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(54) **Floor coating agent applying machine and construction of its applying unit.**

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Description

The present invention relates to a floor coating agent applying machine with

- a movable machine body;
- an applying member attached to the movable machine body via a plurality of members arranged apart from each other in a loop-like formation as viewed from above the machine body, said applying member applying a floor coating agent onto a floor surface;
- an eccentric cam drivably attached to the movable machine body and rotatable on a vertical axis;
- a circular recess formed in said applying member, said recess being vertically slidably fitted about said eccentric rotary cam to transmit a rotational force of said cam to said applying member thus producing vertical vibration of said applying member.

A typical floor coating agent applying machine is known from e.g. JP-A-63-315169. In this machine, a drive mechanism is provided for vertically vibrating an agent applying member so that the vibration can effectively apply and spread the agent uniformly over a floor surface thus forming as thin a coating layer as possible on the floor surface.

The above machine suffers, however, the problem that the vertical vibration generates air bubbles in the agent applied on the floor surface. If the coating as containing air bubbles therein is let to dry, there occurs nebula, roughness or irregularity in the finish surface.

A further prior art of US-A 2 447 172 discloses a construction in which the applying member is oscillated in the horizontal direction in addition to the vertical direction. In this conventional case, the mechanism for the vertical drive and that for the horizontal drive are procided separately from each other. Thus, this construction has the disadvantage of the complexity of the construction.

The primary object of the present invention is to overcome the above-described problem of the prior art by providing an improved floor coating agent applying machine and its applying unit construction which is simple, yet can effectively restrict generation of air bubbles in the agent layer and which can uniformly apply the agent for superior finish.

For accomplishing the above-noted object, a floor coating agent applying machine, relating to the present invention, comprises: a movable machine body; an applying member attached to the movable machine body for applying a floor coating agent onto a floor surface. The applying member includes; a plurality of elastic rods vertically suspended from the movable machine body, with the rods being arranged in a loop-like formation as viewed from above the movable machine body, an eccentric rotary cam drivably attached to the movable machine body and rotatable on a vertical axis positioned inside the loop of the elastic rods, and a circular recess vertically slidably fitted about the eccentric rotary cam so as to cause a rotational force of the cam to elastically deform the elastic rods thus producing vertical vibration of the applying member.

With the above-described construction in operation, as the eccentric rotary cam being rotated, this cam rotation is transmitted through the circular recess to the applying member. Also, because of the eccentricity of the cam, the applying member is horizontally oscillated relative to the floor surface with a radius corresponding to the eccentricity of the rotary cam, while elastically deforming the elastic rods one after another. Accordingly, as the oscillating motion of the applying member proceeds, the elastic rods repeatedly contract and expand thereby to lift up and down the applying member. Further, with these movements of the elastic rods, the applying member moves up and down with respect to the machine body with the circular recess vertically sliding relative to the eccentric rotary cam.

Then, as the applying member effects vertical vibration and horizontal oscillation simultaneously, the floor coating agent can be efficiently and uniformly applied over the floor surface with generation of air bubbles in the applied agent being effectively prevented.

As described above, according to the floor coating agent applying machine of the present invention, the simultaneous vertical vibration and horizontal oscillation of the applying member achieves uniform and thin coating agent layer. Thus, the machine of the present invention can provide superior, i.e. thin and smooth coating surface and also achieve improvement of efficiency by quickening of subsequent drying opertion by thinness of the coating layer.

Moreover, the driving mechanism for providing simultaneous vertical vibration and horizontal oscillation of the applying member has a very simple construction consisting mainly of a plurality of elastic rods suspended vertically from the machine body and an eccentric rotary cam. This driving mechanism construction, as compared with the conventional driving construction adaped for vertically vibrating the entire applying unit which supports the applying member and oscillates the same as well, requires considerably fewer number of machine elements and therefore is very simple, compact and economical.

