



Preliminaries

The Basic Framework and Initial Questions

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Konomark
Most rights sharable

Roadmap:

- What is intellectual property?
 - The kinds of IP
 - Comparisons
 - The label “intellectual property”
- Why is IP law necessary?
- How did IP law come to be?

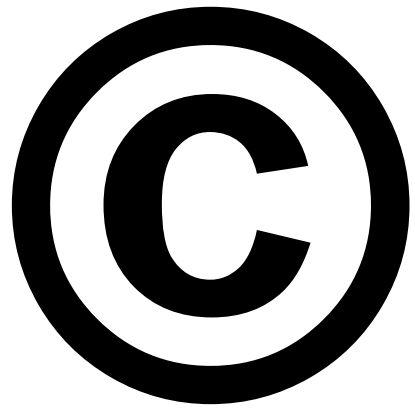
**What is
intellectual
property?**

**the kinds
of IP**

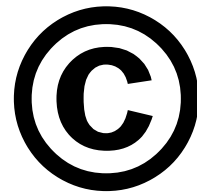
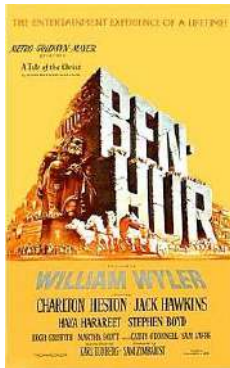
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**What is
“intellectual property”?**

**Copyrights
Trademarks
Patents
Trade Secrets
Rights of Publicity**



Copyright



Copyright



Copyright

- Books
- Poems
- Movies
- Computer software
- Photographs
- Paintings
- Sculptures

Copyright

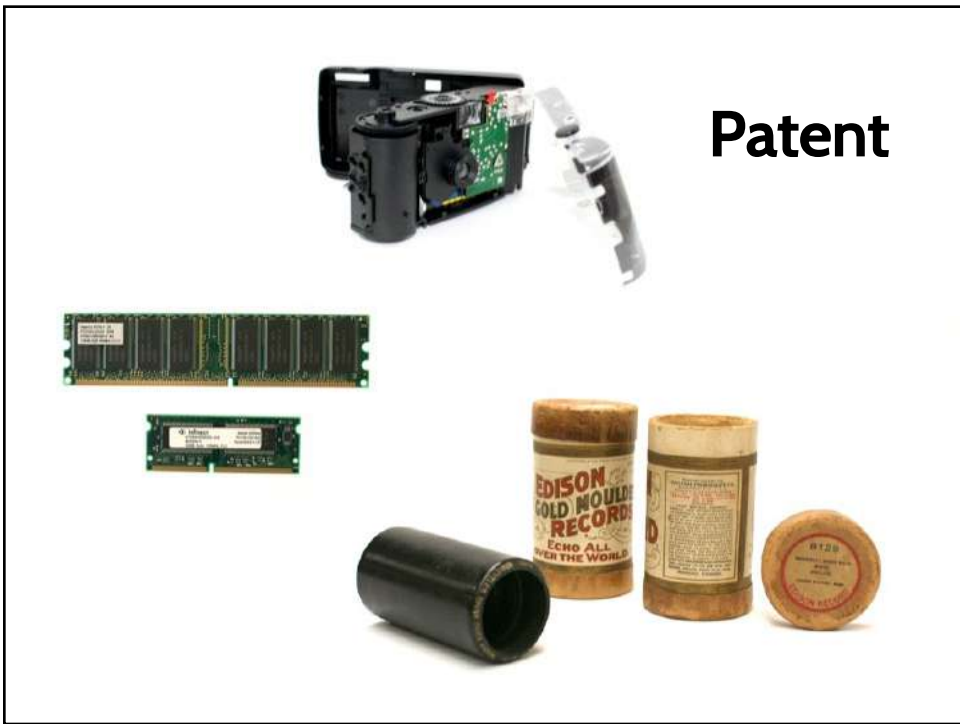
- original works of authorship fixed in any tangible medium of expression from which they can be perceived, either directly or with the aid of a machine


Copyright ©

Protects	expression (text, images, recordings) fixed in a tangible medium
Requires	a mere modicum of creativity
Vests	automatically upon creation
Sustained by	[nothing]
Lasts	lifetime + 70 years; or 95 years
Theory	incentive to create; public goods problem

PAT.

