



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: METHOD OF IMPROVING THE WHIPPING PROPERTIES OF CREAM (57) Abstract Method of improving the whipping properties of cream by addition of a fraction of buttermilk to the cream. A concentrate is produced by ultrafiltration of buttermilk, which concentrate is made acid to a pH lower than 4.0, preferably 3.8. This concentrate is mixed with cream with desired fat content in an amount of 5-15 % of concentrate counted on the amount of cream. The obtained mixture is neutralized and thereafter treated in a desired manner.		

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Method of improving the whipping properties of cream.

The present invention relates to a method of improving the whipping properties of cream by adding a fraction of buttermilk to the cream.

Two processes run in parallel when cream is whipped. The first one consists of beating air into the cream with a gradual atomizing of the air into smaller and smaller bubbles. The second one is that fat globules in the cream stick together to form aggregates with increasing size.

During the whipping a two phase system is formed, in which air is the disperse phase and cream the continuous phase. In the continuous phase the fat globules are packed such that they form a supporting skeleton. If the supporting skeleton shall form there is needed

- a. that the fat is crystallized
- b. that aggregate forming agents are available.

The skeleton must be rigid and kept together of aggregate forming substances. These substances are found in the membranes of the fat globules. The membranes consist of two different types of lipoprotein complex with different solubility in water. The inner layer of the membranes consists of the lipides which have the least polar properties. The outer layer consists of phospholipides with hydrophile groups to which further proteins are bound. These aggregates of phospholipides and proteins are key components in order to obtain a sufficient aggregate state of the fat globules.

The possibility to whip cream diminishes at a lower fat content. In order to obtain a stable foam a fat content of 35 - 40 % fat is needed. At a lower fat content there is not a sufficient amount of

the aggregate forming substances mentioned above. If one wants to produce cream which may be whipped with a lower fat content, aggregate forming substances, for example monoglycerides, must be added. Such substances may however change the taste of the cream.

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One has earlier tried to obtain naturally occurring aggregate forming components from milk, which components have been mixed with cream with a low fat content. Such a procedure is described in the Norwegian patent publication 118 019. According to the patent publication cream with a fat content over 30 percent by weight is mixed with buttermilk in such a relation that a cream with a fat content of 17 - 28 % is obtained. According to the patent publication it is possible to whip this cream. A mixture with a corresponding amount of skimmilk gives a cream, which is impossible to whip. The reason for this should be that while skimmilk has a content of phospholipides of 0,01 - 0,02 %, buttermilk with the same fat content contains 10 times more phospholipides.

In the Swedish patent publication 391 633 there is described another way of obtaining a cream, which is whippable with a low fat content. In this case one starts with cream having a fat content of at least 30 percent by weight from which there is separated a fat rich fraction with a fat content of over 90 percent by weight. The fraction rich in fat is separated in such a degree that the remaining water containing fraction consists of a cream, which is whippable. Separation takes place in a homogenizer. According to the patent publication the fact that the cream is whippable depends on a complex compound of phospholipides and proteins, which complex easily breaks down. When carrying through a total phase change and separation of clean butteroil the complex compound will still be left in the water containing fraction.

The Swedish patent publication 362 343 describes another method of producing whippable cream. According to this method a fraction containing membrane substance is added to cream, which fraction

has been obtained by melting butter, which has then been centrifuged. Cream with a fat content of at least 30 percent by weight is mixed with the obtained fraction containing membrane substance, which has a low fat content to yield a mixture with a fat content of 20 - 25 percent by weight of the mixture. Butter oil is obtained as a by-product.

The patents which have been mentioned above were applied for in the middle and end of the sixties, but the methods, which have been described have not been used industrially. With the described method, problems have arisen to obtain a whippable cream with a stable foam. No whippable cream with a low fat content is found on the market today, where the whipping properties have been increased by means of a buttermilk fraction.

In a report 242 Account from Statens Forsogsmejeri, Hillerod, Denmark "The emulsion stability of whipping cream" the alleged positive effect of an addition of sweet buttermilk on the whipping properties of the cream is questioned, since no amendment of the whipping properties of the cream have been obtained by adding a concentrate of buttermilk obtained by ultrafiltration.

According to the invention a method has been found to obtain a concentrate from buttermilk, which mixed with cream surprisingly gives a stable foam. According to the proposed method buttermilk is concentrated by ultrafiltration. The obtained concentrate is made acid to a pH lower than 4.0, preferably 3.8. The obtained acid concentrate is mixed with cream with desired fat content. The amount of buttermilk concentrate consists of 5 - 15 % of the amount of cream. The mixture is neutralized and the cream is treated further in the desired manner. An addition of the acid concentrate amends the whipping properties of the cream, while concentrate, which has not been made acid, has no effect at all.

