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(71) Applicant: **BITELLI S.p.A.**
40061 Minerbio (BO) (IT)

(72) Inventor: **Bitelli, Romolo**
S. Lazzaro (BO) (IT)

(74) Representative: **Bonini, Ercole**
c/o STUDIO ING. E. BONINI SRL
Corso Fogazzaro 8
36100 Vicenza (IT)

(54) Suction and handling device for dust produced by scarifiers

(57) The invention produces a dust handling device on a self-driven scarifier that includes a milling drum, a conveyor belt for the material broken up and an elevator belt. The device includes: a tunnel-like hood (5) covering at least the conveyor belt (3); a housing (4) enshrouding the milling drum (2; 21) and demarcating at least one suction area (9) located to the rear and top of the milling drum and covering the whole width of the drum, and two upper lateral areas (8; 8') that enfold said milling drum and that are connected with said suction area (9); a duct (10) that links said suction area (9) with the inlet (71) of a centrifugal fan (7); a centrifugal fan (7), with its outlet (74) connected to a filter (11) designed to withhold the solid components of the dust and fumes.

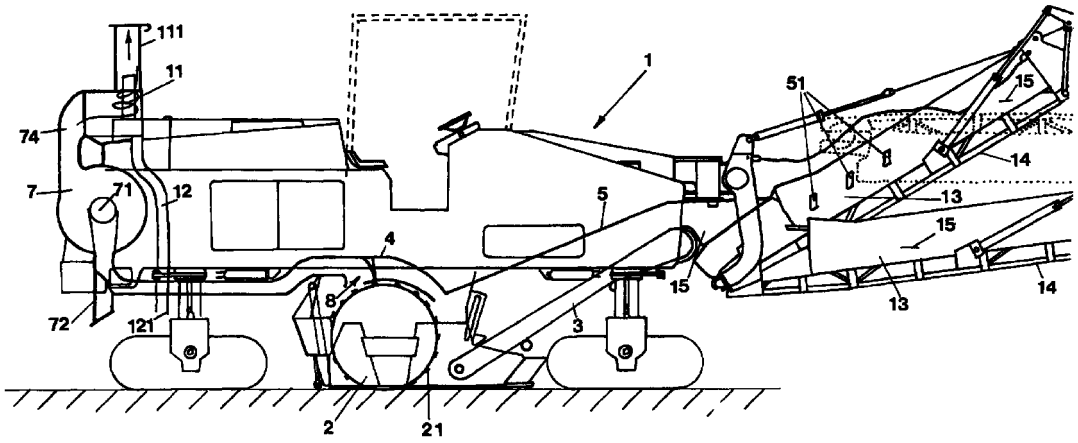

FIG.1

EP 0 971 075 A1

Description

[0001] The invention concerns a device to be applied to scarifiers tor road surfaces, especially suitable tor sucking up dust and fumes that are produced when removing the actual road surfaces.

[0002] It is known that scarifiers are machines used to remove the surface asphalt that covers road courses. They basically involve a frame mounted on wheels, provided with a tractor engine, a driver's cab and at least one milling drum set against the road surface to be broken up. The milling drum is made to rotate and, by means of the protruding tines covering its circumference, it breaks up the road surface that it is set against and which it is made to break down into.

[0003] The material resulting from said breaking up process can still be implemented tor subsequent uses and is therefore removed from the milling drum work area before continuing the digging.

[0004] The most recent scarifiers are fitted with a conveyor belt that continuously collects the material resulting from breaking up the road surface, directly during the actual breaking up process, using the centrifugal force that the milling drum exerts on the material as it is being broken up.

[0005] The conveyor belt then channels the material that has been broken up towards a second elevator belt that is part of an adjustable loader that allows the material to be fed into the body of a dump truck that drives alongside the scarifier while it is working. The broken up material can then be transported to a collection site, ready tor subsequent reuse. One of the major problems found when using the aforementioned scarifiers is that a substantial quantity of bitumen dust and fumes are produced as a result of the enormous friction that the ripper equipment exerts on the asphalt surface to remove it completely.

[0006] The cloud of dust and fumes mainly builds up around the work area, but it rapidly spreads upwards and along the two belts, especially around the conveyor, which collects and moves the material away from the milling drum.

[0007] Therefore it is easy to understand the discomfort that the scarifier operator has to face while controlling this machine, both for aspects regarding inhalation of harmful, unhealthy dust and fumes, and tor the limited visibility created around the operations.

[0008] A similar harmful environment and visual disturbance also affect the other workers assisting in the work of breaking up the road surface, not to mention passers by that are more or less surrounded by clouds of dust and fumes raised by the machine.

[0009] The problems of harmful dust have even worse effects when the scarifier's milling drum works on quarry faces for the production of cement components.

[0010] This invention intends to prevent these damaging effects and overcome the inconveniences mentioned above.

[0011] One particular scope of the invention is to produce a scarifier fitted with a means of sucking the harmful dust and fumes that are produced during the breaking up of road surfaces.

[0012] Another scope is that said dust and fumes should be channelled towards a means of filtering that withholds the harmful particles they contain, returning purified air to the atmosphere, not harmful to health.

[0013] The above scopes are achieved by producing a dust suction and handling device on a scarifier that, in accordance with the main claim, includes at least one milling drum, at least one conveyor belt for the removed material adjacent to the milling drum and one elevator belt to channel the material into a collection site, and it is characterised in that it includes:

- A tunnel-like hood covering at least the conveyor belt
- A housing enshrouding the milling drum and demarcating at least one suction area located to the rear and top of said milling drum, and covering the whole width of the drum and two upper lateral areas that enfold said mitting drum and that are connected with said suction area
- A duct that links said suction area with the suction inlet of a centrifugal fan
- A motor driven centrifugal fan with its outlet connected to a filter
- A filter designed to withhold the solid components of the dust and fumes.

[0014] According to a preferred form of execution of this invention, the dust suction and handling device is fitted with a centrifugal suction fan driven by a hydraulic motor and connected to a cyclone filter designed to withhold the harmful fumes and also separate the solid particles suspended in the dust.

[0015] According to another form of execution of this invention, the centrifugal suction fan is driven by an electric motor, or by a pneumatic motor and the dust filter has a mesh construction. Additional characteristics and details of the invention shall be better illustrated in the description of the preferred form of execution of the dust suction and handling device on a scarifier, given as a guideline but not a limitation and illustrated in the attached diagrams, where:

- fig. 1 shows the side view of the invention device applied to the most commonly used scarifier
- fig. 2 shows the housing of the milling drum of the invention device.

[0016] With reference to the above figures the invention device proves its advantage when applied to a scarifier 1 that has the milling drum 2 on its underside fitted with a mass of protruding tines 21 covering its circumference designed to break up a road surface as wide as the drum itself.

[0017] For this purpose said milling drum is made to rotate by a suitable motor and raise the broken up material by launching it by centrifugal force over the conveyor belt 3 that is running in a continuous loop.

[0018] The violent breaking up of the layer of road surface, that is achieved by the implanting and eroding friction of the drum's tines into the actual surface, also produces a substantial amount of bituminous dust and fumes that tend to quickly rise and spread in the surrounding atmosphere causing the inconveniences and disturbance mentioned earlier.

[0019] The invention device prevents this diffusion by means of the housing 4 that covers the milling drum 2 over its front section, where there is the greatest turbulence, and is connected with the tunnel 5 that covers the conveyor belt 3 along its whole length towards the second elevator belt 13.

[0020] Said tunnel 5 has louvers 51 along both side walls to suck in air from the outside so that the dust around the broken up material on the conveyor belt is sucked up by the action of the centrifugal suction fan 7 in the housing 4.

[0021] Said housing includes two lateral suction areas 8 and 8' along the milling drum's flat ends and top of the milling drum that overhang the front of the drum itself, and a suction area 9 central to its rear that connects through a funnelled section to the duct 10.

[0022] Said duet channels the dust and fumes towards the centrifugal suction fan 7 that has a vertical branch 72 in line with its suction inlet 71 to collect free falling larger sized solid particles contained in the sucked dust.

[0023] In order to prevent the continual suction of air by the suction fan through said vertical branch, the bottom of this branch is closed by a hatch 73 that is only opened under the weight of a pre-set quantity of deposited material, which is discharged onto the ground and the hatch 73 then returns shut immediately afterwards.

[0024] The centrifugal suction fan 7 is preferably driven by a hydraulic motor, electrically controlled by the operation of the milling drum. This suction fan has its outlet 74 coupled to the inlet of the filter 11 that separates the solid particles still present in the dust, discharging them by gravity into a vertical chute 12 that has its bottom fitted with a tipping discharge hatch 121 similar to the one described above.

[0025] In this way the outlet flue 111 of the filter only gives off purified air, that is thereby of no harm to persons and environment. The example illustrated in the attached diagram belongs to the most recent generation of scarifiers that incorporates a second elevator belt 13 on its front, belonging to a loader 14. Said loader can be adjusted in height to suit the position of a dump truck's body that proceeds before the scarifier and collects the broken up material.

[0026] In this case a possibility should be provided to extend the tunnel-like hood 5 of the conveyor belt 3, to cover the length of the second elevator belt 13, joining together the two sections of the actual tunnel at the swivel section of the loader 14, by means of a cover 15 in elastic material or similar that withholds the dust and forces the sucked air to enter the tunnel primarily through the side louvers to increase its speed.

[0027] From the above explanations, it can be seen that the dust suction and handling device described and illustrated herein fulfils all the set scopes.

[0028] Changes may be made in the construction details of the finding during its actual production. In particular, any kind of known centrifugal suction fan may be used, as long as it is suited to the purpose. In the same way, even a different type of filter may be used such as, for example, a cyclone separator or mesh filter.

[0029] Any variation to its execution shall be covered by this invention.

Claims

1. Dust handling device on a self-driven scarifier, which includes at least one milling drum, at least one conveyor belt of the broken up material adjacent to the milling drum and an elevator belt to channel the material into a collection site, characterised in that it includes:

   - a tunnel-like hood (5) covering at least the conveyor belt (3);
   - a housing (4) enshrouding the milling drum (2; 21) and demarcating at least one suction area (9) located to the rear and top of said milling drum and covering the whole width of the drum and two upper lateral areas (8; 8') that enfold said milling drum and that are connected with said suction area (9);
   - a duct (10) that links said suction area (9) with an inlet (71) of a centrifugal fan (7);
   - a centrifugal fan (7) driven by means of motors, with its outlet (74) connected to a filter (11);
   - a filter (11) designed to withhold the solid components of the dust and fumes.

2. Dust handling device, according to claim 1), characterised in that said tunnel-like hood (5) of the conveyor belt (3) also extends to cover the elevator belt (13), having two sections of cover connected together by means of elastic joints (15).

3. Dust handling device, according to claims 1) or 2), characterised in that the tunnel-like hood (5) of the conveyor belt (3) has a mass of louvers (51) along its side walls where the suction air of the centrifugal fan enters.

4. Dust handling device, according to the previous claims, characterised in that the centrifugal suction fan (7) has a vertical chute (72) under its inlet (71), with its bottom fitted with a tipping hatch (73) that

opens itself under the action of the weight of the larger sized solid particles sucked through the duct (10) connecting the housing (4).

5. Dust handling device, according to any of the previous claims, characterised in that the filter (11) communicates with a vertical chute (12) where the smaller solid particles deposit as they are separated by said filter, said chute being fitted with a hatch (121) that opens by weight.

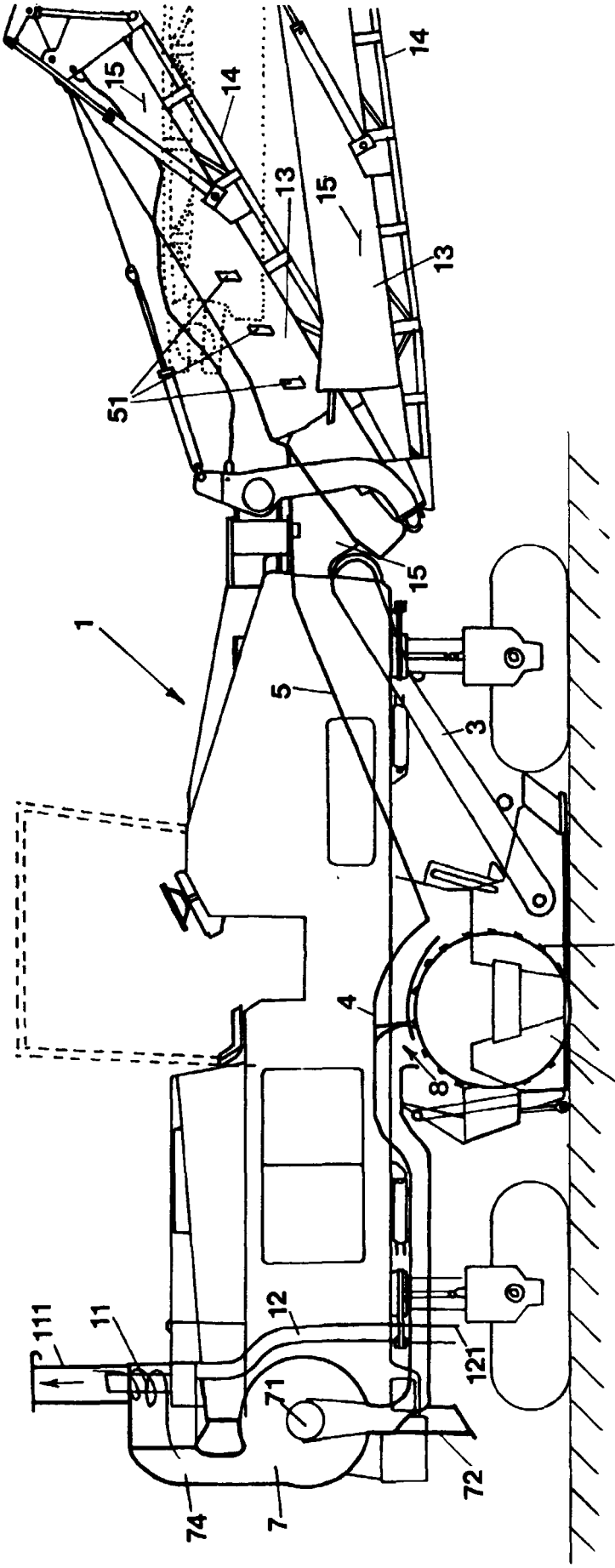

FIG.1

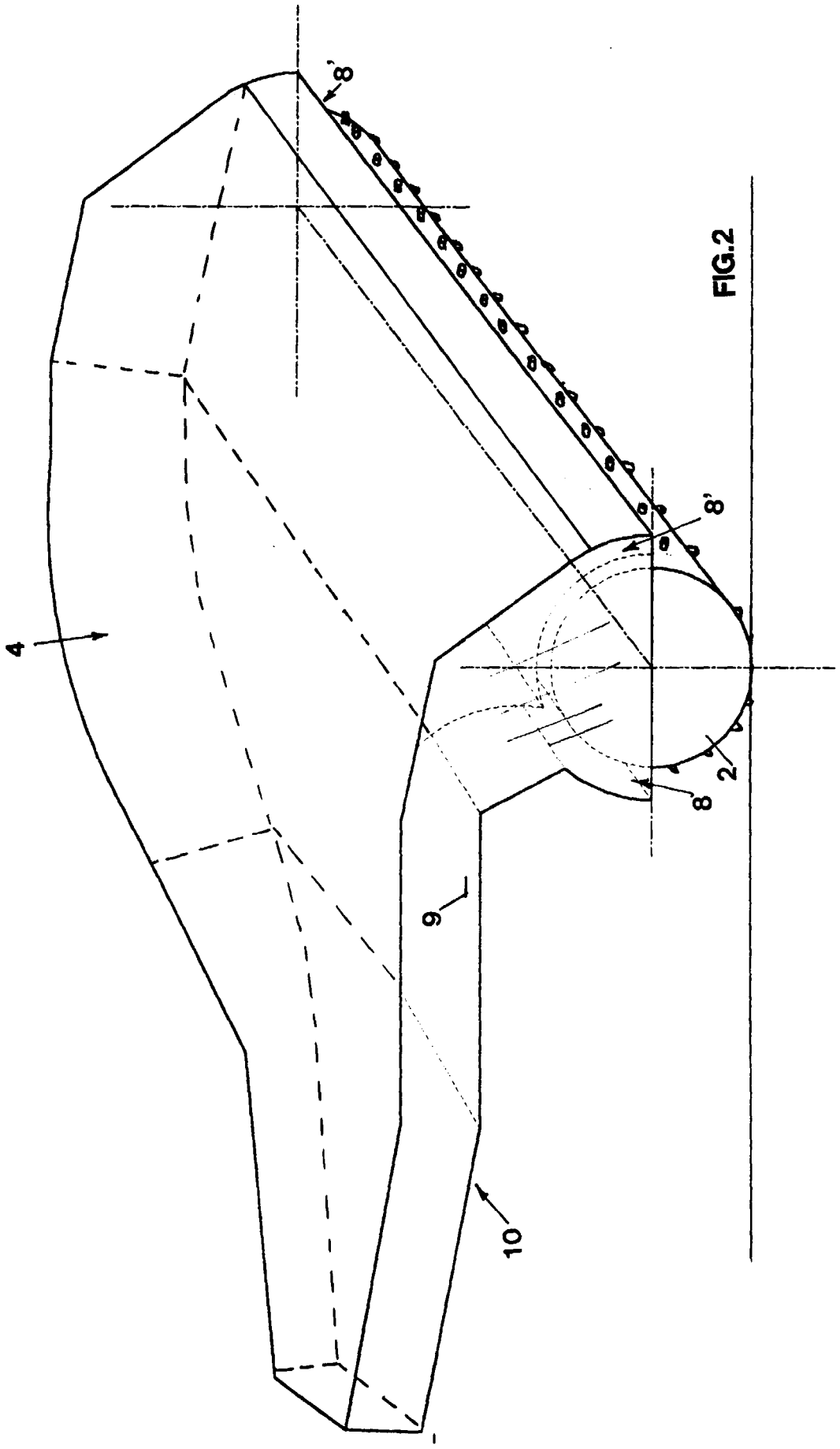

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 11 3115

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.7)
A	US 4 561 145 A (LATHAM WINCHESTER E) 31 December 1985 (1985-12-31) * the whole document *	1	E01C23/088
A	US 5 378 081 A (SWISHER JR GEORGE W) 3 January 1995 (1995-01-03) * figure *	1	
A	US 5 063 713 A (BUCHHEIT JR GERALD A) 12 November 1991 (1991-11-12) * abstract; figures 3-5 *	1,5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 October 1999	Dijkstra, G

CATEGORY OF CITED DOCUMENTS

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T : theory or principle underlying the invention
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 11 3115

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-10-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4561145 A	31-12-1985	NONE	
US 5378081 A	03-01-1995	NONE	
US 5063713 A	12-11-1991	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82