(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 448 824 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90124953.2**

(22) Date of filing: **20.12.90**

(51) Int. Cl.5: **A47L 11/30**, A47L 11/00, A47L 11/10

(30) Priority: **26.03.90 IT 1981890**

(43) Date of publication of application:
02.10.91 Bulletin 91/40

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR LI LU NL SE

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(54) Washing machine for wide surfaces, in particular for industrial floorings.

(57) A washing machine for wide surfaces, in particular for industrial floorings, including a brush unit (9) arranged between front and rear end sides (4) of said machine and having a transversal dimension higher than the maximum distance between said machine lateral body sides (3), in a manner suitable to establish washing edges (9b) having a reciprocal distance higher than the maximum distance between said lateral body sides (3), said brush unit (9) being rotatably supported by a pin (10) establishing an oscillation axle (10a), centering means (35) for preventing free rotations of said brush unit (9) around said oscillation axle (10a).

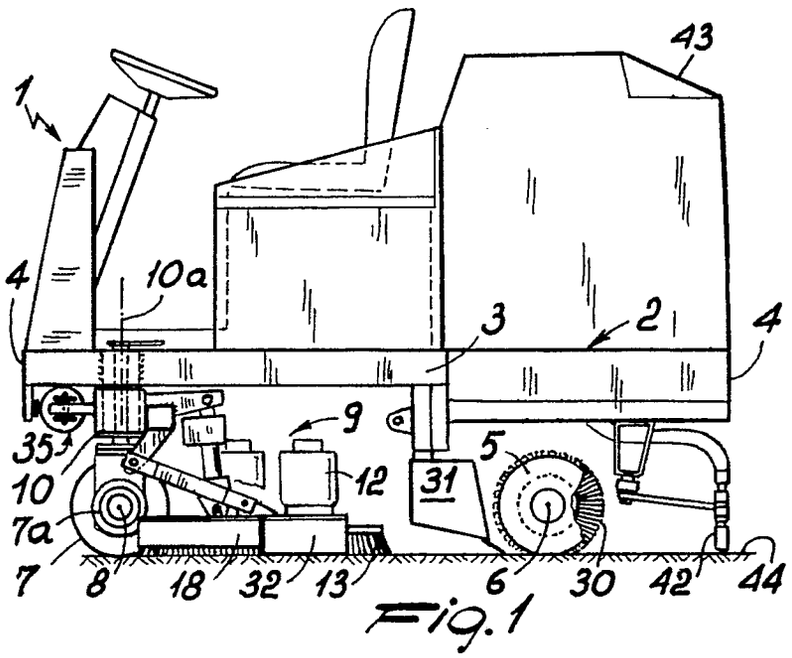

Fig. 1

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The present invention has for its subject matter a washing machine for wide surfaces, in particular for industrial floorings.

As it is known the cleaning of floorings, e.g. in the inside or in the outside of industrial sheds is made using machines supplied, among other equipments, with particular rotating washing brushes.

These brushes develop, in presence of a suitable water or any other liquid spraying, a washing and scraping action on the flooring surfaces and have bristles much more short and stiff than the ones commonly used in brushes and rollers for street swipers, suitable for simple garbage collecting.

For supporting these brushes it is generally foreseen a brush-holder unit that surrounds the same brushes.

As an ancillary equipment for these particular brushes, that have a particularly active action onto the ground, the washing and cleaning machines can be also supplied with normal brushes and rollers with long and soft bristles for getting a further sweeping and collection action of the debris or garbage having wider dimensions.

The indicated machines have an important technical problem, that is the selection of the position of brush-holder unit: the same unit can be located overhanging before the machine chassis, as generally occurs, or also under the same chassis.

The overhanging position before the chassis has the advantage to make very easy the control or replacement or cleaning of brushes and related motors and supports. Further the driver can observe easily the position of the washing brushes. Therefore it becomes possible to keep the brushes near to eventual obstacles or sides or walls or other matter present in conjuction with the surfaces to be cleaned.

In fact it cannot be carried out an efficient washing and scraping action, as the action made by said brushes, neglecting spaces or angles having a certain dimension.

Nevertheless the overhanging position on the chassis front part has the great drawback to cause great overall dimensions of the washing machines. These great dimensions cause a limited maneuvrability of the same machines and therefore a difficult access in various areas to be cleaned and a limited maneuvre capacity near obstacles or sides.

The position of the brush-holder unit under the chassis reduces the dimensions of these machines and increases the maneuvrability thereof. Yet this technical solution actually reduces the possibility of good running of these machines.