The ultrafiltration is preferably carried through after heating the buttermilk to a temperature within the interval 40 - 75°C, preferably around 50°C. The starting material is sweet buttermilk or neutralized acid buttermilk. Reconstituted buttermilk made from buttermilk powder may also be used. The buttermilk is concentrated by ultrafiltration in a relation 1:4. The obtained buttermilk concentrate is preferably made acid with lactic acid, which means that only naturally occurring milk substances are used for the acidification. Of course, it is possible to use any acid, which is allowed as a food additive. The fat content of the cream is standardized by mixing the cream with skimmilk or lightmilk. The ultrafiltrate which has been adjusted to its pH is added in an amount of 5-15 % counted on the cream, which is thereafter neutralized to pH 6.5 with diluted NaOH. The cream, which has been produced in the manner described above, the whipping properties of which have been amended, may thereafter be pasteurized and sterilized.

In the usual case one starts with cream with a fat content of 40 % which is given the desired fat content by mixing with milk, but of course it is also possible to produce cream with the desired fat content directly. The method according to the invention may with advantage be used to produce whippable cream with as low a fat content as 22 - 26 %.

The mechanisms which lie behind the invention are described further below. During the ultrafiltration the buttermilk is concentrated.

<u>Analysis</u>	<u>Buttermilk</u>	<u>Concentrate</u>	<u>Permeate</u>
Dry substance	8,5	18,0	4,5
Phospholipide %	0,10	0,44	0,00

According to the analysis all phospholipide is obtained in the concentrate.

If UF-concentrated buttermilk is added to cream there is obtained no amendment of the whippability, which may be seen in the table.

Table

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Whipping of cream with a fat content of 22,5 % after addition of different amounts of concentrate. Whipping temperature +5°C.

10	Sample No	Added amount of concentrate (%)	Hardness	Whipping time (sec)	Increase in volume (%)	Separation of serum (ml)
15	1	0	10	385	102	23
	2	3	10	373	98	22
	3	6	8	388	92	23
	4	9	6	380	90	23

20 An addition of buttermilk concentrate results in an impairment of the properties of the cream at this low fat content. This negative result probably depends on the fact that the active complex between phospholipide and proteins is dissolved.

25 According to the present invention a method has been found to reform the complex in the UF-concentrated buttermilk by making the concentrate acid before it is added to the cream. The positive effect is retained also after the following neutralization of the cream.

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The invention is described further with reference to the attached drawings, where Fig 1 shows a flowchart over the production of light cream, which is whippable according to the invention and Figs-2 and 3 show diagrams over experiments with whipping according to Funke with or without addition of UF-concentrate.

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In Fig 1 there is shown the steps, which are needed for the production of cream. Sweet or neutralized buttermilk is thus heated to 50°C and is ultrafiltrated in a relation 1:4. The obtained concentrate is made acid with lactic acid to a pH lower than 4.0.

5 Cream is standardized with skimmilk and is then mixed with concentrate to the desired fat content. The amount of concentrate is 5-15 % of the cream. The mixture is thereafter neutralized with NaOH to pH 6.5. The cream is pasteurized, cooled, let to ripen and is packed. The whipping cream according to the invention retains its

10 good whipping qualities in spite of pasteurizing or sterilizing.

In Fig 2 there is shown a diagram over the whipping time of cream samples with different fat contents, one graph with cream samples containing 5 % buttermilk concentrate according to the invention

15 and one with cream samples without this addition. As may be seen from the diagram the whipping time is lowered in a considerable degree by addition of acid concentrate, at which the difference is the greatest at low fat contents.

20 In Fig 3 there is shown a diagram over the hardness of the foam according to Funke for cream samples containing 5 % buttermilk concentrate according to the invention and for cream samples without this addition. As may be seen from the diagram cream foams obtained according to the invention are considerably more

25 stable than cream foams without this addition.

As may be seen from the diagrams the addition of acid concentrate, has a positive effect at fat contents within the interval 22-35 %, but the effect is more marked for creams with a low fat content.

30 It is consequently possible to obtain a whippable cream having low fat content according to the invention.

Also from a manufacturing point of view the proposed invention is beneficial. The acidified buttermilk concentrate has extraordinary

35 keeping qualities and may be transported from butterdairies to

dairies, which produce cream, without a diminishing of the quality.

