, the machine may comprise means for sucking up and drying the paints and the protective products, which are associated with the supporting structure.

[0027] With this arrangement, the machine is able to uniformly spray the paints or powders over the entire surface of the article, even when the latter has a large size, over complex surfaces comprising curves, undercuts, concavities or recesses, and over more than one article at a time.

[0028] Advantageous embodiments of the invention are obtained in accordance with the dependent claims.

Brief description of the drawings

[0029] Further features and advantages of the invention will be more apparent from the detailed description of a preferred, non-exclusive embodiment of a machine for spraying paints or powders onto surfaces of articles according to the invention, which is described as a non-limiting example with the help of the annexed drawings, in which:

FIG. 1 is a perspective view of a machine for spraying paints or powders according to the invention in a first application state;

FIG. 2 is a perspective view of the machine for spraying paints or powders of Fig. 1 in a second application state;

FIG. 3 is a broken-away front view of the machine of Fig. 1;

FIG. 4 is a bottom view of a detail of the machine of Fig. 1;

FIG. 5 is a side view of the machine of Fig. 1;

FIG. 6 is a broken-away lateral view of the machine of Fig. 1, with a respective enlarged portion;

FIGS. 7 and 8 are front views of the machine according to two alternative embodiments.

Detailed description of a preferred exemplary embodiment

[0030] Referring to the accompanying figures, there is shown a machine, generally designated by numeral 1, which is designed to spray paints or powders P under pressure to create a particular aesthetic effect on the outer surface S of the articles M, or to change their surface properties, e.g. to impart a friction coefficient, adhesive properties, or weather resistance, using protective agents, anticorrosion agents, or the like.

[0031] The articles M may be made of a stone material, stone, concrete, iron, steel, aluminum, wood, plastic and other similar materials without departure from the scope of the invention, whereas the powders P may comprise sands, filings, resins, plastics, release agents, glues and other similar chemicals particularly suitable for spraying.

[0032] Furthermore, the articles M may have different shapes and comprise slabs, beams, columns, blocks or the like, possibly of very large size and with any type of geometry, e.g. with recesses, undercuts or a C shape.

[0033] In the embodiment as shown in the accompanying figures, the machine 1 comprises first longitudinal guide means 2 adapted to be anchored to the ground and defining a lower support area 3 for an article M to be sprayed.

[0034] The first longitudinal guide means 2 may comprise a pair of rails 4, 5 that are fixed to the ground in substantially parallel and spaced positions with a transverse center-to-center spacing p, as shown in FIG. 1.

[0035] The machine 1 comprises a supporting structure 6 that is slidably mounted to the rails 4, 5 and second transverse guide means 7 associated with the supporting structure 6.

[0036] Namely, the supporting structure 6 may have a pair of substantially vertical uprights 8, 9, each having a pair of wheels 10, 11 at its base, which are slidably supported by the rails 4, 5 for rectilinear translation of the supporting structure 6 in the support area 3 for the article M, above the latter.

[0037] The sliding movement of the wheels 10, 11 in the rails 4, 5 may be controlled by gearmotor units 12 of known type, associated with each of the uprights 8, 9.

[0038] Furthermore, each pillar 8, 9 defines a respective housing compartment 13, 14 whose purpose will be more apparent hereinafter.

[0039] In the embodiment as shown in the figures, the second transverse guide means 7 comprise a first pair of transverse guides 15, 16 whose length corresponds to the transverse pitch p between the longitudinal rails 4, 5 and whose ends are secured to the uprights 8, 9 to stiffen the supporting structure 6.

[0040] The transverse guides 15, 16 are in mutually facing and longitudinally offset positions, thereby defining a first sliding gap 17.

[0041] In the preferred embodiment of the invention as shown in the figures, the second transverse guide means 7 comprise a further pair of transverse guides 18, 19 similar to the above mentioned ones, and also having ends secured to the vertical uprights 8, 9.

[0042] The second transverse guides 18, 19 are mounted in mutually facing and longitudinally offset positions, thereby defining a second sliding gap 20.

[0043] In an alternative embodiment of the invention, not shown, further pairs of transverse guides may be provided in addition to those as described above, having respective ends secured to the vertical uprights 8, 9 and defining respective sliding gaps.

