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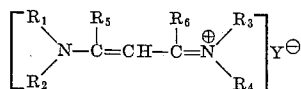
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3,288,784

## METHOD OF PREPARING SUBSTITUTED CHLOROIMINIUM SALTS

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No Drawing. Filed Apr. 11, 1966, Ser. No. 541,495  
10 Claims. (Cl. 260-239)

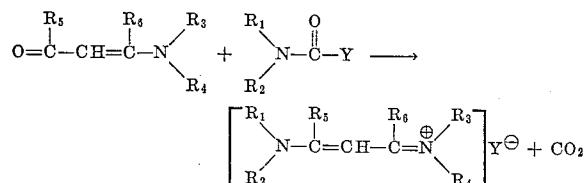
This invention relates to a novel direct method of preparing compounds of the structure



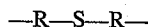
from readily available reactants.

This application is a continuation-in-part of application Serial No. 303,947, filed August 22, 1963.

The compounds prepared by this novel procedure are useful additives for upgrading animal feeds. Stimulation of the rate of growth and improved feed efficiencies are observed in animals fed normal feeds to which have been added from about 0.01 to 2.0 percent by weight of the said compounds. The desired effects are due to the inhibition of parasitic helminths and in providing increases in the available nitrogen content of the feeds. The novel reaction may be represented generically by the following equation:

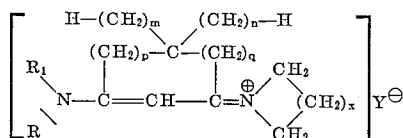


wherein  $R_1$  and  $R_2$  are each alkyl having up to four carbon atoms; wherein  $R_3$  and  $R_4$  are each selected from the class consisting of alkyl having up to four carbon atoms and radicals such that  $R_3$  and  $R_4$  together form divalent structures selected from the class consisting of alkylene of from two to eight carbon atoms,  $-R-O-R-$  wherein  $R$  is alkylene of two to six carbon atoms and



wherein  $R$  is alkylene of two to six carbon atoms; wherein  $R_5$  is selected from the class consisting of alkyl having up to four carbon atoms and radicals such that  $R_5$  and  $R_6$  together is alkylene having from one to ten carbon atoms and forming a closed ring of four to eight carbon atoms; and wherein  $R_6$  is selected from the group consisting of hydrogen, alkyl radicals of up to four carbon atoms and radicals in which  $R_5$  and  $R_6$  together is alkylene as defined above; wherein  $Y^-$  is an anion of the class consisting of  $Cl^-$  and  $Br^-$ .

Preferred practice involves the use of enaminoketones derived from a cyclic ketone and an N-heterocyclic amine and a carbamyl chloride to form compounds of the structure



wherein  $m$ ,  $n$ ,  $p$  and  $q$  are integers from zero to two and  $x$  is an integer from zero to five.

The novel reaction is accomplished by dispersing the enaminoketone and the carbamyl chloride (or other salt) in a suitable inert solvent such as chlorobenzene, cyclopentane, toluene, cyclooctane, xylene, hexane, cyclohexane or other water-immiscible solvent. The reactants

are heated, for example at the reflux temperature, until the reaction is substantially complete. After cooling water is added in amount sufficient to dissolve at least part of the salt, the reaction mixture is thoroughly stirred. The water layer is then separated from the solvent and the desired product recovered from the aqueous solution.

The inert solvent should be selected so as to permit a reaction temperature between 50° C. and 180° C., but preferably between 100-150° C., below the boiling point at atmospheric pressure or at the reflux temperature, which may be at a reduced pressure. The heating should continue until the reaction is substantially complete.

The chloride and bromide salts above described are water soluble and a convenient method of separating them from the anhydrous reaction mixture is to add water and separate the aqueous phase from the organic phase. The salts can be separated from the water by evaporation but are difficult to purify because of their hygroscopic properties. If, however, the chloride or bromide are treated with an excess of an inorganic acid or salt of such acid less water soluble and less hygroscopic salts can be prepared, for example those wherein  $Y$  of the above formula is  $HSO_4^-$ ,  $NO_3^-$ ,  $\frac{1}{2}SO_4^{2-}$ ,  $H_2PO_4^-$ ,  $ClO_4^-$ ,  $I^-$  and  $BF_4^-$ . Many of these can be precipitated from water solution and recrystallized from water, alcohol or solvent. Further purification of the solution with activated charcoal may be effected at boiling temperatures and the salts recovered by cooling the solutions.