Further and other objects, features and effects of the invention will become more apparent from

the following more detailed description of the embodiments of the invention with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Accompanying drawings illustrate preferred embodiments of a floor coating agent applying machine relating to the present invention; in which,

Fig. 1 is a side view showing an entire applying machine,

Fig. 2 is a bottom view of the applying machine,

Fig. 3 is a cross section taken along a line III-III of Fig. 1,

Fig. 4 is a partially cutaway plane view showing a rotary cam and its periphery,

Fig. 5 is a cross section taken along a line V-V of Fig. 1,

Fig. 6 is a cross section of an applying member,

Fig. 7 is a partially cutaway side view of an applying member relating to a further embodiment of the present invention,

Fig. 8 is a cross section of an applying member relating to a further embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of a floor coating agent applying machine relating to the present invention will now be particularly described with reference to the accompanying drawings.

As shown in Fig. 1, a floor coating agent applying machine of the invention is constructed as a walking-operator type including front wheels 1 and rear weels 2 both of free rotation type, a steering handle 3, a housing 5 for covering the movable machine body, a plurality of coating agent feed nozzles 6...attached to a bottom of the machine body and disposed side by side in the transverse direction of the machine body, an agent applying member 7 formed of elastic material, a first air feed opening 8 and an air feed pipe 10 having a plurality of second air feed openings 9 aligned along the transverse direction of the machine body. The housing 5 accommodates therein coating agent tank T, a pair of hot-air feed fans F1 , F1 disposed side by side along the transverse direction, a further air feed fan F2 for feeding normal temperature air and so on. Further, a control box 4 is attached to the movable machine body.

In operation, a coating agent solution of thermoplastic resin material is charged to and reserved at the tank T. Then, as the machine body is propelled by a walking operator on a floor surface formed e.g. of stone, wood, concrete or other artificial material so as to apply the coating agent solution on the floor surface.

More particularly, the coating agent feed nozzles 6...are disposed with distance from the floor surface and are connected with the tank T through agent feed tubes 11, a distributor 12 and an electric pump P. This pump P is controlled and driven by means of a controller 13 housed at the control box 4 for withdrawing the agent solution from the tank T and feeding the solution to the distributor 12, so that a fixed and substantially equal amount of the solution is supplied from the tank T to the respective feed nozzles 6 to be consequently applied therethrough to the floor surface therethrough. The amount of the solution is predetermined by the displacement of the pump P and also by the number of the nozzles 6.

The applying member 7 is disposed rearwardly of the feed nozzles 6 with respect to the advancing direction of the machine body. Also, as shown in a plane view of Fig. 2, the applying member 7 is attached to an attaching portion 7a through a plurality of attaching bolts 14, for the purpose of facilitating cleaning and exchange operation of the applying member 7 if and when necessary. Further, between the attaching portion 7a and a machine body frame 15 formed of plate metal, there are provided four rubber rods 16 as elastic rods oriented vertically relative to the machine body and together forming an angular loop as seen in the plane view of Fig. 2. Accordingly, the applying member 7 is attached to the machine body frame 15 while being suspended there from through the elastic rubber rods 16. Incidentally, for obtaining proper contact pressure between the applying member 7 and a floor surface to be treated, the height of the machine body frame 15 as measured from the floor surface and the distance between the frame 15 and the applying member 7 are properly predetermined.

As shown in Fig. 3, for laterally oscillating and vertically vibrating the above-described applying member 7, there is provided an applying member driving mechanism A. This mechanism A includes a rotary cam 17 disposed between the attaching portion 7a and the machine body frame 15 and an electric motor M2 fixedly mounted on the frame 15. More particularly, the rotary cam 17 is fitted on an output shaft 18 of the electric motor M1, so that the cam 17 is rotated together with the shaft 18 about a vertical axis X thereof at a velocity of 3,000 rpm. The rotation and operation of the motor M1 is controlled by the controller 13. Further, the rotary cam 17 is constructed as an eccentric rotary cam having two axes, with one axis being positioned at a center of a cylindrical outer periphery of the cam and the other axis being the rotational axis corresponding to the aforementioned vertical axis X and horizontally displaced from the first-mentioned

axis. Also, in this particular embodiment, the vertical axis X is positioned at the center of the angular loop formed by the four rubber rods 16.