[0044] As well shown in FIG. 6, the supporting structure 6 may define a substantially vertical plane of symmetry π and the first 15, 16 and the second pairs of transverse guides 18, 19 will be located on opposite sides of the plane of symmetry π .

[0045] Advantageously, cases 21 may be provided at the sides of and over the transverse guides 15, 16; 18, 19 to protect them and prevent impurities from entering the support area 3.

[0046] The machine 1 further comprises a first spray head 22 which is slidably mounted to the above discussed guide means 7 and is operably connected to one or more reservoirs 23 for the product P to be sprayed via flexible hoses and at least one pump, of the known type and not shown in the figures.

[0047] Conveniently, each reservoir 23 may be accommodated in one of the compartments 13, 14 delimited by a respective vertical upright 9, to follow the longitudinal movement of the supporting structure 6 and avoid excessive stretching of the hoses.

[0048] According to a peculiar aspect of the invention, the first spray head 22 is secured to a substantially vertical post 24 fixed to a first carriage 25 that is designed to move along the second transverse guide means 7.

[0049] Furthermore, third guide means 26, e.g. prismatic guides, are associated with the first carriage 25 for guiding the first post 24 in a substantially vertical direction V_1 , for spraying to occur in three mutually perpendicular directions.

[0050] Thus, the combined movement of the supporting structure 6, the first carriage 25 and the first post 24 afford controlled movement of the spray head 22 within the entire lower support area 3 to quickly and simply reach any point of the article M and promote uniform spraying thereof.

[0051] Advantageously, respective motor means 27 may be provided, which are adapted to cause the first carriage 25 to move along the second transverse guide means 7 and additional motor means 28 may be also operably associated with the carriage 25 and the post 24 to cause the vertical movement thereof along the third guide means 26.

[0052] The first carriage 25 may be slidably mounted to the first pair of opposed transverse guides 15, 16 to be translated in the first gap 17 defined therebetween by the second motor means.

[0053] In a preferred embodiment of the invention, as shown in the figures, the machine 1 comprises a second spray head 29, similar to the first, which is mounted to a second substantially vertical post 30 fixed to a second carriage 31, identical to the first carriage 25.

[0054] Like the first post 24, the second post 30 may be translated in a respective vertical direction V_2 relative to the second post 31 along fourth guide means 32 which are rigidly joined to the second carriage 31 and by the respective motor means 28.

[0055] Like the first carriage 25, the second carriage 31 may be slidably mounted to the second pair of transverse guides 18, 19 to be translated in the second gap 20.

[0056] Furthermore, the second spray head 29 is operably connected to one or more of the reservoirs 23 containing the products P to be sprayed via respective flexible hoses, which are partially accommodated within the second sliding gap 20 and a respective pump, both not shown.

[0057] In an alternative embodiment of the invention, not shown, the machine 1 may comprise further spray heads mounted to respective carriages and at least one pair of carriages may be slidably introduced into each sliding gap.

[0058] In the embodiment as shown in the figures, the first 24 and second 30 posts have respective spray heads 22, 29 mounted to opposite ends, i.e. an upper end 33 and a lower end 34 thereof.

[0059] This will allow the machine 1 to simultaneously spray both an article M that rests on the

ground or on an appropriate support structure in the lower support area 3, as shown in FIG. 1, and an additional article M' located in an upper support area 3' relative to the supporting structure 6, as shown in FIG. 2 and hanging by means of a bridge crane or an appropriate frame, not shown.

[0060] Possibly, the spray heads 22, 29 may be mounted to the same end, e.g the lower end 34 of the posts 24, 30 to cooperate within a single support area 3, e.g the lower support areas relative to the supporting structure 6, as shown in FIG. 7.

[0061] In this embodiment, the machine comprises three carriages 25 having respective spray heads 22 mounted at the lower ends 34 of the posts 24 for simultaneous spraying of all the faces of a channel beam located in the support area 3.

[0062] Furthermore, in an alternative embodiment of the invention, not shown, each post 24, 30 may comprise at least one pair of spray heads located at both ends 33, 34 or an additional head in an intermediate position.