Patent





150093023001

(12) **United States Patent**
Kamen et al.

(13) **Patent No.:** US 6,302,230 B1
(14) **Date of Patent:** Oct. 16, 2001

(54) **PERSONAL MOBILITY VEHICLES AND METHODS**

(57) **Inventors:** Don E. Kamen, Bedford, Robert R. Ashford, Needham, Robert L. Dugan, Needham, J. Douglas Field, Bedford, Richard Kurt Heilmann, Franconia, et al. NEI (US); Reef Amodeo, Cambridge, MA (US); Christopher C. Longwell, Needham, NH (US)

(73) **Assignee:** DEKA Products Limited Partnership, Manchester, NH (US)

(*) **Notes:** Subject to any disclaimer, the term of this patent is extended in adjusted order 35 U.S.C. 154(b) by 0 days.

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(52) **U.S. Cl.:** 380/171; 380/218; 380/271; 380/211; 380/444

(56) **Field of Search:** 380/218, 271; 380/274, 370, 371, 31, 41, 480, 380/436; 441, 440, 439, 000, 030, 318/005, 001, 700; 388/041 Cl. 240/655.2; 238/171, 5, 29 B

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(37) **ABSTRACT**

An automatically balancing vehicle having a headroom sensor. The headroom sensor determines the difference between the maximum velocity of the vehicle and the present velocity of the vehicle. An alarm receives a signal from the headroom sensor and produces a warning when the headroom falls below a specified limit.

7 Claims, 16 Drawing Sheets



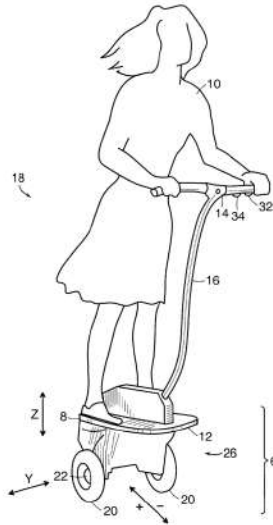


FIG. 1

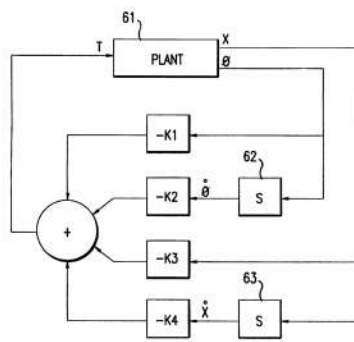


FIG. 3

1 PERSONAL MOBILITY VEHICLES AND METHODS

TECHNICAL FIELD

The present invention pertains to vehicles and methods for transporting individuals, and more particularly to balancing, vehicles and methods for transporting individuals over ground having a surface that may be irregular.

BACKGROUND ART

A wide range of vehicles and methods are known for transporting human subjects. Typically, such vehicles rely upon static stability, being designed so as to be able under all force conditions of placement of their ground-contacting members. Thus, for example, the gravity vector acting on the center of gravity of an automobile passes between the points of ground contact of the automobile's wheels, the suspension keeping all wheels on the ground at all times, and the automobile is thus stable. Another example of a statically stable vehicle is the non-tilting vehicle described in U.S. Pat. No. 4,790,540 (Duclos et al.).

SUMMARY OF THE INVENTION

In one embodiment there is provided a vehicle for carrying a user. In this case, the user is a standing person. The vehicle of this embodiment includes:

- a. a ground-contacting module which supports a payload including the standing person, the ground-contacting module consisting an underlying surface substantially at a single region of contact; and
- b. a rotational drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the rotational drive arrangement consisting, when powered, automatically balanced operation of the system.

In another embodiment, there is provided a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

- a. a ground-contacting module including two substantially opposed wheels;
- b. a platform supporting the user in a standing position substantially above both wheels; and
- c. a rotational drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the rotational drive arrangement consisting, when powered, automatically balanced operation of the system.

In another embodiment, there is provided a vehicle for carrying a payload including a user, and the vehicle of this embodiment includes:

- a. a platform which supports the user;
- b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;
- c. a proximity sensor for determining the presence of the user on the device; and
- d. a safety switch, coupled to the proximity sensor, for inhibiting operation of the ground-contacting module unless the proximity sensor has determined the presence of the user on the device.

