

PATENT SPECIFICATION

(11) 1 282 002

DRAWINGS ATTACHED

- (21) Application No. 15634/69 (22) Filed 25 March 1969
 (23) Complete Specification filed 25 March 1970
 (45) Complete Specification published 19 July 1972
 (51) International Classification B05C 1/00
 (52) Index at acceptance A4K 15
 (72) Inventor JOHN HOLROYD



(54) IMPROVEMENTS IN OR RELATING TO THE APPLICATION OF LIQUIDS IN AGRICULTURE

(71) We, NATIONAL RESEARCH DEVELOPMENT CORPORATION, a British Corporation established by Statute, of Kingsgate House, 66—74 Victoria Street, London, S.W.1, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manual application of liquids over a surface and, more particularly to the application of liquids in those agricultural contexts where avoidance of contamination of the surrounding area is desirable, for example in the localised application of herbicides.

The application of a liquid over a surface with the avoidance of any substantial contamination of the surrounding area by the liquid is a technique applicable for a variety of agricultural purposes. It is, for example, of value in the removal of weeds interspersed among a crop or among plants in a garden. Although the weeds can be removed by uprooting or by the application of a selective herbicide over the whole area, the former method is time-consuming and difficult since the whole of the weeds should be removed, and the latter is apt to prove expensive, both as a result of the equipment required and frequently also because of the cost of a suitable selective herbicide. The localised application of a herbicide to the weeds has the advantage that less herbicide is required since it is applied only where required, and that a non-selective herbicide may be used if the application is effectively localised.

Despite the advantages conferred by the localised application of herbicide, the methods so far developed for this purpose are far from satisfactory and the method has, therefore, been widely employed in the cultivation of crops. Thus, it has been proposed to apply herbicide to garden weeds by means of a glove having absorbent gripping surfaces which are dipped into and thus charged with a liquid

preparation of the herbicide, but this device is inconvenient for use over extensive areas and is also difficult to use without spillage of the herbicide.

According to the present invention apparatus for use in agriculture for the manual application of a liquid over a surface substantially without spillage thereof comprises a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, a portable reservoir for the liquid which does not form an integral part of the glove, and means for connecting the glove and reservoir to supply the liquid from the reservoir to the absorbent material of the glove in a controlled fashion thereby avoiding an excess of liquid in the absorbent material and dripping of the liquid from the glove, the liquid being supplied to beneath the outer surface of the absorbent material and said material being such that the liquid is expressible therethrough on to its outer surface through pressure exerted by the hand of the user within the glove.

It will be appreciated that the term glove is used herein in the broad sense of a covering for the hand, and that the front of the glove is that side containing the palm.

The use of apparatus of the type described above for the application of a herbicide over extensive areas provides a considerable saving in time as compared with previous methods, as well as minimising spillage of the herbicide. In order to avoid the build up of an excessive quantity of liquid in the absorbent material of the glove, which can lead to dripping of liquid from the glove, the liquid is fed to the glove in a controlled manner, and this control is preferably actuated by the user of the glove through appropriate actuating means.

The present invention thus also comprises a device for use in the apparatus described above comprising a glove having absorbent material on at least a part of the outer surface

of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, the absorbent material being such that the liquid is expressible therethrough on to its outer surface by pressure exerted by the hand of the user within the glove, and passage means for supplying the liquid from the reservoir to the absorbent material of the glove beneath the outer surface thereof, said device having means operable by the user of the glove for actuating control of the flow of liquid from the reservoir to the absorbent material whereby the flow can be stopped to avoid an excess of liquid in the absorbent material and dripping of the liquid from the glove.

One convenient form of the actuating means is provided by a chamber located at the front of the glove beneath the absorbent material, liquid being supplied to the chamber from the passage means, and being discharged from the chamber into the absorbent material in controlled quantities by a positive operation, for example by manual pressure. The chamber may be constructed individually or may, if desired, be formed integrally with an under-glove. The chamber may be resiliently compressible, the resilience being achieved either by the use of a piece of resilient absorbent material inside the chamber or, more conveniently, by construction of the chamber itself of a resilient material, and it is particularly convenient for the chamber to be charged and discharged respectively by the action of opening and closing the hand. Although the operator can control the amount of liquid discharged from the chamber, it is possible by constructing the chamber with a liquid capacity not greater than that of the absorbent material to automatically avoid the build up of an excess of liquid in the material. Whilst the chamber may be located either in the finger portion or the palm of the glove it is most conveniently located in the palm, for example in that area between the thumb and forefinger. It is of course possible, if desired, to use more than one chamber.