Moreover, as shown in Fig. 4, a bearing 19 having an inner ring 19a acting as a circular recess surrounding the rotary cam 17 is fixed through a bearing holder 20 to an upper face of the attaching portion 7a. Then, in operation, as the rotary cam 17 is driven to rotate, this rotational force of the cam 17 is transmitted through the bearing 19 to laterally oscillate the attaching portion 7a about the vertical axis X within the radial eccentricity of the cam 17 while elastically deforming the rubber rods 16, whereby the applying member 7 effects an oscillating motion relative to the floor surface. At the same time, because the oscillating motion of the attaching portion 7a causes elastic contraction and expansion of the rubber rods 16 repeatedly and also because the inner ring 19a is vertically slidable with respect to the rotary cam 17, the attaching portion 7a effects a vertical motion which produces vertical vibration of the applying member 7.

That is to say, because of the driving force of the electric motor M1, the eccentricity of the rotary cam 17 and also of the elastic deformation of the rubber rods 16, the applying member 7 laterally oscillates and vertically vibrates along the floor surface, so that the coating agent solution fed through the feed nozzles 6 can be applied onto the floor surface uniformly and thinnly.

The first air feed opening 8 includes an orifice type air guide member 21 attached to the machine body frame 15 with a downward orientation relative thereto and rearwardly of the applying member 7 and an air guide plate 22 attached to an inner face of the guide member 21. As shown in Fig. 5, the pair of hot air feed fans F1, F1 are respectively driven by further electric motors M2 attached to fan casings 23 which are mounted on an upper plate portion of the air guide member 21. The electric motors M2 are controlled by the controller 13. In operation, as the motors M2 are driven by the controller 13, rotary fan bodies 24 are driven thereby to introduce ambient air through air intake openings 25 into the fan casings 23. The introduced air is caused to advance through air exhaust cylinders 23a incorporating heater cables 26, whereby the air is heated up to about 60 degrees Celsius by the cables 26 and this hot air is fed to the interior of the air guide member 21. In this way, the first air feed opening 8 feeds the heated air flow from the fans F1, F1 onto the floor surface coated with the agent solution applied by the applying member 7. That is to say, after the passage of the applying member 7 and when the presence of this member 7 no longer interfers with evaporation of water content in the applied agent solution, the hot air is fed to render the surface plasticized and glossy while effectively and speedily drying the applied solution.

The air feed pipe 10 is attached to a substantially rear end position of the machine body, i.e. to a rear face of the control box 4, with a predetermined downward orientation with respect to the machine body; hence, all of the second air feed openings 9 of the pipe 10 are disposed rearwardly of the first air feed opening 8. Also, the air feed pipe 10 is connected through an air tube 27 to the further fan F2 for feeding the normal temperature air flow. This fan F2 is operatively connected with a further electric motor M3 which is fixedly attached to a fan casing 28 and is controlled by the controller 13. In operation, as the motor M3 is driven by the controller 13 to drive the fan F3, a rotary fan body 29 is driven by the motor to introduce ambience air through an air filter 30 into the air tube 27, so that the second air feed openings 9 feed therethrough the normal-temperature air flow to the floor surface after the hot-air treatment by the first air feed opening 8. This normal-temperature air blowing operation is for forcibly drying any water content remaining after the hot-air blowing operation, thereby further quickening the entire machine operation.

As shown in Fig. 6, the applying member 7 comprises a combination of an elastic rubber element 31 and a sheet element 33 for forming an agent applying face. This sheet element 33 is formed of such material as woven material, non-woven material, felt, paper, leather or the like. That is, the element 31 for supporting the sheet element 33 is formed of rubber material which is relatively soft and elastic for conveniently preventing generation of air bubbles in the applied coating and also for providing cushion effect for the sheet element 33. Whereas, the sheet element 33 is formed of one of the above-mentioned material which is suitable for retaining the coating agent solution therein.

Fig. 7 shows an alternate construction of the applying unit. In this construction, the applying member 7 is formed of a water-retentive material such as sponge. Further, the coating agent feed nozzles 6 are adapted to first feed the agent solution to this applying member 7. That is, the coating agent solution from the tank T is caused to be once retained in the applying member 7 and then applied onto the floor surface.

Fig. 8 shows an alternate construction of the applying member 7. The applying member 7 of this construction includes a rubber element assembly 31, a water-retentive sponge 37 and an applying-face forming sheet element 33 formed of such material as woven material, non-woven material, felt, paper, leather or the like. With this construction, even if the rubber element assembly 31 has relatively low elasticity, the entire elasticity of the

applying member 7 is appropriately increased by that of the sponge 37. Also, the sponge 37 and the sheet 33 together provide the wetting power needed for retaining a certain amount of the coating agent solution. Furthermore, the sheet 33 acts to restrict generation of air bubbles due to air intake through elastic contraction and expansion of the sponge 37.