2 The proximity sensor may be a member, mechanically coupled to the safety switch, having its operating position and a non-operating position, whereas the member is in the non-operating position in the absence of the user from the device and the member is movable to the operating position when the user is on the device. The member may include a plunger, disposed on the device, for moving a level of the user, whereas placement of the foot on the plunger causes the user into the operating position.

Alternatively, the proximity detector may be electronic and may include a semiconductor device. In a further related embodiment, the device may include a rotational drive arrangement, coupled to the ground-contacting module, the rotational drive arrangement consisting, when powered, automatically balanced and stationary operation of the device unless the proximity sensor has determined the presence of the user on the device.

In another embodiment, there is provided a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

- a. a platform which supports the user;
- b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;
- c. a rotational drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the rotational drive arrangement consisting, when powered, automatically balanced operation of the system whereas the rotational drive arrangement has a power output output and a speed output power output, and, in operation, has balancing energy obtained by the difference between the maximum power output and the power output of the drive arrangement;
- d. a balancing margin monitor, coupled to the rotational drive arrangement, for generating a signal characterizing the balancing margin; and
- e. an alarm, coupled to the balancing margin monitor, for notifying the user when the balancing margin falls below a specified limit.

The alarm may include a light, a sound, or a vibration, or any combination thereof.

In still further embodiment there is provided a device for carrying a user, and the device includes:

- a. a platform which supports a payload including the user;
- b. a ground-contacting module, mounted to the platform, including at least one ground-contacting member and defining a fore-aft plane;
- c. a rotational drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the rotational drive arrangement consisting, when powered, automatically balanced operation of the system in an operating position that is unstable with respect to tipping in at least a fore-aft plane where the rotational drive arrangement is not powered; and
- d. a user input control that receives an indication from the user of a specified pitch of the device under conditions of motion at uniform velocity.

The user input control may include a thrust-wheel disposed upon a handle that is part of the device. A related embodiment

such as means members and elements of wheels are described in the prior application incorporated herein by reference, and the user's hand is used to move the user's feet such ground-contacting element without limitation. The single wheel 44 of alternate embodiment of FIG. 8 and 9 may be supplemented, as shown in FIG. 10, by a nearly wheel providing a pair of adjuster and ground wheels 20. It is to be noted that the vehicle of FIG. 10, like vehicles of various other embodiments disclosed in this disclosure, when riding on wheels 20 for contact with the ground, is inherently unstable in the fore-aft direction with respect to a normal 1. While the vehicle of FIG. 10 is relatively stable in the lateral direction, vehicles of some other embodiments are unstable in both lateral and fore-aft directions. The motion of vehicle 10 may be controlled by user 10 shifting his weight, and thus the center of mass (COM) of the loaded vehicle, in accordance with teachings described above.

Also, as described above, in addition to the direct effect of subject leaning, on the variables governing the torque applied to user for tilting the vehicle, or in an alternate control strategy, user input may be separately incorporated into the control loop in a manner equivalent to variation of one or more of the input variables. Thus, for example, the user may provide an input, by means of a user interface of any sort, the input being treated by the control system separately to a change, for example, in vehicle tilt. Such an interface may include, for example, a handswitch or a joystick mounted on the grip 14.

Referring again to FIG. 10, leaning of vehicle 10 may be provided by user 10 shifting his weight laterally in the Y-Y' direction with respect to wheel 20. The change in position of user 10 relative to the platform 12, and/or the consequent lateral shift of the COM of the combination of user 10 and vehicle 10 may be sensed using any strategy. One example is the use of one or more forceplates disposed on the upper surface of platform 14 to sense differential pressure exerted by a fore leg 42 of user 10 with respect to a second leg 34 of the user. Alternatively, a seat may be used to sense the force between the user and the seat, or a shift in the weight of the user and thus generate a signal for controlling the vehicle's center of the vehicle in response to user leaning. As an alternate example, tilt of platform 12 relative to the axis (Y-Y') of rotation of wheel 20 may be sensed using an inclinometer, or one or more gyroscopes. Corrections may be applied to the measured tilt of differential pressure in a manner that is equivalent to the surface being force-placed by wheel 10, as determined by the measured tilt, with respect to a plane perpendicular to the gravity of the COM (Y-Y') of rotation of wheel 20. In accordance with yet further alternate embodiments of the invention, a force sensor may be provided within handle 10 or a sensor sensor may be provided at point 40, either strategy for sensing leaning by the user and applying the sensed leaning as a user input in the control loop for governing vehicle operation.