Conveniently, the flow of liquid from the reservoir through the passage means to the chamber may be controlled by a pressure operated non-return valve which closes when pressure is exerted on it due to compression of the chamber and opens when this pressure is released. This valve may be incorporated either in the glove itself, for example at the entrance to the chamber, or more conveniently at some point in the passage means, for example adjacent to its connection with the glove. Transfer of the liquid from the chamber to the absorbent material may be arranged in various ways, for example the chamber may be provided with a slit or slits in its wall adjacent to the absorbent material, which are of a size such that they remain closed when the chamber

retains its normal shape but open on compression of the chamber.

A feature of the glove is that the liquid from the reservoir is not supplied directly to the outer surface of the absorbent material but is instead expressed through the material onto its outer surface from a point beneath this surface. Although the passage means may, if desired, terminate within the interior of the absorbent material of the glove, the liquid is preferably supplied to the innermost surface of the absorbent material. The absorbent material may be of various types, but is preferably a cellular material, for example expanded polyurethane, so that the liquid is expressed on to the outer surface of the material in the form of a foam. (If desired, the production of a foam can be encouraged by the inclusion of a foam-inducing agent in the liquid.)

It is almost invariably the case, by virtue of the requirement for localisation of the application of the liquid, that contact of the liquid with the skin of the hand is undesirable. The absorbent material of the glove is thus separated from contact with the hand by a material impermeable to the liquid which is to be applied by the glove. Conveniently, therefore, the glove may comprise a complete under-glove of liquid impervious material, for example of rubber or plastics material, at least part of the front of which is covered with absorbent material. Most usually the absorbent material is fixedly attached to the under-glove.

In order to reduce wear on the absorbent surface, the glove, which may have the form of a mitt or may accommodate one or more fingers separately, may be used in combination with a covering having a resistance to frictional wear. Passage of the liquid from the absorbent material through the covering must of course be possible, and this may be achieved by the use of a porous material or of a non-continuous material for the covering. Thus a further glove, for example of cotton, or a piece of netting, for example of a plastics material such as nylon, may be used for this purpose. Conveniently this cover, designed to take much of the wear on the glove, may be detachable from the rest of the glove so that it may be replaced as necessary.

Various forms of passage means may be used for supplying the liquid to the glove, one convenient simple form being provided by a length of tubing. It will be appreciated that although more conveniently incorporated in the glove, the means for actuating control of the flow of liquid may alternatively be incorporated in the passage means. Similarly, the control means itself may be located in the glove, or in the passage means, or in both the glove and the passage means.

The portable reservoir may take various forms provided that it does not form an in-

tegral part of the glove, i.e. the glove and reservoir are not constructed together as a whole. One particularly convenient arrangement comprises a reservoir mounted on the back of the operator connected by passage means to a glove or a pair of gloves. Besides providing a convenient method of transport, mounting the reservoir on the operator's back has the added advantage that it provides a gravity feed to the glove, aided when a compressible chamber is used by slight suction from the chamber. If desired, however, the feed may be achieved or aided by some other form or forced feed.

It will be appreciated that the present invention further includes a method for the application of a liquid to a plant substantially without spillage thereof which comprises applying the liquid to the surface of the plant by wiping with a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, and which is connected with a portable reservoir for the liquid which does not form an integral part of the glove, the flow of liquid from the reservoir being supplied to the absorbent material beneath the outer surface thereof and the liquid being expressed through the absorbent material on to its outer surface by pressure of the hand of the user within the glove, said flow being controlled to avoid an excess of liquid in the absorbent material and consequent dripping of the liquid from the glove.

An effective degree of localisation can be achieved in the application of herbicides by the present invention, thus permitting a wide choice among available herbicides. Various formulations may be used, and although these are often of an aqueous nature, solutions or emulsions in organic solvents may also be employed. The formulations may include additives such as wetting agents, surface activators, foam-inducing agents, and other materials including, for example, dyes so that those weeds which have been treated are easily recognised.

The invention may be employed in the localised treatment of a variety of weeds, including lalang grass among rubber and oil palms; poisonous weeds, for example ragwort, thistles and nettles, amongst grassland; perennial weeds in perennial crops, for example bindweed among vines; and shrubs and saplings. It may be used with particular advantage in the case of any crops from which weeds are at present removed by hand, for example for the treatment of wild and red rice among cultivated rice, especially where the weeds project above the main crop and are thus readily visible.