In the foregoing embodiment, the applying unit construction includes four rubber rods 16. Instead, less or more than four of the rubber rods 16 can be employed. Further alternately, coil springs or cylindrical springs can be used instead of the rubber rods 16.

In the foregoing embodiment, the rotational axis X of the rotary cam 17 is positioned at the center of the loop formed by the elastic rods 16. Instead, the axis X can be positioned off the center within the loop.

In place of the inner ring 19a, it is conceivable to form a circular through hole in the attaching portion 17a or to attach a cylindrical member to the portion 17a so that the attaching portion 17a outwardly engages the rotary cam 17 directly or through the circular through hole for vertically sliding relative to the cam 17. For this reason, the inner ring 19a is generically referred to as a circular recess 17a outwardly engaging the rotary cam 17.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Claims

1. A floor coating agent applying machine having:
- a movable machine body;
- an applying member (7) attached to the movable machine body via a plurality of members arranged apart from each other in a loop-like formation as viewed from above the machine body, said applying member (7) applying a floor coating agent onto a floor surface;
- an eccentric cam (17) drivably attached to the movable machine body and rotatable on a vertical axis (X);
- a circular recess (19a) formed in said applying member (7), said recess being vertically slidably fitted about said eccentric rotary cam (17) to transmit a rotational force of said cam (17) to said applying member (7) thus producing vertical vibration of said applying member (7),

characterized in that
- said members attaching said applying member (7) to the machine body comprise a plurality of elastic rods (16) suspended vertically from the machine body;
- said vertical axis (X) of said eccentric rotary cam (17) is disposed inside the loop formed by said elastic rods (16), and in that
- said rods (16) are elastically deformed by horizontal vibration of said circular recess (19a).

2. A floor coating agent applying machine as claimed in Claim 1,
characterized in that
said applying member 7 includes an elastic element 31 and an applying-face forming sheet 33 surrounding said elastic element 31.

3. A floor coating agent applying machine as claimed in Claim 2,
characterized in that
said applying member 7 further includes a water-retentive element 37 interposed between said elastic element 31 and said applying-face forming sheet 33.

4. A floor coating agent applying machine as claimed in Claim 1,
characterized in that
said applying member 7 is formed of water-retentive material.

5. A floor coating agent applying machine as claimed in Claim 4,
characterized in that
said rods 16 comprise four rubber rods forming said loop.

6. A floor coating agent applying machine as claimed in claim 1,
characterized by
first drying means (8) positioned behind said applying member (7) and blowing hot air towards said floor surface; and
second drying means (9) positioned behind said first drying means (8) and blowing normal-temperature air towards said floor surface.

Patentansprüche

1. Maschine zum Auftragen eines Fußbodenbeschichtungsmittels mit
   - einem beweglichen Maschinenkörper;
   - einem Auftragteil (7), das an dem beweglichen Maschinenkörper über eine Vielzahl von Teilen befestigt ist, die beabstandet zueinander in einer von oberhalb der Maschine gesehenen schleifenförmigen Anordnung angeordnet sind, wobei das Auftragteil (7) ein Fußbodenbeschichtungsmittel auf eine Fußbodenoberfläche aufträgt;
   - einem exzentrischen Nocken (17), der antreibbar an dem beweglichen Maschinenkörper angeordnet und um eine vertikale Achse (X) drehbar ist;
   - einer kreisförmigen Ausnehmung (19a), die in dem Auftragteil (7) ausgebildet ist, wobei die Ausnehmung vertikal verschiebbarum den exzentrischen Rotationsnocken (17) angeordnet ist, um eine Rotationskraft des Nockens (17) auf das Auftragteil (7) zu übertragen, um so ein vertikales Schwingen des Auftragteils (7) zu bewirken,

   dadurch gekennzeichnet,
   - daß die Teile, die das Auftragteil (7) an dem Maschinenkörper befestigen, eine Vielzahl von elastischen Stäben (16) umfassen, die vertikal von dem Maschinenkörper hängen;
   - daß die vertikale Achse (X) des exzentrischen Rotationsnockens (17) innerhalb der durch die elastischen Stäbe (16) gebildeten Schleife angeordnet ist, und
   - daß die Stäbe (16) elastisch verformt werden durch horizontales Schwingen der kreisförmigen Ausnehmung (19a).