In accordance with other embodiments of the present invention, leaning by user 12 may be used solely for governing fore-aft motion of vehicle 10, or, alternatively, leaning may be used solely for governing steering of the vehicle, or for both functions.

A user perspective view of an alternate embodiment of the invention is shown in FIG. 11 where vehicle 10 is a single wheel 28 and user 12 stands, during normal operation of the vehicle, on platform 14 which wheel 24. An embodiment is shown where handle 14 is rigidly attached to platform 14, in this case, via coupling 46.

FIG. 11 shows an embodiment of the invention wherein a wheel 28 is controlled by leaning, as described above with respect to other embodiments, and no handle is provided, such that the entire support of user 10 is by standing on platform 12. Within the scope of the present invention, as described herein and as claimed in any appended claims, user 10 may be supported on platform 12 by standing with feet separated along axis 36 of rotation of wheel 24, as shown in FIG. 11, or, alternatively, with feet positioned across axis 32 of rotation of wheel 24, as shown in FIG. 12 and FIG. 13. A handle 16 may also be provided in the case of a configuration of the invention in which wheel 24 is mounted rearwardly to the direction (faced by user 10, with handle 16 coupled to platform 12 via coupling 46, as shown in FIG. 14.

FIG. 15 shows an embodiment of a vehicle wherein the ground-contacting member is a natural foot. Such a foot may be separately driven in the x and y directions and the vehicle stabilized in one or both of these directions in the manner described above.

In addition to the personal mobility vehicles described and claimed above, in accordance with alternate embodiments of the invention, wheel drive versions of any of the embodiments described may be employed for recreational or educational purposes, whether or not human subjects are controlled therewith. Such user versions may track over various terrain while maintaining balance in the fore-aft plane.

The above embodiments of the invention are intended to be merely exemplary and numerous variations and modifications will be apparent to those skilled in the art. All such variations and modifications are intended to be within the scope of the present invention as defined in the appended claims.

What is claimed is:

1. A vehicle for carrying a payload including a user, the vehicle comprising:
 - a. a platform which supports the user;
 - b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;
 - c. a rotational drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system being unstable with respect to tipping when the rotational drive is not powered, the rotational drive arrangement consisting, when powered, automatically balanced operation of the system whereas the rotational drive arrangement has a power output and a maximum operating velocity, determined by a requirement of accelerations to maintain balance and, in operation, has a balancing margin determined by the difference between the maximum operating velocity and the power velocity of the vehicle;
 - d. a balancing margin monitor, coupled to the ground-contacting module, for generating a signal characterizing the balancing margin; and
 - e. an alarm, coupled to the balancing margin monitor, for notifying the user when the balancing margin falls below a specified limit.
2. A device according to claim 1, wherein the alarm includes a light, a sound, or a vibration, or any combination thereof.
3. A device according to claim 1, wherein the alarm includes a light, a sound, or a vibration, or any combination thereof.

Patent ^{PAT.}

Protects	machines, inventions
Requires	novelty, some level of cleverness (nonobviousness, inventive step), and some other things
Vests	after application, upon issuance by government
Sustained by	escalating maintenance fees
Lasts	up to 20 years
Theory	incentive to invent and disclose; public goods problem

