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(54) Benævnelse: **Landbrugs-marksprøjte med multidysehoveder**

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Description

The invention relates to an agricultural field spraying device and a method for using an agricultural field spraying device according to the preamble of Claims 1 and 3.

Such an agricultural field spraying device and such a method for using an agricultural field spraying device are disclosed in EP 1 254 723 B1. This field spraying device has a distribution boom, a liquid supply line being arranged thereon. Connection branches for spray nozzles are arranged at intervals on this liquid supply line. So-called multi-nozzle bodies with various spray nozzles for producing a variable dispensing quantity and variable droplet size spectra are arranged on each connection branch. Thus spray nozzles having different drift classes may also be mounted on the multi-nozzle body. Remote-controllable switching elements which are to be arranged on an output line of the multi-nozzle body and by which the liquid supply to the individual spray nozzles may be switched on and/or off via a control device are respectively assigned to the multi-nozzle bodies. In this case, the individual spray nozzles are switched on and/or off such that spray nozzles of the same type and drift class are always used over all working widths of the distribution boom.

A further field spraying device is disclosed in DE 44 441 472 A1 which also has a distribution boom which has a liquid line with spray nozzles. If the field is to be sprayed with plant protection products on the field edge boundary, it is provided herein that the nozzle adjacent to the field edge boundary ejects the liquid with an asymmetrical spray cone, with a limit dropping off steeply toward the field edge boundary, or that the outer spray nozzle is assigned a guide plate protruding into the spray cone for producing a spray distribution dropping off steeply in the boundary region. Moreover, even in the case of the spray nozzle which is adjacent to the field edge boundary, approximately the same droplet spectrum has to be maintained which is also produced by the remaining spray nozzles of the distribution boom.

US 5 704 546 A discloses a control system for a field spraying device with pulse-modulated nozzle units, comprising in each case a spray nozzle and an electromagnet which is centrally controlled by a control unit via a bus line, for timed opening of the spray nozzle with a variable timing ratio. Moreover, in the case of a plurality of nozzle units collectively or in the case of individual nozzle units, centrally controlled throttle valves are present for setting the control pressure of the spray nozzles. The droplet size spectrum of the spray nozzles may be set by the control pressure. The throughflow rate is set according to the type of spray nozzle used in the field spraying device by varying the timing ratio. The control is based on an adaptation both of the control pressure and of the timing ratio. In this manner the droplet size spectrum and throughflow rate may also be set separately for individual partial regions of the working width.

EP 1 254 723 B1 discloses an agricultural field spraying device for dispensing liquids with a distribution boom having at least one liquid supply line which runs transversely with respect to the direction of travel and which is provided at intervals with connection branches for connecting multi-nozzle bodies with spray nozzles which are connected thereto and which are optionally also of various types. In each case a valve arrangement with switching elements, which are remote-controllable via a pneumatic control line, is arranged in the housings of the multi-nozzle bodies in order to switch on or switch off the liquid supply to the respective spray nozzles via the valve arrangement.

Official requirements are set for spraying cultivated crops in the boundary region, according to which an appropriate distance has to be maintained from the field edge boundary, in particular from the surface of bodies of water. However, this distance may be reduced when loss-reducing application technology is used, i.e. when spraying field edge boundaries spray nozzles which produce a coarse droplet spectrum are used on the distribution boom. Whilst such spray nozzles which are suitable for minimizing drift are used in practice, according to the official regulations only a substantially smaller edge region would have to be sprayed by means of the drift reducing spray nozzles.

The object of the invention is to establish the conditions that, according to the official regulations, edge strips in the boundary region, which are not substantially wider than necessary, are sprayed by means of drift minimizing spray nozzles.

This object is achieved by a field spraying device according to Claim 1, wherein the control device has a circuit arrangement for the switching elements, for switching on and off the liquid supply to the spray nozzles, wherein different spray nozzles are switched on in different partial regions of the distribution boom, and wherein in the case of a plurality of spray nozzles arranged on at least one of the two outermost partial regions of the distribution boom, only spray nozzles for producing a droplet spectrum with less drift than in the remaining region of the distribution boom are switched on.

As a result of these measures, different types of spray nozzles may be activated in partial regions of the distribution boom so that, according to the official regulations, when used on the field edge boundary in the region facing the boundary, spray nozzles which produce a coarse droplet spectrum for minimizing drift are activated in a partial region on the distribution boom whilst in the remaining region of the distribution boom, which is remote from the field edge boundary, spray nozzles which produce a droplet spectrum required for this purpose of use are activated.

