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ARDUINO-BASED AUTOMATIC MOTORCYCLE CHAIN LUBRICATION DESIGN

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Abstract: ***In recent years, we can see the increasing growth of the motorcycles. The motorcycle riders frequently forget and ignore chain maintenance problems due to their daily busyness and routines thereby making them forget and lazy to maintain and lubricate the chains at home. We also frequently see the riders push their motorcycles due to broken chains and lack of maintenance. With the high incidence of broken chains and short lead time of chains due to lack of routine maintenance, the author will hereby manufacture chain lubricators for motorcycles. The device can facilitate the motorcycle riders to lubricate their motorcycle chains on their own. Based on the comprehensive testing results, the chain lubricators can function to lubricate the motorcycle chains. The indication is the chain lube can come out or spray when activated according to the chosen time namely 6 seconds, 9 seconds and 12 seconds. The hardware and software can integrate well upon the functional testing of the system on the whole.***

Keyword: ***Arduino, Motorcycle Chain Lubricator***

I. INTRODUCTION

The number of motorcycle riders keeps on increasing particularly those in Indonesia. In addition, the motorcycle riders usually forget and are lazy to maintain their motorcycle chains due to the increasing busyness and activity so as to make them forget minor and critical things to maintain the motorcycle chains. Therefore, it is necessary to make a device to facilitate the motorcycle riders to maintain their motorcycles.

Several researches used as references and comparisons are among others:

1. R. Piyare, M.Tazil, (2011) who designed *Bluetooth-Based Home Automation System Using Cell Phone*, where it uses the components, such as arduino, bluetooth module, and relay used for controlling home devices using smartphone [1].
2. Harshit Singhai, Abhishek Umrao, and Ameer Faisal, (2015) who designed merancang Android & *Bluetooth Module Based Door Automation System*, using the components of bluetooth HC-05 relay module and solenoid door lock. It can open and close with the help of smartphone [2].
3. Kanchan, Priyanka Agarwal, and Mahesh Vibhute, (2015) who designed *Home Automation Using Android and* Bluetooth, it uses the components such as arduino, bluetooth module, and relay for controlling home devices by smartphone [3]
4. Yudhi Gunardi, Andi Adriansyah and Tito Anindhito (2015) design with arduino for small smart community: an application of internet of things [4]
5. Yudhi Gunardi, Mohammad Airul Mutaqin (2016) who designed expedition vehicle access system by using arduino and radio frequency identification to control the expedition [5]

Therefore this research will design arduino-based automatic motorcycle chain lubrication design; the motorcycle riders can expectedly maintain their motorcycle chains frequently. Motorcycle chains play a vital role because broken or snagged chains can endanger the riders for instant halt and fall.

1.1 PURPOSE OF RESEARCH

This device will be manufactured by making programs to control the work of solenoid, therefore, the solenoid can work at the set time and the device can work efficiently. Arduino is an open source electronic kit whose main component is AVR microcontroller chip from Atmel Company. The microcontroller is a chip or IC (Integrated Circuit) that can be programmed by using computer.

The purpose of implanting the program in the microcontroller is to make the electronic circuit able to read and process inputs and then produce the outputs as expected. So, microcontroler serves as a brain to control, process the inputs and produce the outputs in an electronic circuit.

GENERAL DIAGRAM OF ARDUINO-BASED MOTORCYCLE CHAIN LUBRICATOR BLOCK IS AS FOLLOWS:

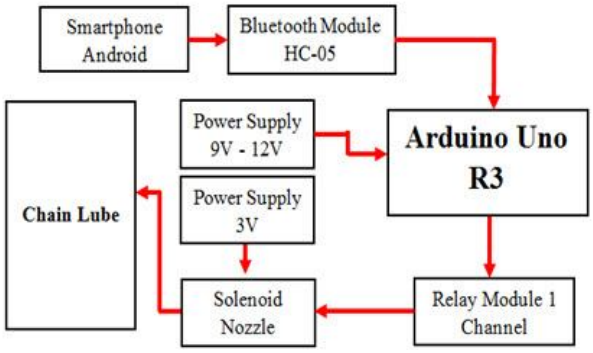

Fig.1 block diagram

II. HARDWARE AND SOFTWARE DESIGN

This hardware design comprises the design of arduino module, relay 1 channel, bluetooth module and solenoid nozzle used for supporting the device operating system. Smartphone signal is chosen as an input to make the device work in accordance with the set time in the arduino. This arduino uno is chosen as a sensor to read and process the data from the signal sent from smartphone and bluetooth modul [6] [7]. Relay is used as a circuit breaker switch to set the time to make the device work as set.

