



(11)

EP 3 056 607 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.08.2016 Bulletin 2016/33

(51) Int Cl.:
E01C 23/14 (2006.01)

(21) Application number: **15002902.3**

(22) Date of filing: **12.10.2015**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA

(30) Priority: **10.02.2015 CZ 201530716 U**

(71) Applicant: **Koplik, Antonin
89604 Svatobor (CZ)**

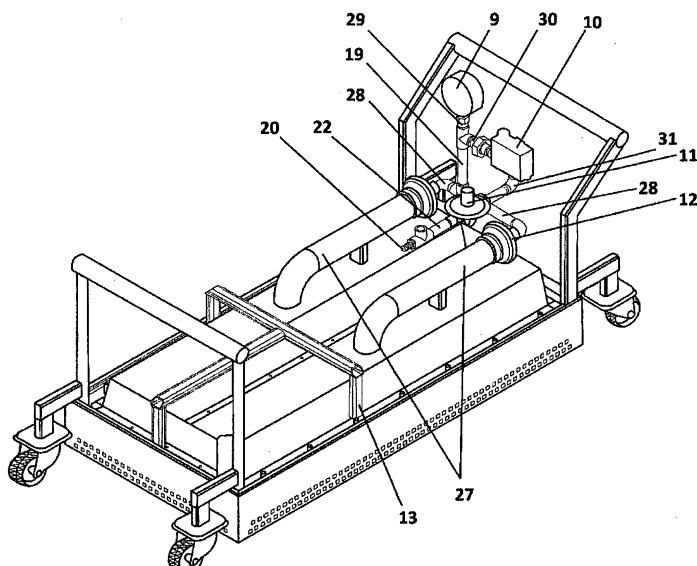
(72) Inventor: **Koplik, Antonin
89604 Svatobor (CZ)**

(74) Representative: **Kendereski, Dusan
Koliste 13a
602 00 Brno (CZ)**

(54) DEVICE FOR REPAIRING OF ASPHALT SURFACES

(57) Device for repairing of asphalt surfaces consisting of a frame (23), gas supply, a control, regulation and manipulation elements, having a horizontal base plate (24) rigidly connected to the frame (23) and provided with an ignition (16) and a burner arranged on the bottom part of the horizontal base plate (24), which is further provided with recesses (25) for arrangement of system of ceramic plates (17) which are provided with a set of openings

(26), above which the mixing chambers (14) are positioned, to which the tubes (27) provided with nozzles (12) on their initial portion are arranged, connected through the piping (19), in which a regulator (11) of pressure is arranged connected to the gas supply (22) with a valve (20) of the gas supply, which is connected with a gas tank (3), wherein the set of ceramic plates (17) forms an infrared heater.



Obr. 2

DescriptionField of the Invention

[0001] Technical solution relates to a mobile device for repairing of damaged asphalt surfaces of all types of communications, it relates especially to a mobile device for repairing these communications using heat.

Background of the Invention

[0002] Wearing layers of all types of communications are due to all kinds of climate conditions and loads, i.e. movement of the vehicles, damaged and destroyed. These damages and defects occur naturally and randomly, however, they can be reduced by the selection of building material, its composition and method of application, and thus reduce the likelihood of damages. Roads during their lifetime show a variety of damages of the wearing course surface, its cover, the base of the road to damage of the bedrock and earth body. The common defects occurring on roadways is the loss of roughness, loss of mass from the cover, and cracks, e.g. frost cracks, reflective cracks and mosaic cracks, further also roadway deformation and bumps. The damage usually emerges on the roadway surface, spreads in all directions, in depth and at the same time throughout the whole area, and the severity of the roadway damage is determined by the time, during which the damage is left on the roadway. Borderlines between damages of the surface and structure of the roadway is determined by the depth of the wearing course damage. The seriousness of each damage is assessed in terms of operational functions and load capacity of the road and negatively affects the road traffic safety, speed, fluency, efficiency, comfort of the road traffic and damages the roadway structure. All damages are further costly because of the losses in traffic accidents, losses of traffic efficiency and by the costs of maintenance, repair or eventually reconstruction of the roadway. Repair of these damages depends on amount of financial funds. The common practice is to repair them according to importance of the communication, repair costs, exclusions from the operation and a number of other criteria. A significant feature of the repairs which have been carried out so far is that they are carried out with delay. In case the damage of the road is noticed and repaired in the first year, the repair costs per 1 m² are lower. The repair costs increase roughly exponentially with the increasing "seasons".