In order to be able to fulfil the official requirements when spraying field edge strips, it is provided that the outermost partial region, in which only the spray nozzles for producing a droplet spectrum with less drift than in the remaining region of the distribution boom are activated, has at least a width of 5 m, preferably 10 m. In this case, the distance may be progressively increased if required.

For carrying out the method according to the invention for using an agricultural field spraying device when spraying field edge boundaries, according to Claim 3, it is provided amongst other things that the control device has a circuit

arrangement for the switching elements for switching on and off the liquid supply to the spray nozzles for spraying agricultural areas in the edge region thereof, such that different spray nozzles are able to be switched on in different partial regions of the distribution boom, such that in the case of a plurality of spray nozzles arranged on at least one of the two outermost partial regions of the distribution boom, only the spray nozzles for producing a droplet spectrum with less drift than in the remaining region of the distribution boom are switched on, when the liquid is discharged by the field spraying device in the edge region of the agricultural area. This results in the advantages set forth above.

Further details of the invention are to be derived from the description of exemplary embodiments and the drawings, in which:

Fig. 1 shows an agricultural field spraying device with a distribution boom in a perspective view, with the distribution of droplet size spectra which may be produced by the spray nozzles arranged on the distribution boom, in a schematic view,

Fig. 2 shows a multi-nozzle head with spray nozzles, wherein the spray nozzle which is able to produce a coarse droplet spectrum is activated, in a perspective and schematic view,

Fig. 3 shows a multi-nozzle head with spray nozzles, wherein the spray nozzle which is able to produce a fine droplet spectrum is activated, in a perspective and schematic view and

Fig. 4 shows a detail of a field area to be treated in a schematic view.

The towed agricultural field spraying device 1 is coupled to the tractor 3 by the towbar 2. The field spraying device has the distribution boom 4, the chassis 5, and the storage hopper 7 arranged on the frame 6. The connection branches 8 are arranged on the distribution boom 7 at equal distances on the liquid supply line, which is arranged on the distribution boom 7, for connecting multi-nozzle bodies

9 to a plurality of different types of spray nozzles 10, 11, 12. In each case a valve arrangement with remote-controllable switching elements is arranged in the housings 13 of the multi-nozzle bodies 9, said switching elements being connected to an on-board computer via the ports 14 and data lines connected thereto. The liquid supply to the respective spray nozzles 10, 11, 12 may be switched on or switched off via this valve arrangement. The remote-controllable switching-off elements of the valve arrangement are controlled via a control device which is configured as an on-board computer. Thus the switching elements for switching on and switching off the liquid supply to the spray nozzles 10, 11, 12 may be controlled and actuated via the control device such that in different partial regions 15, 16, 17 of the distribution boom 4, which may correspond to the partial widths, different spray nozzles 10, 11, 12 are switched on, and namely such that in the case of a plurality of spray nozzles 10, 11, 12 arranged on one of the two outermost partial widths 15 of the distribution boom 4, it is possible to switch on only the spray nozzles 10 for producing a droplet spectrum, namely a coarse droplet spectrum 18, with less drift than in the remaining region of the distribution boom 4, in which the spray nozzles 11 producing a fine droplet spectrum are switched on, as Fig. 1 shows.

However, as Fig. 1 also shows, it is also possible that similar spray nozzles 11 for producing a fine droplet spectrum 19 are switched on over the entire width of the distribution boom 4.

The switching-over of spray nozzles 11 which produce a fine droplet spectrum 19 according to Fig. 3 to spray nozzles 10 which produce a coarse droplet spectrum 18 according to Fig. is carried out by the valve device of the respective multi-nozzle body 9 to be actuated by switching elements.

In this case, the control device which is configured as an on-board computer is designed such that the outermost partial region 15, in which only the spray nozzles 10 for producing a droplet spectrum 18 with less drift than in the remaining region of the distribution boom 4 are switched on, has at least a width of 5 m, preferably 10 m, as shown in Figs. 1 and 4. In this case, according to the

design of the control device and the control of the valve arrangement of the multi-nozzle bodies 9 the number of spray nozzles 10 producing a coarse droplet spectrum 18, and thus the width of this coarse droplet spray strip, may be varied and adapted corresponding to the agent to be dispensed and in accordance with the official regulations. In this case, the strip 20 of the field which is not allowed to be treated, between the field edge boundary 21 and the strips on which the agent to be discharged with the coarse droplet spectrum 18 is to be dispensed, may vary in width, for example between 0 and 10 m. Thus trenches 22, paths or adjacent fields, which adjoin the field boundary 21 of the field to be treated, are not treated and/or no spraying agent is dispensed in these regions.