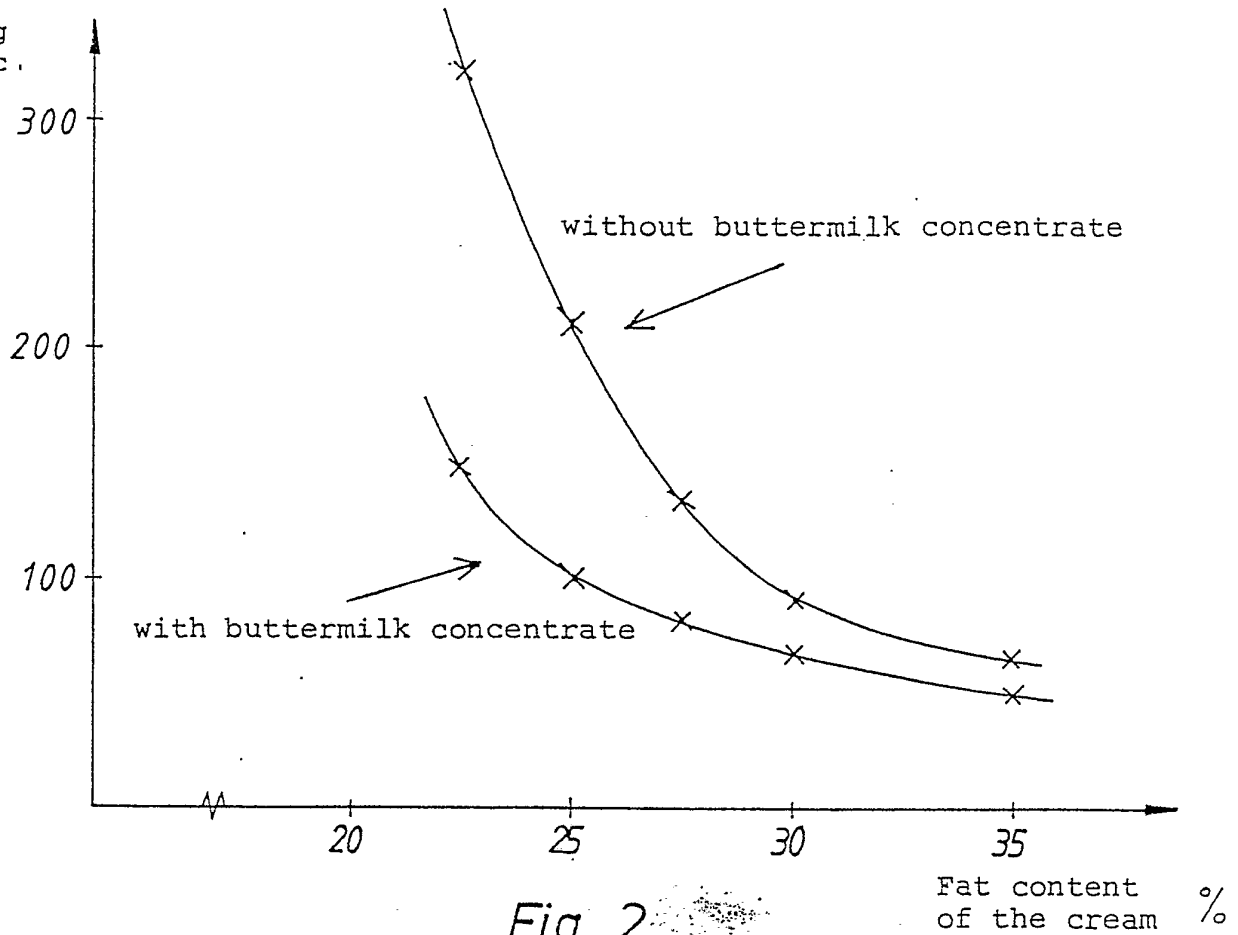
- 5 The given limits for the addition of buttermilk concentrate is determined by a lower value, under which no positive effect on the whipping is obtained and an upper value, above which an effect on the taste of the cream sets in, which the consumers may react to.