[0003] Hairline, mosaic, transverse, longitudinal or narrow cracks are eliminated by one-layer or two-layer coating, or topping respectively. Repairs are usually performed over the whole area. A drawback is the fact that the coating or micro-topping is laid on the existing damaged surface, which is cleaned only with pressurized air or steel brush. Oil drops from car engines, dirt between the aggregate and in cracks, paint residues from the horizontal road marking are not completely removed and

has negative effect on the adhesion of the new system, which results in its reduced lifetime.

[0004] The main drawback of the current forms of the asphalt surface repair is formation of dangerous waste (milled asphalt) and especially ubiquitous humidity, which results in repeated damage of the road surface.

[0005] The second method is the use of a so called cold mix composition, when a substitute is placed into a humid pothole, which is, thanks to its humid base, affected by water dilatation and it is pressed by expanding ice out of the pothole after a repeated freezing.

[0006] Drawbacks of the current solutions are characterized mainly by the fact that the surroundings of the damaged place in the asphalt was milled so as to provide space for a new asphalt composition or its substitute, and the humid mass is applied directly onto the undried and usually humid hole. The humidity affecting the new material with its physical properties by the influence of temperatures always stays under the new material. Moreover, milling creates a border, which is unable to merge with the new material, and therefore a gap appears in which the humidity emerges and water accumulates during rainfalls, which does not freeze in the winter and by expanding it also expands the gap. Sometimes a special material is used which is used to fill the gaps, but it is applied in cold state as well and does not prevent the above described problem. When using other covering methods, the main problem remains the fact that the damage of the surface is only covered by one-centimeter layer of substitute material, however, the cause of the damage is not eliminated.

[0007] The aim of the solution is a new construction of a mobile device for repairing the defects in wearing coarse of roadway, comprising gas distribution, control unit with a control, regulating and manipulation elements, which by means of mixture of gas and air heat the system of ceramic plates arranged in a frame, wherein the ceramic frames subsequently generate radiant heat that heats the asphalt in the place intended for repair.

Summary of the Invention

[0008] The above described drawbacks are eliminated by a device for repairing of asphalt surfaces consisting of a frame, gas distribution, a control, regulation and manipulation elements, characterized in that a horizontal base plate with ignition is rigidly connected to the frame, preferably with piezoelectric ignition, and with a burner arranged on the bottom side of the horizontal base plate, which is further provided recesses for arrangement of system of ceramic plates provided with a set of openings, above which mixing chambers are disposed, to which the tubes provided with a nozzle on their inlet portions are attached, connected via a piping in which a pressure regulator is arranged, which is further coupled with a gas tank supply, which is preferably a portable propane butane gas bottle, wherein gas in the tube is enriched with air and enters the space inside the mixing chambers,

from which the mixture of gas and air is guided through the openings of the system of ceramic plates, where it burns in their bottom parts after ignition, wherein after heating the systems of ceramic plates form an infrared heater, when the device is provided on the gas pipeline with measuring of gas pressure and a control unit for supplying and controlling the gas, and in order to achieve mobility the device is provided with a front handle and a back handle connected to the frame of the device, and with the caster swivel wheels with locking, to increase the safety the device is provided with vertical housing consisting of the front frame cover and side frame cover directed towards the part of the wearing course of the roadway which is being repaired, further consisting of the control unit and gasification cover and mixing chambers cover, wherein the vertical housing of the bottom part directed towards the communication which is being repaired is provided with openings in order to allow the flow of air, and for easier replacement of the system of ceramic plates is this system of ceramic plates pressed to the horizontal base plate by compression moulding.

[0009] Device for repairing of asphalt surfaces of road communications with damaged wearing course according to the present technical solution considerably simplifies and significantly optimizes the technology of repairing of damaged asphalt surfaces during the whole year. Priority advantage is the fact that the repair is carried out "hot", it means that it merges the warmed initial asphalt and the warmed new asphalt within the wearing course by radiant heat, which ensures that no gap appears for dilatation of water leaking into the milled gaps using the current repairing methods, when thanks to the radiant heat no constant damage of asphalt contained in the wearing course occurs, which means burning out of the bitumen and tar ingredients. Technical advantage of the device is mainly the fact that the repairs may be carried out even in winter up to the -7°C temperature, thanks to absolute drying and dehumidification of the roadway base for new asphalt. Another significant advantage is the speed of the damage repair, as the repair may be realized in 15 to 20 minutes.