Thus the control device has a circuit arrangement for the switching elements of the valve arrangement for switching on and switching off the liquid supply to the spray nozzles 10, 11, 12 for spraying agricultural areas in the edge region thereof, such that different spray nozzles 10, 11, 12 are able to be switched on in different partial regions 15, 16, 17 of the distribution boom 4, and namely such that a plurality of spray nozzles 10 which are arranged on at least one of the two outermost partial regions 15 of the distribution boom 4, for producing a droplet spectrum 18 with less drift than in the remaining region of the distribution boom 4, are switched on when the liquid is dispensed by the field spraying device in the edge region of the agricultural area, as is shown in Figs. 1 and 4.

A droplet spectrum 18 with less drift is characterized in that the liquid droplets in the spray fan are relatively coarse droplets.

PATENTKRAV

1. Landbrugs-marksprøjte (1) til udbringning af væsker, med en fordelerbom (4) med mindst en væsketilførselsledning, som strækker sig på tværs i forhold til køreretningen og med indbyrdes afstand er udstyret med tilslutningsstudser (8) og dertil tilsluttede multidysehoveder (9) med dertil tilsluttede, forskelligartede sprøjtedyser (10, 11, 12), hvorved der i de respektive multidysehoveders (9) huse (13) er arrangeret en ventilanordning med fjernbetjenbare koblingselementer, som via tilslutninger (14) og dertil tilsluttede dataledninger er forbundet med en on-board computer med henblik på via denne ventilanordning at tilkoble eller frakoble væsketilførslen til de respektive sprøjtedyser (10, 11, 12), og hvorved on-board computeren omfatter en koblingsanordning for koblingselementerne med henblik på til- og frakobling af væsketilførslen til sprøjtedyserne (10, 11, 12) på den måde, at der i forskellige delområder (15, 16, 17) af fordelerbommen (4) er tilkoblet forskellige sprøjtedyser (10, 11, 12), og nærmere betegnet således, at der ud af en flerhed af sprøjtedyser (10, 11, 12), som er arrangeret på mindst eet af de to yderste delområder (15) af fordelerbommen (4), kun sprøjtedyser (10) til frembringelse af et smådråbespektrum (18) med mindre drift end i det øvrige område (16, 17) af fordelerbommen (4) er tilkoblet.

2. Landbrugs-marksprøjte ifølge krav 1, **kendetegnet ved, at** det yderste delområde (15), i hvilket kun sprøjtedyserne (10) til frembringelse af et smådråbespektrum (18) med mindre drift end i det øvrige område af fordelerbommen (4) er tilkoblet, omfatter en bredde, som mindst er 5 m, fortrinsvis 10 m.

3. Fremgangsmåde til anvendelse af en landbrugs-marksprøjte (1) til udbringning af væsker til besprøjtning af landbrugsarealer i deres randområde, med en fordelerbom (4) med mindst en væsketilførselsledning, som strækker sig på tværs i forhold til køreretningen og med indbyrdes afstand er udstyret med tilslutningsstudser (8) og dertil tilsluttede multidysehoveder (9) med dertil tilsluttede, forskelligartede sprøjtedyser (10, 11, 12), hvorved der i de respektive multidysehoveders (9) huse (13) er arrangeret en ventilanordning med fjern-

betjenbare koblingselementer, som via tilslutninger (14) og dertil tilsluttede dataledninger er forbundet med en on-board computer, og der via denne ventilanordning sker tilkobling eller frakobling af væsketilførslen til de respektive sprøjtedyser (10, 11, 12), og hvorved on-board computeren omfatter en koblingsanordning for koblingselementerne med henblik på til- og frakobling af væsketilførslen til sprøjtedyserne (10, 11, 12) til besprøjtning af landbrugsarealer i deres randområde, og der i forskellige delområder (15, 16, 17) af fordelerbommen (4) er tilkoblet forskellige sprøjtedyser (10, 11, 12), og nærmere betegnet således, at af en flerhed af sprøjtedyser (10, 11, 12), som er arrangeret på mindst eet af de to yderste delområder (15) af fordelerbommen (4), kun sprøjtedyser (10) til frembringelse af et smådråbe-spektrum (18) med mindre drift end i det øvrige område (16, 17) af fordelerbommen (4) er tilkoblet, når væsken med marksprøjten (1) udbringes i landbrugsarealets randområde.