2. Maschine zum Aufbringen eines Fußbodenbeschichtungsmittels gemäß Anspruch 1, dadurch gekennzeichnet, daß das Auftragteil (7) ein elastisches Element (31) und ein, eine Auftragfläche bildende dünne Lage (33) einschließt, die das elastische Element (31) umgibt.

3. Maschine zum Auftragen eines Fußbodenbeschichtungsmittels gemäß Anspruch 2, dadurch gekennzeichnet, daß die besagten Auftragteile (7) weiterhin ein wasserzurückhaltendes Element (37) aufweisen, das zwischen dem elastischen Element (31) und der eine Auftragfläche bildenden Lage (33) angeordnet ist.

4. Maschine zum Auftragen eines Fußbodenbeschichtungsmittels gemäß Anspruch 1, dadurch gekennzeichnet, daß das Auftragteil (7) aus wasserzurückhaltendem Material gebildet ist.

5. Maschine zum Auftragen eines Fußbodenbeschichtungsmittels gemäß Anspruch 4, dadurch gekennzeichnet, daß die Stäbe (16) vier Gummistäbe umfassen, die die Schleife bilden.

6. Maschine zum Auftragen eines Fußbodenbeschichtungsmittels gemäß Anspruch 1, gekennzeichnet durch, erste Trocknungsmittel (8), die hinter dem Auftragteil (7) angeordnet sind und heiße Luft auf die Fußbodenoberfläche blasen, und zweite Trocknungsmittel (9), die hinter den ersten Trocknungsmitteln (8) angeordnet sind und normal temperierte Luft auf die Fußbodenoberfläche blasen.

Revendications

1. Une machine d'application d'agent de revêtement de sol comprenant:
   un corps mobile de machine;
   - un élément applicateur (7) attaché au corps mobile de machine au moyen d'une série d'éléments agencés à distance l'un de l'autre dans une formation du type boucle en vue depuis le dessus du corps de machine, ledit élément applicateur (7) appliquant un agent de revêtement de sol sur une surface de sol;
   - une came excentrique (17) attachée au corps mobile de machine, de manière à être entraînée, et susceptible de tourner sur un axe vertical (X);
   - un évidement circulaire (19a) ménagé dans ledit élément applicateur (7), ledit évidement étant monté à coulissement vertical autour de ladite came rotative excentrique (17) afin de transmettre audit élément applicateur (7) une force de rotation de ladite came (17) en produisant ainsi une vibration verticale dudit élément applicateur (7),

   caractérisé en ce que
   - lesdits éléments attachant ledit élément applicateur (7) au corps de machine comprennent une série de tiges élastiques (16) suspendues verticalement au corps de machine;
   - ledit axe vertical (X) de ladite came rotative excentrique (17) est disposé à l'intérieur de la boucle formée par lesdites

tiges élastiques (16), et en ce que

- lesdites tiges (16) sont déformées élastiquement par une vibration horizontale dudit évidement circulaire (19a).

2. Une machine d'application d'agent de revêtement de sol selon la revendication 1 caractérisée en ce que ledit élément applicateur (7) inclut un élément élastique (31) et une feuille (33) qui constitue la face d'application et entoure ledit élément élastique (31).

3. Une machine d'application d'agent de revêtement de sol selon la revendication 2, caractérisée en ce que ledit élément applicateur (7) inclut en outre un élément rétenteur d'eau (37) interposé entre ledit élément élastique (31) et ladite feuille (33) qui constitue la face d'application.

4. Une machine d'application d'agent de revêtement de sol selon la revendication 1, caractérisée en ce que ledit élément applicateur (7) est formé d'une matière rétentrice d'eau

5. Une machine d'application d'agent de revêtement de sol selon la revendication 4, caractérisé en ce que lesdites tiges (16) comprennent quatre tiges en caoutchouc formant ladite boucle.