Description of the Drawings

[0010] Construction of the mobile device for repairing of asphalt surfaces of road communications with damaged wearing course according to this technical solution will be further illustrated by means of drawings, where fig. 1 illustrates the overall axonometric bottom view of the device, fig. 2 illustrates a solution of a complete gasification of the device, fig. 3 illustrates the front view of the gas distribution with the mixing chamber, piezo ignition, compression mouldings, thermocouple and an igniter element, fig. 4 illustrates the frame structure with horizontal base plate, and figs. 5 and 6 illustrate an example of ceramic plate with vertical openings.

Examples of Preferred Embodiments of the Technical Solution

[0011] Arrangement of the device for repairing of asphalt surfaces of communications with damaged wearing course according to this technical solution will be further described by means of exemplary embodiments, which are not intended to limit the scope of the protection.

[0012] Arrangement of the device for repairing of asphalt surfaces of communications with damaged wearing course according to the present technical solution is illustrated in the figs. 1 to 6. The device consists of a frame 23, horizontal base plate 24 with recesses 25, system of ceramic plates 17 provided with a set of vertical openings 26, gas distribution, control unit 10 with a control, and regulation and manipulation elements. On the horizontal base plate 24 with recesses 25 for arrangement of the system of ceramic plates 17, rigidly connected to the frame 23, is arranged a system of these ceramic plates 17, which in order to be heated are supplied by the mixture of gas and air by means of piping 19 and nozzles 12 from the mixing chambers 14 arranged in the space above the system of ceramic plates 17. Gas is supplied to these mixing chambers 14 by means of piping 19, in which the regulator 11 of gas is arranged and is connected to the gas supply 22 with a valve 20, which is connected to the gas tank 3, which is preferably a portable propane butane bottle, using a flexible hose 21. The portable propane butane bottle is arranged in the housing 7 of the mixing chambers 14, reinforced with tubular stiffener 13. Through the nozzles 12 gas flows to the tubes 27, by which it is blown into the mixing chambers 14, and the mixture of gas and air sucked by the tubes 27, then after the ignition by piezo ignition 16 it burns in the vertical openings 26 of the system of ceramic plates 17. Ceramic plates 17 intended for heating generate infrared light, which then heat the asphalt to the required temperature. System of ceramic plates 17 is pressed to the horizontal base plate 24 with recesses 25 by means of compression mouldings 18.

[0013] The device is provided with a manometer 9 to control the gas pressure and performance, a control unit 10 and a gas pressure regulator 11, which are mutually connected by means of gas distribution 29, 30 and 31.

To achieve mobility the device is provided with the front handle 4 and back handle 1 attached to the frame 23 of the device with rotational caster swivel wheels 6 with locking. To increase safety, the device is provided with metal sheet housing in the bottom part directed towards the communication which is being repaired, consisting of two front covers 5 and two side covers 8, further with a cover 2 of the control unit 10 and gasification, and cover 7 of the mixing chambers 14, wherein the housing of the bottom part directed towards the communication which is being repaired is provided with openings to allow the flow of air.

[0014] Device for repairing of damages of wearing course of communications according to the exemplary

embodiment heats the system of ceramic plates arranged in the frame of the device by means of regulated ignited gas and air mixture, wherein the heated ceramic plates subsequently generate radiant heat, which in the place of the repair heats the initial asphalt wearing course of the communication, and thus allows perfect blend with the new material used for repairing of this communication.

Industrial Applicability

[0015] Device for repairing of asphalt surfaces of communications with damaged wearing course according to the present technical solution is thanks to its high mobility are applicable for minor repairs of all types of communications basically throughout the whole year, except the temperatures under -7 °C.