Trade Secrets

Trade Secret



Trade Secret

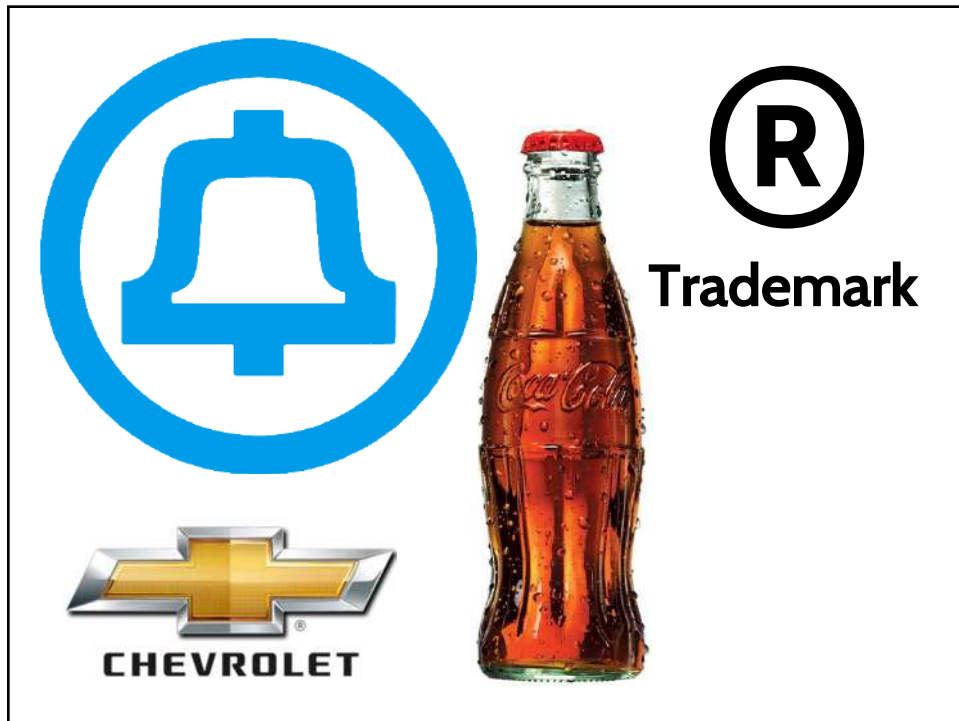
Protects	formulas, recipes, manufacturing techniques, and other intangibles with independent economic value
Requires	secrecy and reasonable efforts to keep secret
Vests	automatically
Sustained by	continuing secrecy and efforts to keep secret
Lasts	potentially forever
Theory	????



Trademark

TM

Trademark



source

Trademark ® TM

Protects	names, logos, slogans, other indications of commercial source
Requires	distinctiveness (can identify a commercial source)
Vests	common law: upon use federal: after use, upon registration
Sustained by	continued use
Lasts	as long as used, potentially forever
Theory	provides information to consumers, which helps the market function better, increasing economic efficiency



Right of Publicity



Right of Publicity

Protects	name, voice, image, other indicia of identity of a real person
Requires	nothing; fame in a few jurisdictions maybe
Vests	automatically
Sustained by	[nothing]
Lasts	lifetime; post-mortem in some states
Theory	????



You

own intellectual property

Comparisons

What is protected?

©	Expression (text, images, recordings)
Pat.	Inventions
TM	Indications of commercial source
Trade Secret	Transferrable commercial secrets
Right of Publicity	Indications of personal identity

What does it take to get it?

©	Fixation (immediate)
Pat.	Application, gov' t review
TM	Use in commerce, creating meaning
Trade Secret	Nothing
Right of Publicity	Nothing (fame, some places maybe)

What does it take to keep it?

©	Nothing
Pat.	Payment of maintenance fees
TM	Continued use in business
Trade Secret	Keeping it secret
Right of Publicity	Nothing

How long does it last?

©	on the order of 100 years
Pat.	on the order of 20 years
TM	forever (if used)
Trade Secret	forever (if kept secret)
Right of Publicity	life + extra sometimes

How is it lost?

©	Very difficult
Pat.	Unpaid fees; successful challenge
TM	Failure to keep exclusive control
Trade Secret	The secret gets out
Right of Publicity	Very difficult (?)

Defenses include ...

©	Fair use, first-sale
Pat.	Invalidity, first-sale
TM	Non-trademark uses, fair uses, first-sale
Trade Secret	Reverse engineering
Right of Publicity	News, free speech, non-commercial

Remedies include ...

©	Injunctions; restitution (of D's wrongful gains); statutory damages up to \$150K per infringement
Pat.	Injunctions; royalties; treble damages
TM	Injunctions; punitive damages; treble damages
Trade Secret	Injunctions; restitution (of D's wrongful gains); punitive damages; royalties
Right of Publicity	Injunctions; punitive damages

the
LABEL

—

What is
“intellectual property”?

