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# 3D Printing and Patent Law

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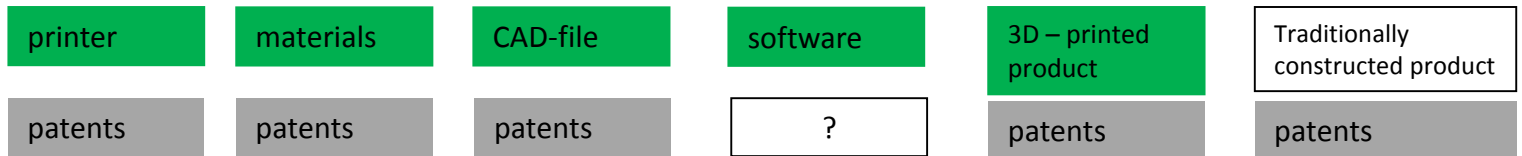


# Two perspectives...

## Two questions

Inventor perspective

Patentable?



Infringement?

NON commercial intent  
/consumer

COMMERCIAL intent  
/competitor

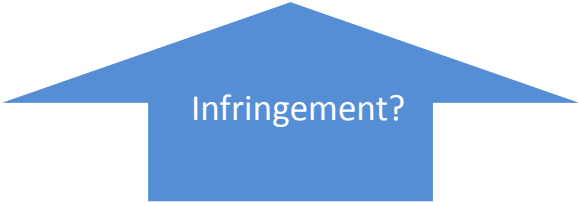
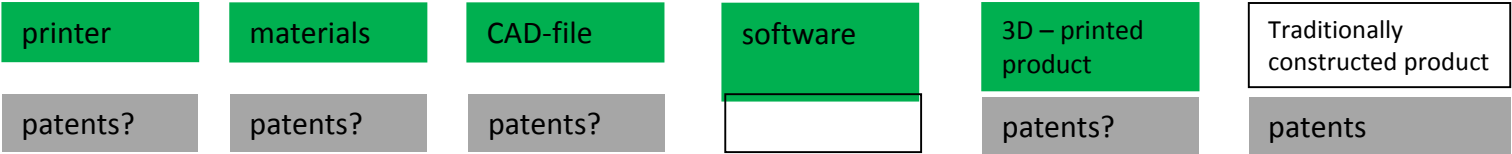
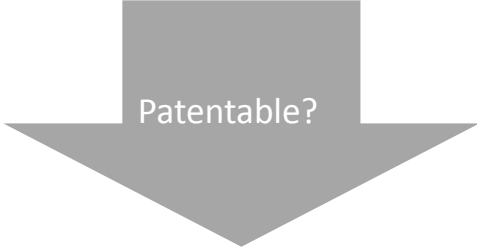
User perspective



# 1. Inventor perspective

Patentability of the components  
of a 3D printing process

# Inventor perspective



NON commercial intent  
/consumer

COMMERCIAL intent  
/competitor

# User perspective

## a. 3D Printer hardware



# The printers

Patent Application Publication Apr. 24, 2014 Sheet 1 of 4 US 2014/0110872 A1

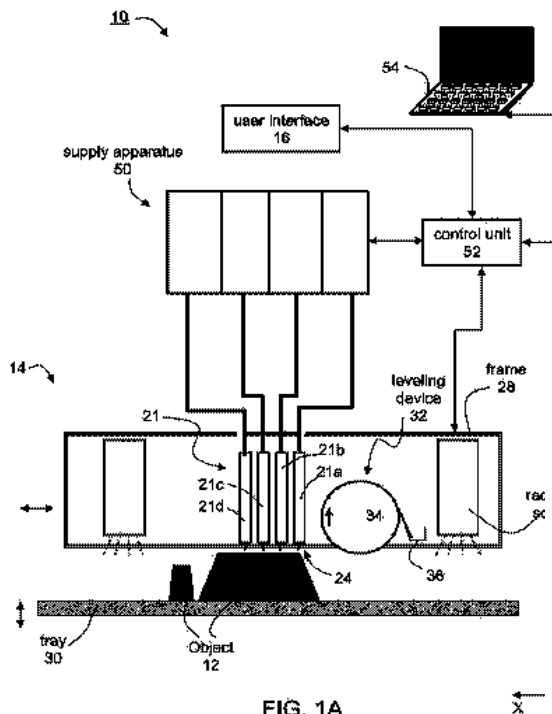


FIG. 1A

We claim:

1. In a rapid prototyping system for forming parts of a predetermined material, said system including a slurry and means for depositing a bead of said slurry onto a surface, wherein said surface moves in a predetermined pattern with respect to the bead, said slurry consisting of a mixture of:

a volatile liquid;

no more than 10 volume percent nonvolatile binders and dispersants; and

particles of said predetermined material, said particles being insoluble in said liquid, the volume percentage of particles in said mixture being sufficiently high that said slurry is pseudoplastic, said slurry becoming dilatant upon deposition by said system in a drying environment.