In fact the brush-holder unit located under the chassis is scarcely accessibile and therefore all operations of cleaning, maintenance and control are difficult. Further the operator that drives the machine can be obliged to skim the obstacles and sides present in conjuction with the flooring surfaces to be washed with the body sides of the same machine, and further the same operator must move his eyes from the move direction, if he must observe the chassis body sides.

So it is caused a work slowing-down and there are also present serious possibilities of damages by shock, both for the machine and for the civil or industrial structures present in conjuction with the flooring to be washed. In pratice, using these machines, it can be advisable to let a little distance between the brush-holder unit and poles, columns, sides, shelvings, plant basements, walls or the like, with the consequence that the cleaning is not perfect or complete.

In this situation the technical aim of the present invention is to supply a machine suitable for obviating substantially to the above mentioned drawbacks.

The technical aim, is substantially obtained by a washing machine for wide surfaces, in particular for industrial floorings, including a chassis substantially limited in plan view by lateral body sides and by end sides transversal to said lateral body sides and supporting near a pavement to be cleaned at least wheels for the movement of said machine, and a brush unit including washing brushes and located between said end sides,

- characterized in that said brush unit has a transversal dimension in a direction transversal to said lateral body sides exceeding the maximum distance between said lateral body sides, in a manner suitable for establishing a washing path having washing sides with reciprocal distance higher than said maximum distance between said lateral body sides,
- in that between said brush unit and said chassis it is interposed a pin establishing an oscillation axle for said brush unit, said brush unit being rotatable around said oscillation axle in a direction substantially parallel to said pavement,
- and in that there is centering means engaged to said chassis and suitable for preventing said brush unit to rotate freely around said oscillation axle.

In the following it is described a preferred fulfilment form of a machine according to the invention, making reference to the annexed drawings, in which:

Figure 1 shows in a lateral view a machine according to the invention, in general view;

Figure 2 shows how some machine members are developed and act onto the ground, considering the overall dimensions of the chassis with

respect to ground, indicated in dotted lines;

Figure 3 shows a part of brush unit shown in preceding figures in perspective view;

Figure 4 shows a detail of said brush unit in partial section and lateral view;

Figure 5 shows the centering means of said brush unit;

Figure 6 shows a front view of Figure 3;

Figure 7 shows a detail of Figures 3 and 6 in lateral view; and

Figure 8 is a partial lateral view of brush unit of Figures 3 and 7.

Making now reference to the annexed figures, the machine according to the invention is generally indicated by the reference number **1**. It includes a support chassis **2** that in plan view has overall dimensions substantially limited by body sides **3** and end edges **4**. The lateral body sides 3 are substantially parallel with one another and to the main development direction of machine 1. The end edges 4 are transversal to the lateral body sides 3 and establish the front and rear edges of chassis 2.

The chassis 2 holds, in direction of a pavement **44** to be cleaned, wheels for the movement of the machine 1 divided in two rear wheels **5**, located adjacent to the lateral body sides 3 and aligned with one another in conjuction with a rear axle **6** transversal to the same body sides, and a single front steering wheel **7** located onto a front axle **8**. The same front axle 8 is joined to an electric motor **7a**. Preferably the front steering wheel is a drive wheel and the two rear wheels 5 are idle wheels.

Further it is foreseen a brush unit **9** located under the chassis 2 in a position included between the end edges 4, and also included between front axle 8 and rear axle 6. In pratice the brush unit 9 is located along the move direction immediately downstream the front steering wheel 7.

The brush unit 9 is supported by the chassis 2 by the insertion of a pin **10**, that forms an oscillation axle **10a** for the same brush unit 9, substantially in vertical direction. In a novel way the oscillation axle 10a coincides with the rotation axle of the front steering wheel 7.

As shown in Figure 2, the brush unit 9 has a transversal dimension exceeding the maximum distance between the body sides 3 and therefore establishes a washing path **9a** having washing edges **9b**, reciprocally spaced of a measure greater than said distance between the same body sides 3.

The brush unt 9 develops according to a shape that surrounds partially the front steering wheel 7 and includes an articulated structure **11**, suitable for supporting a plurality of motors **12**, to which a plurality of washing brushes **13** are joined.

On its turn the articulated structure 11 includes a first support body **14**, rotatably joined with the pin 10, a couple of arms **15** engaged, in conjuction with the first ends **16** thereof, to the first support body 14 along first pins **17**, located parallel with one another and transversal to the oscillation axle 10a.

A second support body **18**, suitable for supporting the motors 12 and the washing brushes 13, is rotatably engaged to second ends **19** of the arms 15 in conjuction with second pins **20** parallel to the first pins.

Further there is a crosspiece body **21** developing between the arms 15 and hinged with respect to the same arms for allowing a different angular position thereof with respect to the ground.