“intellectual property
infringement”


“intellectual property
infringement”

Is it
“property”?
It depends on who you ask.

—

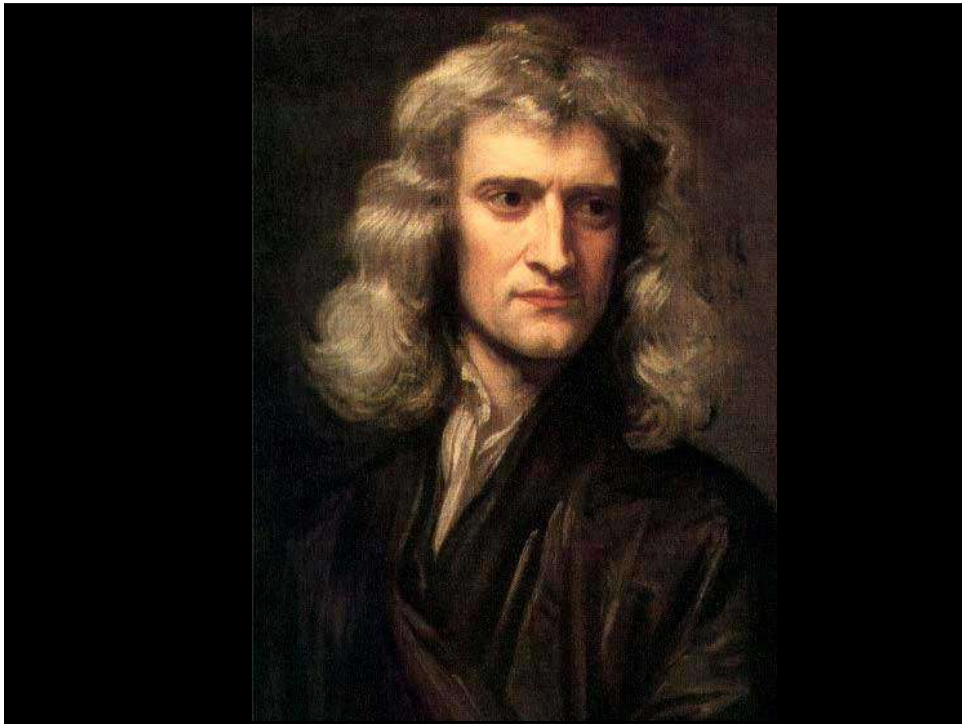
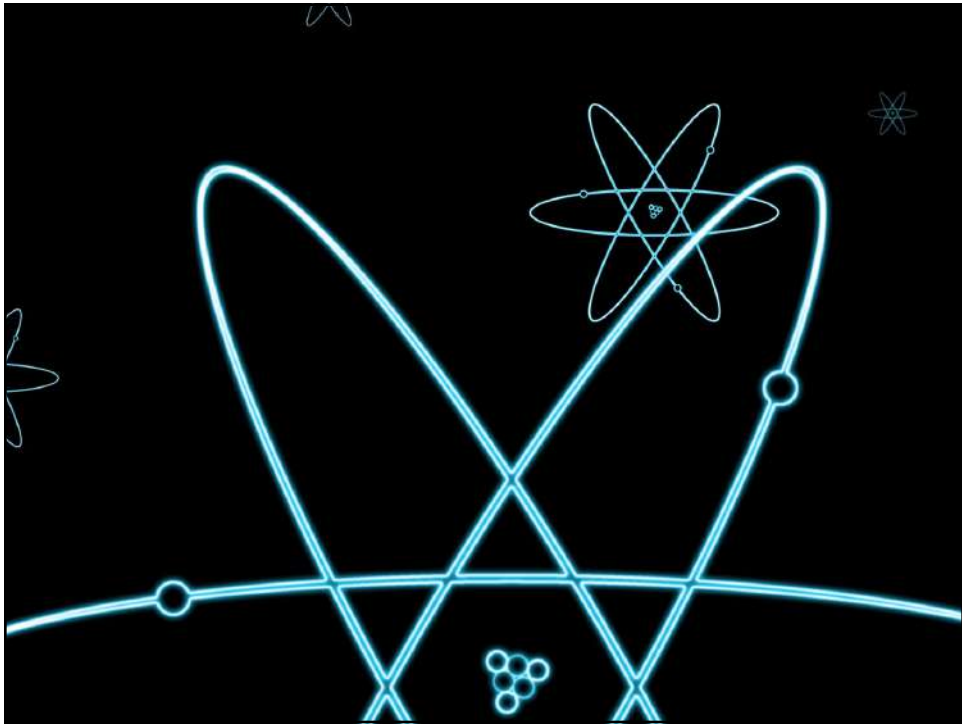
**Is the right to receive
government welfare
property?**