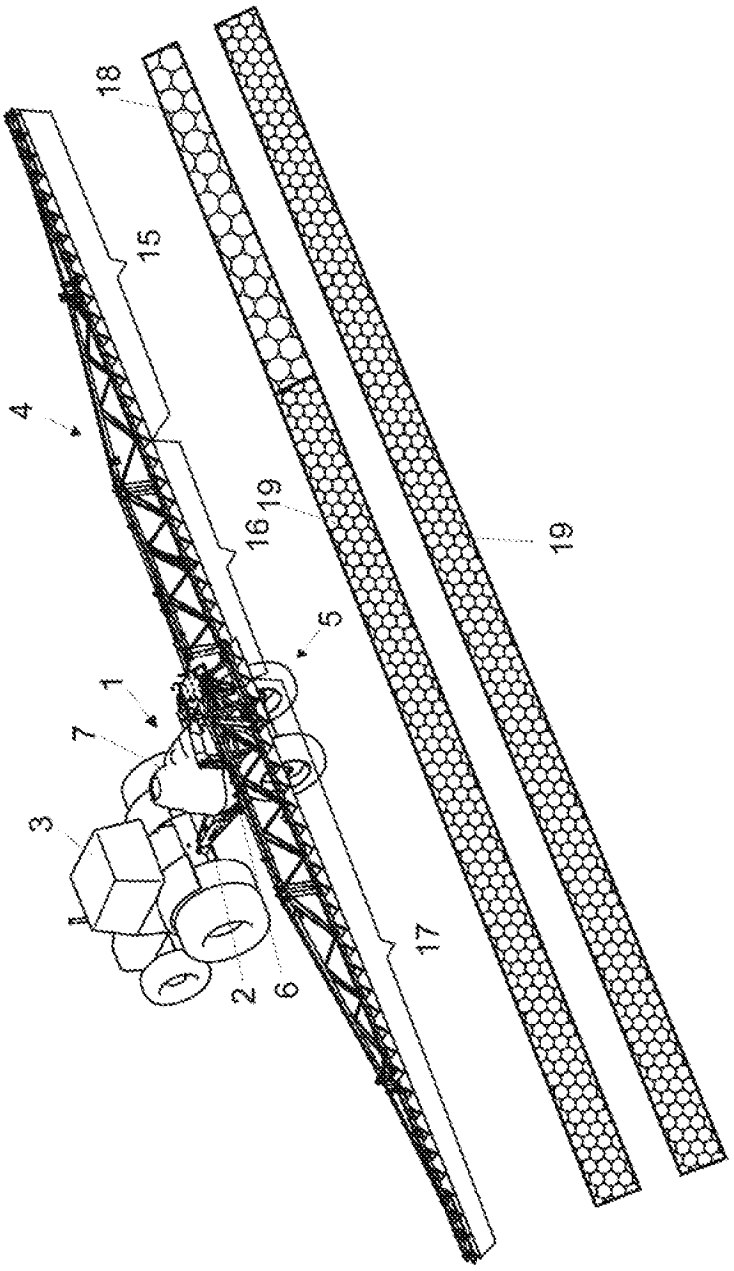

Fig. 1

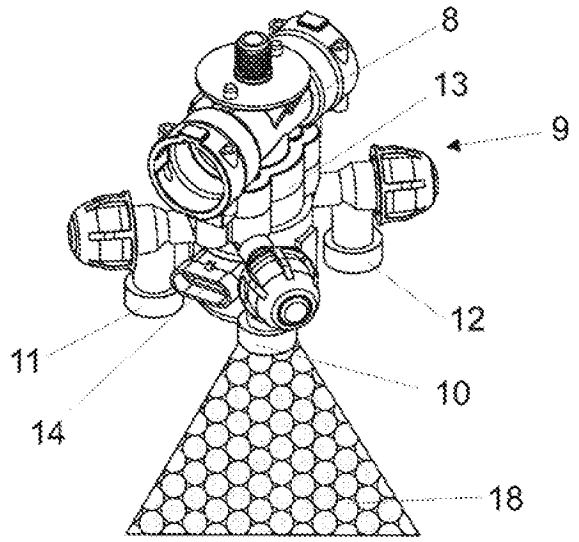

Fig. 2