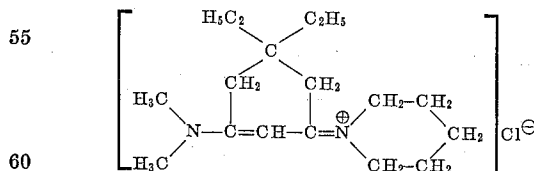
Further details of the preparation are set forth in the following specific examples.

### Example 1

5,5-dimethyl-3N-pyrrolidylcyclohex-2-en-1-one (4.9 grams) was dissolved in chlorobenzene and 3.45 grams of diethylcarbamoyl chloride dissolved in 20 ml. of chlorobenzene. The two solutions were combined and the mixture refluxed for 7 hours. After cooling the reaction mixture, 100 ml. of water was added and the mixture was stirred for 20 minutes. The aqueous phase was treated with 2.5 ml. of perchloric acid. The precipitate was separated and redissolved in boiling water. After treatment with activated charcoal and filtering the filtrate was cooled to reprecipitate the product, which was identified as N-(3-diethylamino-5,5-dimethylcyclohex-2-en-1-ylidene)pyrrolidinium perchlorate, M.P. 130-132° C.

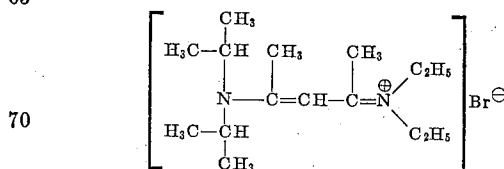
### Example 2

Using the procedure of Example 1 except that dimethylcarbamoyl chloride was reacted with 5,5-diethyl-3N-piperidylcyclohex-2-en-1-one. After refluxing, cooling and adding an equal quantity of water, the product separated from the aqueous phase was identified as having the structure



### Example 3

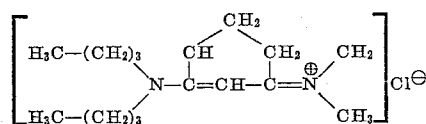
The reaction between diisopropylcarbamoyl bromide and 4-N,N-diethylaminopent-3-en-2-one yields a compound of the structure



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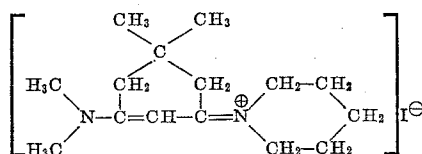
## Example 4

The reaction between N,N-di(n-butyl)carbamoyl chloride and 3-N-dimethylaminocyclohex-2-en-1-one yielded a compound of the structure



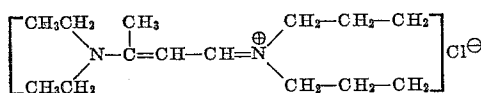
## Example 5

N,N-dimethylcarbamoyl iodide was reacted by the procedure of Example 1 with 5,5-dimethyl-3-N-piperidylcyclohex-2-en-1-one to yield a compound of the structure



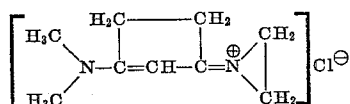
## Example 6

The reaction between 4-N-hexamethyleneimine but-3-en-2-one and N,N-diethylcarbamoyl chloride by the procedure of Example 1 produced a compound of the structure



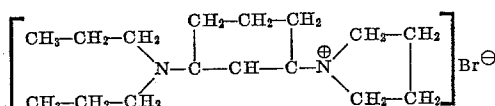
## Example 7

Using the procedure of Example 1, N,N-dimethylcarbamoyl chloride and 3-N-ethyleneiminecyclopent-2-en-1-one were reacted forming the compound of the structure