[0063] Each of the spray heads 22, 29 may comprise at least one support 35 which is rotatably mounted to one of the ends 33, 34 of a respective post 24, 30 to rotate about a substantially vertical axis T_1, T_2 .

[0064] Also, each spray head 22, 29 may have a respective nozzle 36 rotatably mounted to a respective support 35 to rotate about an axis substantially perpendicular R_1, R_2 to the vertical axis T_1, T_2 , such that each nozzle 36 may be oriented in the three directions of space.

[0065] The movement of each support 35 and each nozzle 36 relative to the corresponding support 35 may be caused by respective independent motor means 37.

[0066] Besides paints and powders P, the nozzles may be fed with highpressure air, water or pickling chemicals, for the machine 1 to be able to clean the surfaces to be treated.

[0067] Furthermore, in the embodiment in which both heads 22, 29 are mounted at the lower end 34 of the posts 24, 30, as shown in FIG. 7, their movement will allow the nozzles 36 to be constantly positioned above the article M and deliver the paints or powders P by dripping from top to bottom.

[0068] In an alternative embodiment of the invention, as shown in FIG. 8, the machine may comprise a plurality of nozzles 36 mounted to a single support 35 of a head 22 at a respective end 34 of a post 24 for simultaneously spraying all the inner surfaces S of a channel plate located in the support area 3.

In one embodiment of the invention, not shown, multiple spray heads 22, 29 may be provided instead of one, at each end 33, 34 of a respective post 24, 30.

[0069] As shown in the figures, vacuum-operated means 38 may be provided, having a suction

port 39 located within the support area 3 for sucking up dispersed particles of the products P to be sprayed.

[0070] Furthermore, as shown in FIG. 3, radiation means 40, preferably IR lamps, may be fixed to the supporting structure 6 and be oriented toward the lower 3 or upper 3' support area to dry the products P deposited on the surfaces S of the articles M being processed.

[0071] The machine 1 comprises processor control means 41 connected to the motor means 12, 27, 28, 37 to ensure controlled movement of the supporting structure 6, the carriages 25, 31, the posts 24, 30, the supports 35 and the nozzles 36 according to the shape and size of the articles M to be sprayed and the respective pumps.

[0072] The machine for spraying paints or powders onto articles made of concrete or stone materials according to the invention is susceptible of a number of changes and variants, within the inventive concept disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

[0073] While the machine has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention.

REFERENCES CITED IN THE DESCRIPTION

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- US2009120249A [0018]
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Patentkrav

1. Maskine (1) til at sprøjte maling eller pulver (P) på overflader (S) af fremstillingsgenstande (M), der omfatter:

- 5 - første langsgående føringsorgan (2), der er indrettet til at være forankret til jorden og definere et nedre støtteområde (3) til en genstand (M), der skal sprøjtes;
- en støttestruktur (6), som er glidbart monteret på nævnte første langsgående føringsorgan (2);
- 10 - anden tværgående føringsorgan (7), der er forbundet med nævnte støttestruktur (6) og omfatter et første par tværgående føringer (15, 16 i gensidigt modstående og langsgående offsetforhold for at definere en første spalte (17);
- mindst et første sprøjtehoved (22), som er glidbart monteret på nævnte anden føringsorgan (7);
- 15 - et eller flere reservoirer (23) til produkter (P), der skal sprøjtes, som er operativt forbundet til nævnte første sprøjtehoved (22);

hvor nævnte mindst ene første hoved (22) er fastgjort til en første i alt væsentligt vertikal stolpe (24), der er fastgjort til en første vogn (25), som er bevægelig til at bevæge sig langs nævnte anden tværgående føringsorgan (7), idet nævnte første vogn (25) er glidbart monteret på nævnte første par tværgående føringer (15, 16) for at glide i nævnte første spalte (17), idet det tredje føringsorgan (26) er associeret med nævnte første vogn (25) for at føre nævnte første stolpe (24) i en første i alt væsentligt vertikal retning (V_1), på en sådan måde, at det tillades at sprøjte i tre indbyrdes vinkelrette retninger;