A presser device **22**, engaged to the first support body 14 and developing between this last body and the crosspiece body 21, presses the second support body 18 in the direction of surfaces to be cleaned by the insertion of elastic elements **23**.

In detail the presser device 22 includes a drive unit **24** and a bar **25** sliding substantially in the axial direction included between the first support body 14 and the crosspiece body 21.

The control unit 24 is preferably made by a known electric actuator, including a geared motor **24a**, suitable for rotating, e.g. by means of a worm screw, a toothed coupling **24b**, winding the bar 25 and screwed thereto. The bar 25 can be axially moved and rotatably fixed and therefore the rotation of the toothed coupling 24b causes the bar 25 to be moved axially.

At the end of the bar 25 it is joined transversally a rod **26** that is inserted, with a play, in slots **27** made in couple of wings **28** joined to the crosspiece body 21.

The elastic elements 23 are made-up by tensile springs restrained at its ends with the rod 26 and with projections **29** of the same wings 28.

A roller **30** substantially cylindrical in form is foreseen between the rear wheels 5 for collecting debris or garbage and this roller is turning with respect to a rotation axle substantially coincident with the rear axle 6. The roller 30 establishes a debris collection path **30a** with collection edges **30b**, having a width lower to the minimum distance between the body sides 3.

The debris or garbage are thrown by the roller 30 into a collector **31**, of the extractable type for getting a better cleaning, having the bottom supplied with holes for allowing the collected water to be discharged onto the ground.

For allowing the debris collection onto a path wider than the roller 30, there are conveyor members **32** converging towards the same roller 30 and developing between the washing edges 9b and the collection edges 30b.

The Figures 1 and 2 show the conveyor mem-

bers 32 that are made up of scraping wings located onto the edges of the second support body 18. The Figure 4 shows that the conveyor members 32 include also elastic members 34 that press the scraping wings **33** onto the flooring 44. The elastic members 34 have a strut **34a** supporting scraping wings 33 and sliding through the support body 18, under the control of a lever **34b** driven by a spring element **34c**.

Further centering means **35**, indicated in Figures 1 and 5, acting onto the brush unit 9 and suitable for hindering its oscillations around the oscillation axles 10a is arranged.

The centering means 35 includes a rod **36** located transversal to the oscillation axle 10a and engaged at its end by a projection **10b** of pin 10, turning around the oscillation axle 10a together with the brush unit 9. The engagement of the rod 36 with the protrusion 10b is made by a manually detachable connection pin **36a**.

The rod 36 is partially slidingly embodied into a tubular housing body **37** rotatably joined to the chassis 2. Further the rod 36 is slidingly surrounded by elastic means **38** formed by a compression spring hold between a couple of housing rings **39** sliding internally to the housing body 37 and locked in the inside of the housing body 37 by limit stop means **40**.

The housing rings 39 and therefore the spring means 38 engage by pressure the presser elements **41**, formed by two threaded nuts, engaged fixedly to the rod 36 in position external to the housing rings 39.

The residual water remaining onto the pavement 44 is sucked by suction elements **42**, located downstream the rear axle 6 and in contact with the pavement ground 44 and sent into a tank housed in the zone **43**.

The running of the machine occurs as follows.

During the work the second support body 18 supporting the washing brushes 13 is pressed against the ground by means of a presser device 22 and the pressure, adjustable by the operator, controlling the drive unit 24, depends on the intensity of the required cleaning action and by the type of treated pavement 44. Normally the pressure is suitable for locating the rod 26 in an intermediate position within the slots 27: therefore the elastic elements 23 transmit elastically the force of the presser device 22 to the crosspiece body 21 and to the arms 15.

If the surfaces to be cleaned have unevennesses, the slots 27 allow oscillations of the second support body 18 and arms 15 and these oscillations are balanced by the elastic elements 23. There are possible oscillations both in vertical direction, with equal tensile force of the two elastic elements 23, and tilts for the lifting of a lateral brush and following tensile force different in the elastic elements 23.

For making possible the lateral liftings, in which the arms 15 are lifted in different manner, the first and second pins 17 and 20, or at least these last pins, are assembled with play for allowing twists between the joined parts. Further the second pins 20, aligned with one another, establish a pitch axle suitable for allowing adjustment movements of the second support body 18 around the same axle.

The eventual lateral obstacles met by the brush unit 9, that projects from the machine body sides, do not cause any hitch to the machine movement, owing to the oscillation possibility of the brush unit 9 around the pin 10, opposing to the centering means 35. In these last means the rod 36 is moved mainly in axial direction and is resisted by the elastic means 38 on which it is pressed one of the holding rings 39, according to the oscillation direction, under the action of a presser element 41.