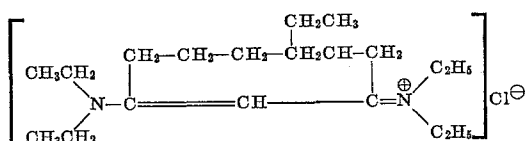
## Example 8

Di-n-propylcarbamoyl bromide and 3-N-pyrrolidylcyclooct-2-en-1-one react to form a compound of the structure



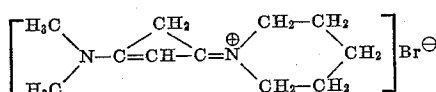
## Example 9

The reaction product of N,N-diethylcarbamoyl chloride and 3-N-diethylamino-6-ethylcyclooct-2-en-1-one has the structure



## Example 10

Using the procedure of Example 1, the reaction product of N,N-dimethylcarbamoyl bromide and 3-N-piperidylcyclobut-3-en-1-one has the structure

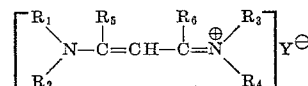


Although the invention is described with respect to specific modifications, it is not intended that the details thereof are limitations on the scope of the invention except to the extent incorporated in the following claims.

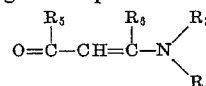
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What is claimed is:

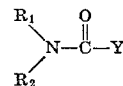
1. The method of preparing compounds of the structure



wherein R<sub>1</sub> and R<sub>2</sub> are each alkyl having up to four carbon atoms; wherein R<sub>3</sub> and R<sub>4</sub> are each selected from the class consisting of alkyl having up to four carbon atoms and such that R<sub>3</sub> and R<sub>4</sub> together form divalent structures selected from the class consisting of alkylene of from two to eight carbon atoms, —R—O—R— wherein R is alkylene of two to six carbon atoms and —R—S—R— wherein R is alkylene of two to six carbon atoms; wherein R<sub>5</sub> is selected from the class consisting of alkyl having up to four carbon atoms and such that R<sub>5</sub> and R<sub>6</sub> together are alkylene having from one to ten carbon atoms forming a closed ring of four to eight carbon atoms; wherein R<sub>6</sub> is selected from the class consisting of hydrogen, alkyl of up to four carbon atoms and radicals in which R<sub>5</sub> and R<sub>6</sub> together is alkylene as above described; wherein Y<sup>−</sup> is an anion of the class consisting of Cl<sup>−</sup>, Br<sup>−</sup>, HSO<sub>4</sub><sup>−</sup>, NO<sub>3</sub><sup>−</sup>, ½SO<sub>4</sub><sup>2−</sup>, ClO<sub>4</sub><sup>−</sup>, H<sub>2</sub>PO<sub>4</sub><sup>−</sup>, BF<sub>4</sub><sup>−</sup>, which comprises reacting a compound of the structure

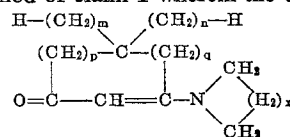


with a compound of the structure:

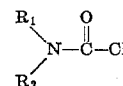


at a temperature of 50° C. to 180° C.

2. The method of claim 1 wherein the compound



wherein m, n, p and q are each integers from zero to two and wherein x is an integer from zero to four; is reacted with a compound of the formula



wherein R<sub>1</sub> and R<sub>2</sub> are alkyl radicals having up to four carbon atoms.

3. The method of claim 1 wherein N,N-di(n-butyl)carbamoyl chloride is reacted with 3-N-dimethylaminocyclohex-2-en-1-one.

4. The method of claim 1 wherein dimethylcarbamoyl iodide is reacted with 5,5-dimethyl-3-N-piperidylcyclohex-2-en-1-one.

5. The method of claim 1 wherein, N,N-diethylcarbamoyl chloride is reacted with 4-N-hexamethylenimine.

6. The method of claim 1 wherein diethylcarbamoyl chloride is reacted with 5,5-dimethyl-3-N-pyrrolidylcyclohex-2-en-1-one.