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kendetegnet ved, at det omfatter mindst et andet sprøjtehoved (29), der er monteret på en anden i alt væsentligt vertikal stolpe (30), som er fastgjort til en anden vogn (31), hvor nævnte anden tværgående føringsorgan (7) omfatter et andet par tværgående føringer (18, 19) i gensidigt modstående og langsgående offsetforhold for at definere en anden spalte (20), hvor nævnte støttestruktur (6) omfatter et par i alt væsentligt vertikale standere (8, 9), hvor nævnte første par (15, 16) og nævnte andet par (18, 19) af tværgående føringer har langsgående ender, der er fastgjort til de øvre ender af nævnte standere (8, 9), hvor nævnte anden vogn (31) er glidbart monteret på nævnte anden par føringer (18, 19) for

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at glide i nævnte anden spalte (20), hvor nævnte anden stolpe (30) er bevægelig i en anden i alt væsentligt vertikal retning (V_2) på fjerde føringsorgan (32), stift forbundet med nævnte anden vogn (31).

- 5 **2.** Maskine ifølge krav 1, **kendetegnet ved, at** nævnte støttestruktur (6) definerer et i alt væsentligt vertikalt symmetriplan (π), hvor nævnte første (15, 16) og nævnte andet (18, 19) par tværgående føringer er placeret på modsatte sider af nævnte symmetriplan (π).
- 10 **3.** Maskine ifølge krav 1, **kendetegnet ved, at** hver af nævnte sprøjtehoveder (22, 29) omfatter mindst en støtte (35), som er roterbart monteret på en af enderne (33, 34) af en respektiv stolpe (24, 30) for at rotere omkring en i alt væsentligt vertikal akse (T_1, T_2).
- 15 **4.** Maskine ifølge krav 3, **kendetegnet ved, at** hver af nævnte sprayhoveder (22, 29) omfatter mindst en dyse (36), som er roterbart monteret på nævnte støtte (35) for at rotere omkring en i alt væsentligt horisontal akse (R_1, R_2), således at den kan orienteres i de tre rumdimensioner.
- 20 **5.** Maskine ifølge krav 3, **kendetegnet ved, at** nævnte første (24) og nævnte anden (30) stolper har respektive sprøjtehoveder (22, 29), der er monteret på modsatte ender (33, 34), en øvre ende og en nedre ende henholdsvis, for at sprøjte genstandene (M), der er placeret i nævnte nedre støtteområde (3), eller i et støtteområde (3'), der er placeret over nævnte støttestruktur (6).
- 25 **6.** Maskine ifølge krav 1, **kendetegnet ved, at** nævnte ene eller flere reservoirer (23) til produkter (P), der skal sprøjtes, er i selektiv fluidforbindelse med respektive sprøjtehoveder (22, 29) via passende fleksible slanger mindst delvist akkommoderet i nævnte første (17) og nævnte anden (20) glidespalter.
- 30 **7.** Maskine ifølge krav 1, **kendetegnet ved, at** den omfatter vakuumorganer (38), der har en sugeåbning (39), der er placeret indeni nævnte støtteområde (3) for at opsuge spredte partikler af nævnte produkter (P), der skal sprøjtes, og strålingsorganer (40), der er fastgjort til nævnte støttestruktur (6) for at tørre
- 35 produkterne, der er aflejret på overfladerne (S) af genstandene (M), der

behandles.

- 8.** Maskine ifølge krav 4, **kendetegnet ved, at** den omfatter processtyringsorganer (41), der er forbundet for at tilvejebringe motororganer
- 5 (12, 27, 28, 37), der er designet til at sikre kontrolleret bevægelse af nævnte støttestruktur (6), nævnte vogne (25, 31), nævnte stolper (24, 30), nævnte støttere (35) og nævnte dyser (36) ifølge formen og størrelsen af genstandene (M), der skal sprøjtes.