Disengaging the connecting pin 36a between the rod 36 and the brush unit 9, it is possible to turn completely the brush unit 9 towards the outside, around the pin 10, allowing an easy replacement of brushes and an easy maintenance or cleaning of the whole brush unit 9.

The scraping wings 33, during the move of the machine, transport water and debris or garbage in conjuction with the roller 30 that projects them into the collector 31. The remaining water laid onto the surfaces is removed by the suction elements 42 in contact with the ground.

When the machine must make simple movements, the brush unit 9 can be lifted by means of the presser device 22, that, under the control of the drive unit 24, causes the lifting of the rod 25 and rod 26. This last rod slides lifting along the slots 27, reducing the tensile force of the elastic elements 23 and finally adjusting itself in mechanical rest onto the superior ends of the slots 27. Therefore the lifting can be completed by the direct action onto the wings 28 and onto the crosspiece body 21.

The invention achieves important advantages.

The particular washing brushes are positioned backwards with respect to the front edge of the machine chassis, in such a manner to make the same machine compact and manoeuvrable, but this does not cause a reduced access possibility to the same brushes, or a difficult control of the washing action in presence of obstacles.

In fact owing to the presence of the pin 10, it is possible to extract completely the brush unit from the lower side of the chassis, for allowing the access to the brushes, and it exists no danger of shocks, owing to the oscillation possibility of the brushes, and it is possible to adjust systematically the brushes in contact with sides and walls, be-

couse the brush unit can work in angled position.

In pratice the machine allows to work quickly, without keeping a particular attention to obstacles. Therefore the work capacity increases and the washing costs are reduced. Further the quality of the executed work increases as a complete cleaning is more easy, even near the sides or walls.

The presence of conveyor members 32 allows that, notwithstanding the amplitude of the brush unit 9, a collecting roller 30 of very reduced width can be used, located between the rear wheels 5 and therefore in a zone not used by members that act directly onto pavements.

In this manner the overall dimensions of machine on ground are reduced and its maneuvrability is increases.

This advantageous position between the rear wheels is also possible as the rear wheels are not drive wheels.

Finally it must be also underlined that the use of a sole drive and steering wheel 7 located in front side of the brush unit 9 allows to obtain for this unit a shape that partially surrounds the same wheel 7, that is useful for a more efficient reciprocal layout of the washing brushes, without requiring greather overall dimensions of the machine.

Claims

1. . A washing machine for wide surfaces, in particular for industrial floorings, including a chassis (2) substantially limited in plan view by lateral body sides (3) and by end sides (4) transversal to said lateral body sides (3) and supporting near a pavement (44) to be cleaned at least wheels (5, 7) for the movement of said machine, and a brush unit (9) including washing brushes (13) and located between said end sides (4),
   - characterized in that said brush unit (9) has a transversal dimension in a direction transversal to said lateral body sides (3) exceeding the maximum distance between said lateral body sides (3), in a manner suitable for establishing a washing path (9a) having washing sides (9b) with reciprocal distance higher than said maximum distance between said lateral body sides (3),
   - in that between said brush unit (9) and said chassis (2) it is interposed a pin (10) establishing an oscillation axle (10a) for said brush unit (9), said brush unit (9) being rotatable around said oscillation axle (10a) in a direction substantially parallel to said pavement (44),
   - and in that there is centering means (35) engaged to said chassis (2) and suitable for preventing said brush unit (9) to rotate freely around said oscillation axle (10a).

2. . A machine according to Claim 1, in which there is a single front steering wheel (7), and in which said front steering wheel (7) has a rotation axle located in conjuction with said oscillation axle (10a) of said brush unit (9).

3. . A machine according to Claim 2, in which said brush unit (9) surrounds said front steering wheel (7) in plan view.

4. . A machine according to Claim 1, in which under said chassis (2) there is a roller (30) substantially cylindrical in form for collecting debris, located backwards with respect to said brush unit (9), in the movement direction of said machine and showing a rotation axle substantially parallel to said pavement (44) said roller (30) establishing a collection path (30a) having a width inferior than said washing path (9a), and in which there are conveyor members (32), developing between said washing path (9a) and said collection path (30a) in contact with said pavement (44) and suitable for conveying debris and washing liquid in direction of said roller (30).

5. . A machine according to Claim 4, in which said conveyor members (32) are supported by said brush unit (9) and mobile therewith.

6. . A machine according to Claim 4, in which said conveyor members (32) include scraping wings (33) converging towards said collection path (30a) from said washing edges (9b) of said washing path (9a), and elastic members (34) suitable for pressing elastically said scraping wings (33) against said flooring (44).

7. . A machine according to Claim 4, in which said roller (30) is located between the rear wheels (5) of said machine aligned with one another following a rear axle (6) transversal to said lateral body sides (3), said rotation axle of said roller (30) substantially coiciding with said rear axle (6) and said roller (30) establishing said collection path (30a) of width inferior than said maximum distance between said lateral body sides (3).