2. The system of claim 1 wherein said liquid is water.

3. The system of claim 2 wherein said material is ceramic.

4. The system of claim 3 wherein said material is alumina.

15. A system for additive manufacturing of a three-dimensional object, comprising: a dispensing unit configured for dispensing at least one type of uncured building material; a curing unit configured for curing said uncured building material; and a controller configured for operating said dispensing unit and said curing unit to sequentially form a plurality of layers in a configured pattern corresponding to the shape of the three-dimensional object, such that for at least one layer of said layers, said curing is initiated at least t seconds after commencement of curing of a layer immediately preceding said at least one layer, said t being longer than an overall time required for said formation.

16. The system according to claim 15, wherein said t is at least 6.

17. The system according to any of claims 15 and 16 wherein said t is from about 10 seconds to about 25 seconds.

18. The system according to any of claims 15-17, wherein said controller is configured to receive characteristic heat deflection temperature (HDT) data of said at least one building material, and to select a value of said t responsively to said HDT.

(19) **United States**

(12) **Patent Application Publication**  
Swanson et al.

(10) Pub. No.: US 2012/0018924 A1

(43) Pub. Date: Jan. 26, 2012

(54) **MULTIPLE ZONE LIQUEFIER ASSEMBLY  
FOR EXTRUSION-BASED ADDITIVE  
MANUFACTURING SYSTEMS**

Publication Classification

(51) Int. Cl. *B29C 35/04* (2006.01)

(52) U.S. Cl. .... 264/40

(57) **ABSTRACT**

A liquefier assembly for use in an extrusion-based manufacturing system, and a method for building a dimensional model with the extrusion-based additive manufacturing system, where the liquefier assembly includes a liquefier tube having multiple, independently heatable zones along a longitudinal length of the liquefier tube.

(75) Inventors: **William J. Swanson**, St. Paul, MN (US); **J. Samuel Batchelder**, Somers, NY (US)

(73) Assignee: **STRATASYS, INC.**, Eden Prairie, MN (US)

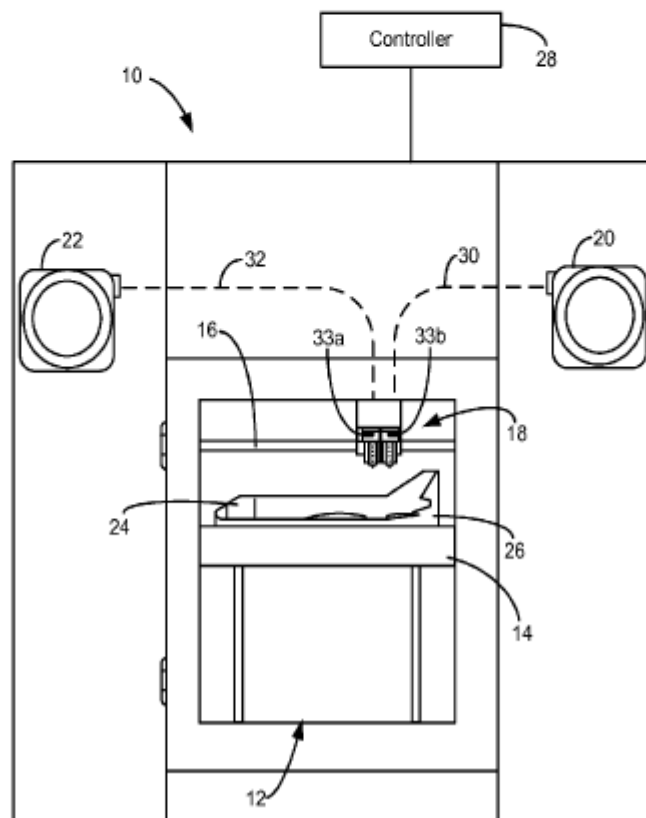
(21) Appl. No.: **12/841,341**

(22) Filed: **Jul. 22, 2010**

## Parts of Printers (printing head)

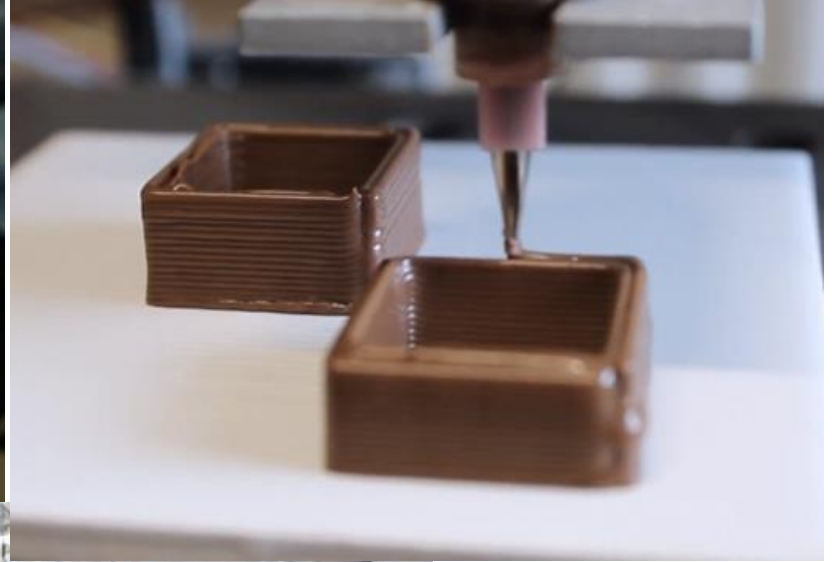
1 A liquefier assembly for use in an extrusion-based additive manufacturing system, the liquefier assembly comprising:

- a liquefier tube having a first end and a second end offset along longitudinal length;
- an extrusion tip secured to the first end of the liquefier tube;
- a first thermal unit operably secured to the liquefier tube adjacent the first end of the liquefier tube; and
- a second thermal unit operably secured to the liquefier tube between the first thermal unit and the second end of the liquefier tube, wherein the first thermal unit and the second thermal unit are configured to be operated independently of each other.



