Case Study L3-005

Categorial NMT Hallucination in Patent Claim Translation

EP 4 028 082 B1

Medical Injection Device with Needle Guard

Domain: Medical Devices

Language pair	EN → FR
NMT source	RWS / Trados
Claims	15
Severity class	Critical — claim invalidation
Analysis date	March 2026
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Contents

1 Executive Summary

This case study documents a **categorial hallucination** produced by the RWS neural machine translation (NMT) engine in the EN → FR translation of European patent EP 4 028 082 B1 (medical injection device).

Core Finding

Claim 13: The NMT engine substituted "injection device" with "système d'évitement de collision" (collision avoidance system) in the claim preamble—a term from the automotive/robotics domain, entirely foreign to the patent. This hallucinated term appears nowhere in the source text. All 14 remaining claims correctly translate *injection device (10)* as "dispositif d'injection (10)."

The error is legally fatal: a dependent claim whose preamble designates a non-existent object is **severed from its dependency chain** and loses all legal scope.

Beyond this critical hallucination, the terminological evaluation reveals **12+ systemic terminological inconsistencies**, a **degenerate repetition loop** (claim 8), and a **morphological doubling** (claim 12).

2 Critical Hallucination: Claim 13

2.1 Source / Target Alignment

Source (EN)

"**The injection device (10)** of any one of claims 1–11, wherein: the arm (34, 134) of the upper housing (16, 116) includes a flap (182) that extends longitudinally [...]"

NMT Output (Erroneous)

"**Système d'évitement de collision** selon l'une quelconque des revendications 1 à 11, dans lequel : le bras (34, 134) du boîtier supérieur (16, 116) comporte un rabat (182) qui s'étend longitudinalement [...]"

Correct Translation

"**Dispositif d'injection (10)** selon l'une quelconque des revendications 1 à 11, dans lequel : le bras (34, 134) du boîtier supérieur (16, 116) comporte un volet (182) qui s'étend longitudinalement [...]"

2.2 Nature of the Error

This error constitutes a **categorial hallucination**: the NMT engine does not merely produce an unsuitable synonym or a terminological variant—it substitutes *the entire technical domain*. The

term "système d'évitement de collision" belongs to industrial robotics, autonomous vehicles, and automotive engineering. It has no semantic connection to the medical injection device described in the patent.

Consistency Check

The term "injection device (10)" appears in the preamble of **all 15 claims** in the source text. The NMT output correctly renders it as "dispositif d'injection (10)" in claims 1–12 and 14–15. **Only claim 13** exhibits the hallucination.

2.3 Hypothesis on Root Cause

Several factors may explain the failure:

- **Decoder context drift:** Claim 13 is long and structurally complex (four nested sub-clauses). The NMT decoder loses track of the main subject as generation proceeds.
- **Cross-domain contamination:** The model was likely trained on multi-domain patent corpora where the sequence "device of any one of claims" co-exists with automotive/robotics preambles. Without strong terminological anchoring in the immediate context window, the decoder sampled a high-frequency preamble from an unrelated domain.
- **Missing reference numeral:** The reference numeral "(10)" is present in the source. The NMT also dropped it in claim 13, reinforcing the hypothesis of a complete decoder detachment.

3 Legal Impact

3.1 Claim Dependency Mechanism

Under the European Patent Convention (EPC, Rule 43(4)), each dependent claim inherits the scope of the claim(s) it depends on through its preamble. The preamble defines the **claimed subject-matter**; the characterising portion adds limitations.

3.2 Consequence of the Hallucination

Scenario 1: Opposition Proceedings

If the FR translation were filed as-is, an opponent could argue that claim 13 does not define an "injection device" but a "collision avoidance system"—a subject that exists neither in the description nor in the independent claims. The claim would be **held unclear** (Article 84 EPC) or **unsupported** by the description (Article 83 EPC).

Scenario 2: Infringement Action

In infringement proceedings, the patent holder could not invoke claim 13 to pursue a manufacturer of injection devices, because the FR text literally protects a "collision avoidance system"—a product the manufacturer does not make. The claim is **legally void**.

4 Secondary Systemic Errors

4.1 Degenerate Repetition Loop — Claim 8

Source (EN)

"[...] a larger radial thickness than **a remainder of the distal guard portion (52)** [...]"

NMT Output (Erroneous)

"[...] une épaisseur radiale plus grande qu'un reste de la partie de la partie de la partie de la partie de la partie de la partie de protection distale (52) [...]"