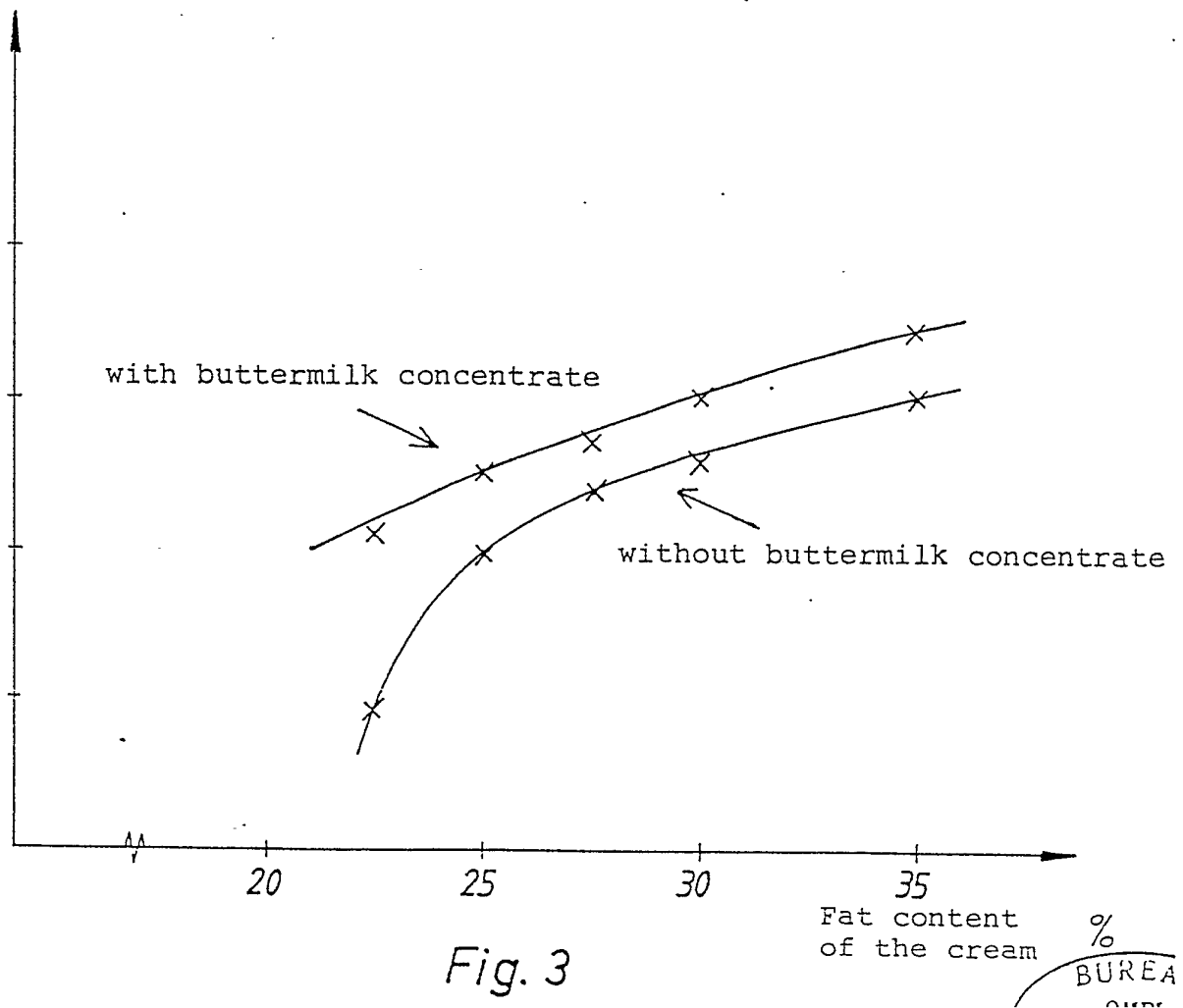
Claims

1. Method of improving the whipping properties of cream by addition of a fraction of buttermilk to the cream, c h a r a c -
5 t e r i z e d i n that a concentrate of buttermilk is obtained by ultrafiltration, that the obtained buttermilk concentrate is made acid to a pH lower than 4.0, preferably 3.8, that acid concentrate is added to cream with a desired fat content, in an amount of 5-15 % counted on the amount of cream and that the ob-
10 tained mixture is neutralized and treated further in a desired manner.
2. Method according to claim 1, c h a r a c t e r i z e d i n that the ultrafiltration is carried through at a temperature
15 within the interval 40-75°C, preferably about 50°C.
3. Method according to claim 1, c h a r a c t e r i z e d i n that the pH of the buttermilk is neutral during the ultra-
20 filtration.
4. Method according to claim 1, c h a r a c t e r i z e d i n that the buttermilk is concentrated by ultrafiltration in a relation 1:4.
- 25 5. Method according to claim 1, c h a r a c t e r i z e d i n that the obtained buttermilk concentrate is made acid with lactic acid.
6. Method according to claim 1, c h a r a c t e r i z e d
30 i n that concentrate which has been made acid is mixed with cream having a fat content of 22-26 %, at which a whippable cream with low fat content is obtained.