YES: (Parts of) printers are patentable.

## b. Materials





Wool?

Chocolate?

Cement?

Plastic? PMC?

Copper?

Iron Powder?



Inventions?

New?

Innovative?



**NOT** patentable

## But what about special types of material?

Inventions?

New?

Innovative?



**YES** patentable

# E.g. certain supporting structures?

US Patent 6790403 B1: Soluble material and process for three-dimensional modeling

## CLAIMS (37)

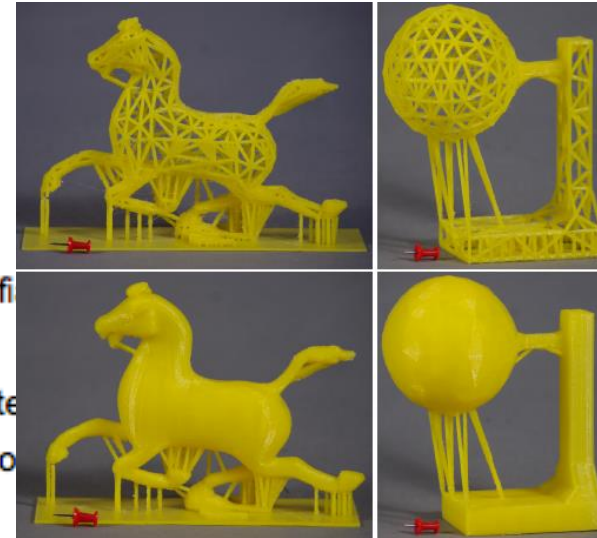
What is claimed is:

1. In a process for making a three-dimensional object by dispensing solidifiable modeling material in a predetermined pattern so as to define the three-dimensional object in coordination with dispensing solidifiable support material as to define a support structure for the three-dimensional object, the support structure thereby having portions thereof in contact with the object, the improvement comprising:

forming at least those portions of the support structure contacting the object from an alkali-soluble thermoplastic material comprising:

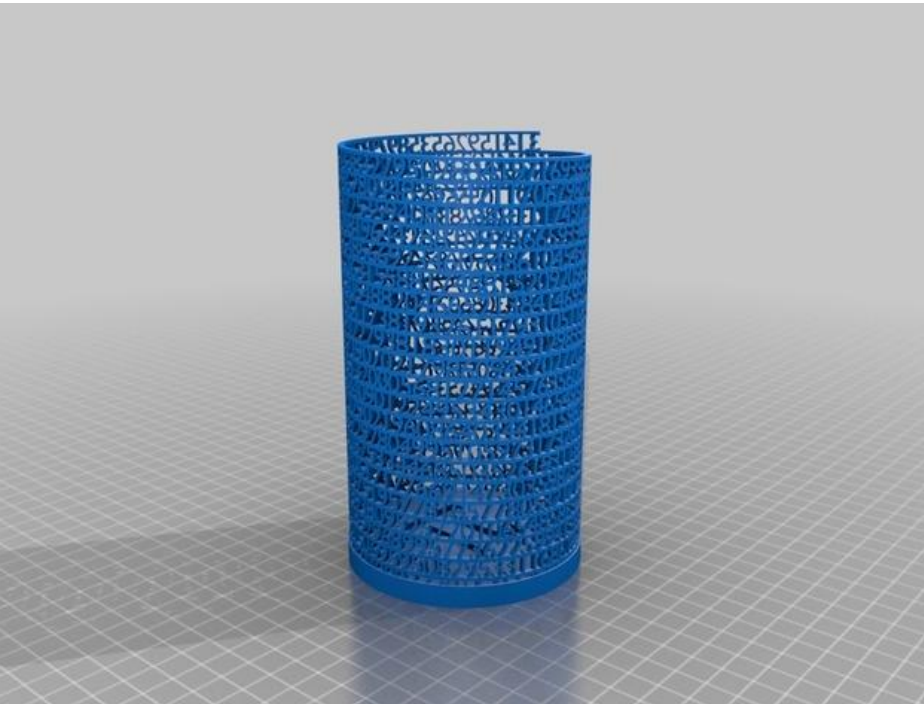
a base polymer containing a carboxylic acid; and

a plasticizer.



YES: some materials are patentable!

## c. CAD-File



"Tower of Pi" by Roman\_Heggin (<http://www.thingiverse.com/thing:271769>)

CAD-file = digital representation = data  
→ Future research!

