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(12) # EUROPEAN PATENT APPLICATION

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(71) Applicant: SIMMEL S.p.A.
Borgo Padova 2
I-31033 Castelfranco Veneto Treviso(IT)

(72) Inventor: Dall'orto, Eugenio, Dr.
via Brigata Battisti, 62
I-31033 Castelfranco Veneto (Treviso)(IT)

(74) Representative: Zini, Alessandro
Ufficio Tecnico Internazionale Brevetti Ing. Alessandro
Zini Piazza Castello 1
I-20121 Milano(IT)

(54) **Illuminating mixture for illuminating canisters intended to be inserted in artillery projectiles.**

(57) The illuminating mixture for illuminating canisters intended to be inserted in an artillery projectile comprises an expander of the type of the blowing agents used in the technology of plastics. In this way it is prevented that the ashes accumulate and become compact during the combustion of the illuminating mixture and thus the ejection of the ashes from the canister is facilitated.

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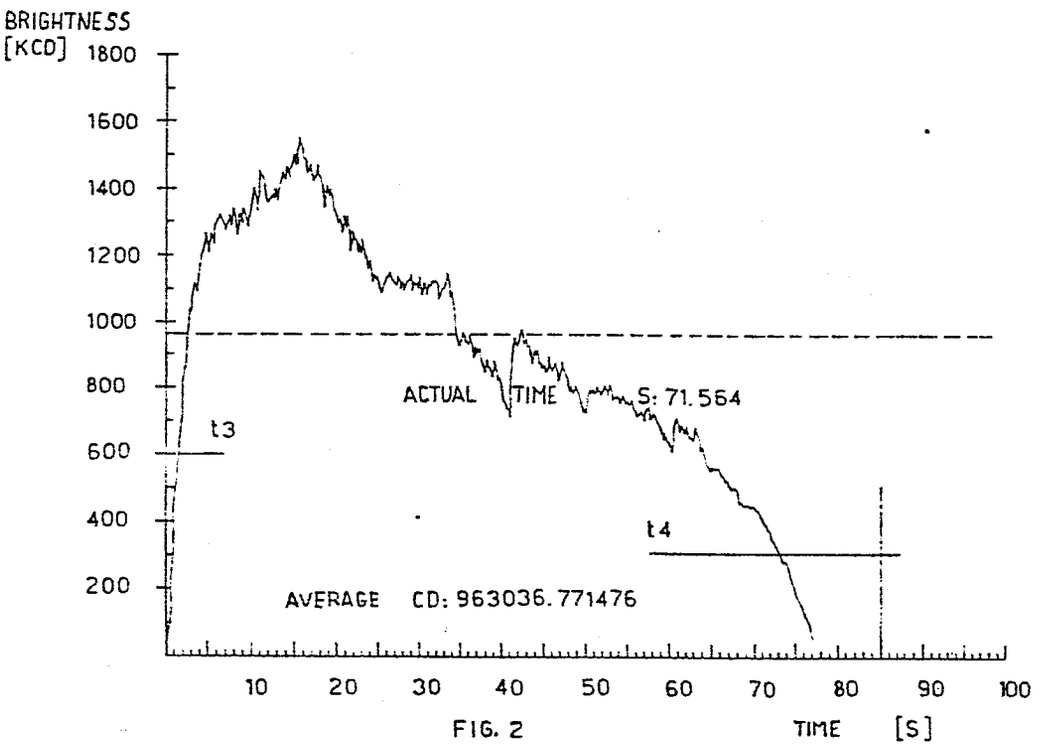
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FIG. 2

Illuminating mixture for illuminating canisters intended to be inserted in artillery projectiles.

The present invention relates to illuminating mixtures for illuminating canisters intended to be inserted in an artillery projectile.

There are known illuminating canisters to be inserted in artillery projectiles which, once the projectile has been fired and has reached a predetermined point of its trajectory, are ejected by the use of a suitable explosive charge, which generally has also the purpose of igniting the illuminating mixture contained in the canister. After the ejection from the projectile the canister descends suspended to a parachute so as to illuminate a surrounding area for a predetermined time depending on its dimensions and the combustion velocity of the illuminating mixture.