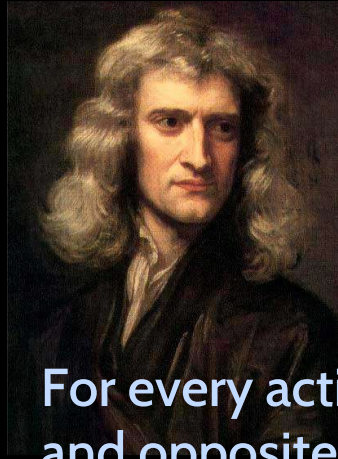
**Is a professional license
property?**

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**Is a government pension
property?**

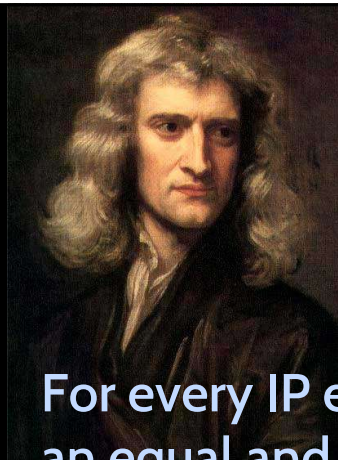
**What's
“intellectual”
about it?**





Newton's Third Law of Motion

For every action, there is an equal
and opposite reaction



Newton's Third Law of IP

For every IP entitlement, there is
an equal and opposite reduction in
freedom.

Why is intellectual property law necessary?

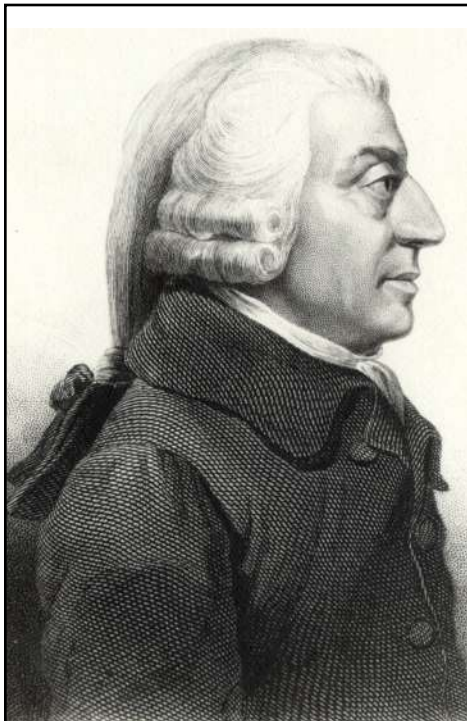
If it is even necessary ...

Why is intellectual property law necessary?

If it is even necessary ...