## d. Software

- Software to transform CAD-file (visual representation) into STL-file (printable file)
- Most important software
  - Magics
  - Streamics
  - Mimics
  - 3Matic
- Software as such **NOT** patentable
  - **BUT** sometimes claims on a machine may include software claims

## e. 3D-printed product



# # different scenario's

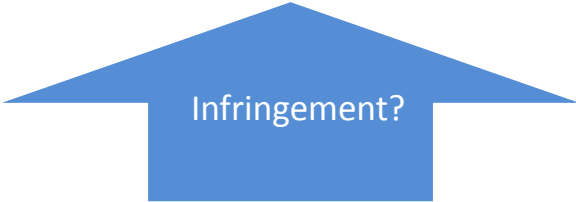
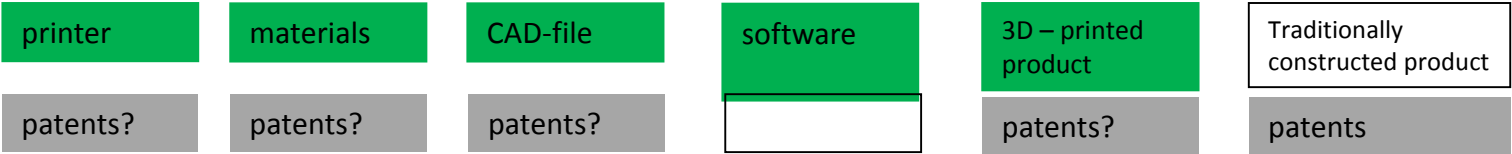
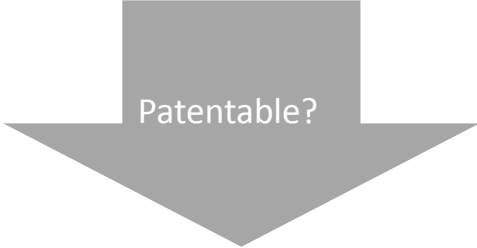
- Scenario 1:
  - **New** physical object printed with 3D printer
    - **YES**, physical object patentable
- Scenario 2:
  - **Existing** physical object printed with 3D printer (but in new material)
    - Novel? YES
    - Inventive? NO
    - Physical object **NOT** patentable



