MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS -1961-A
APPLICATION FOR A PATENT

DANKWARD SIEGFRIED VON SALDERN, Wine-maker,

of Cottage No. 1, Langmeil Road, Tanunda, State of South Australia, Commonwealth of Australia

hereby apply for the grant of a Patent for an invention entitled

"IMPROVEMENTS IN THE FERMENTATION OF WINE"

which is described in the accompanying provisional/complete specification.

My/Our address for service is care of R. K. MADDERN & ASSOCIATES, Patent Attorneys, 97 King William Street, Adelaide, South Australia.

Dated this 19th day of November, 1975

DANKWARD SIEGFRIED VON SALDERN,

By his Patent Attorneys,

R.K. MADDERN & ASSOCIATES

TO:

THE COMMISSIONER OF PATENTS,
CANBERRA, A.C.T.
COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Application made by

DANKWARD SIEGFRIED VON SALDERN

for a patent/patent of addition for an invention entitled

"IMPROVEMENTS IN THE FERMENTATION OF WINE"

I /We

DANKWARD SIEGFRIED VON SALDERN

are the applicant(s) for the patent/patent of addition

(or, in the case of an application by a body corporate)

I /We are authorized by the abovementioned applicant(s) for the patent/patent of addition

to make this declaration on his/their behalf.

I /We are the actual inventor(s) of the invention

(or, where a person other than the inventor is the applicant)

I /We are the actual inventor(s) of the invention and the facts upon which the applicant(s) is /are

entitled to make the application are as follows:

Declared at Bridgewater this third day of July 1979

(Signature(s) of declarant(s)).

(Note: No attestation or other signature is required).

To: The Commissioner of Patents,
Commonwealth of Australia.
LIQUID NITROGEN COOLING OF FERMENTING WINE

VON SALDERN, D. S.

CLAIM 1. Improvements in the fermentation of wine in a vat which contains grape juice and cultured yeast, comprising allowing the yeast to effect partial fermentation of the grape juice, and passing sufficient quantities of liquid nitrogen into the fermenting juice to reduce the temperature and also destroy some of the yeast cells, at spaced intervals of time during fermentation.
TO BE COMPLETED BY APPLICANT

DANKWARD SIEGFRIED VON SALDERN

C/- Waterwheel Flourmills Pty. Ltd., Bridgewater, State of Victoria, Commonwealth of Australia

DANKWARD SIEGFRIED VON SALDERN

Care of R.K. MADDERN & ASSOCIATES, 97 King William Street, Adelaide, State of South Australia, Commonwealth of Australia

"IMPROVEMENTS IN THE FERMENTATION OF WINE"

The following statement is a full description of this invention, including the best method of performing it known to me.
This invention relates to improvements in the process of fermenting wine in vats.

In the usual wine producing process, grape juice (in the case of red wine together with skins) is fed into a vat and a cultured yeast is added, the wine being allowed to ferment under conditions where the yeast converts some at least of the grape sugar into alcohol and carbon dioxide, the carbon dioxide being released.

The fermentation is an exothermic reaction, and if allowed to go unchecked when ambient conditions are at about 60°F, the temperature of the wine will rise, and in the case of white wine, at about 92°F, the yeast will cease to function and if fermentation is not completed at that time, it requires to be restarted. In the case of red wine the skins rise to the top and form a cap or crust, and for this and other reasons the temperature rises even higher (in many instances as high as 104°F), until the yeast becomes ineffective.

In addition to the difficulties occasioned by temperature rise, the incoming grape juice is infested with wild yeast which needs to be suppressed. For the above reasons it is normal to cool the wine, the wine being passed through a heat exchanger and the heat being extracted by cooling water. The cooling has several effects, the most important being the preservation of the cultured yeast which is effective right up until the termination of fermentation, while another important function is the suppression of the effectiveness of the wild yeast. However the equipment required is of high cost and one object of this invention is to provide improvements wherein
the equipment need not be of such high cost than that associated with heat exchangers.

Briefly, in this invention, the yeast in wine fermenting in a vat is allowed to effect partial fermentation of the grape juice and passing sufficient quantities of liquid nitrogen into the fermenting juice to reduce the temperature and also destroy some of the yeast cells, at spaced intervals of time during fermentation. It will immediately be seen by those skilled in the art that the amount of equipment required is very small, and at least as far as capital outlay is concerned, there is a price advantage.

However we have found that the advantage is not merely a price advantage and that there are secondary effects which are very valuable. One such secondary effect is that the liquid nitrogen is effective in rendering less harmful the wild yeast if applied to the grape juice after it has entered the vat but before fermentation has reached an advanced stage. Further, and even more important, the effect of the liquid nitrogen is to kill at least some of the yeast cells which rise to the top of the wine along with the nitrogen bubbles and subsequently drop to the base of the vat, and this has the effect of reducing fermentation rate so that the need for cooling is in turn reduced.

A still further advantage which has been found with this invention is that the effect of the nitrogen bubbling violently through the liquid is to break up any crust or cap formed by skins in the fermenting of red wine, and this in turn reduces the cooling need since the carbon dioxide formed is more readily
released. Still further, it has some effect in mixing the grape skins with the fermenting wine.

Two embodiments of the invention are described hereunder in some detail with reference to and are illustrated in the accompanying drawings in which:

5. Fig. 1 is a diagrammatic section illustrating the elements of the invention, and

Fig. 2 is a section of an installation which includes a white wine fermenting tank and a red wine fermenting tank.