6. Une machine d'application d'agent de revêtement de sol selon la revendication 1, caractérisé par un premier moyen de séchage (8) positionné derrière ledit élément applicateur (7) et soufflant de l'air chaud vers ladite surface de sol; et un deuxième moyen de séchage (9) positionné derrière ledit premier moyen de séchage (8) et soufflant de l'air à température normale vers ladite surface de sol

FIG. 1

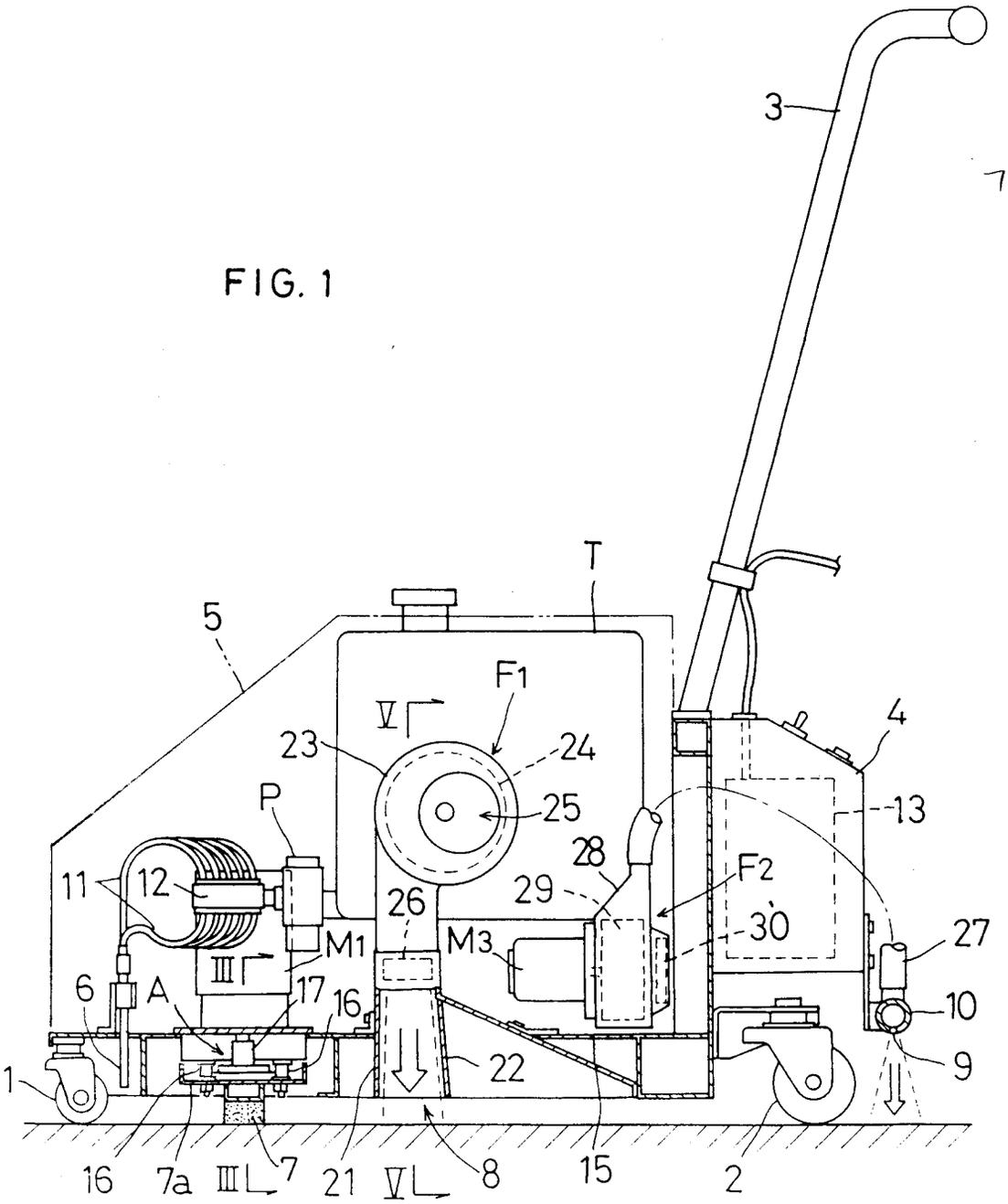

3
5
T
F1
Ⅴ
23
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25
P
4
13
11
12
26
28
29
F2
30
27
M1
M3
Ⅲ
6
A
17
16
10
1
22
9
16
7a
Ⅲ
7
21
Ⅴ
8
15
2

FIG. 2

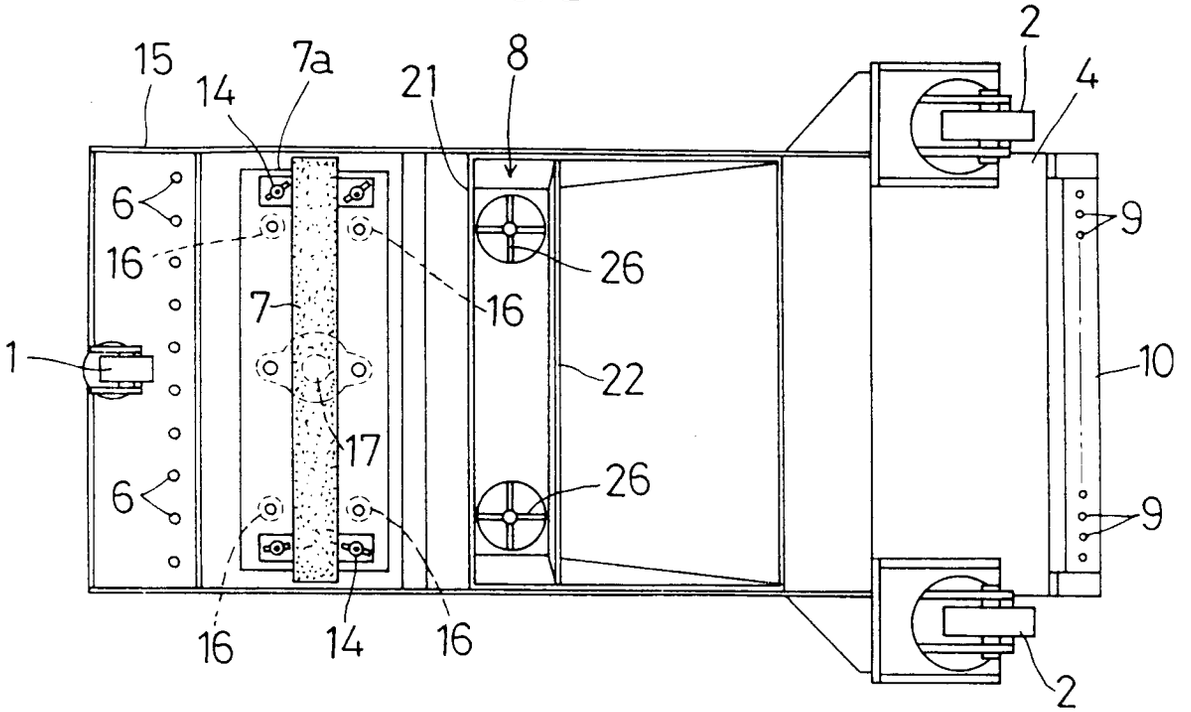

15
14
7a
21
8
2
4
6
16
7
1
26
16
22
9
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26
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16
14
16
2

FIG. 3

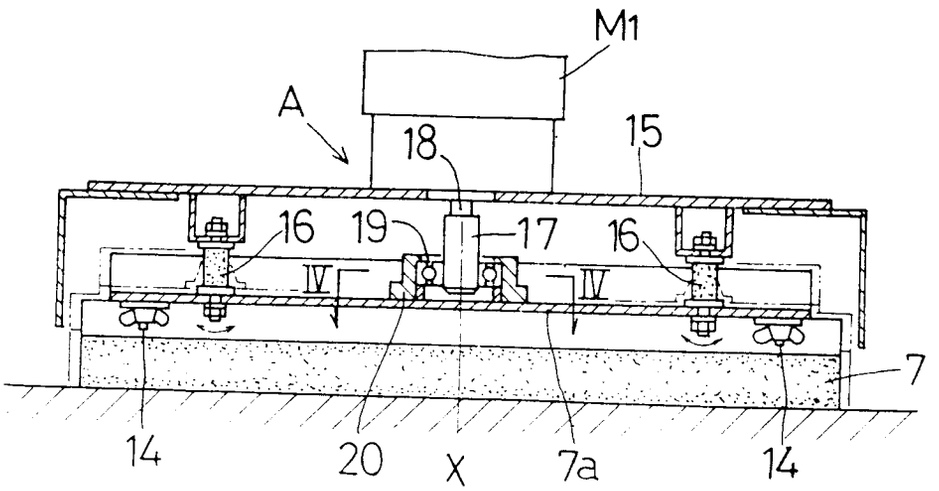

M1
A
18
15
16
19
17
16
IV
IV
7
14
20
X
7a
14

FIG. 7

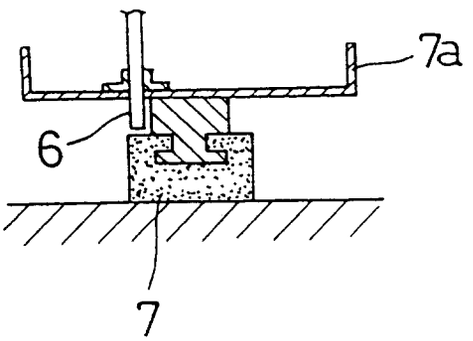


FIG.4

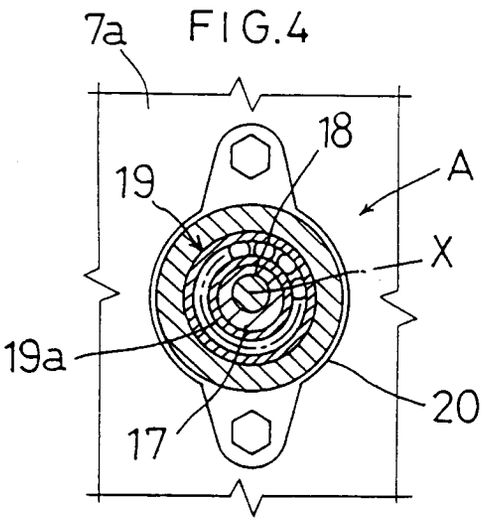


FIG.5

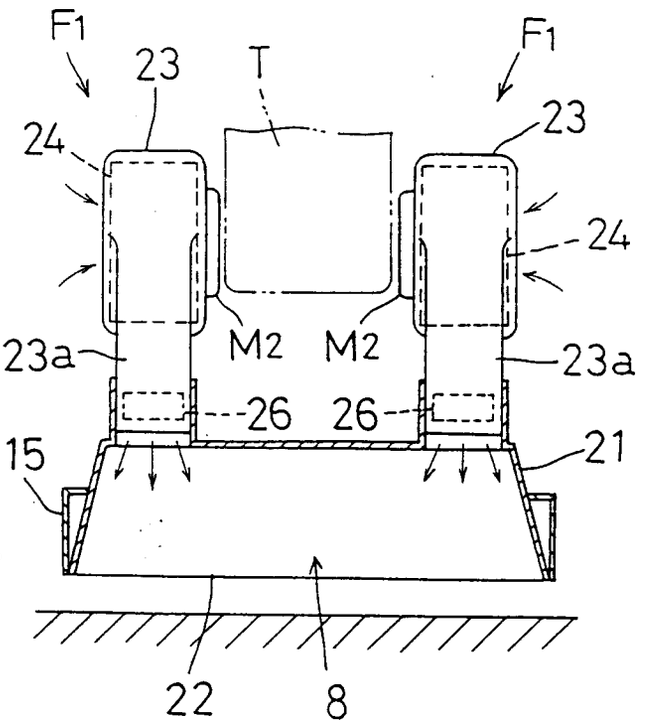


FIG.6

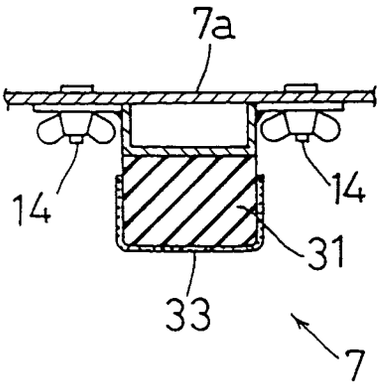


FIG.8