The prior art illuminating mixtures consist substantially of a metal powder acting as a combustible, an oxidizer acting as a supporter of combustion, and a binder. These mistures are charged in a suitable

manner, f.e. by compression or pouring, in a container of a suitable shape and mechanical strength so as to form the so called illuminating canister.

One of the major disadvantages which occurs in the course of the combustion consists of the accumulation of ashes along the walls and the mouth of the canister. This phenomenon is much enhanced in the case of projectiles fired by rifled firearms which undergo a spin which can reach speeds up to 18000 r.p.m. In fact, in this case, if the canister is not provided with a suitable aerodynamic braking device, it retains the spin moment it had at the ejection and because of the centrifugal force the ashes are thrown against the walls on which they accumulate and form a hard and compact layer which tends to obstruct the canister mouth.

This fact is dangerous for various reasons. Firstly, the obstruction of the canister mouth reduces the emission surface whereby a decrease of the luminous intensity of the device occurs. Secondly, because of the obstruction an increase of the pressure of the gases inside the canister takes place with a resultant increase of the combustion velocity and as a result a shorter illumination time and the risk that the canister explodes. Thirdly, the ashes by depositing on the underlying mixture cover it so as to prevent its ignition whereby at the end of the combustion a lot of unburnt mixture remains in the canister.

As stated hereinbefore, in order to attenuate this phenomenon aerodynamic brakes have been provided on the canister which slow down its spin. This method has proved effective but is expensive inasmuch as it involves further manufacturing steps and, in addition, a space is taken up which is necessarily no longer available for the useful load.

It is the object of the present invention to eliminate or at least substantially reduce the above mentioned disadvantages of the prior art canisters by acting in a simple and practical manner only on the chemical composition of the illuminating mixture without altering the conventional conformation of the canister and/or the structure of the illuminating body.

More particularly, the illuminating mixture according to the invention for illuminating canisters intended to be inserted in an artillery projectile is characterized in that it comprises an expander of the type of the blowing agents normally used in the technology of plastics.

The expander is simply added in the mixing step of the compounds intended to form the illuminating mixture.

Typical classes of compounds usable to this purpose are azo-derivatives such as azo-dicarbonamide or azodiisobutyronitrile (2:2'-azodi-2-methylpropionitrile); sulphonhydrazide-derivatives, such as benzen-m-di-

sulphonhydrazide; N-nitroso-derivatives such as N, N' dimethyl-N, N'-dinitroso-terephthalimide or N, N'-dinitroso-pentamethylen-tetramine; or other compounds, such as tris-hydrazin-triazin or nitrourea.

These compounds are characterized in that they decompose at a well defined temperature and generate a quantity of gas which depends on their chemical formula. The gas developed generates a pressure inside the illuminating mixture downstream the combustion front, along a section in which said mixture has reached, because of the thermal conduction, a temperature equal to or higher than that of the decomposition point of the expander. As a result, at the time of combustion said gas under pressure expands instantaneously, up to the ambient pressure, in the ashes, and causes their disintegration. In this way it is prevented that the ashes accumulate and become compact and it is facilitated their ejection which is further aided by the circumstance that the canister burns with its mouth turned downwards.

The choice of the expander and the quantity to be used are no problem for those skilled in the art; however the length of the section whose temperature is higher than that of the point of decomposition of the expander as well as the compatibility with the other compounds of the illuminating mixture must be carefully estimated.

As an example, in Figs. 1 and 2 of the accompanying drawings there are illustrated the graphs of the luminous intensity v. time of two equal compositions including magnesium powder, sodium nitrate and epoxy resin as a binder. In Fig. 1 the composition is without expander, while in Fig. 2 3% weight of azo-dicarbonamide has been added. It is apparent the improvement obtained in the performance which is due to a substantial reduction in the quanity of ash accumulated in the canister.

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Claims

1. Illuminating mixture for illuminating canisters intended to be inserted in an artillery projectile, characterized in that it comprises an expander of the type of the blowing agents normally used in the technology of plastics.

2. Illumination mixture as claimed in claim 1, characterized in that the blowing agent is an azo-derivative.

3. Illuminating mixture as claimed in claim 1, characterized in that the blowing agent is a sulphon-hydrazide-derivative.