2.1 BLUETOOTH HC-05

Bluetooth HC-05 is a wireless communication protocol operating in 2.4 GHz radio frequency for data exchange in mobile devices, such as PDA, laptop, HP, etcetera. This HC-05 is used for connecting the smartphone and arduino uno and as an input communication from arduino to run the program already made.

Fig.2 : Bluetooth HC-05

2.2 RELAY MODULE 1 CHANNEL

As we know, relay design is used for setting the work of solenoid already installed in *chain lube* tube. Relay circuit is as follows:

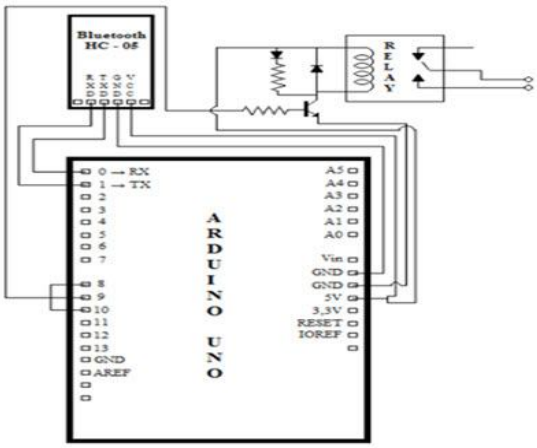

Fig. 3: Relay Module 1 Channel

The circuit above is relay 1 circuit directly connected to arduino uno as the brain of microcontroler. Relay in the circuit has to be connected to any pin. Pins being the input of the relay can be seen there to instruct the relay to make the solenoid operate.

2.3 Solenoid Nozzle

Solenoid nozzle is an electronic device used for pressing *chain lube* tube and spraying lubricant on the motorcycle chains. It sprays the lubricant in the chain lube tube on the motorcycle chains for even lubrication in each part. Solenoid nozzle operates at 3V, likewise arduino needs 3V to operate or open and close the nozzle needle. Therefore, when the nozzle is open, it will spray chain lube.

Fig. 4: Solenoid Nozzle

2.4 Mechanical Model of Motorcycle Chain Lubricator

The following drawing is a mechanical model of motorcycle chain lubricator. This model also has a useful mechanism of lubricating the chains evenly and is easy to apply to the motorcycles. This model can help the device to operate well and directly facilitate the installation and operating system of the device.

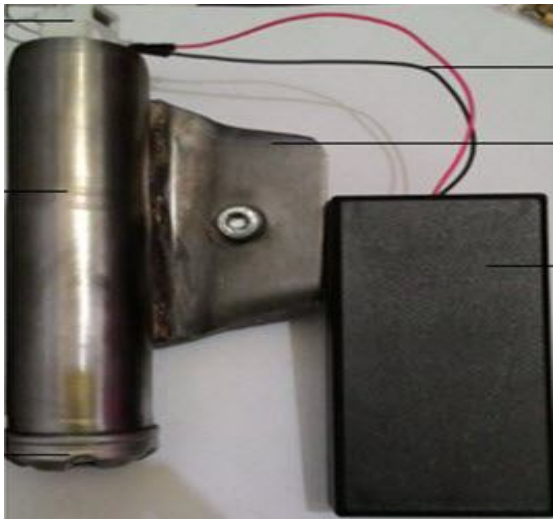

Fig. 5 Mechanical model of chain lubricant

2.5 Software Design

Software design comprises the making of program algorithm used for lubricating motorcycle chains using IDE arduino software.IDE arduino software is an inherent program of arduino board as an electronic board, this IDE arduino software is an open source in nature where everyone can make his own program. IDE arduino software uses C programing language to make a sketch or write programs, with complete library facilitated by the main function developer () that should be written in language C and replaced with setup function () and loop function (). Setup function () is used for initiating or configuring the ports and loop function () is used for repeating the program [8].