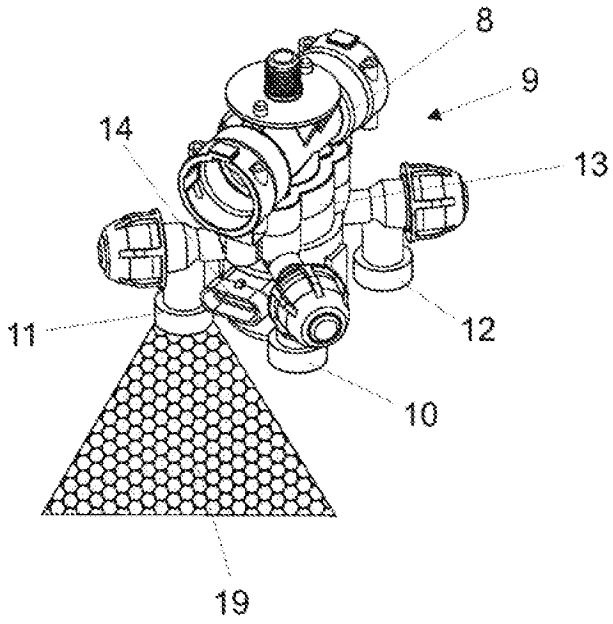

Fig. 3

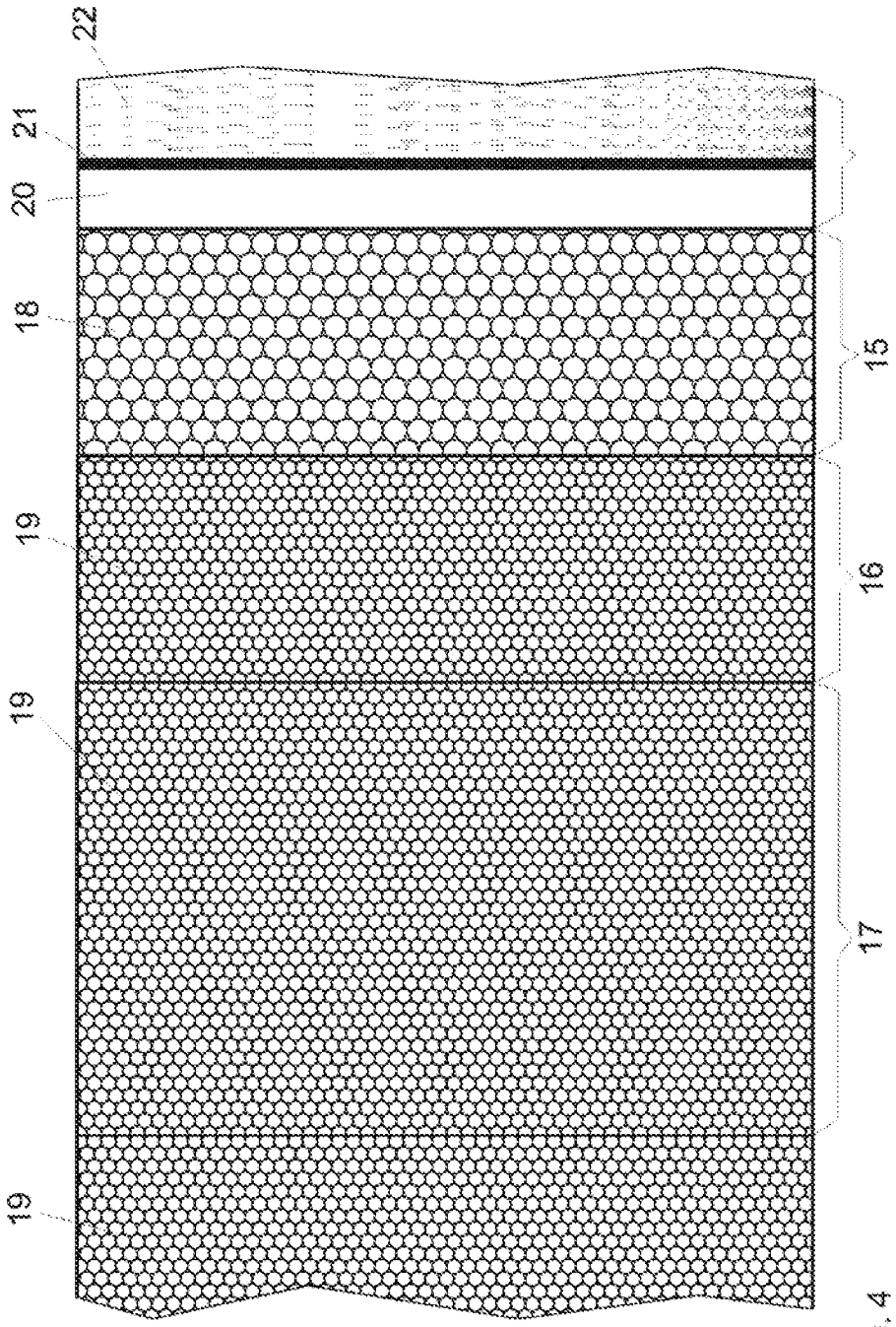

Fig. 4