8. . A machine according to Claim 1, in which said brush unit (9) is provided with an articulated structure (11) including: a first support body (14) rotatably joined to said pin (10), at least a couple of arms (15) engaged to said

first support body (14) in conjuction with first pins (17) parallel with one another and transversal to said oscillation axle (10a) and a second support body (18) suitable for supporting said brushes (13) and rotatably engaged to said arms (15) in conjuction with second pins (20) located substantially parallel to said first pin (17).

9. . A machine according to Claim 8, in which there is at least a presser device (22), engaged to said first support body (14) and suitable for pressing said second support body (18) in the direction of said flooring (44).

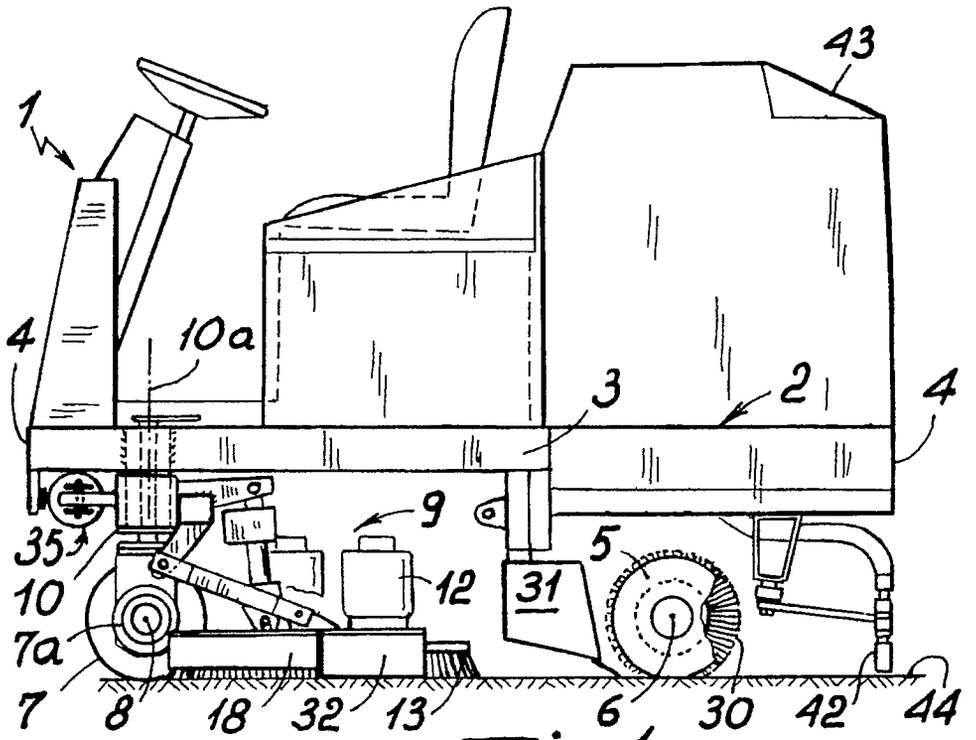
10. . A machine according to Claim 9, in which said presser device (22) includes a control unit (24) and a bar (25) axially mobile under the action of said control unit (24) in the direction of said second support body (18).

11. . A machine according to Claim 9, in which there is a crosspiece body (21) developing between said arms (15), hinged with respect to said arms and engaged to said presser device (22), said presser device (22) developing between said first support body (14) and said crosspiece body (21).

12. . A machine according to Claim 11, in which there are elastic elements (23), interposed between said presser element (22) and said crosspiece body (21) and suitable for acting onto said flooring (44).

13. . A machine according to Claim 1, in which said centering means (35) includes: a rod (36) mobile with said brush unit (9) and engaged to said unit by a manually releasable connection pin (36a), and elastic means (38) being interposed between said chassis (2) and said rod (36).

14. . A machine according to Claim 13, in which said rod (36) is located transversally to said oscillation axle (10a) and mobile in a main axial direction, and in that said centering means (35) further includes a tubular holder body (37) rotatably hinged to said chassis (2) and housing at least partially and slindingly said rod (36) and said elastic means (38), said elastic means (38) being slidingly wound onto said rod (36), limit stops (40) for said elastic means (38) engaged to said holder body (37) and presser elements (41) of said elastic means (38) engaged onto said rod (36).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43
4
10a
3
2
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35
10
12
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7a
7
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42
44