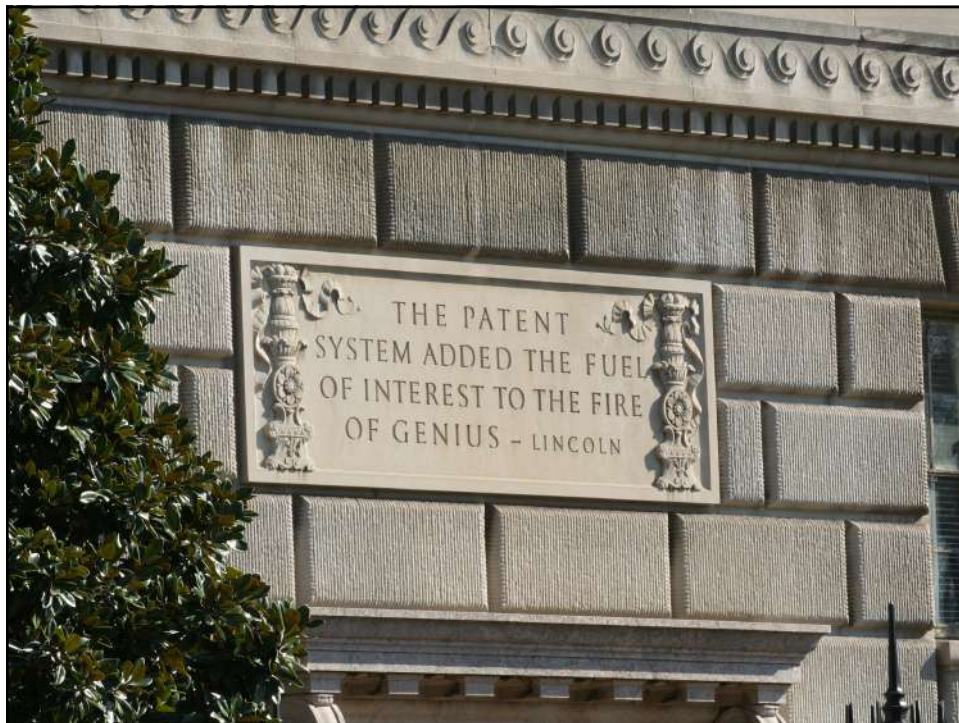


*Classical
Economics*



Adam Smith





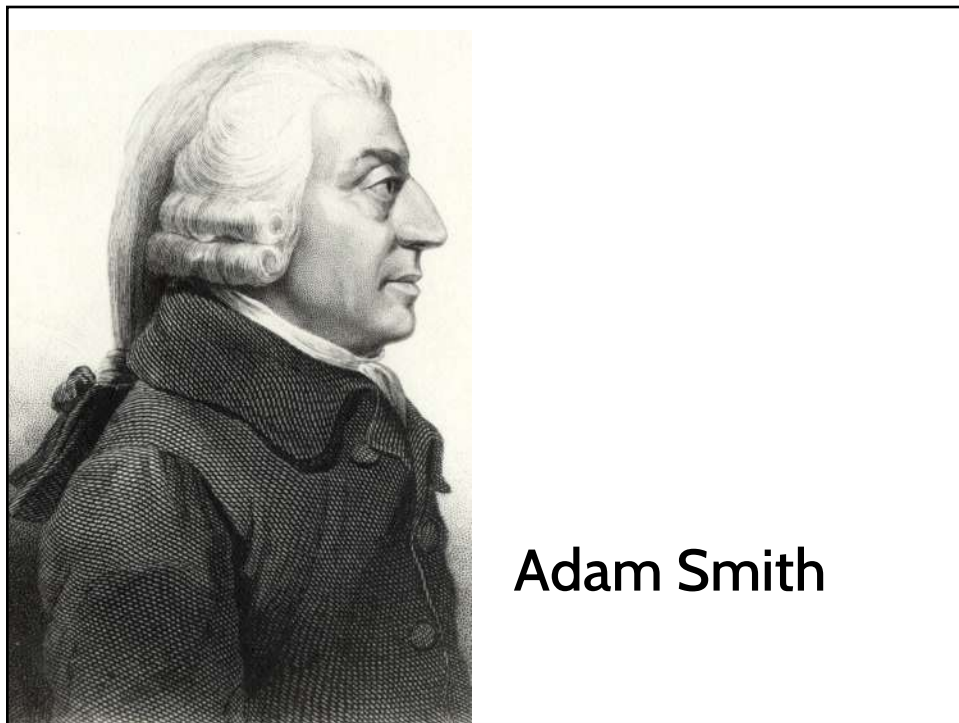
*To promote the Progress of Science and useful Arts,
by securing for limited Times to Authors and Inventors
the exclusive Right to their respective Writings and
Discoveries;*

**How did
intellectual
property law
come to be?**





Queen Anne



Adam Smith

*To promote the Progress of Science and useful Arts,
by securing for limited Times to Authors and Inventors
the exclusive Right to their respective Writings and
Discoveries;*

raison d'être

d'être raison



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