DRAWINGS

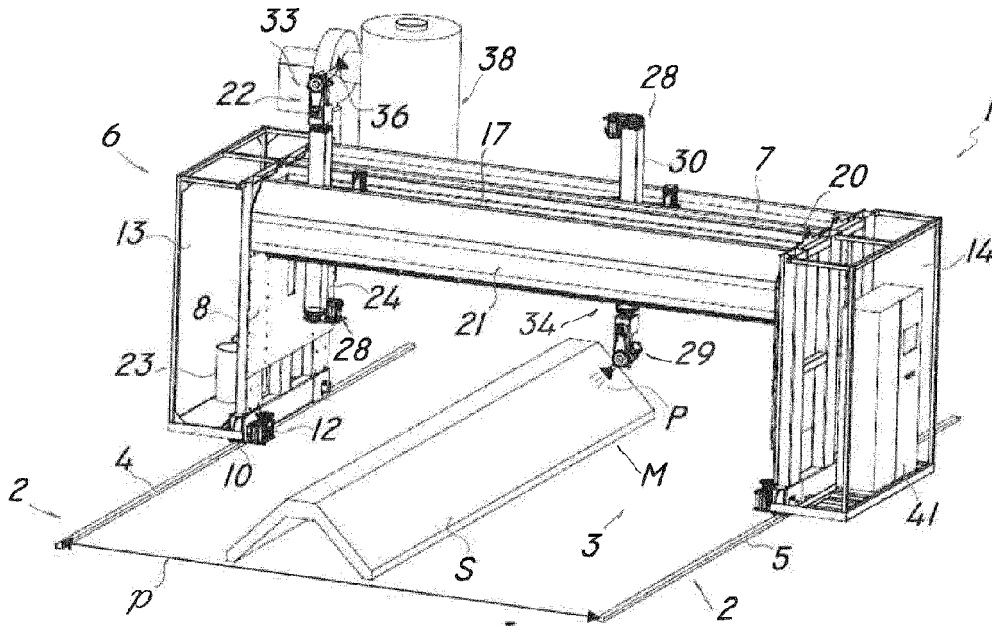


FIG. 1

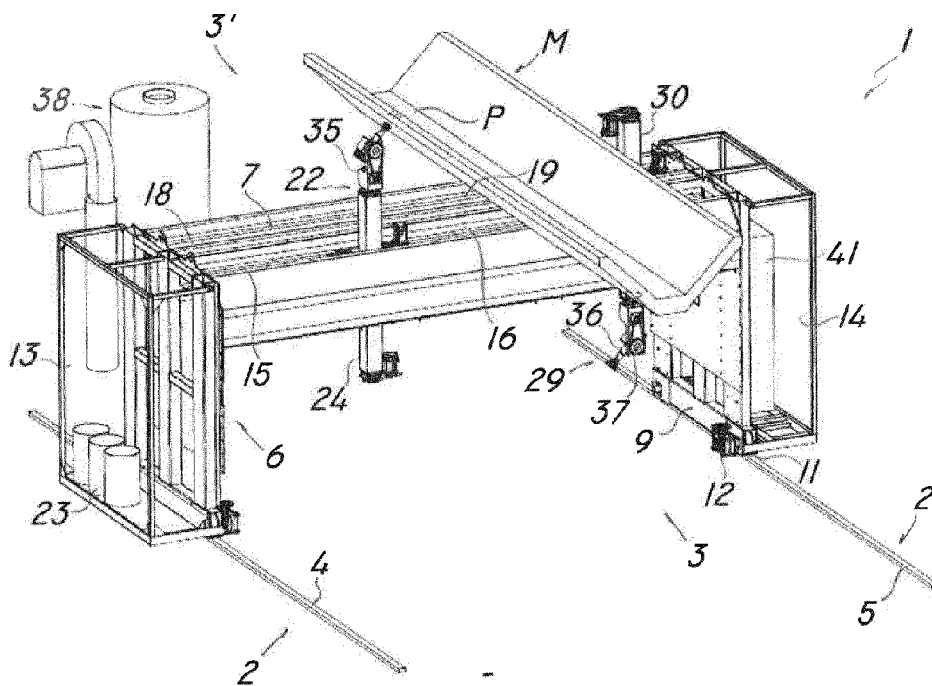


