

DESIGN OF AUTOMATIC ASTHMA CONTROLLING MASK WITH INHALER

Gudise Santosh Kumar¹, Palakonda Nandith Kumar², Balmoor Sreelekha³

^{1,2,3}PG Scholar, Dept. of Mechatronics Engineering, JNTUH College of Engineering and Technology, Telangana, India

Abstract - This paper explains the development of a device that can be controlled by detecting the respiration frequency, a better treatment for the lung acute episode of Chronic Obstructive Pulmonary Disease (COPD), the symptoms of this attack being shortness of breath due to climatic changes that arise due to cold weather and severe exercise. Inhaler is the specially advised medicine suggested by doctors that relax the muscles of bronchitis. It is generally prescribed to take equal dosage whenever required through inhaler attached by a spacer, it is the hollow tube that has one valve opening for the mouth to inhale to the full capacity, spacer that is used to reduce the dosage of medicine per attack which is attached to inhaler mechanism equipped with crank and slider that can move the cylinder in the inhaler to a fixed distance for the medicine to release. The spirometer is used to check the volume of inhaled air where the inhalation volume is measured at the attack for the mechanism to activate. Setup will work by sensing the intake through mouth, integrated into a lightweight mask specially for solitary individuals who might have sudden asthma attacks even on bikes or deep nights.

Key Words: COPD, Valve, Spirometer, Crank and Slider, Solitary.

1. INTRODUCTION

1.1 Asthma

Asthma may be a chronic, or long-term, condition that intermittently inflames and narrows the airways within the lungs. The inflammation makes the airways swell. Asthma wheezing, sound tightness of chest, short breathedness, and cough. People who have asthma may experience symptoms that range from mild to severe which can happen rarely or each day. When symptoms worsen, it's called an asthma. Asthma affects people of all ages and sometimes starts during childhood.

The goal of asthma management is to realize control with an asthma action plan. Asthma can be controlled by proper monitoring, avoiding the triggers, and by taking medicines.

1.2 Causes

The immune system to an allergen in the exact cause of asthma is unknown, and the causes may vary from person to person. However, asthma is often the result of a strong response environment. For example, exposure to an allergen within the environment, like ragweed, may make your airways react strongly. Other people exposed to an equivalent allergen might not react in the least, or their response could also be different. The reason one person

reacts to an exposure while others don't isn't completely understood, though it's going to be partially explained by genes.

1.3 Symptoms

Categorized into severe or intense, the asthma is, and whether you're exposed to allergens. Some people have symptoms a day, while others have symptoms only a couple of days of the year. For some people, asthma may cause discomfort but doesn't interfere with daily activities. If you've got more severe asthma, however, your asthma may limit what you're ready to do.

When asthma is well controlled, it's going to not cause symptoms. When symptoms worsen, it's called an asthma, exacerbation, or flare-up. Over time, uncontrolled asthma can damage the lungs.

1.4 Control Medicines

Corticosteroids to reduce the body's inflammatory response. If your symptoms worsen, your doctor may increase the dose of the inhaled steroids to stop severe asthma attacks or maybe give steroids orally for brief periods. Common side effects from inhaled, it include a hoarse voice or a mouth infection called thrush. A spacer is provided with inhaler to help avoid these side effects. Using high-dose inhaled more often or for extended periods may affect growth in young children. Oral medicines even have more side effects than inhaled.

1.5 Treatments

If you're like most of the folks that have asthma, treatment can manage your symptoms, allow you to resume normal activities, and stop asthma attacks. Age, Asthma severity, and your response to a given treatment is checked by the doctor. Doctor might adjust your treatment until symptoms are reduced.

Most people who have asthma are treated with daily medicine, called long-term control medicines, along side inhalers containing medicine for short-term relief during an asthma or when symptoms worsen. An inhaler allows the drugs.

2. COMPONENTS

MASK - It's an object normally worn around the face, normally for canopy, disguise, performance, decoration or entertainment. Masks are used since antiquity for both

ceremonial and practical purposes, also as within the humanistic discipline and for entertainment. They are usually worn on the face, although they can be used anywhere on the body depending on its purpose.

More generally in humanistic discipline, especially sculpture, "mask" is that the term for a face without a body that's not modeled within the round (which would make it a "head"), but for example appears in low relief.

INHALER - An inhaler may be a device that gets medicine directly into an individual's lungs. The medicine may be a mist or spray that the person breathes in. Unlike a pill or liquid that's swallowed, an inhaler gets medicine right to the lungs. This helps people with asthma because the drugs work quickly to open up narrowed airways. There are two sorts of inhalers: metered dose inhalers, also referred to as puffers, and dry powder inhalers.

SPACER - Spacer may be a device wont to increase the convenience of administering aerosolized medication from a metered-dose inhaler (MDI). It adds space within the sort of a tube or "chamber" between the mouth and canister of medication. One-way valve on one side that permits the person to inhale the medication while inhaling and Two-way valve on other side for exhaling normally.