Fig.1

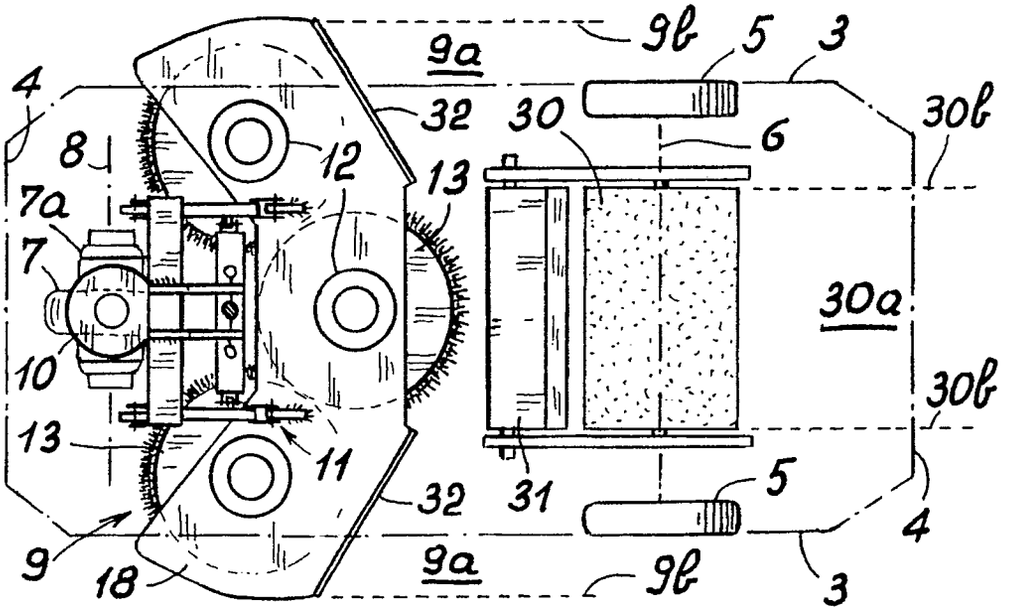
9b
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Fig.2