FIG. 2

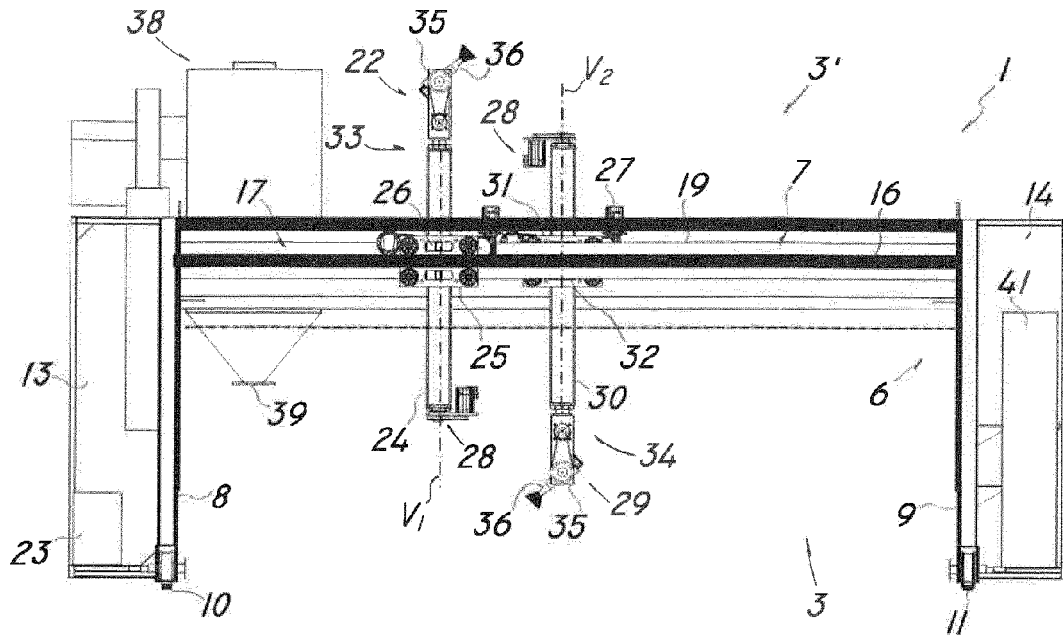


FIG. 3

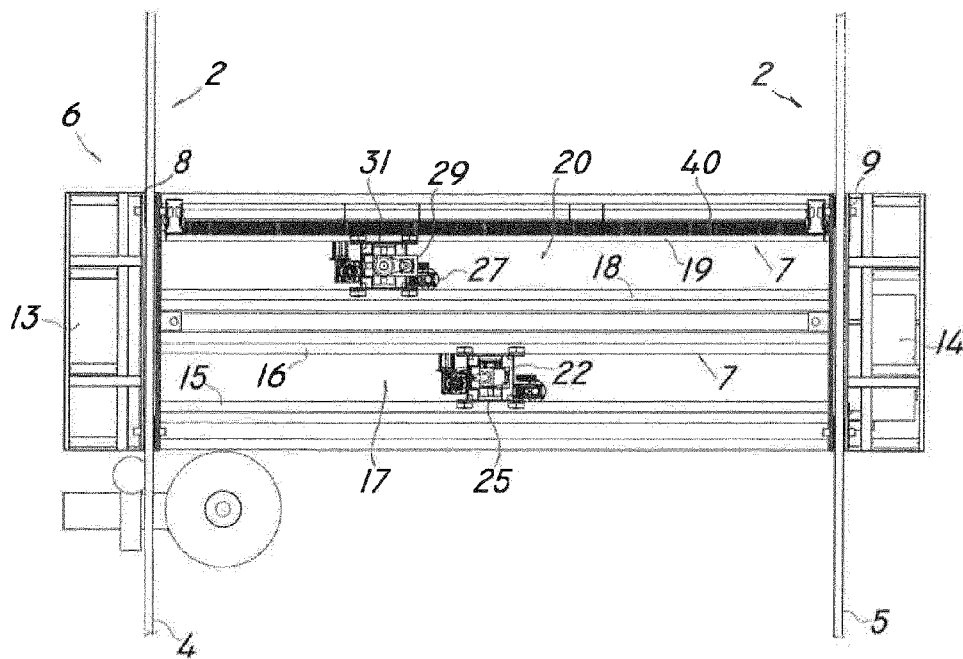


FIG. 4

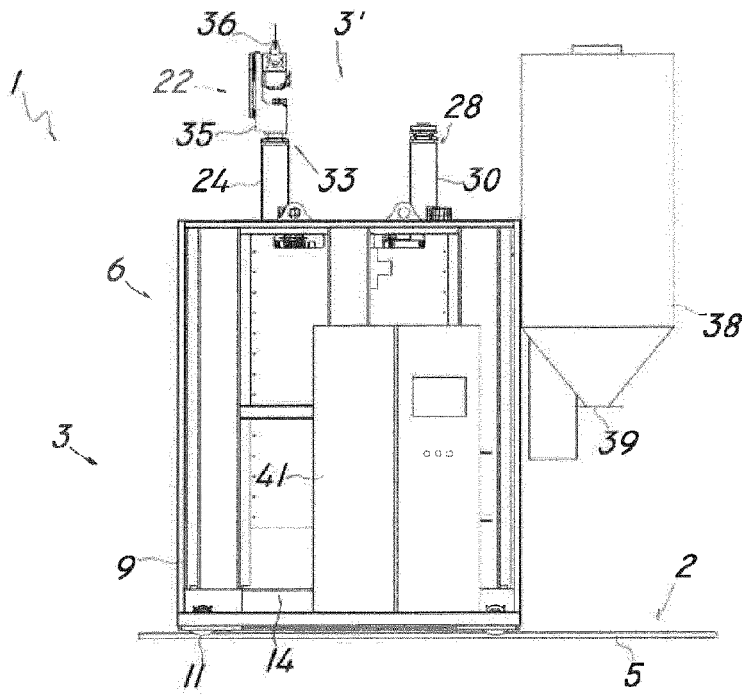


FIG. 5

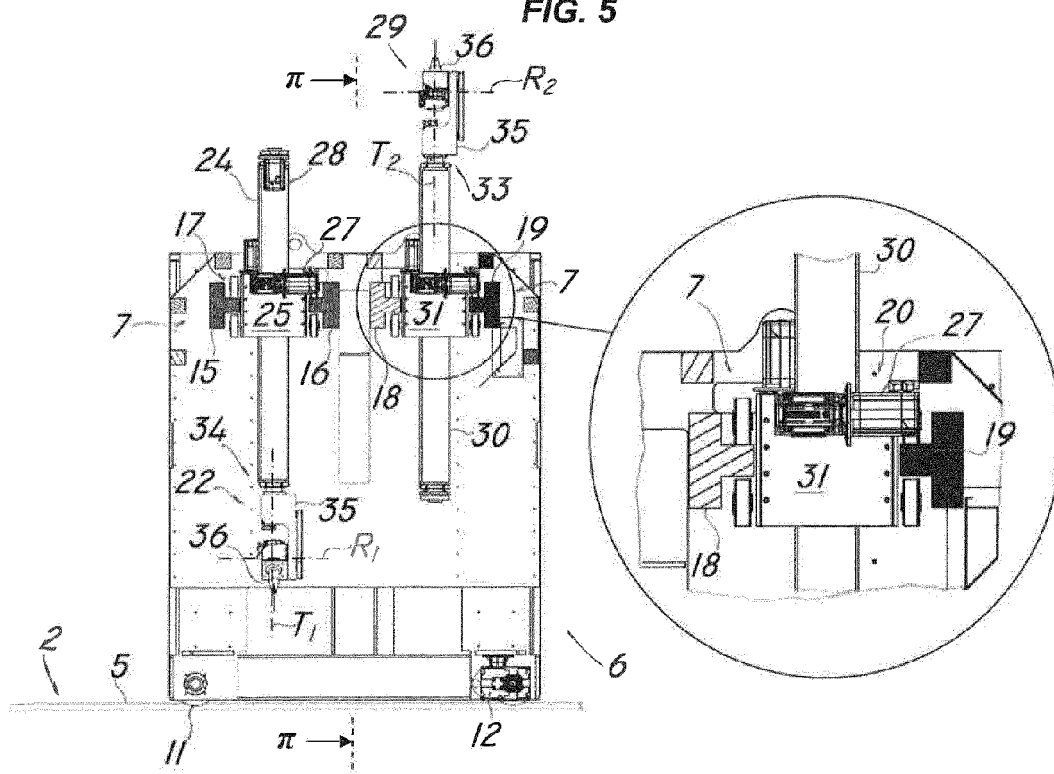