## 2. User perspective

Infringement and consumer 3D printing

# Inventor perspective



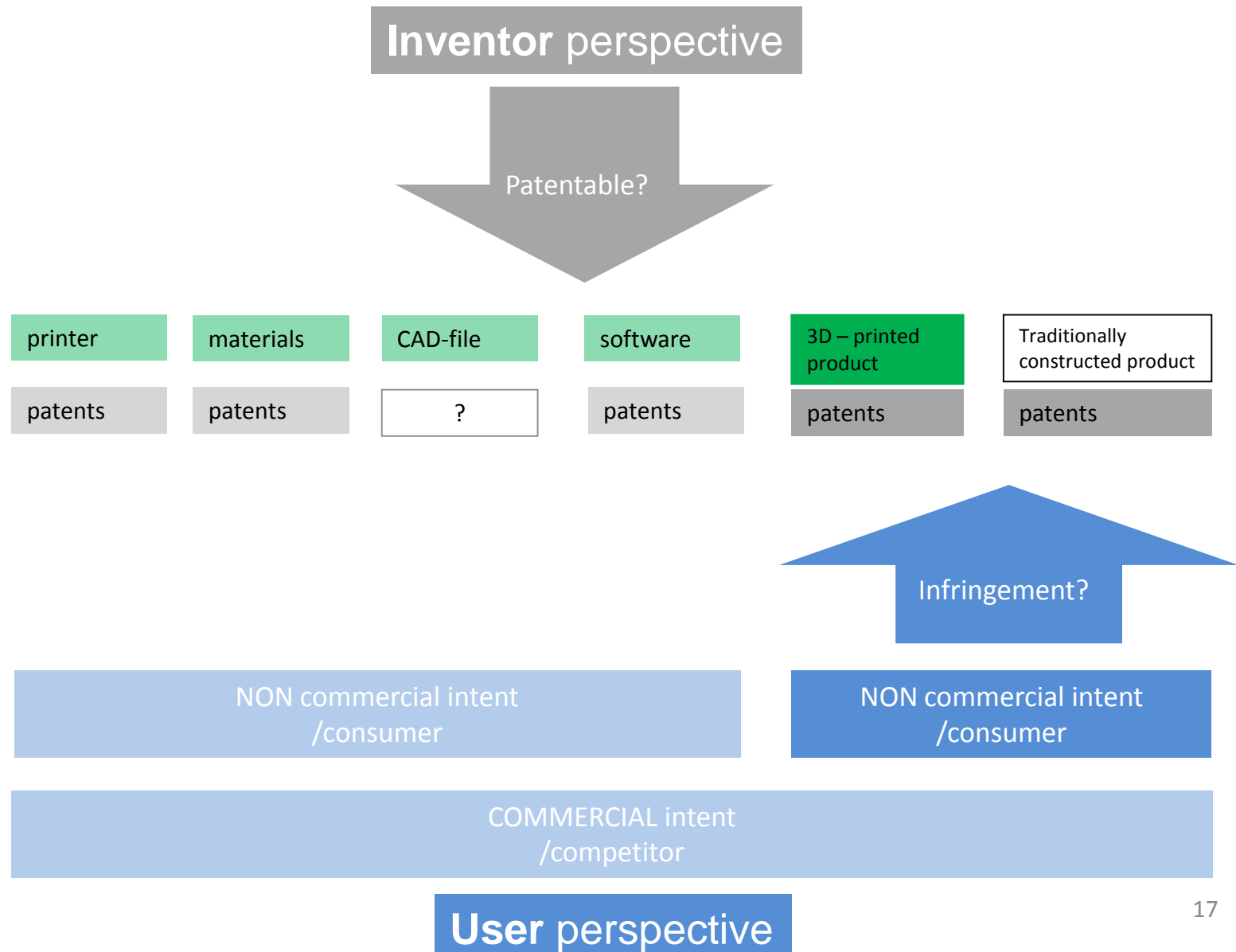
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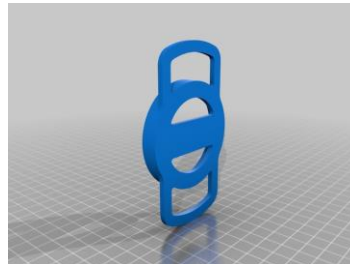
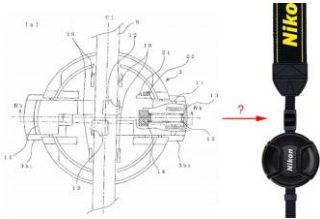
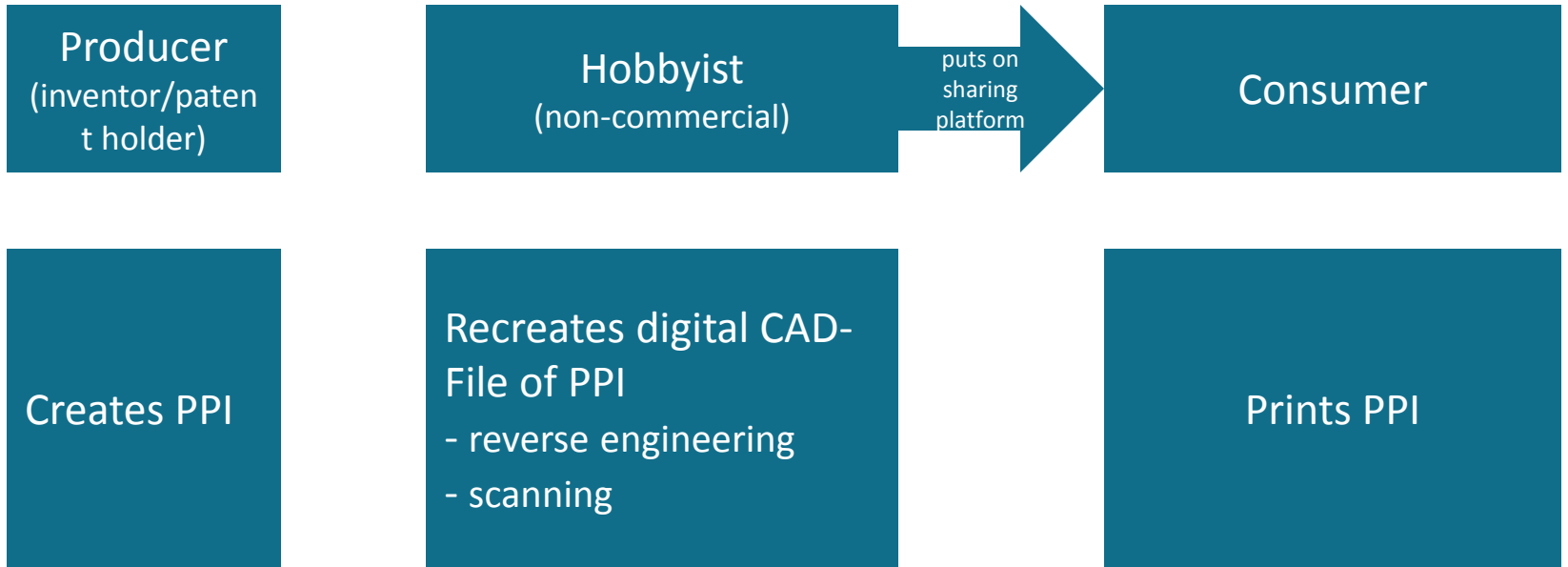
# User perspective