Particular success has been met with in the treatment of wild oats (*Avena fatua* and *Avena ludoviciana*), especially among temperate

cereal crops such as wheat and barley, but also among other crops such as sugar beet and potatoes (the present methods for the removal of the wild oats, which is of some importance, not being totally satisfactory). With a glove employing a resiliently compressible chamber in conjunction with a pressure operated non-return valve, the successive opening and closing of the hand as it is placed around each wild oat plant will automatically charge and discharge the chamber, and it is thus possible to achieve a rapid rate of operation even when the whole plant is treated including the tillers. Although the speed of operation is affected by the density of the wild oats, an average rate of treatment is 1000 panicles per hour as compared with 500 panicles per hour for hand pulling, and some operators are able to achieve rates of 2000—3000 panicles per hour, sufficient herbicide being contained in a conveniently sized reservoir mounted on the back of the operator to treat this number of plants without recharging.

A variety of herbicides may be used for the treatment of the wild oats and there is no need to use only selective herbicides. Various types of herbicide may be used, i.e. those which (1) achieve complete sterility, (2) allow grain formation but not germination, (3) allow germination but prevent growth and (4) allow growth to the leaf stage but prevent further growth, and the results given in the Example reflect the various types used. The following herbicides have been found to be particularly suitable:

1,1 - dimethyl - 4,4 - bipyridylum dichloride
N - (1,1 - dimethylpropynyl) - 3,5 - dichlorobenzamide
propionic acid
Sodium 2,2 - dichloropropionate
sodium dimethylarsinate
S - 2,3,3 - trichloroallyl - N,N - di - isopropyl - thiocarbamate

Although particular mention has been made of the localised application of non-selective herbicides to weeds interspersed among crops, it will be appreciated that the invention is equally applicable to the treatment of weeds in gardens. Indeed, the apparatus of the present invention is of use in agriculture in the widest sense of this term. Thus it has a wide use both with herbicides, for example for the treatment of parasitic weeds on the roots of crops such as striga on maize and for the treatment of weeds such as mistletoe on trees, and also with other liquids, for example for the application of insecticides to crops and of compositions to the stumps of branches and trees. Furthermore, the device may be used in various veterinary applications.

The invention is illustrated by the accompanying drawing and example.

In the Figure, which is diagrammatic in nature and not to scale, the device comprises a rubber under-glove 1 to which is attached an over-glove 2 of $\frac{1}{8}$ " thick expanded polyurethane which covers the surface of the under-glove 1 with the exception of the tips of the fingers and the thumb and the wrist portion thereof. Between the over-glove 2 and the under-glove 1, located on the palm of the under-glove 1 between the thumb and forefinger thereof, is a rubber bulb 3 with a liquid capacity no greater than that of the over-glove 2. The bulb 3 is provided with a slit 4 and is detachably connected through an opening 5 with a tube 6 of plastics material which incorporates a non-return valve 7. (The connection of the glove with the tube 6 may in an alternative embodiment be of a permanent nature.)

10 In operation, the tube 6 is connected to a reservoir (not shown) containing the liquid which is to be applied by the glove. When the hand is open, as shown in the Figure, liquid flows from the reservoir through the tube 6, past the open valve 7, and into the bulb 3. Since the slit 4 is closed, however, the liquid does not pass out of the bulb 3. On compressing the bulb 3 with the forefinger or thumb the slit 4 is opened and the valve 7 is closed. Liquid then passes from the bulb 3 through the slit 4 into the over-glove 2 appearing eventually as a foam on the surface of the front of the overglove 2. The hand is then opened, the opening of the hand closing the slit 4, opening the valve 7 and thus recharging the bulb 3. The liquid may be applied from the surface of the over-glove 2 with the hand either clenched or open depending on the type of surface to be treated.

EXAMPLE

Roguing of Wild Oats

1. Wild Oats interspersed among a cereal crop are treated by hand with various herbicidal compositions using a glove similar to that shown in the Figure. The treatment is carried out when the upper seeds of the wild oat panicles are at the early milk stage. The seeds are subsequently harvested at the usual time, the husks are removed, and the grains, if present, are incubated under optimum conditions for germination. In the case of those grains which germinate, the seedlings are planted out and cultivated under optimum conditions for growth. Results typical of those obtained are shown in Table 1.

2. Wild Oats interspersed among a cereal crop are treated as above by a variety of operators new to the method with a herbicidal composition containing 10% w/v sodium 2,2 - dichloropropionate in water together with 0.2% w/v Agral 90 wetting agent (Agral is a Registered Trade Mark), and 1% w/v of the red water soluble dye HD Monolite Fast Scarlet RNS paste (Monolite is a Registered Trade Mark). At the same time some wild oats among the crop are left untreated as control plants. The procedure of Example 1 is followed with both treated and control plants. Results typical of those obtained are shown in Table 2. It will be seen from Table 2 that typically, whereas the control samples produce normal plants from all those seeds which germinate (75%), only 2 plants are produced from the 900 seeds obtained from treated samples.