The decoder enters a **degenerate repetition loop** on the word "partie." This failure mode is well-documented in NMT literature: it occurs when the model loses the termination signal and repeats the highest-probability token indefinitely.

4.2 Morphological Doubling — Claim 12

Source (EN)

"[...] a distally facing surface of **the locking tab (38)**."

NMT Output (Erroneous)

"[...] une surface tournée vers l'extérieur de la patte de la patte de verrouillage (38)."

The NMT produces a **morphological doubling**: "patte de la patte de verrouillage" instead of "patte de verrouillage." The error combines partial repetition with syntagmatic disintegration.

4.3 Systemic Terminological Inconsistencies

The automated evaluation pipeline (term-consistency-agent) detected **12+ inconsistencies** on key device components:

EN Term	FR Variants	Variants Produced	Expected
leg	3	pied / branche / patte	branche
catch	4	cliquet / cran / taquet / verrou	cliquet
rim	2	rebord / bord	rebord
lower housing	2	boîtier inf. / logement inf.	boîtier inférieur
upper housing	2	boîtier sup. / logement sup.	boîtier supérieur
flap	2	rabat / volet	volet
track	3	voie / chenille / piste	voie
needle guard	3	protège-aiguille / protection d'aiguille / protecteur d'aiguille	protège-aiguille
dispensed position	1 (wrong)	position distribuée	position déployée

Among these variants, the translation of *track* as "chenille" (claim 11) is particularly absurd: "chenille" designates a caterpillar track (tracked vehicle locomotion), not a guide rail in a medical device.

The translation of *dispensed position* as "position distribuée" is also erroneous: in the context of an injection device, this refers to the position in which the medication has been delivered (injected), i.e. "position déployée" or "position d'administration."

5 Automated Detection: term-consistency-agent

The `term-consistency-agent` pipeline developed for the MTPE workflow detects all three error classes documented here:

Detection Mechanism

1. **Preamble extraction:** The agent extracts the subject noun phrase from each claim preamble (source and target).
2. **Cross-claim alignment:** It compares the subject term of each claim against the terms used in all other claims of the same patent.
3. **Divergence detection:** Any claim whose subject term differs from the majority term is flagged.
4. **Severity classification:** A domain mismatch (medical ≠ automotive) is classified as **critical**; a synonymic variant is classified as **minor**.

In the case of EP 4 028 082, the agent would have flagged claim 13 at step 3: the term "système d'évitement de collision" diverges from "dispositif d'injection" (14 out of 15 occurrences). The severity classifier (step 4) would have immediately escalated the error to critical.

6 Methodological Takeaway

6.1 What This Case Demonstrates

1. **NMT hallucinations are not random:** They occur under predictable conditions—long claims, nested structures, exceeded context windows.
2. **The preamble is the point of maximum legal vulnerability:** An error in the preamble of a dependent claim destroys the entire dependency chain.
3. **Human post-editors can miss the error:** A post-editor reading claim 13 in isolation may find the text internally coherent—only cross-claim comparison reveals the anomaly.
4. **Automated cross-claim consistency detection is effective:** The pattern is simple: extract the preamble subject from each claim, compare, flag divergences.

6.2 MTPE Workflow Recommendation

Quality Control Rule

QC-PREAMB-01: For every NMT-translated claim set, systematically verify that the subject term in each dependent claim preamble matches the term used in the claims it depends on. Any divergence triggers a mandatory manual review.

7 Appendix: Error Summary by Claim

Claim	Error Type	Severity	Brief Description
1	Term inconsistency	Minor	*leg* → pied (vs. branche elsewhere)
1	Term inconsistency	Minor	*catch* → cliquet / cran (alternation)
1	Term inconsistency	Minor	*rim* → rebord / bord (alternation)
1	Mistranslation	Medium	*dispensed* → distribuée
4	Term inconsistency	Minor	*lower housing* → logement (vs. boîtier)
5	Term inconsistency	Minor	*needle guard* → protection d'aiguille
5	Term inconsistency	Minor	*upper/lower housing* → logement
8	Repetition loop	Critical	*partie*[5] de protection distale
11	Term inconsistency	Medium	*track* → chenille (absurd)
11	Term inconsistency	Minor	*catch* → taquet (vs. cliquet)
12	Morphological doubling	Medium	patte de la patte de verrouillage
13	**Categorial halluc.**	**Critical**	**Collision avoidance system**
13	Term inconsistency	Minor	*flap* → rabat/volet (alternation)

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tmpe.app — AI Alignment Failure Analysis in Patent Translation

Automated terminological evaluation pipeline for EN → FR patent post-editing

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