2.6 Flowchart of the Device Operating System

To make the program, at first a Flowchart is made. The Flowchart is used as a guide in making the program. The following is Flowchart of the system made.

The Flowchart explains that programming requires initiation of or introduction to the program.

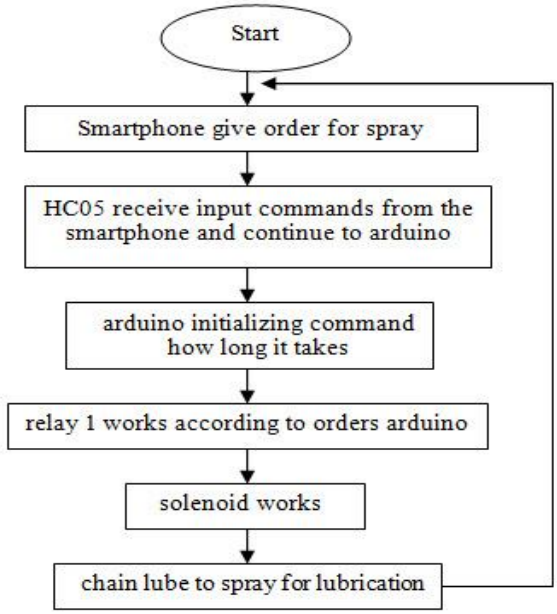

Fig. 6 Flowchart system

III. HARDWARE AND SOFTWARE TESTING

3.1 Bluetooth HC-05 Testing

The testing is conducted to ensure that the relay can operate as the set time in accordance with the sketch uploaded in the arduino. The following is the choice of operation time in the relay: Relay operates after 3 minutes and turns off for 6 seconds and turns on again for 6 seconds and then turns off.

- *Relay operates after 3 minutes and turns off for 9 seconds and turns on again for 9 seconds and then turns off.*
- *Relay operates after 3 minutes and turns off for 12 seconds and turns on again for 12 seconds and then turns off.*

3.2 SOFTWARE Testing

This software testing is conducted to know if the application can give instructions in accordance with the designed operating time and system. The following is a drawing of user interface we made:

Fig.7. Smartphone connect to bluetooth

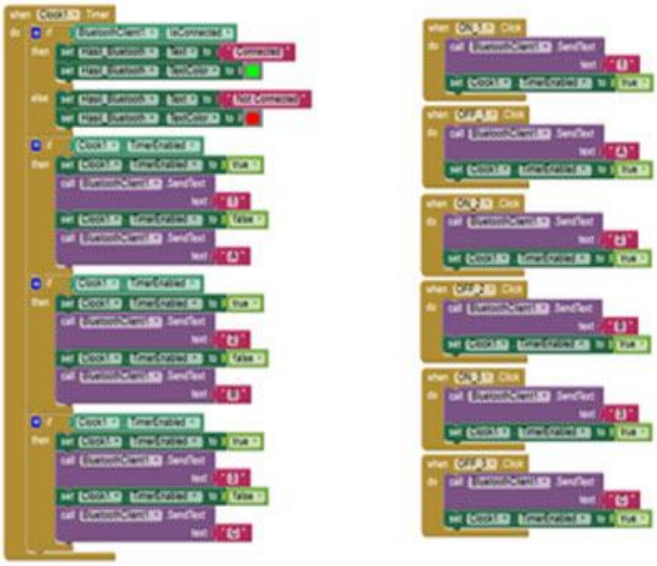

Fig.8:Aandroid connect

IV. TEST AND RESULTS

To prove if the device can operate maximally, testing of chain lubricating time is required namely in accordance with the tome already set in the arduino. From the data result, it is concluded that the device runs well in accordance with the set time and there is no mistake at all. The percentage of error of the timeliness testing is 0%.

TABLE 1: TESTING OF CHAIN LUBRICATING

No	Time	Test	Status Relay
1	6 second	Test 1	Work-ok
		Test 2	Work-ok
		Test 3	Work-ok
2	9 second	Test 1	Work-ok
		Test 2	Work-ok
		Test 3	Work-ok
3	12 second	Test 1	Work-ok
		Test 2	Work-ok
		Test 3	Work-ok

4.1 TESTING OF THE QUANTITY OF CHAIN LUBE RELEASING

To prove if the device can operate maximally, testing of the quantity of chain lube releasing is required namely in accordance with the set time with three choices of time. From the data results, it is concluded that the more the lubricating time, the quicker the chain lube is exhausted or the shorter the duration of the use of the chain lube. From the testing, it is concluded that each lubricating time needs a different number of chain lube. The longer the lubricating time the more the chain lube is needed. The percentage of error of the testing above is 5%.

TABLE 2: TESTING OF THE QUANTITY OF CHAIN LUBE RELEASING

No	Time	Volume	Oil Out	Status Relay
1	6 second	70 ml	14 ml	Work-ok
			13 ml	Work-ok
			14 ml	Work-ok
2	9 second	70 ml	19 ml	Work-ok
			18 ml	Work-ok
			19 ml	Work-ok
3	12 second	70 ml	24 ml	Work-ok
			24 ml	Work-ok
			23 ml	Work-ok

4.2 Testing On The Whole

Analysis testing is conducted to know if the system runs well. The following is an analysis of the system.

- Arduino microcontroller runs well in accordance with the design. When the input of the smartphone is pressed, the microcontroller will produce outputs.
- Bluetooth HC-05 runs well. Input signal or instruction can be received and processed by arduino microcontroller and executed.
- Relay 1 channel runs well. The relay can break and connect the current, so the solenoid nozzle can operate to spray the chain lube.
- When the solenoid is open, the chain lube can release and lubricate the chains well.

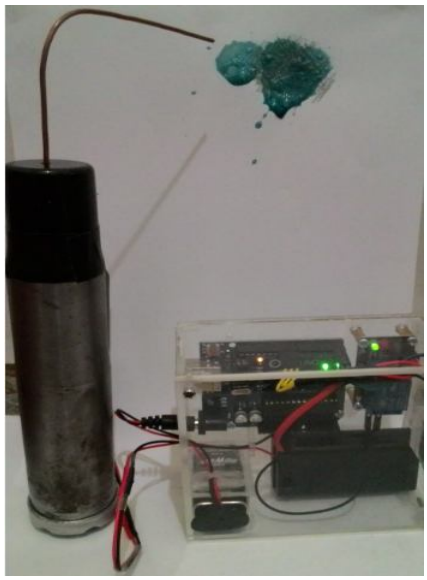

Fig.9: Chain Lubrication spray

V. CONCLUSION

From the designing, manufacturing, and testing results of motorcycle chains lubricators, it is concluded as follows:

1. The device can operate in accordance with the design and can lubricate the motorcycle chains in accordance with its functions.
2. The device can facilitate the motorcycle riders to lubricate the motorcycle chains for humid condition of the motorcycle chains.

This device can operate in accordance with the set time without any error.

REFERENCE

[1] R. Piyare, M.Tazil.2011. “Bluetooth Based Home Automation System Using Cell Phone”, 2011 IEEE 15th International Symposium on Consumer Electronics.
[2] Harshit Singhai., Abhishek Umrao., and Ameer Faisal. 2015. ” Android & Bluetooth Module Based Door Automation System”. Advances in Computer Science and Information Technology (ACSIT)
[3] Kanchan, Priyanka Agarwal, dan Mahesh Vibhute. 2015. “Home Automation Using Android and Bluetooh”. 2015 International Journal of Science and Research (IJSR).
[4] Gunardi, Yudhi, Adriansyah Andi., and T. Anindhito, “Small Smart Community : an Application of Internet of Things,” 2015 Asian Research Publishing Network Journal 2015.
[5] Gunardi, yudhi dan Mutaqin Airul Mohammad, “Perancangan Sistem Akses Kendaraan Ekspedisi menggunakan Arduino dan Radio Frequency Identification”, 2016 jurnal teknologi elektro universitas mercu buana.
[6] Syahwil, Muhammad. 2013. *Panduan Mudah Simulasi & Praktek Mikrokontroler Arduino*. Yogyakarta : Penerbit Andi
[7] Brian Evans. 2011. *Beginning Arduino Programming*. New York Springer Science.
[8] Walter , Derek., and Sherman, Mark. *Learning MIT App Inventor.*