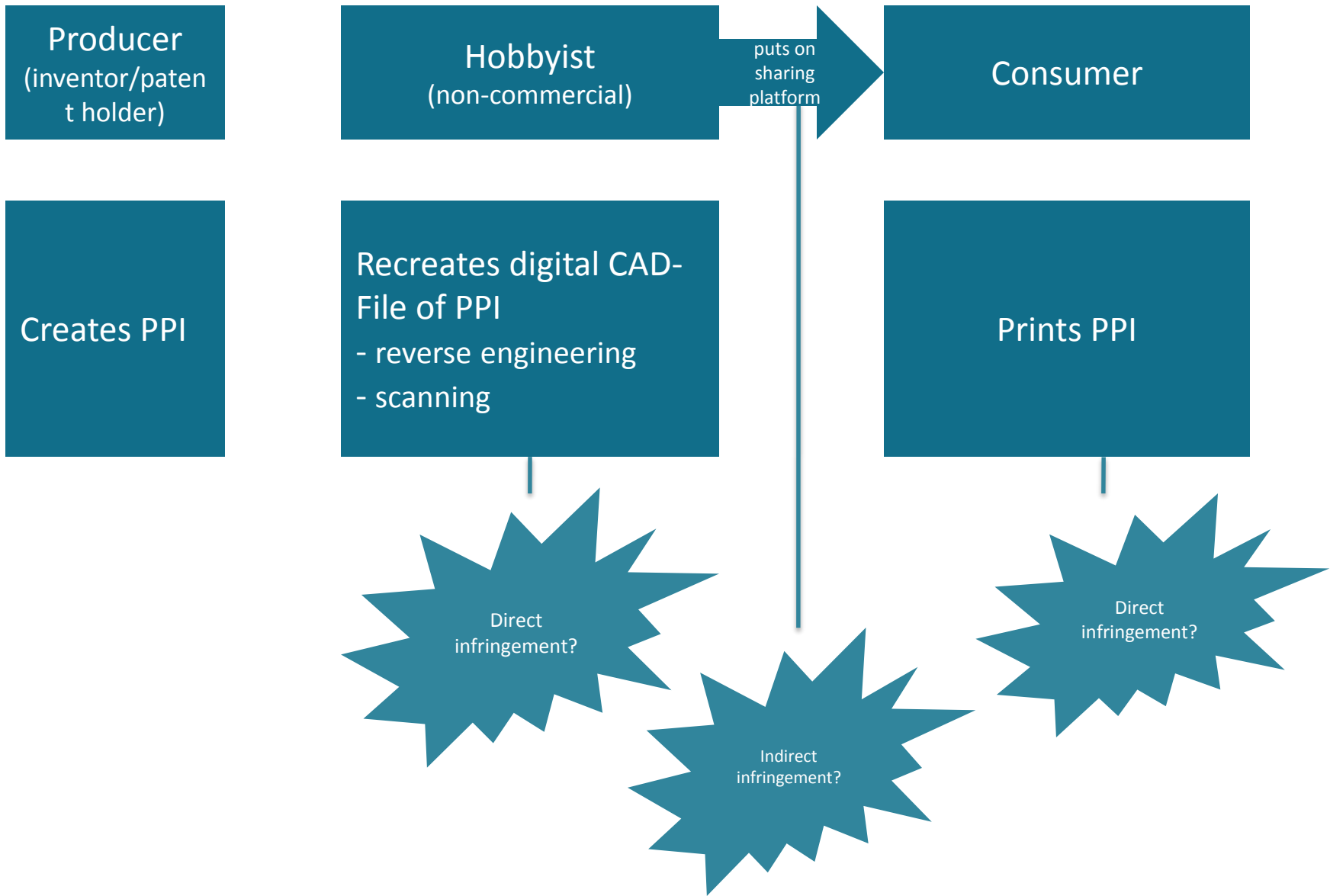
# Two perspectives... Two questions



# Relevant players



\* PPI = Patent Protected Invention



## a. Non-commercial hobbyist

### Direct infringement by creating a CAD-file?

= the manufacturing, offering, use, import or storage of the PPI?

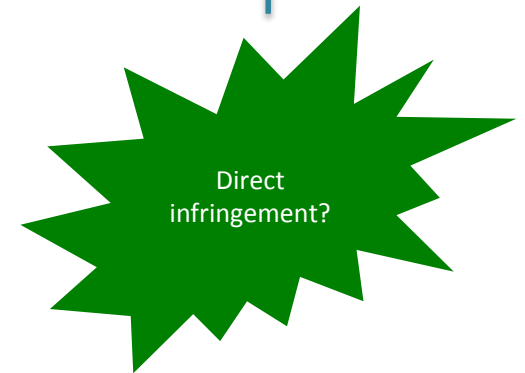
In USA: **NO**

- **Not using** (“PPI being put into service in accordance with its intended functions”)
- **Not manufacturing** PPI

In Belgium: **NO?**

Hobbyist  
(non-commercial)

Recreates digital CAD-  
File of PPI  
- reverse engineering  
- scanning



## a. Non-commercial hobbyist

Hobbyist  
(non-commercial)

puts on  
sharing  
platform

### indirect infringement by creating a CAD-file?

= supplying or offering to supply to any other person other than a party entitled to exploit the patented invention means relating to an essential element of that invention.

In USA: **NO**

- Not means relating to an essential element of the PPI

In Belgium: Not sure

Indirect  
infringement?