TABLE 1

Herbicide	Concentration of Composition	Number of seeds	Number of grains after dehusking	% Germination based on grains	% Germination based on seeds
3-amino-1,2,4-triazole	1%	266	139	6*	3*
1,2-dihydropyridazine-3,6-dione	10%	107	16	0	0
1,1'-dimethyl-4',4'-bipyridylum dichloride	10%	136	97	0	0
1,1'-ethylene-2,2'-bipyridylum dibromide	1%	122	75	3	2
iso-octyl 2,4-dichlorophenoxy acetate	10%	147	7	0	0
	10%	134	60	25	11
	50%	57	6	0	0
methyl 2-chloro-9-hydroxyfluorene-9-carboxylate	10%	64	21	43*	14*
2-(α -naphthoxy)-N,N-dimethylpropionamide	10%	73	21	0	0
sodium chlorate	10%	131	28	36	7
sodium 2,2-dichloropropionate	10%	82	71	52*	48*
sodium dimethylarsenate	1%	161	21	0	0
2-S,3,3-trichlorallyl N,N-di-isopropylthiocarbamate	10%	77	37	6*	3*

*With these herbicides, although some germination occurred, the normal subsequent further development did not occur.

TABLE 2

%Germination of control samples based on seeds ⁽¹⁾	Stage of growth when treated	Treated Samples		
		Number of grains per 100 seeds after dehusking	Number of grains per 100 seeds germinating	Number of grains per 100 seeds which produce viable plants
100	early milk	68	0	0
90	early milk	61	0	0
70	early milk	47	0	0
60	early milk	33	1	1
100	late milk	13	0	0
100	late milk	67	3	0
80	late milk	79	15	1
70	late milk	65	4	0
60	hard cheese	80	3	0

⁽¹⁾ The control samples produced normal plants from all the grains which germinated.

WHAT WE CLAIM IS:—

1. Apparatus for use in agriculture for the manual application of a liquid over a surface substantially without spillage thereof comprising a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, a portable reservoir for the liquid which does not form an integral part of the glove, and means for connecting the glove and reservoir to supply the liquid from the reservoir to the absorbent material of the glove in a controlled fashion thereby avoiding an excess of liquid in the absorbent material and dripping of the liquid from the glove, the liquid being supplied to beneath the outer surface of the absorbent material and said material being such that the liquid is expressible therethrough on to its outer surface by pressure exerted by the hand of the user within the glove.
2. Apparatus according to claim 1, having means for controlling the flow of liquid from the reservoir to the absorbent material such that the flow may be stopped.
3. Apparatus according to claim 2, having means operable by the user of the glove for actuating control of the flow of liquid whereby transfer of the liquid to the absorbent material

20

25

30

TABLE 2

%Germination of control samples based on seeds ⁽¹⁾	Stage of growth when treated	Treated Samples		
		Number of grains per 100 seeds after dehiscing	Number of grains per 100 seeds germinating	Number of grains per 100 seeds which produce viable plants
100	early milk	68	0	0
90	early milk	61	0	0
70	early milk	47	0	0
60	early milk	33	1	1
100	late milk	13	0	0
100	late milk	67	3	0
80	late milk	79	15	1
70	late milk	65	4	0
60	hard cheese	80	3	0

⁽¹⁾ The control samples produced normal plants from all the grains which germinated.

WHAT WE CLAIM IS:—

1. Apparatus for use in agriculture for the manual application of a liquid over a surface substantially without spillage thereof comprising a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, a portable reservoir for the liquid which does not form an integral part of the glove, and means for connecting the glove and reservoir to supply the liquid from the reservoir to the absorbent material of the glove in a controlled fashion thereby avoiding an excess of liquid in the

absorbent material and dripping of the liquid from the glove, the liquid being supplied to beneath the outer surface of the absorbent material and said material being such that the liquid is expressible therethrough on to its outer surface by pressure exerted by the hand of the user within the glove.

2. Apparatus according to claim 1, having means for controlling the flow of liquid from the reservoir to the absorbent material such that the flow may be stopped.

3. Apparatus according to claim 2, having means operable by the user of the glove for actuating control of the flow of liquid whereby transfer of the liquid to the absorbent material



* C T M S *



occurs in discrete portions, the size of the portions being within the capacity of the material through which the liquid can be expressed by pressure exerted by the hand of the user within the glove.