7. The method of claim 1 wherein dimethylcarbamoyl chloride is reacted with 5,5-diethyl-3-N-piperidylcyclohex-2-en-1-one.

8. The method of claim 1 wherein N,N-dimethylcarbamoyl chloride is reacted with 3-N-ethyleneiminecyclopent-2-en-1-one.

9. The method of claim 1 wherein N,N-diethylcarbamoyl chloride is reacted with 3-N-diethylamino-6-ethylcyclooct-2-en-1-one.

10. The method of claim 1 wherein N,N-dimethylcarbamoyl bromide is reacted with 3-N-piperidylcyclobut-3-en-1-one.

No references cited.

ALEX MAZEL, Primary Examiner.

ALTON D. ROLLINS, Assistant Examiner.

# UNITED STATES PATENT OFFICE

## CERTIFICATE OF CORRECTION

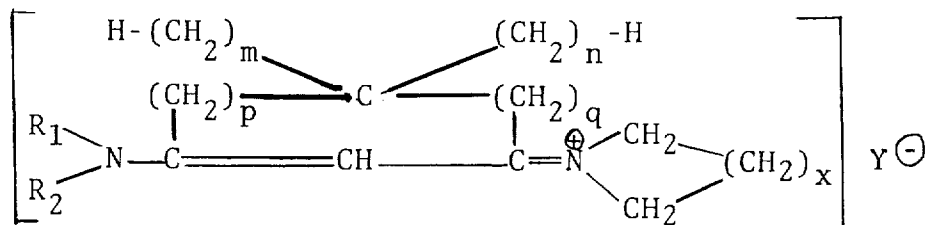
Patent No. 3,288,784

November 29, 1966

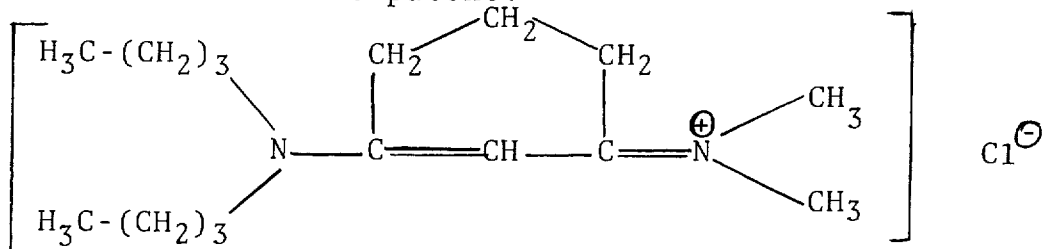
Angelo John Speziale et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, lines 60 to 65, the formula should appear as shown below instead of as in the patent:



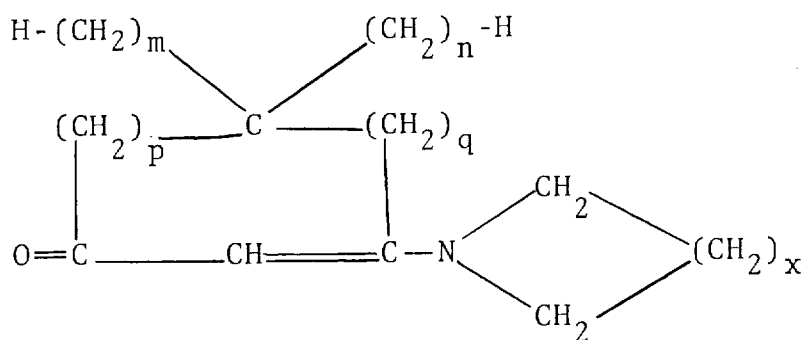
column 3, lines 5 to 10, the formula should appear as shown below instead of as in the patent:



same column 3, line 43, for "pyrroolidyl-" read -- pyrrolidyl--; column 4, line 13, for "ti" read -- to --; same column 4, lines 36 to 40, the formula should appear as shown below instead of as in the patent:

(2)

3,288,784



Signed and sealed this 15th day of October 1968.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

EDWARD J. BRENNER  
Commissioner of Patents