## b. Consumer

### Direct infringement by creating a CAD-file?

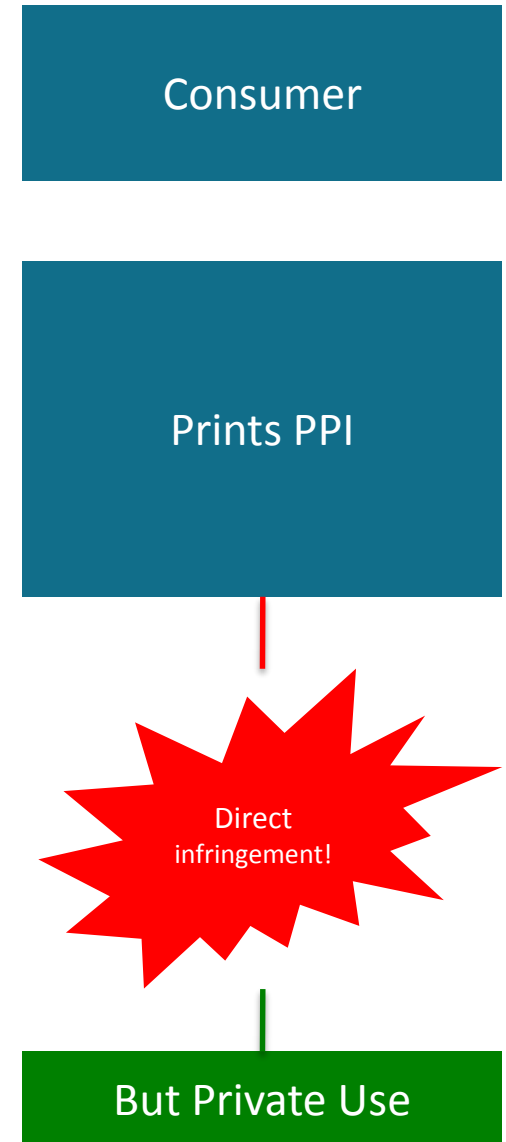
= the manufacturing, offering, use, import or storage of the PPI?

In USA: YES

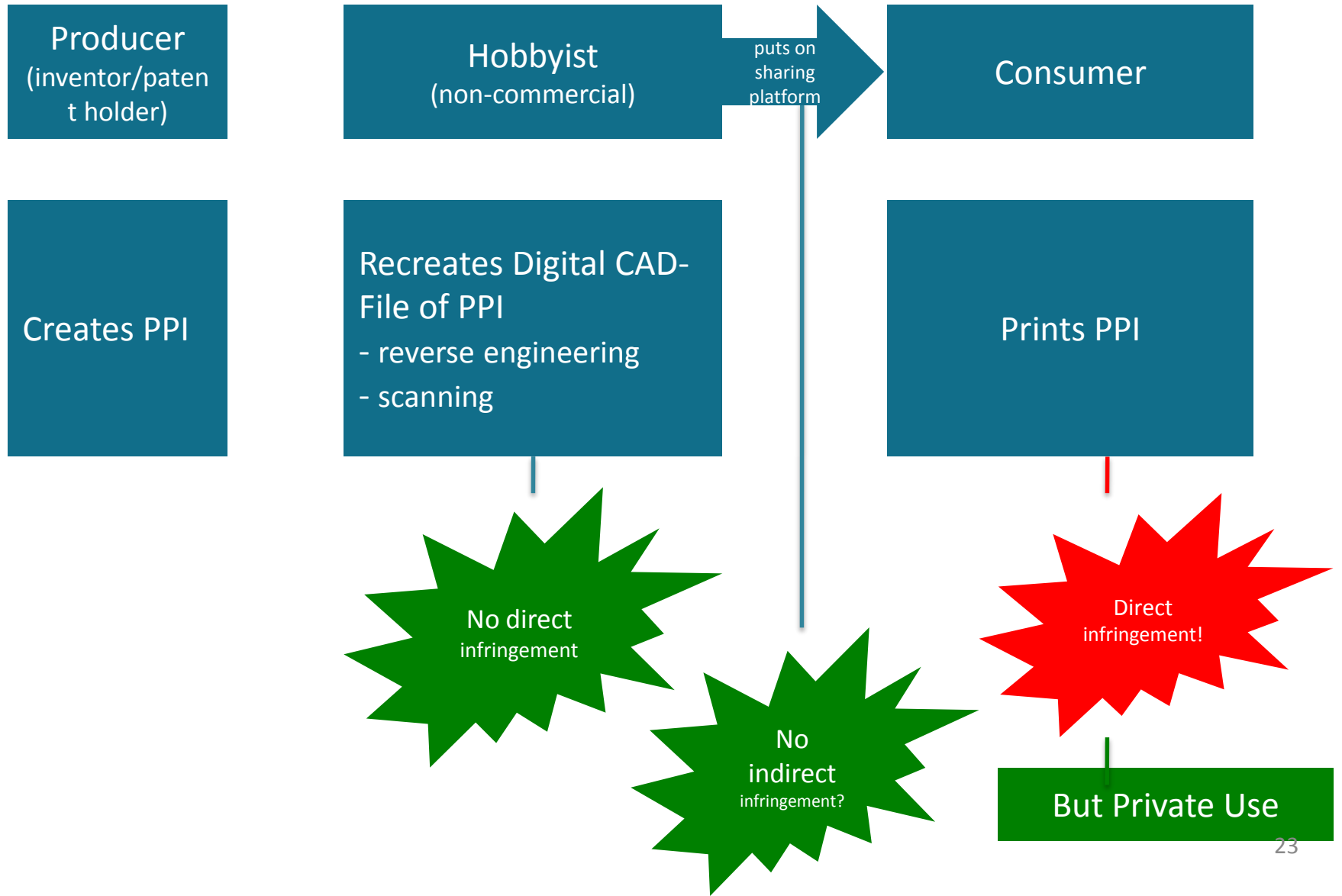
In Belgium: **private use exception!**

= no patent infringement if acts in **private sphere** for **non-commercial** purposes