In the embodiment of Fig. 1 a vat 10 is provided with a tube 11 extending into it diametrically across its base. The wall of the tube is perforate, the perforations in this embodiment lying in several planes so that gas issuing forth from the tube will be spread over a wide area of the vat.

A conduit 12 connects tube 11 to a bank of liquid nitrogen tanks collectively designated 13, and each tank is provided with valve means 14 for controlling the flow rate of the liquid nitrogen into the wine.

In the fermenting of wine, the grape juice enters the vat, along with the skins in the case of red wine. Wild yeast is controlled by application of sulphur di-oxide, by cooling, or by other prior art methods.

Cultured yeast is added to the wine and once fermentation commences, bubbles of carbon dioxide become dispersed throughout the wine. Liquid nitrogen is then added at controlled speed and cools the fermenting wine. The speed should exceed four litres per minute to reduce development of vapour locks.

Six hundred litres of liquid nitrogen will lower the temperature
of ten thousand litres of wine by about 5°C, that is, 9°F. The presence of the carbon dioxide greatly reduces the water hammer effect, providing the liquid with some degree of resilience, that is, functioning as a shock absorber.

The effect on a white wine is for the very cold nitrogen bubbles to carry some of the yeast cells to the top of the vat, and in so doing the yeast cells are killed and the dead yeast cells then dropped to the bottom. In the case of red wine, not only are some yeast cells killed, but the crust or cap of skins is broken by the relatively large volume of nitrogen passing through them and this results in an intermixing with the grape juice which is beneficial to the final product since more of the contents of the skins are mixed with the final product.

Since some yeast cells are destroyed by the application of liquid nitrogen, the fermentation rate is lowered and therefore the need to cool is also reduced, and for this reason the liquid nitrogen is passed through the wine in the vat for short periods only, there being considerable periods of time during which there is no nitrogen passed in the vats.

Fig. 2 illustrates a practical embodiment, wherein the tank 13 contains nitrogen as in the first embodiment, and is also provided with a valve 14. The tank 13 is also provided with a filler valve 15 with which is associated a pressure relief valve.

The conduit 12 has two flexible branches, leading to respective vats 18 (for white wine) and 19 (for red wine), each branch containing a respective inlet injecting valve 20.

The vat 18 (the white wine fermenter) is provided with an
upper manhole 21 in its upper wall and a lower manhole 22 in its side wall near its lower end. It also has a drain sump 23, this construction being in accordance with known art, but the tank walls must have sufficient strength to withstand the pressure surge in the wine which occurs upon nitrogen release.

The tube 11 enters the vat from one side and terminates in an upwardly directed nozzle 25 which is situated centrally in the tank and above the base of the vat by a distance approximately equal to the radius of the tank, this positioning reducing turbulence when nitrogen is passed into the fermenting juice. Stays 26 support the nozzle 25 against displacement as nitrogen is emitted therefrom.

The vat 19 is a red wine fermenter, and also has a manhole 21 at its upper end. The vat 19 has a drain valve 28 and a skin removal port 29, both of which are normally closed. Nozzle 30 is supported by stays 31 against displacement, and situated similarly to nozzle 25 to limit turbulence.

In each instance, the temperature rise is carefully controlled by injection of sufficient quantities of nitrogen to cool the wine and also destroy some of the yeast cells, and at a rate (exceeding 4 litres per minute) so as to avoid vapour locks. Once temperature has thus been lowered, fermentation is allowed to continue, until a further application of nitrogen is applied when temperature again rises. The selection of maximum temperature will be within the skill of the winemaker, but ideally the temperature should be retained between 70°F. and 75°F. during fermentation.
It will be seen by those skilled in the art, that an advantage of liquid nitrogen is its very low cost and ready availability and its inert nature as far as wine production is concerned. Furthermore, there is a substantial labour saving, since the use of conventional coolers requires considerable attention when one cooler is used with a series of vats successively.

The nitrogen can be injected under gravity instead of under pressure, as contemplated in the above description.
The claims defining the invention are as follows:

1. Improvements in the fermentation of wine in a vat which contains grape juice and cultured yeast, comprising allowing the yeast to effect partial fermentation of the grape juice, and passing sufficient quantities of liquid nitrogen into the fermenting juice to reduce the temperature and also destroy some of the yeast cells, at spaced intervals of time during fermentation.

2. Improvements according to claim 1 wherein the liquid nitrogen is passed into the fermenting juice through a port situated centrally in the vat and above the base of the vat.

3. Improvements according to claim 1 wherein the liquid nitrogen is passed into the fermenting juice through a nozzle rigidly supported by stays from the base of the vat and retained centrally in the vat at a distance above said base approximately equal to the radius of the vat.

4. Improvements according to any preceding claim wherein the liquid nitrogen is passed into the fermenting juice at a rate exceeding four litres per minute.

5. Improvements according to any preceding claim wherein the liquid nitrogen is passed into the fermenting juice in sufficient quantities and sufficiently frequently to maintain the temperature of the fermenting juice below 75°F.

6. Improvements in the fermentation of wine in a vat substantially as hereinbefore described in the embodiment of the specification with reference to and as illustrated in the accompanying drawings.

Dated this 16th day of November, 1976

DANKWARD SIEGFRIED VON SALDERN,

By his Patent Attorneys,

R.K. MADDERN & ASSOCIATES