4. Illuminating mixture as claimed in claim 1, characterized in that the blowing agent is a N-nitroso-derivative.

5. Illuminating mixture as claimed in claim 1, characterized in that the blowing agent is tris-hydrozin-triazine.

6. Illuminating mixture as claimed in claim 1, characterized in that the blowing agent is nitrourea.

7. Illuminating mixture as claimed in claim 2, characterized in that the azo-derivative blowing agent is azo-dicarbonamide.

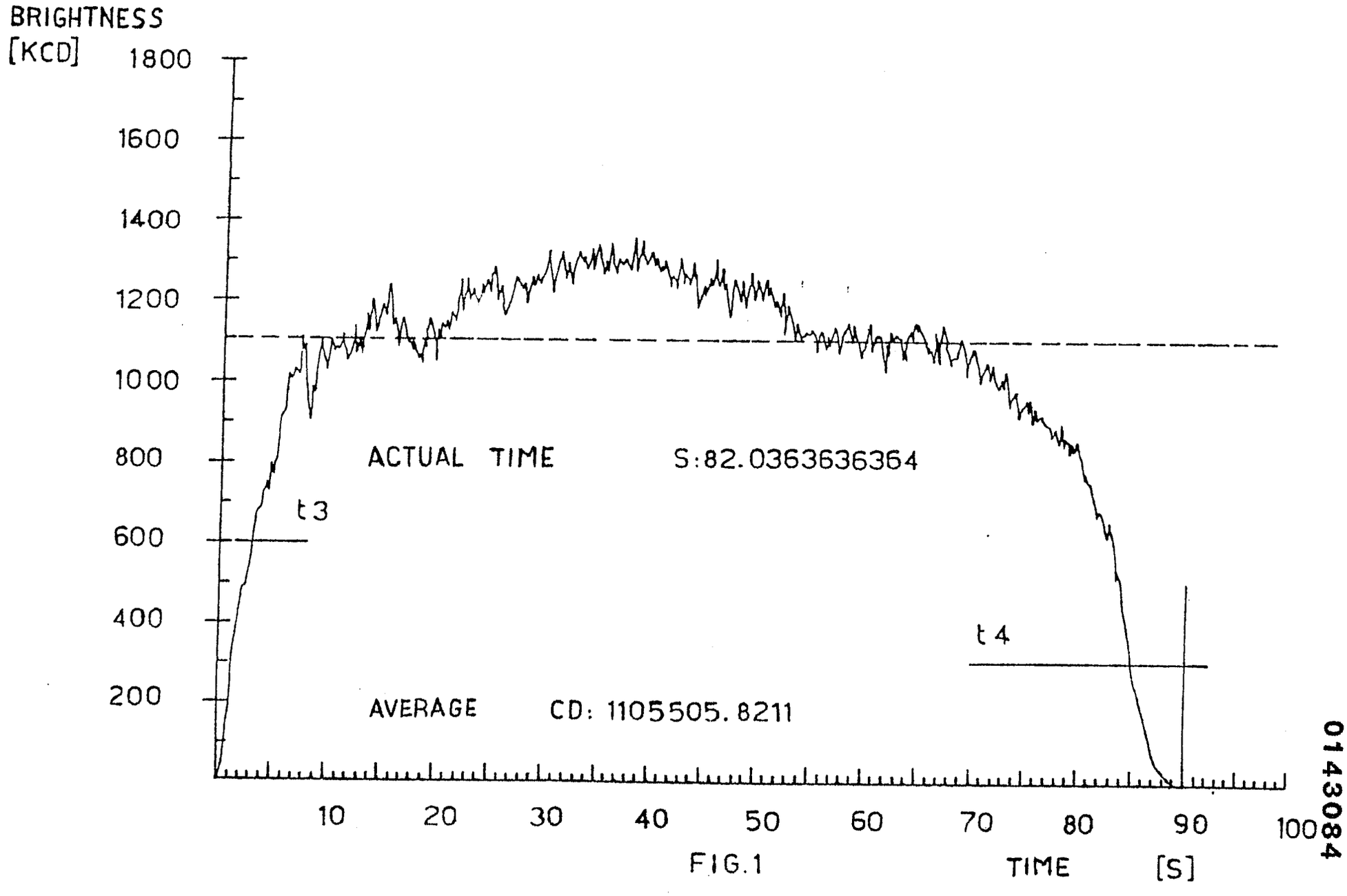

FIG.1

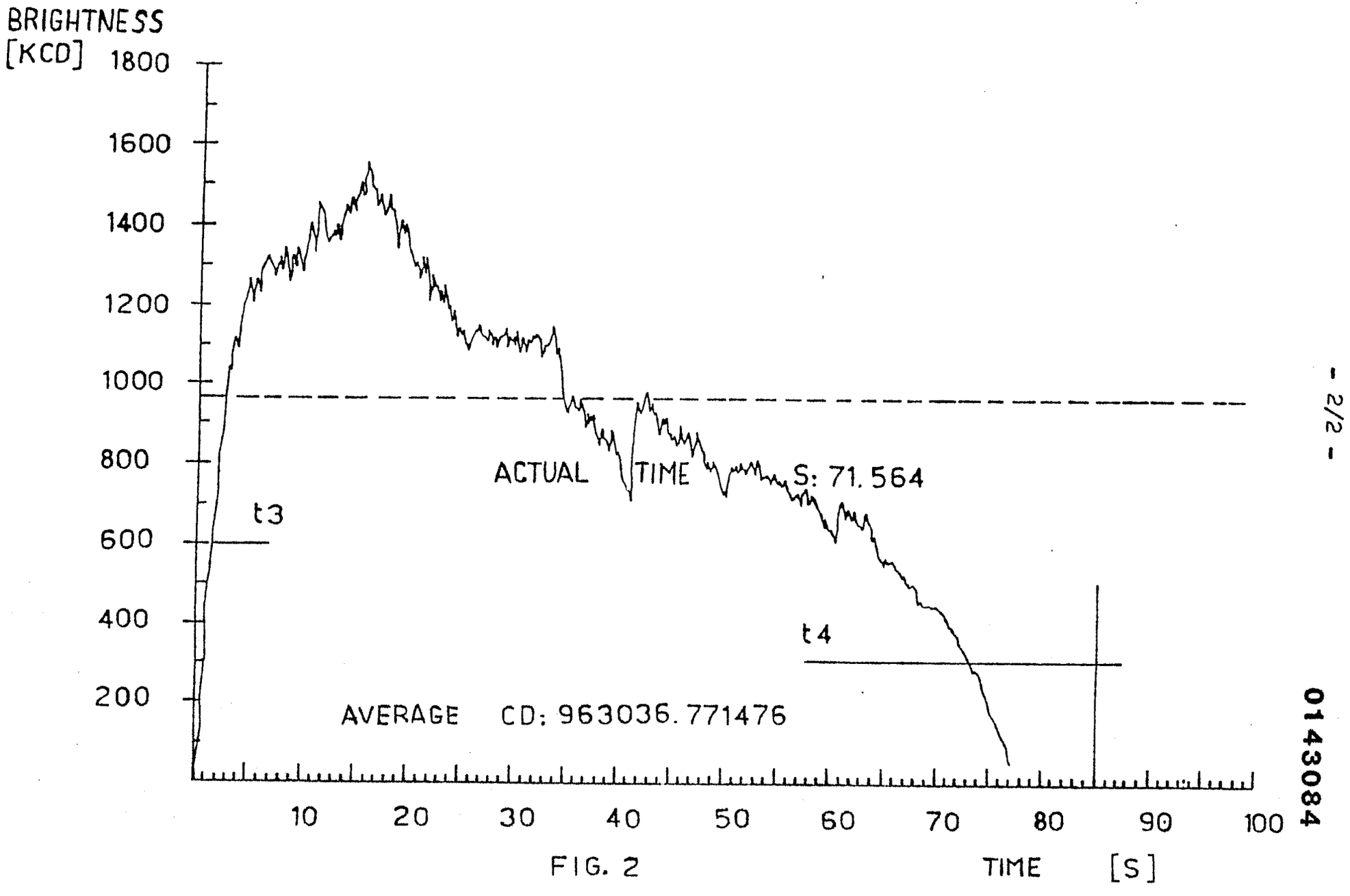

FIG. 2