5 4. A device for use in the apparatus of claim 1, comprising a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, the absorbent material being such that the liquid is expressible therethrough on to its outer surface by pressure exerted by the hand of the user within the glove, and passage means for supplying the liquid from the reservoir to the absorbent material of the glove beneath the outer surface thereof, said device having means operable by the user of the glove for actuating control of the flow of liquid from the reservoir to the absorbent material whereby the flow can be stopped to avoid an excess of liquid in the absorbent material and dripping of the liquid from the glove.

25 5. A device according to claim 4, wherein the actuating means is operable to effect transfer of the liquid to the absorbent material in discrete portions, the size of the portions being within the capacity of the material through which the liquid can be expressed by pressure exerted by the hand of the user within the glove.

30 6. A device according to claim 4 or 5, wherein the actuating means is located at the glove in a position such as to be operable by pressure exerted by the hand of the user within the glove.

35 7. A device according to claim 6, wherein continuous operation of the actuating means by the user of the glove is necessary for continuation of the flow of liquid to the absorbent material.

40 8. A device according to any of claims 4 to 7, wherein the actuating means comprises a chamber to which the liquid is supplied through the passage means and from which the liquid is discharged into the absorbent material.

45 9. A device according to claim 8, wherein the chamber is resiliently compressible and is located so that charging and discharging thereof, respectively, can be effected on expansion and compression of the chamber by the hand of the user within the glove.

50 10. A device according to claim 9, wherein the chamber is located in the palm of the glove beneath the absorbent surface and has a liquid capacity no greater than that of the absorbent material through which liquid can be expressed by pressure exerted by the hand of the user within the glove.

55 11. A device according to claim 8, 9 or 10, wherein the flow of the liquid to the chamber is controlled by a first pressure responsive

means and the flow of liquid from the chamber to the absorbent material is controlled by a second pressure responsive means, the first means opening on expansion of the chamber and closing on compression of the chamber and the second means opening on compression of the chamber and closing on expansion of the chamber.

12. A device according to any of claims 4 to 11, wherein the flow of liquid through the passage means to the absorbent material of the glove is controlled by a pressure operated non-return valve.

13. A device according to any of claims 4 to 12, wherein the liquid is supplied to the innermost surface of the absorbent material.

14. A device according to any of claims 4 to 13, wherein the absorbent material is of a cellular nature so that the liquid is expressible on to the outer surface of the material as a foam.

15. A device according to any of claims 4 to 14, comprising an under-glove of liquid impervious material fully covering the hand.

16. A device according to any of claims 4 to 15 wherein the glove is formed with a thumb.

17. A device according to claim 16, wherein the glove has the form of a mitt.

18. A device according to any of claims 4 to 17, wherein the absorbent material covers at least the palm of the glove.

19. A device according to any of claims 4 to 18, wherein the passage means comprises a length of tubing.

20. Apparatus according to claim 1, 2, or 3, having passage means for connecting the glove and reservoir.

21. Apparatus according to claim 2, including a device according to any of claims 4 to 18.

22. Apparatus according to claim 20 or 21, wherein the passage means comprise a length of tubing.

23. Apparatus according to any of claims 1 to 3 or 20 to 22 for manually applying herbicide to weeds, wherein the reservoir contains herbicide.

24. A method for the application of a liquid to a plant substantially without spillage thereof which comprises applying the liquid to the surface of the plant by wiping with a glove having absorbent material on at least a part of the outer surface of the front thereof and liquid impervious material for separating the absorbent material from the hand of the user within the glove, and which is connected with a portable reservoir for the liquid which does not form an integral part of the glove, the flow of liquid from the reservoir being supplied to the absorbent material beneath the outer surface thereof and the liquid being expressed through the absorbent material on to its outer surface by pressure of the hand of the user within the glove, said flow being

70

75

80

85

90

95

100

105

110

115

120

125

130

controlled to avoid an excess of liquid in the absorbent material and consequent dripping of the liquid from the glove.

25. A method according to claim 24, which comprises using apparatus according to any of claims 1 to 3 and 20 to 22.

26. A method according to claim 24 or 25, which comprises transferring a herbicide to weeds.

27. A method according to claim 26, wherein the weeds are wild oats.

28. A device for use in agriculture for the manual application of a liquid over a surface substantially without spillage thereof constructed and arranged substantially as herein described with reference to, and as illustrated in, the accompanying drawing.

R. S. CRESPI,
Chartered Patent Agent,
Agent for the Applicant.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1972.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *