

# “BPILI: Ball Pen Ink Level Indicator”

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**Abstract—** Patent No:201721045800, *Ball Pen Ink Level Indicator (BPILI)* is the technology which introduces two inventions in it. These inventions are useful to the people ranging from business to the students. Ball pen with any color having refill inside it which is used to write the documents in the world of technology still everyone depends on the pen to write the multiple things. The concept of using a ball point within a writing instrument as a method of applying ink to paper has existed since the late 19th century. In these inventions, the ink was placed in a thin tube whose end was blocked by a tiny ball, held so that it could not slip into the tube or fall out of the pen. Ball pen having thick or heavy cover over the refill because of which user is unable to check the refill status of the pen and once refill ends or unable to write a single word then user come to know that refill have to be changed. BPILI focuses by considering above thing only. User will come to before refill finishes ink inside it with the help of BPILI. Here refill is filled with ink 95% which is user preferred color ink and 5% with faint shade of same ink Once 95% part of ink inside the refill faint shade will be dispensed from the refill. Due to which user will come to know the end status of the refill. Also a ‘Technical pen’ is invented which consists of LED light mounted on it. Once refill of the pen is come to finish level then the ink pressure sensor will give signal to LED to blink. Due to which user will come to know the refill status which is a type of indicator to show the status of refill inside the pen. Proposed technology of pen will be used by any type people in any working area with less amount worrying about refill status.

**Keywords—**BPILI, Ball Pen Ink Level Indicator, Ball pen, LED light, Technical pen

## I. INTRODUCTION

A ballpoint pen, also known as a biro or ball pen, is a pen that dispenses ink over a metal ball at its point, i.e. over a "ball point". The metal commonly used is steel, brass, or tungsten carbide. It was conceived and developed as a cleaner and more reliable alternative to dip pens and fountain pens, and it is now the world's most-used writing instrument: millions are manufactured and sold daily. As a result, it has influenced art and graphic design and spawned an artwork genre. Pen manufacturers produce designer ballpoint pens for the high-end and collectors' markets. Always bring more than one writing pen or pencil to an exam, and use what the test asks you to provide. Pencil is often used on fill in the blanks because of the machinery. Pens are fluid and easy to write with, but are not as easily edited. Pens may smear. Many historically and culturally significant documents from the mid-to-late twentieth century were written in ballpoint pen inks, which contain light-sensitive dyes that present problems for collection custodians and paper conservators. The study results offer collection custodians storage options for historic documents containing ballpoint pen ink. In addition, the ink

must flow to the tip of the pen without interruption when used for rapid writing without accumulating any residue of ink components at the tip of the pen. Many manufacturers and consumers seek writing instruments which will write, color, and or mark objects with multiple colors. As per above paragraph information ball pen is used in various area. But one more problem is that if suppose ball pen ink lasts in the middle of writing any document and user don't have other option to write. Such a kind of situation can be solved with the help of Ball Pen Ink Level Indicator (BPILI) which is a type of indicator used to show the status of the ink inside the pen also user will be informed about the end status of ink inside the pen. Due to which user will not be of in any trouble. Due to such a technology multiple user will take benefit of this pen in low cost.

Ball Pen Ink Level Indicator (BPILI), which comprises of two functionalities which are defined by considering a common people need and use. These two functionalities includes ball pen ink status level indicator and a type of technical pen. These two inventions are useful to the people from business area to the student in any standard. These inventions are used in any type of pen which having refill replacement facility. Ballpoint is a term often used to describe the majority of pens used in daily life. Specifically, however, a ballpoint pen has an internal cartridge or reservoir for ink and a sphere at the point. Ink comes out of the cartridge and coats the sphere. As the ball-shaped point rolls along paper, ink is deposited in the form of writing or drawing. Today, the ballpoint pen is the most used ink-writing instrument in the world. The pens can be seen in homes, businesses, hotels and school rooms. Some pens are very expensive and can be used for years with replacement cartridges. Others cost only a few cents and are made almost completely of plastic. These are thrown away once the ink runs dry. In addition to writing, the pens are used by artists to create striking pen and ink drawings. The ability to make fine lines allows artists to create cross-hatching and other shading techniques without worrying about smudging or bleeding ink.

Businesses also use ballpoint pens for marketing purposes. The affordability and versatility of the pens make it possible to order large quantities with logos or business contact information printed on the barrel. Pens can be delivered through mail-order marketing, by handing them to customers or by offering them as a convenience as is done in banks and hotels. Regardless of how much writing you do, it is likely you see at least one ballpoint pen each day. Over the course of their history, these pens have moved from the desk of an inventive newspaper editor to the purse, pockets and drawers of the entire world.

Revised Manuscript Received on April 15, 2019.

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By considering all above factors BPILI focuses on the usability and durability (life of pen) of a pen having refill replacement facility. This invention describes the idea in which a refill is divided in to 95-5% manner. 95% part of the refill is filled with a color which user has chosen and 5% part of the refill is filled with faint shade of same color. This divide formula is used to inform the user about the status of ink in the refill. Once ink reaches to 95% level then faint shade started to dispense from the pen point due to which user will come to know that ink inside the refill is come to finish. At that point only user don't have to worry because faint shade is filled 5% of refill capacity. By finishing user work user can change the refill. In this way user will know before, finishing of ink inside the pen. One more pen is invented in the proposed technology which can be termed as 'Technical Pen'. Which comprises of ink pressure sensor, LED light and small battery. Once pressure of the ink inside the pen will be less then LED light will blink due to which user will come to know the end status of the ink inside the pen. In this way proposed technology is helpful for the people who have habit to write with the help of pen. Even if user don't have to carry extra refills or ink bottle with him. Before end of ink user will know the end status of ink inside the pen due to which user will not be in any trouble.

### Market Survey

The fig 1.1 shows survey of regular pen and BPILI, BPILI is more demand of the user, it indicates the ink level inside the pen. BPILI is more important of the user, 70% user demanding the BPILI, so here develops this type of system.

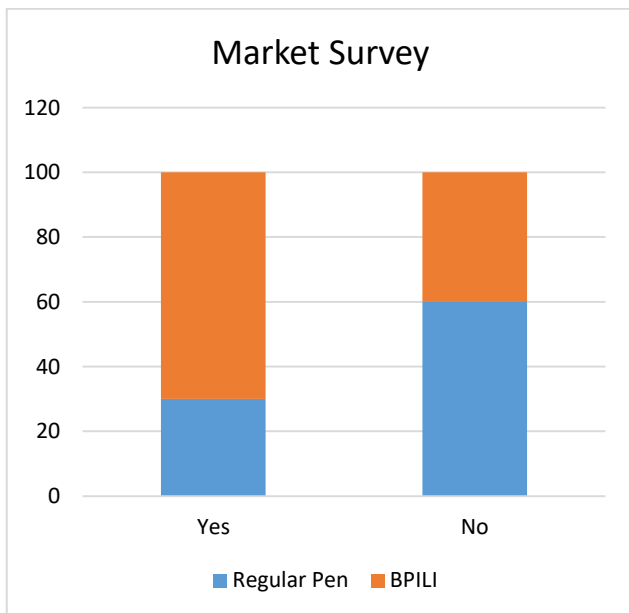


Fig. 1.1 Market Survey

## II. RELATED WORK

Horie Yukio, patent no: US 3446564 A.

Have defined, “Ballpoint pen for water-soluble ink”. A pen outer barrel is filled directly with water-soluble ink, which is fed to the ball of a ballpoint and is air vented and pressure relieved by a device including an inner cylinder with a small vent hole, a gas-permeable structure, an ink absorber, and a cap plug having an air vent hole and capping

the rear end of the barrel. The gas permeable structure and absorber permit passage of air but respectively resist ink flow and absorb ink to prevent ink leakage out of the barrel. [2]

Muliterno Eduardo Sanchez Patent no: EP 0381818 A1.

Have defined “Ink level inspection means for writing devices”

The improvements consist in that the body or covering frame of the loading part of a ball point pen or writing device shows near the end of the pen several windows or openings. Through these windows one can see how the ink kept in the inkwell diminishes and relocates itself at the end point of the pen. A bright red color substance helps to visualize its position.[3].

David E. Hanke, Bruce Gindelberger, Saul Heiman

Patent no: WO 1996001879 A1.

Have defined “Water-based ink composition for ball-point pen

A shear-thinning ink composition for use in ball point pens contains a substantially reduced amount of water. These low water-containing inks contain a polymeric material and exhibit superior 'cap off' properties by remaining free-flowing after the cap has been off of the pen for at least seven days. The ink compositions of this invention comprise as little as 4 parts by weight of water if the ink utilizes dye as the colorant and as little as 10 parts by weight of water, based on 100 parts of the total composition, if the ink utilizes pigment as the colorant. [4].

Judith Bender, Jon Soriano, Darryl HUDOCK

Patent no: US 20100061793 A1.

Have defined “Million color pen”

A self-contained multiple color writing pen has a single writing tip for dispensing a user selectable variable color ink to paper or other surfaces from an internal mixing chamber. Several internal ink reservoirs each having a different color ink, supply their ink to the mixing chamber. A user may easily change the selectable writing color even as he writes by manually moving a rotatable thumbwheel on the pen and the dispensed ink output changes quickly in response to such thumbwheel input. The number of colors selectable by a user is seemingly infinite and includes the entire color spectrum. [5].

## III. BALL PEN INK LEVEL INDICATOR (BPILI)

Ball Pen Ink Level Indicator (BPILI) which is a ball pen or any type of pen consists of refill which is filled with two color ink in a single refill. Two colors include user preferred ink and adjacent faint colored ink. 95% part of the refill is filled with user preferred ink and 5% part of the refill is filled with adjacent faint color ink. This introduction of two colors inside the refill done to minimize the user efforts to check whether ink refill is empty or not. Introduction of these two colors inside the refill informs the user about status of refill inside the pen. Once first color of the refill is about to finish second color ink started to come out through pen nib due to which user will come to know that pen ink has been finished and user have to change the refill. Second part of the BPILI



introduces a 'Technical Pen' which has ink pressure sensor, small battery and LED light indicator. This pen turn on LED light once ink pressure or capacity of ink inside the refill is about to finish. This has been done with the help of ink pressure sensor. This technical pen will used anywhere and there is no chance to finish ink in the middle of writing any document. Because it will give indicator initially about the status of pen refill. Thus this pen will increase its own life and user will also be satisfied by using this pen.

#### IV. IMPLEMENTATION DETAILS

'Ball Pen Ink Level Indicator (BPILI)'

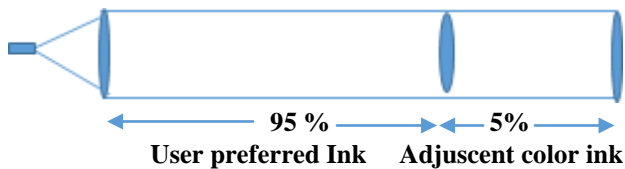


Fig. 1.2 Block diagram of 'Ball Pen Ink Level Indicator(BPILI)'

Explanation Fig. 1.2 shows complete block diagram of Ball Pen Ink Level Indicator (BPILI). It comprises of pen with refill inside it. Fig shows the internal structure of the pen used to write document. Also how the ink part is divided in 95 to 5 parts to inform the user. This pen diagram is of any type which having refill which can be replaced after the complete use. A pen is a writing implement used to apply ink to a surface, such as paper, for writing or drawing. Historically, reed pens, quill pens, and dip pens were used, with a nib dipped in ink. Ruling pens allow precise adjustment of line width, and still find a few specialized uses, but technical pens such as the Rapidograph are more commonly used. Modern types also include ballpoint, rollerball, fountain, and felt or ceramic tip pens. A ballpoint pen dispenses an oil based ink by rolling a small hard sphere, usually 0.5–1.2 mm and made of brass, steel or tungsten carbide. The ink dries almost immediately on contact with paper. The ballpoint pen is usually reliable and comes in both inexpensive and expensive types. It has replaced the fountain pen as the most common tool for everyday writing.

Ballpoint pens have proven to be a versatile art medium for professional artists as well as amateur doodlers. Low cost, availability, and portability are cited by practitioners as qualities which make this common writing tool a convenient, alternative art supply. Some artists use them within mixed-media works, while others use them solely as their medium-of-choice. By considering all above uses of pen from various area we have to focus on the thing that the pen ink will be finished at some time where important work done by any kind of user like artists or student or teacher or writer or anybody who using a pen. Such a kind of situation can be tackled with the help of BPILI. Ballpoint ink is specially formulated to be thick and fast-drying. Its viscosity is precisely controlled: it must be as thick as possible but still thin enough to flow down the barrel of the pen in response to gravity.[6][7]

Inks consist of a pigment or dye, dissolved or suspended in a solvent. Pigments are tiny colored particles that are suspended in the solution; dyes are completely soluble in

liquid. Ballpoint pen inks use dye because the tiny particles of undissolved pigment can clog the ball of the pen. The solvent of most inks is water or oil. Ballpoint pen ink is usually oil-based to give it its thickness. Oil also is why ballpoint pen ink dries quickly and is permanent and water-fast. Ballpoint pen ink is about 50 percent dye. Black ink gets its color from carbon black, a fine powder made from soot. Red ink is made from eosin. Several dyes are used to make blue ink, but the more common ones include substituted triphenylmethane dyes, copper phthalocyanine blue and crystal violet. Black and blue inks often contain iron sulfate, and gallic and tannic acids. These additives have been used since the middle Ages to make ink more permanent. The dyes and additives are dissolved in a solvent, often ethylene glycol or propylene glycol. Then synthetic polymers, often nitrocellulose-based, are added to help disperse the dye through the ink and adjust the viscosity and surface tension. By considering all above things ball pen ink made up of above mentioned chemicals and put in the refill under pressure from start to end of same color. But in the present invention to know the ink level status some modifications has to be done. In this refill instead of single color the color portions has to done in a manner of 95 to 5 percent rather than complete 100%. 95% part of the refill is filled with any dark color of user choice like blue, green, red, black etc. and 5% part of the refill is filled with faint shade of same color using same kind of chemicals but in faint shade. This modification has been done to inform the user regarding the ink status of the pen. Once ink level reaches to 95% level then faint shade of the ink started to be dispense from the ball of the pen due to this shade user will come to know the end status of refill. Faint shade is filled 5% because of which user will complete his work by that time afterword's he has to change the refill for the next use. In this way even if at the mid of writing any document user don't have to stop his work due to invention of ball pen indicator and he will know that refill of the pen must be changed. Such a technology can be used by common people in low cost.[8].

Complete block diagram of Technical Pen

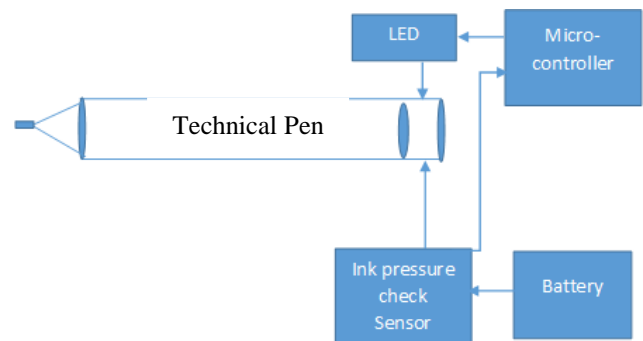


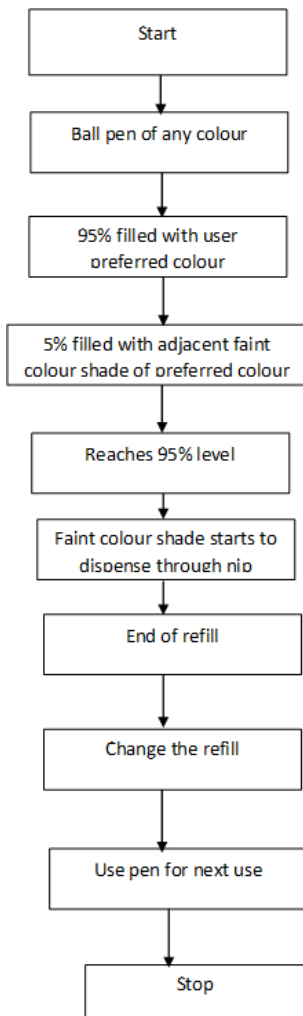
Fig. 1.3 Complete block diagram of Technical Pen

Explanation: Fig. 1.3 is a complete block diagram of Technical pen. It comprises of pen, ink pressure check sensor, battery, micro-controller and LED light. Proposed system developed a pen which can be called as 'Technical

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Pen' and used in any place anywhere as like normal ball pen. This name has been given due to use of some parts like sensor, LED and battery. This invention show the indication of low level ink status to the user with the help of LED light. Here technical pen having pressure sensor which checks the pressure inside the refill and informs this status to the micro-controller. Micro-controller gives signal to the LED light once ink inside the refill reaches to 95% due which pressure will be low inside the refill as well as on the ball point of the pen due to which pressure sensor senses this low pressure and gives this status to the micro-controller. As a response micro-controller glows LED light mounted on the pen. Due to which user will come to know the low ink status of the pen. At that time only users work will not stop but will continue up to some time because user informed before end of ink rather than complete empty ink refill status. After that user will take appropriate action on the current situation.

*Complete Work Flow Diagram Ball Pen Ink Level Indicator(BPILI)*

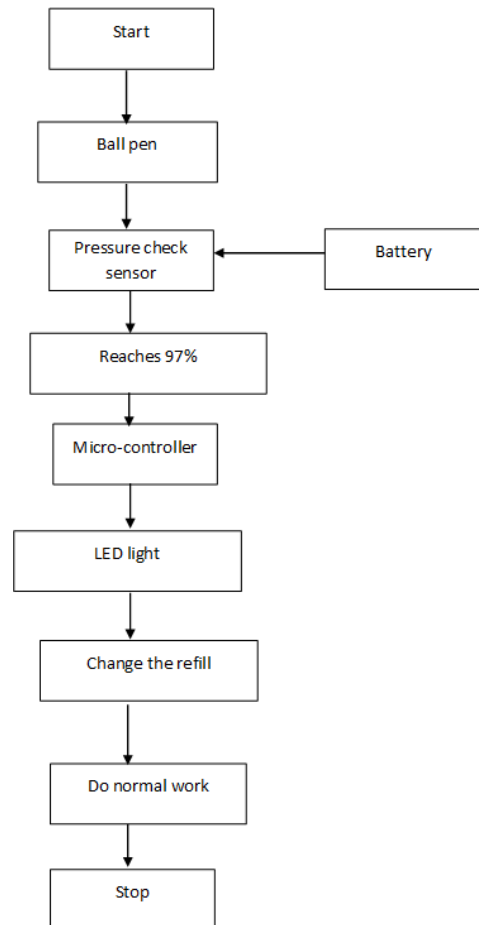


**Fig.1.4 Complete Work Flow Diagram of Ball Pen Ink Level Indicator (BPILI)**

Explanation: Fig. 1.4 is a Complete Work Flow Diagram Ball Pen Ink Level Indicator (BPILI). It comprises of ball pen of any color, 95% filled with user preferred color, 5% filled with adjacent faint color shade of preferred color, Reaches 95% level, Faint color shade starts to dispense through nip, end of refill, change the refill and use pen for next use. This is the workflow diagram shows step by step

working of Ball pen intensity level indicator. Initially user has chosen ball pen or any type of pen which having refill replacement facility with any referred color. Here the refill of the pen is filled with two colors first on is the dark shade of the color and last one is the faint shade of previous color. Here dark shade color filled up to 95% part of the refill and 5% part of the refill is filled with faint shade of same color. This modification has been done to inform the user before end of ink in the pen. User should not face any trouble while working on type of document due to end status of the ink. To face such a condition proposed system discovered such a technology due to which user will don't have any problem rather than user will come to know before end of ink in the ball pen. Due to this modification user don't have to stop or wait for doing his work until replacement of refill inside the pen. User can continue his work without worrying. 95% part of the ink finished then faint shade of the user preferred color started to dispense. Due to which user cannot stop his work immediately but he will know that he has to change the refill after some time. In the current case if suppose refill ink has been finished then user have to stop his work immediately but due to proposed technology user can do his work without interruption up to some time. Once user get time he has to change the refill and do his next work same way without worrying or checking every time.

*Work flow diagram of Technical Pen mechanism*



**Fig.1.5 Work flow diagram of Technical Pen mechanism**



Explanation: Fig. 1.5 is a complete work flow diagram of technical pen. It comprises of ball pen, intensity check sensor, battery, LED light, change the refill, and do normal work. Here a technical pen is developed whose appearing is same as that of normal pen but having LED mounted on it to inform the ink status level to the user due to which this pen is known as technical pen. A technical pen is a normal ball pen having pressure sensor inside it which senses the pressure of ink inside the refill. A small battery is present to give power to the pressure sensor as well as LED. Pressure sensor senses pressure and give this information to the micro-controller. Micro-controller checks this status and once status reached up to 97% then LED light will blink automatically. This signal is given by micro-controller to the LED light. Once LED light will blink user will know that he has to change the refill for his normal working.

In this way present technology solves user problem regarding refill replacement of any type pen. These type of pens can be used by any type of user from small scale to high scale without worrying of refill replacement. Also user don't have to check the ink level status every time and carry multiple pens and refill along with him. This technology will improve the pen life.

**V. NOVEL FEATURE & RESULT OF BALL PEN INK LEVEL INDICATOR (BPILI)**

BPILI uses two shades of same color inside the pen in the manner of 95-5%. Once faint shade started to dispense user will come to know that refill is at the status of empty. Afterwards he will take appropriate action. A technical pen also introduced to define the same thing but some different manner.

Table 1.1 shows the additional features added in the BPILI.

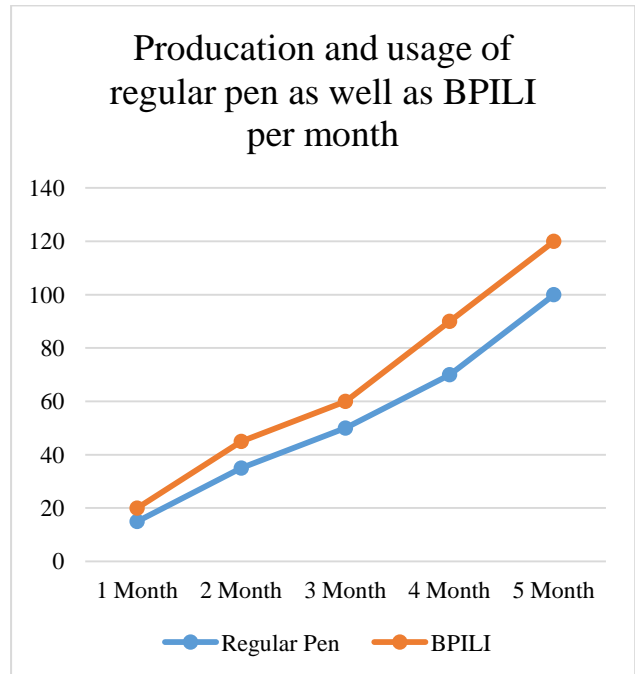
Table 1.2 shows production of regular pen and BPILI per month along with usage by user.