FIG. 6

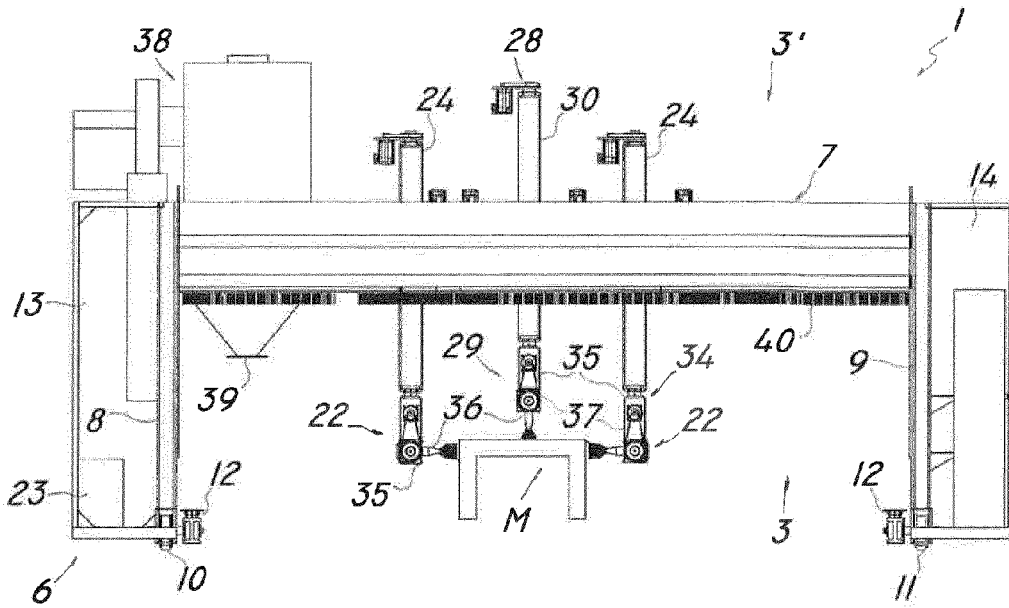


FIG. 7

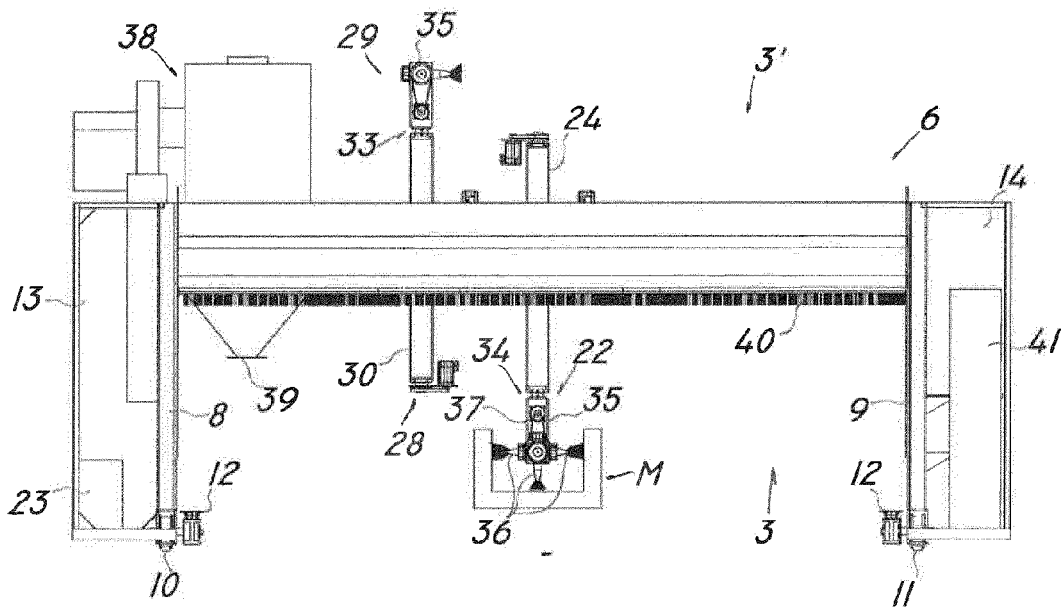


FIG. 8