Claims

1. Device for repairing of asphalt surfaces, consisting of a frame (23), gas distribution, a control, regulation and manipulation elements, **characterized in that** to the frame (23) a horizontal base plate (24) with ignition (16) is rigidly connected, with a burner arranged on the bottom side of the horizontal base plate (24), which is further provided with recesses (25) for arrangement of system of ceramic plates (17) which are provided with a set of openings (26), above

which the mixing chambers (14) are positioned, to which the tubes (27) provided with nozzles (12) on their initial portion are arranged, connected through the piping (19), in which a regulator (11) of pressure is arranged connected to the gas supply (22) with a valve (20) of the gas supply, which is connected with the gas tank (3), wherein the set of ceramic plates (17) form an infrared heater.

2. Device for repairing of asphalt surfaces according to the claim 1, **characterized in that** the gas pipeline (19) is provided with a gas pressure meter (9) and a control unit (10).

3. Device for repairing of asphalt surfaces according to claims 1 and 2, **characterized in that** it is provided with a front handle (4) and back handle (1) connected to the frame (23) of the device and cater swivel wheels (6) with locking.

4. Device for repairing of asphalt surfaces according to claims 1 to 3, **characterized in that** it is provided with vertical housing, consisting of the front cover (5) of the frame and the side cover (8) of the frame, directed towards the part of the wearing course of the communication which is being repaired, a housing (2) of the control unit (10) and gassification, a cover (7) of the mixing chambers (14), wherein the

vertical housing of the bottom part directed towards the communication which is being repaired is provided with opening allowing the flow of air.

5. 5. Device for repairing of asphalt surfaces according to claims 1 to 4, **characterized in that** the system of ceramic plates (17) is fixed to the horizontal base plate (24) with recesses (25) by means of compression moldings (13).

10 6. Device for repairing of asphalt surfaces according to claims 1 to 5, **characterized in that** the gas tank (3) is a portable propan butan bottle.

15 7. Device for repairing of asphalt surfaces according to the claim 1, **characterized in that** the ignition (16) is designed as a piezo igniter.