**Table 1.1 Difference in Regular Pen and BPILI Table**

| System →                          | Regular Pen | BPILI |
|-----------------------------------|-------------|-------|
| Parameters ↓                      |             |       |
| Ink level check                   | No          | Yes   |
| LED light indicator               | No          | Yes   |
| Affordable to user                | yes         | Yes   |
| Human effort and customer comfort | Yes         | No    |

**Table 1.2 Production and usage of regular pen as well as BPILI**

| Month   | Regular pen | BPILI |
|---------|-------------|-------|
| 1 Month | 15          | 20    |
| 2 Month | 35          | 45    |
| 3 Month | 50          | 60    |
| 4 Month | 70          | 90    |
| 5 Month | 100         | 120   |



**Fig. 1.6 Production and usage of regular pen as well as BPILI**

*Key Benefits*

1. Current and future trends adopted by the key market players are highlighted to determine the overall competitiveness of the market of a BPILI (Ball Pen Ink Level Indicator).
2. The technology-effective drivers and opportunities are highlighted to describe the top factors responsible for market growth in Ball Pen Ink Level Indicator (BPILI).
3. A quantitative analysis of the market through 2016-2025 is provided to highlight the market potential.

*Advantage(s) of Ball Pen Ink Level Indicator (BPILI):*

1. Ball Pen Ink Level Indicator (BPILI) uses the technology which indicates ink end level of pen refill inside ball pen.
2. Ball Pen Ink Level Indicator (BPILI) will be useful various places where people don't have time to check every time ink status of ball pen etc.
3. Ball Pen Ink Level Indicator (BPILI) uses 95% of user preferred ink (black, blue, red, green etc.) and 5% ink will be the adjacent shade of ink placed in 95% area of ball pen.
4. Ball Pen Ink Level Indicator (BPILI) is not so expensive.
5. Ball Pen Ink Level Indicator (BPILI) saves human efforts.
6. Ball Pen Ink Level Indicator (BPILI), defines one technical pen which uses sensor to sense pressure of the ink inside the pen.
7. Ball Pen Ink Level Indicator (BPILI), as ink came to finish small LED will blink to inform the user about status of ink inside the pen.
8. Ball Pen Ink Level Indicator (BPILI), saves user money.



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9. Ball Pen Ink Level Indicator (BPILI), used in various kinds of pen like ball pen, fountain pen, ink pen etc.
10. Ball Pen Ink Level Indicator (BPILI) is easy to use/mount.
11. Ball Pen Ink Level Indicator (BPILI), can be useful to students, they don't want to check the ink status every day.
12. Today's pen are covered with thick cover due to which user unable to check the ink status inside the pen, but using present invention user don't have to worry about it.
13. As faint shade started to come out through nib then user will come to know that refill must be changed.
14. No need to carry extra cartridge or ink pot for your ink pens as you will have ball pens and extra refills for them with you.
15. Life of pen will extend due to BPILI (Ball Pen Ink Level Indicator).

### VI. CONCLUSION

Ball Pen Ink Level Indicator (BPILI), invents the feature which is helpful to the people ranging from business area to normal students. Along with Ball Pen Intensity Level Indicator (BPILI), a 'Technical pen' also introduced for these people. Ball Pen Intensity Level Indicator (BPILI) consists of a type of refill which is filled with 95% of user preferred ink and 5% faint shade of same color. This has been done to indicate the people about the empty status of the pen as faint ink started to come out user will come to know that he have to change the refill. Thus he don't have to check every time the status of refill. Also technical pen introduced along with LED light to indicate the end refill status of pen. Once ink inside the refill reaches to 95-97% LED light will blink so that user will come to know the status of pen. In this user don't have to carry multiple pen and refills along with him. This invention will increase the life of pen also.

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