SPIROMETER - Spirometers are non-invasive diagnostic devices used for lung function examination. For instance just in case of tract and lung diseases like asthma or chronic-obstructive bronchitis. They measure the respiratory flow and calculate the respiratory volume breathed in and out (inspiratory and expiratory lung volume) from this. These sensor are usually light in weight and compact.

DC MOTOR - An immediate current or DC motor, converts electricity into energy. It is one among two basic sorts of motors: the opposite type is that the AC or AC motor. Among DC motors, there are shunt-wound, series-wound, compound-wound and static magnet motors.

MICRO CONTROLLER - A microcontroller may be a compact microcircuit designed to control a selected operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on one chip.

CRANK AND SLIDER MECHANISM - It is a four-link mechanism with three revolute joints and one prismatic, or sliding, joint. The rotation of crank will give straight ward motion of the slider, or either by gas expansion against a sliding piston during this cylinder will drive the rotation of the crank.

3. PROBLEM STATEMENT

The individual who has got a severe Asthma attack will not be able to grab inhaler from his bag and take the dosage. This individual will fall have risk of falling unconscious.

Although asthma mortality within the us is among rock bottom within the world, within the year 2000 there have been still approximately 4,500 asthma-related deaths during this country. Moreover, the asthma death rate has risen over the past 20 years approximately, especially in African-Americans and individuals age 85 and older. This increase is of particular concern because it comes at a time when mortality rates from most natural causes within the us are on the decline. Secondhand smoke is being increasingly recognized as an important trigger for asthma. According to the Environmental Protection Agency, secondhand smoke exacerbates asthma in an estimated 200,000 to a million children in the United States every year. It also causes an estimated 8,000-26,000 new cases of asthma among children in the U.S. every year. Increased prevalence of asthma, accounting for an estimated 307,000-522,000 cases among children younger than 15 years of age, Secondhand smoke also exacerbates existing asthma, being responsible for about 0.5 million visits to physicians by children every year.

4. METHODOLOGY

- 1) **SENSOR DETECTION** - When the lungs inhale lesser oxygen in higher rates with mouth. The air flow is measured by the spirometer sensor which is connected at the mouth end of the Bikers Mask.
- 2) **DC MOTOR ACTIVATION** - The DC Motor is activated by the sensor signal sent by spirometer when the shortness of breath is measured causing asthma attack.
- 3) **CRANK SHAFT MECHANISM** - The coupling of motor shaft with crank shaft will rotate the crank in one specific direction for one rotation completely to push the cap downwards.
- 4) **CAP SLIDER** - Cap covers the upper part of refill, this slides on the inhaler body thereby pushing the refill inwards when the crank rotates one complete rotation.
- 5) **INHALER** - Dosage and Chemical Formulation of medicine is dependent on the level of asthma prescribed by doctor. This inhaler has a separate chamber where inhalers can be replaced based on pharmaceutical brands and sizes.
- 6) **SPACER** - Spacer is connected to inhaler, this has a one-way valve that collects the exhaust air from mouth and stores it, this stored air rich in medicine is respired into lungs again by mouth that helps to save extra dose for a particular attack.