The rights conferred by a patent shall not extend to any of the following:  
(a) acts done privately and for non-commercial purposes, (b) – (l). (art. 28 §1 (a) BOW) (Art. 27 UPC agreement 2013/C 175/01)



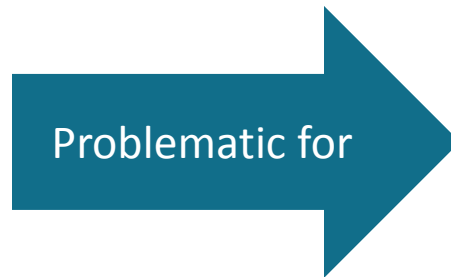
# Conclusion



## Who to sue?

- Hobbyist – NO
- Consumer – NO

Creation of CAD-file  
Copying of CAD-file  
Sharing of CAD-file

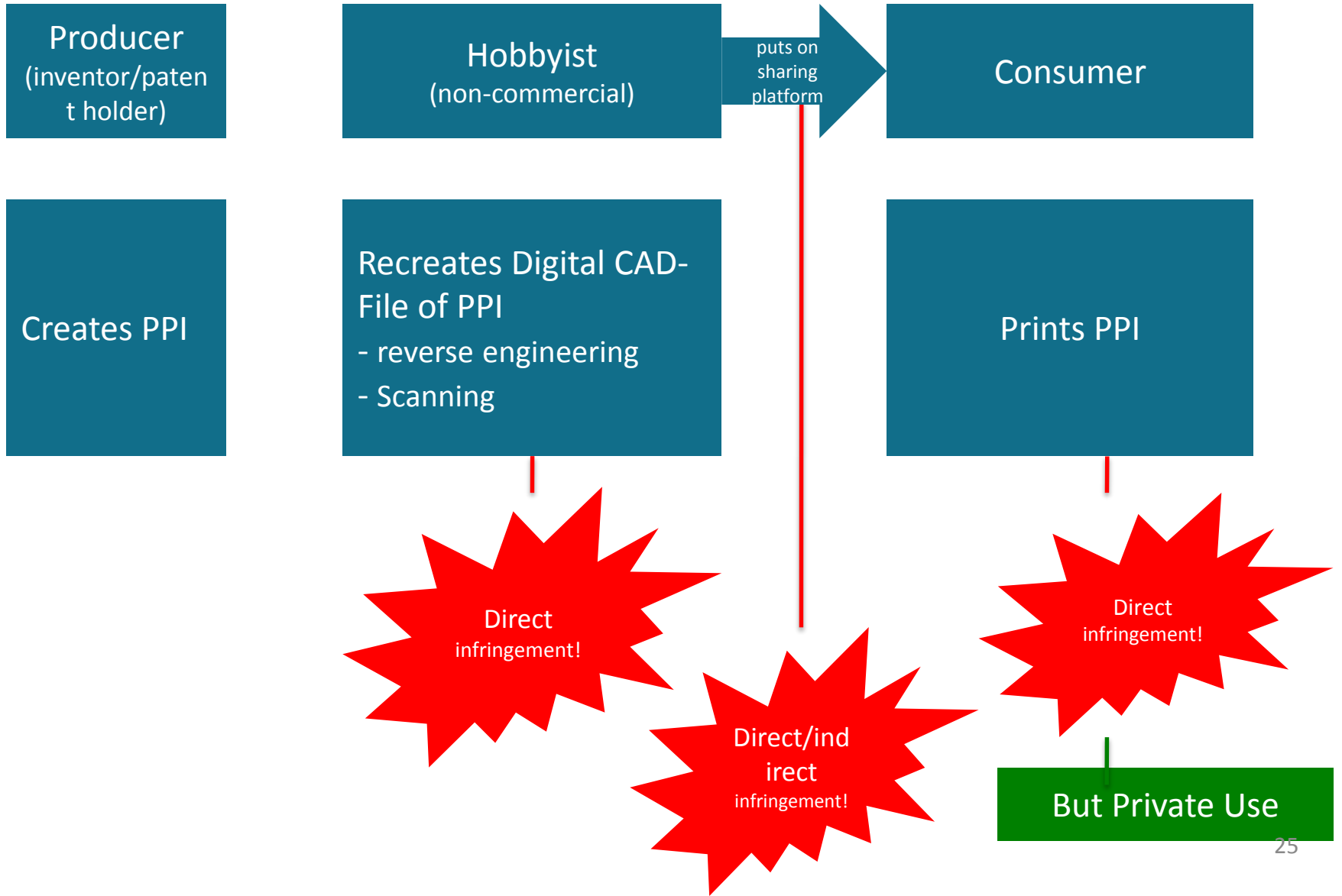


**innovation incentive**

≈ music industry 15 Years ago



# Possible Solution = Protect also CAD-file



# Alternative solutions

- Wide interpretation of **indirect infringement**
- Get rid of the **private use** exception
- Alternative ways of **remuneration** (e.g. taxes on CAD software, taxes on 3D printers, printing material...)
  - ≈ Copyright law