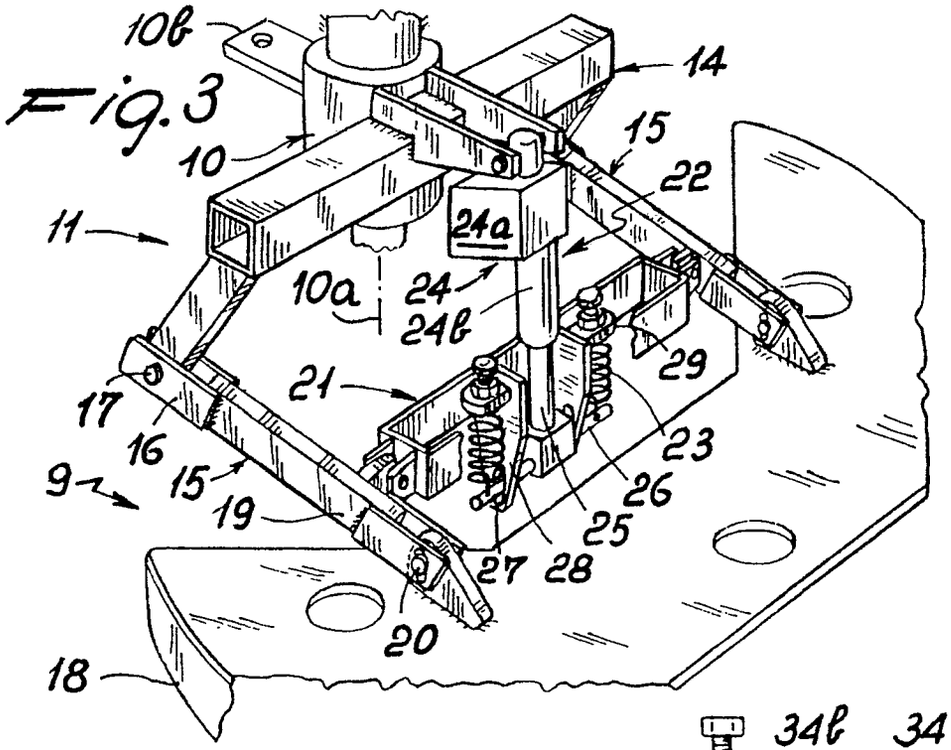

Fig.3

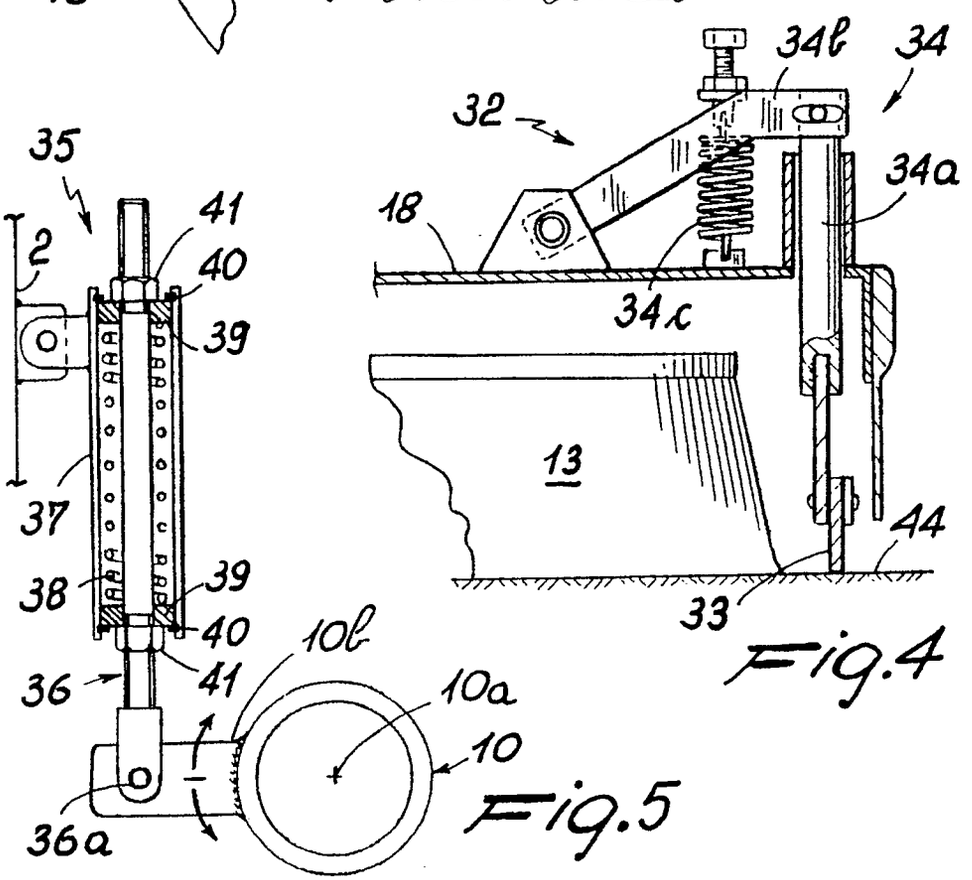

Fig.4

Fig.5

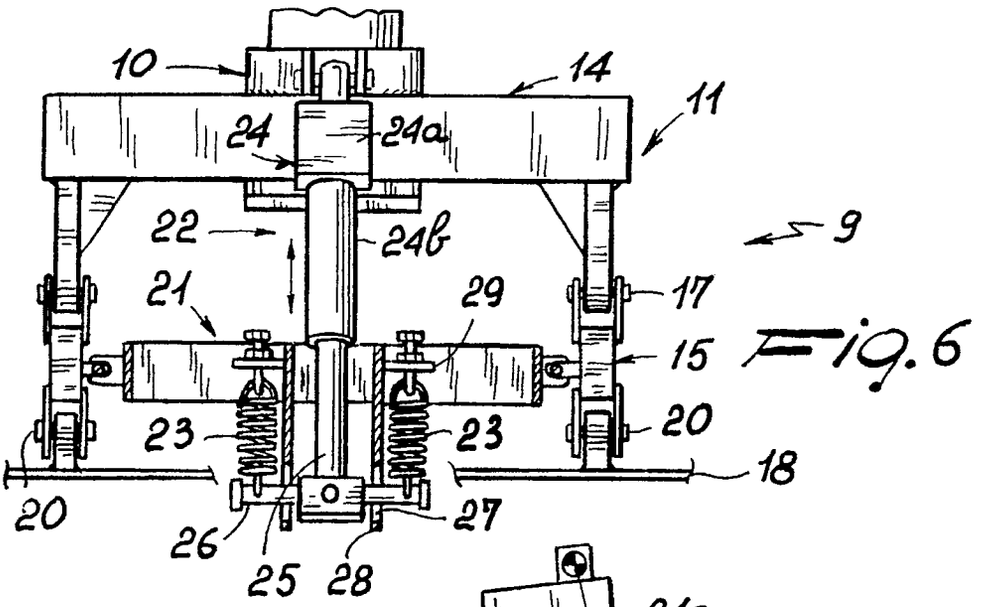

Fig. 6

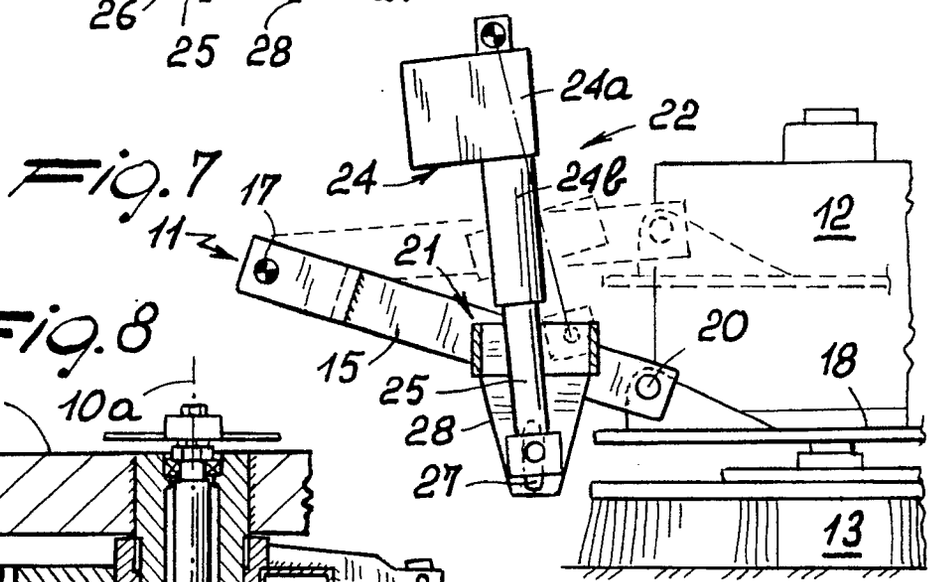

Fig. 7

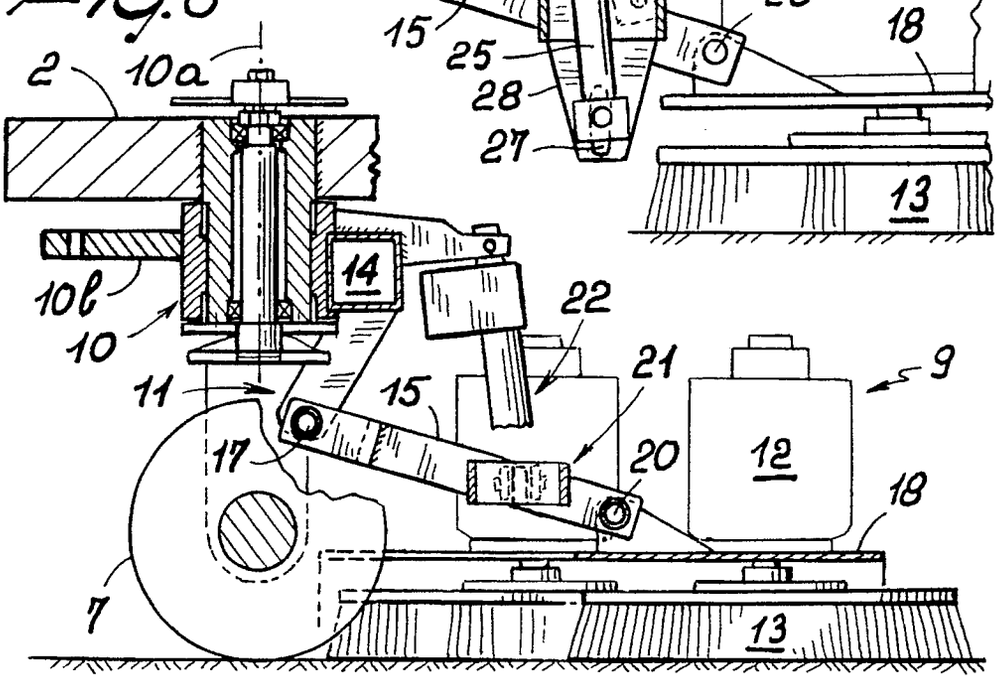

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number

EP 90 12 4953

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y,A	publicity brochure "tennant 42 power sweeper" pages 3 to end copyright 1969 by tennant cy	1-6,7-12	A 47 L 11/30 A 47 L 11/00 A 47 L 11/10
Y	US-A-4 009 500 (W.A. ASHTON) * the whole document *	1-6	
A	US-A-3 233 274 (M.O. KROLL) * the whole document *	1-4	
A	FR-A-1 019 363 (A-G. BOUDIN & F. GARNIER) * the whole document *	1-4	
A	US-A-3 345 671 (R.D. WILSON) * the whole document *	8-12	
A	US-A-3 701 177 (L. MEYER & AL) * the whole document *	1	
A	US-A-4 754 521 (S. ZONI)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 47 L
E 01 H

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	12 June 91	VANMOL M.A.J.G.

CATEGORY OF CITED DOCUMENTS

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