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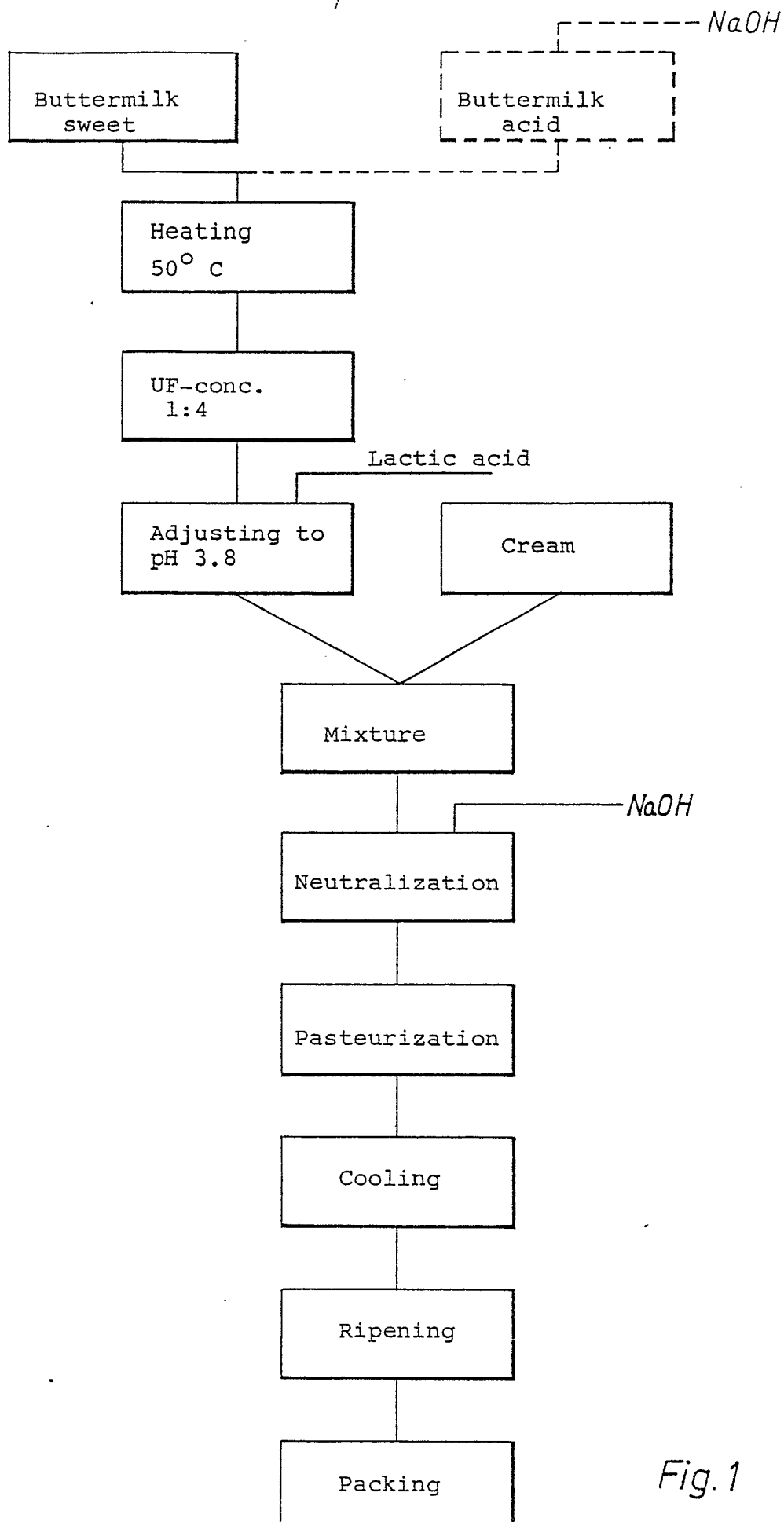
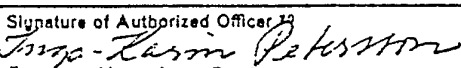


Fig. 1

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE83/00121

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC 3		
A 23 C 13/14		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
IPC 3	A 23 C 13/00, 13/12, 13/14	
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Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched ⁵		
SE, DK, NO, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	Derwent's abstract No. 29031 B/15, SU 426 381	1
X	SE, B , 324 945 (A BRATLAND) 15 June 1970 see claim 1	1
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IV. CERTIFICATION		
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