20

25

30

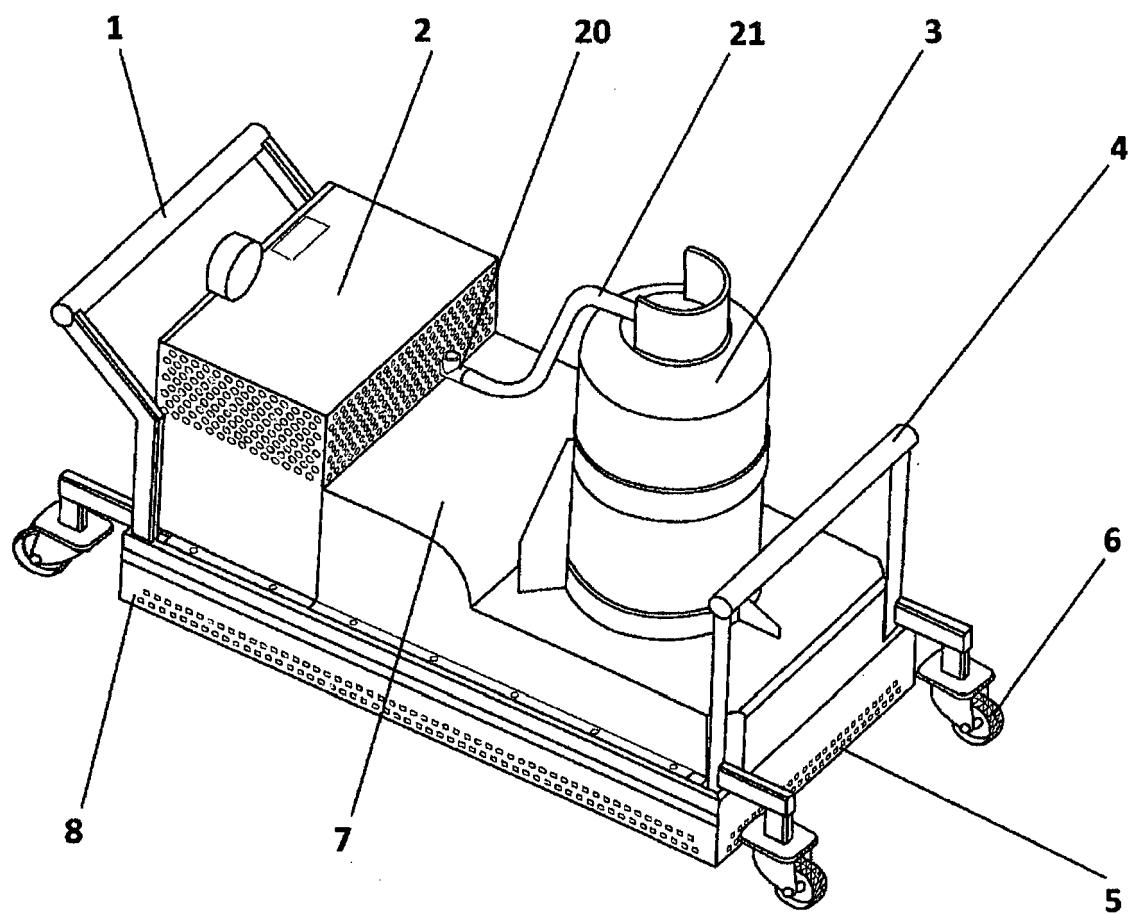
35

40

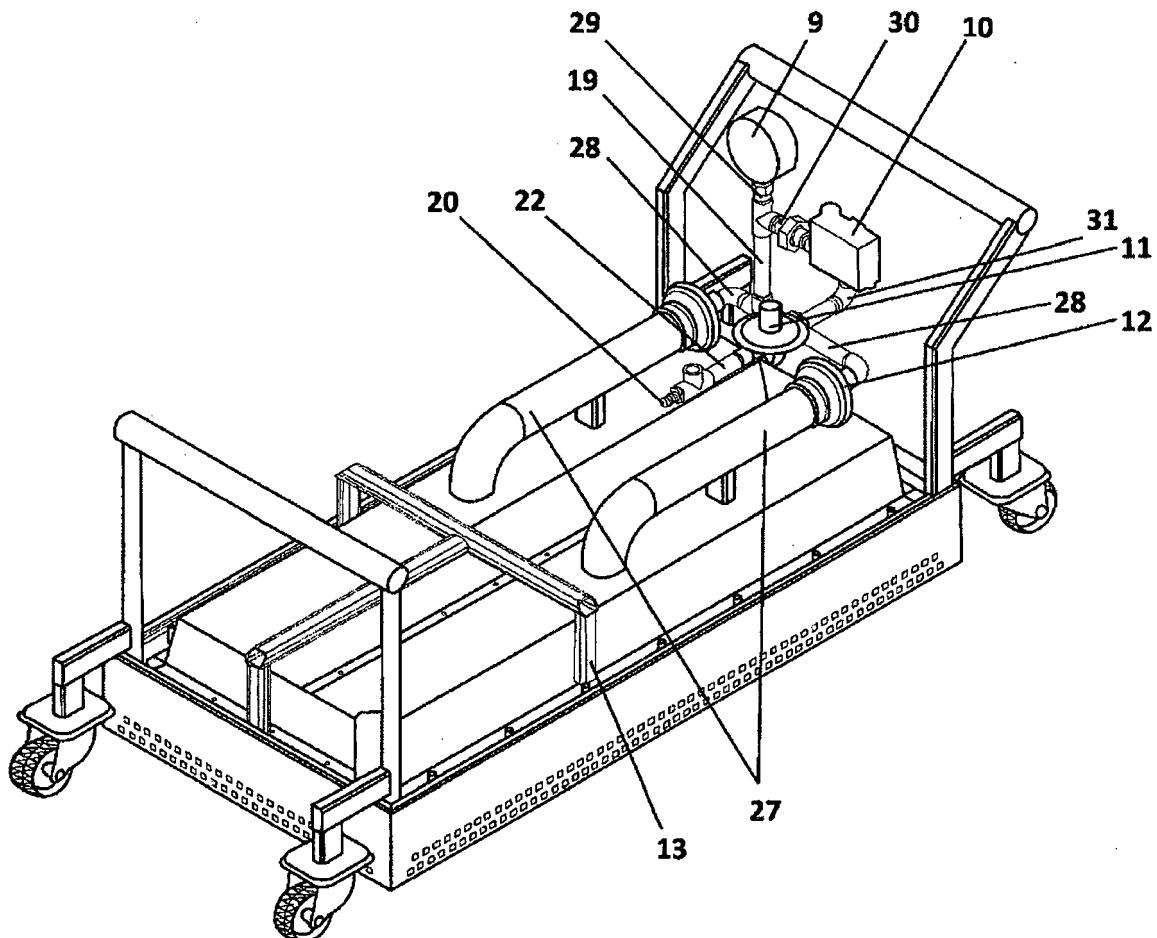
45

50

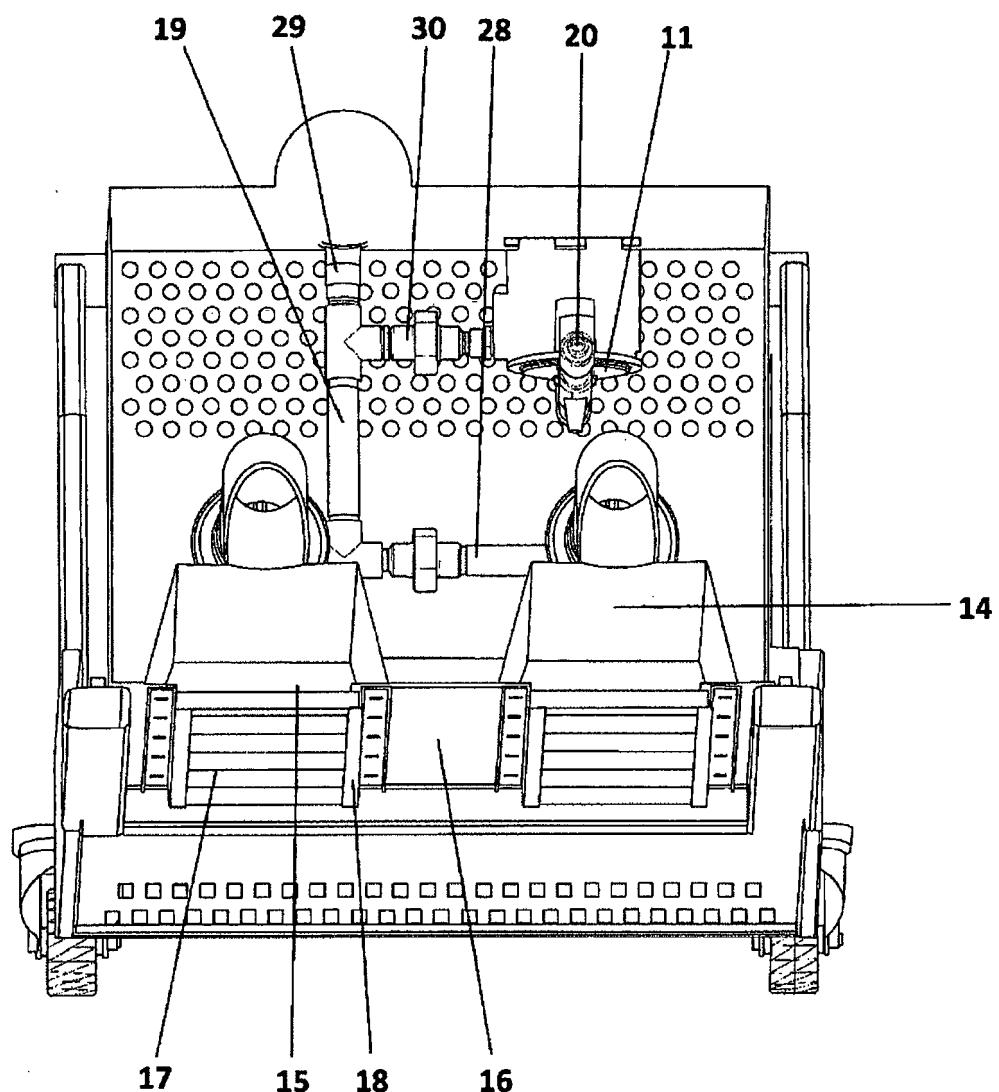
55



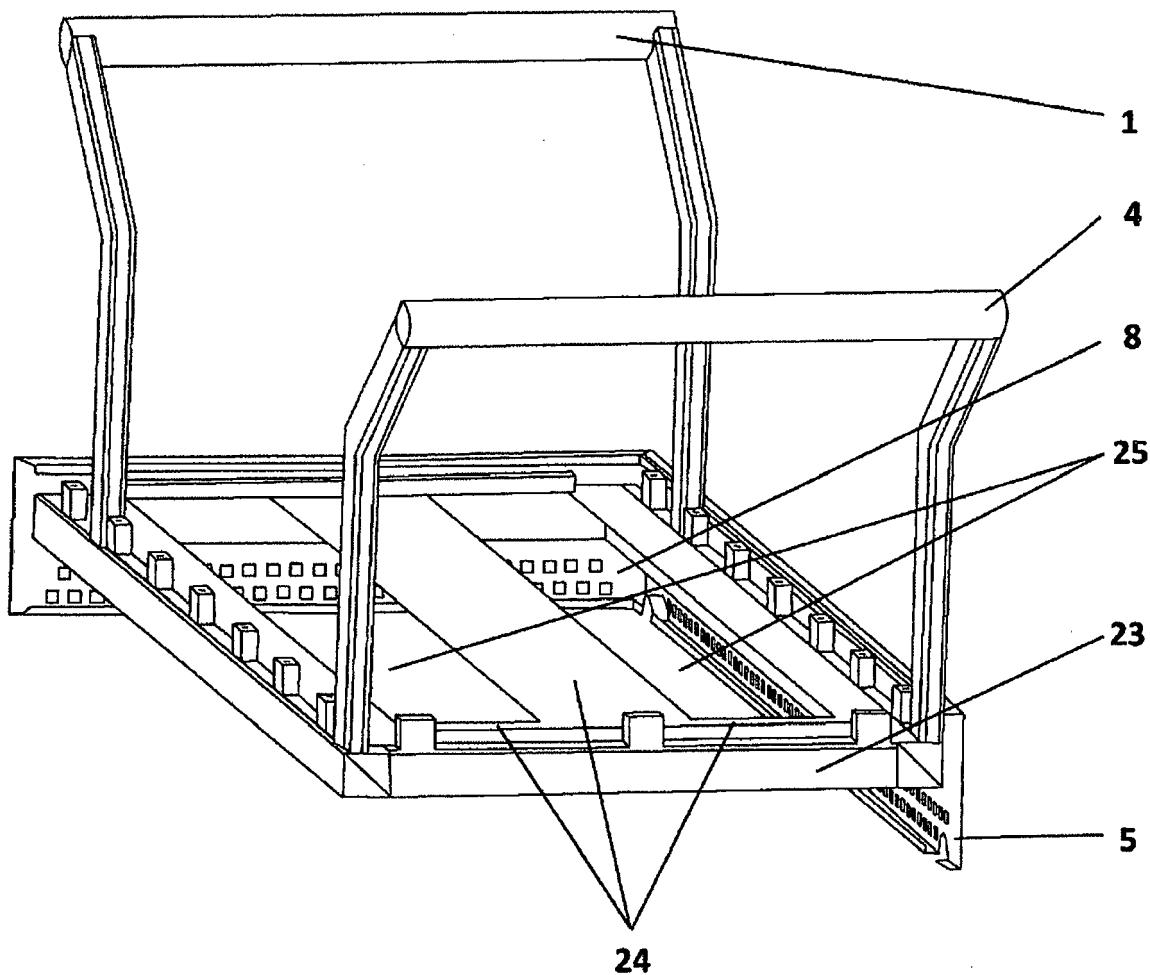
Obr. 1



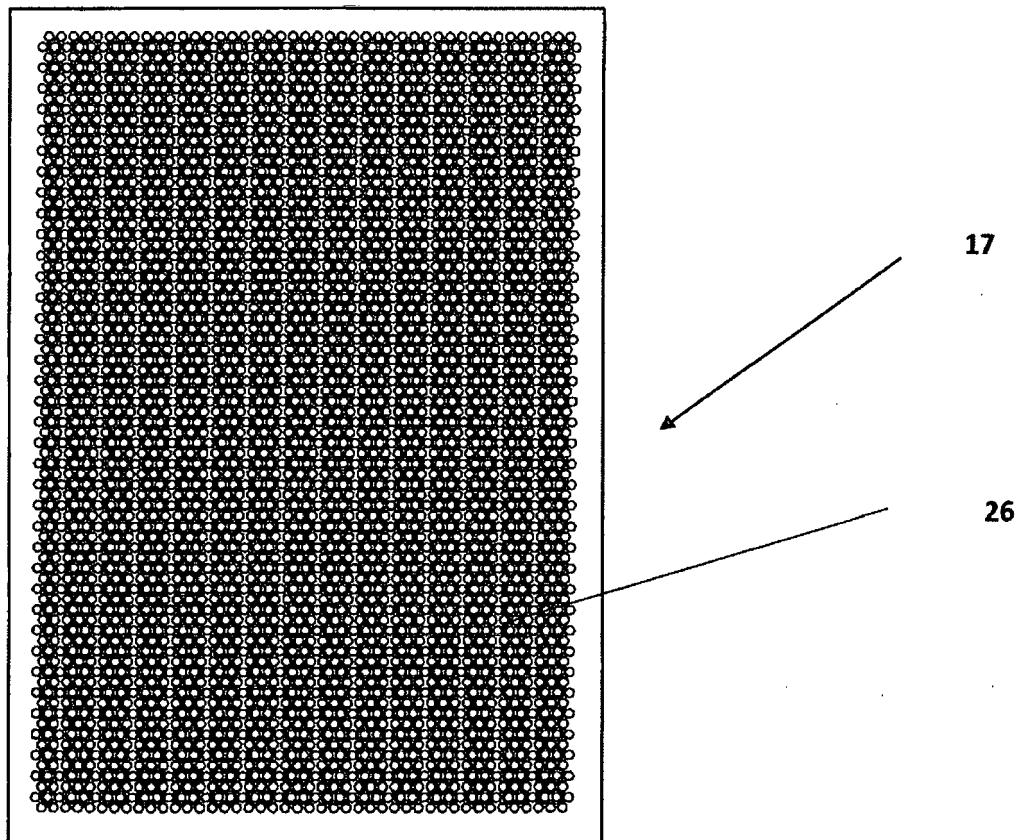
Obr. 2



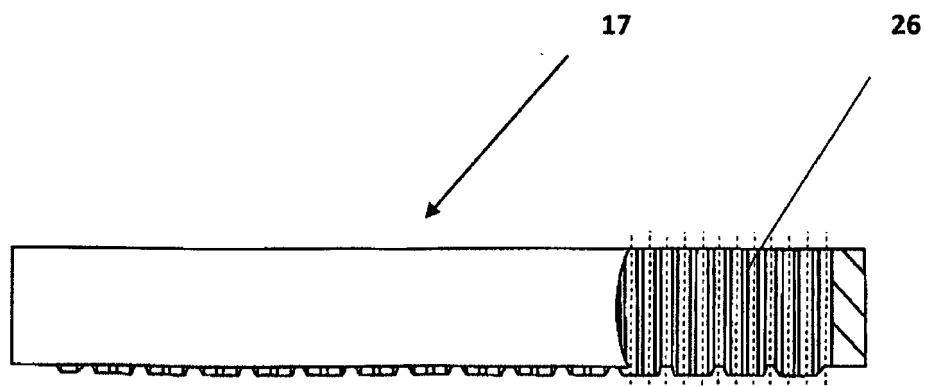
Obr. 3



Obr. 4



Obr. 5



Obr. 6



EUROPEAN SEARCH REPORT

Application Number

EP 15 00 2902

5

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
10	X WO 99/20853 A1 (RIJ HANS VAN [NL]) 29 April 1999 (1999-04-29) * the whole document * -----	1-7	INV. E01C23/14
15	X DE 15 34 401 A1 (TEERBAU GMBH STRASSENBAU) 21 August 1969 (1969-08-21) * the whole document * -----	1	
20	X CH 439 369 A (TEERBAU GMBH STRASSENBAU [DE]) 15 July 1967 (1967-07-15) * the whole document * -----	1	
25			
30			TECHNICAL FIELDS SEARCHED (IPC)
35			E01C
40			
45			
50	1 The present search report has been drawn up for all claims		
55	Place of search Munich	Date of completion of the search 17 June 2016	Examiner Beucher, Stefan
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 00 2902

5 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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-06-2016

10	Patent document cited in search report	Publication date		Patent family member(s)	Publication date
15	WO 9920853	A1	29-04-1999	AU 9766398 A NL 1007331 C2 WO 9920853 A1	10-05-1999 04-05-1999 29-04-1999
20	DE 1534401	A1	21-08-1969	NONE	
25	CH 439369	A	15-07-1967	NONE	
30					
35					
40					
45					
50					
55					

EPO FORM P0459

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