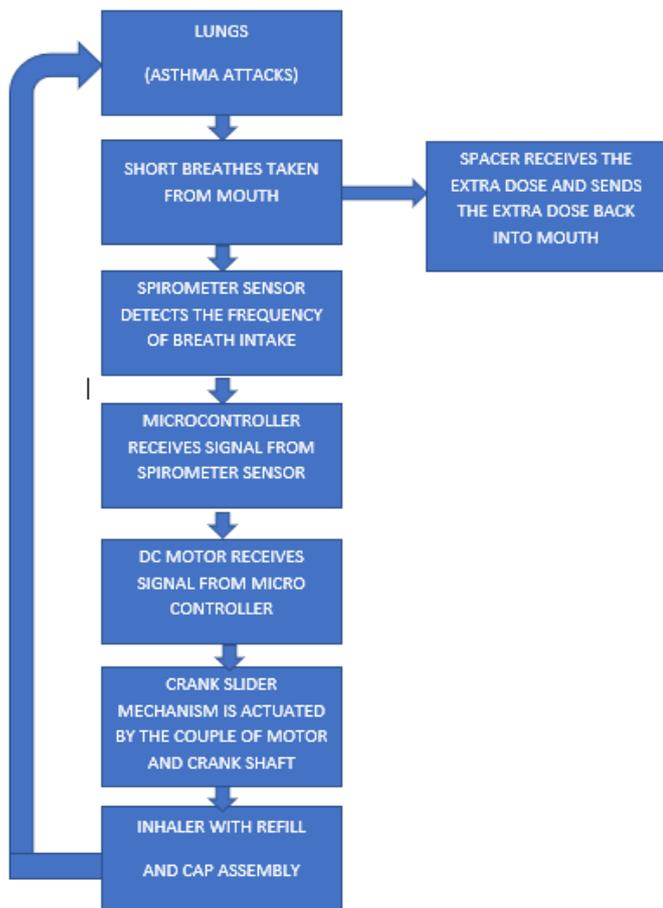


Fig -1: Block Diagram

5. DESIGN



Fig -2: Biker's Mask

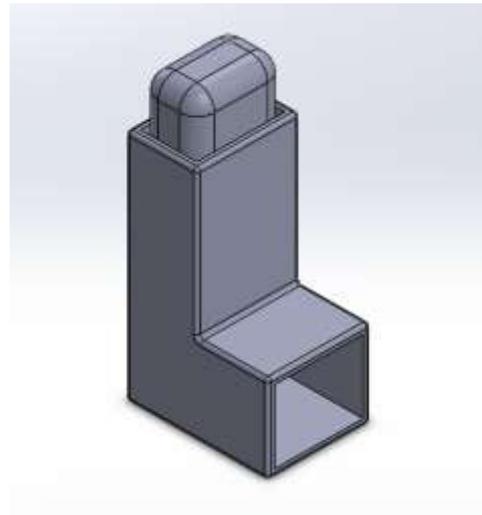


Fig -3: Inhaler Body and Refill

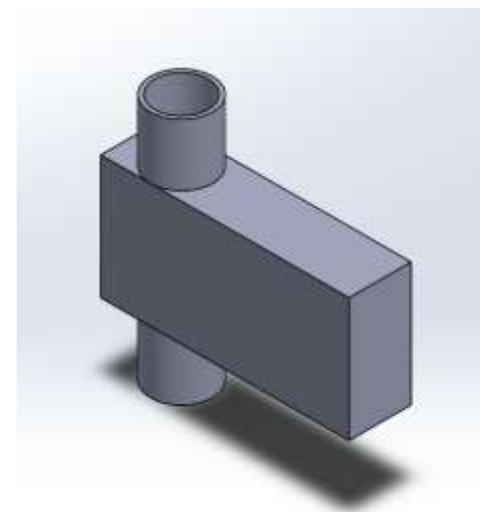


Fig -4: Spirometer Sensor



Fig -5: Spacer

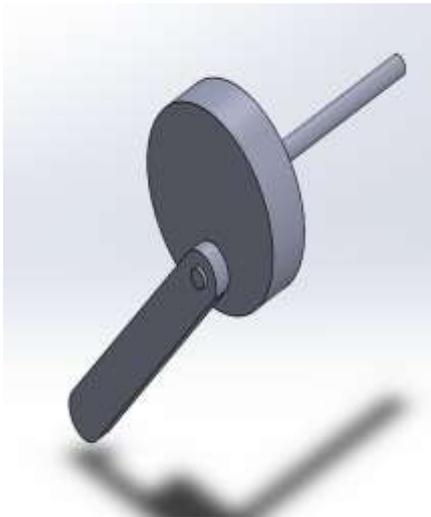


Fig -6: Crank and Connecting Rod

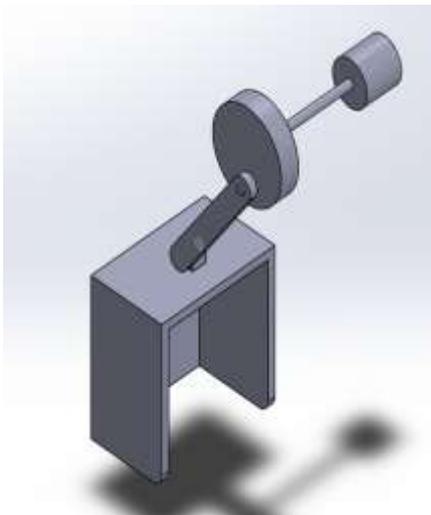


Fig -7: Assembly of Cap, Connecting Rod, Crank and Motor

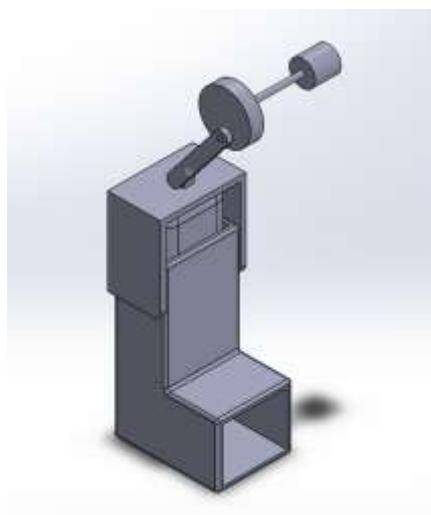


Fig - 8: Final Assembly of Automatic Asthma Inhaler

6. CONCLUSION

This result suggests that the time lapse between the asthma attack and treatment is reduced. This treatment also works without muscular power so is suitable when driving and swimming also. Problem of misplacing inhaler is eliminated by mask which is suitable in emergency situations.

REFERENCES

1. Increased vascular permeability precedes cellular inflammation as asthma control deteriorates YH Khor, AKY Teoh, SM Lam, DCQ Mo, S Weston, DW Reid, EH Walters Clinical & Experimental Allergy 39 (11), 1659-1667, 2009.
2. Maintenance of asthma control by once-daily inhaled ciclesonide in adults with persistent asthma KR Chapman, P Patel, AD D'urzo, M Alexander, S Mehra, C Oedekoven, R Engelstätter, L-P Boulet Allergy 60 (3), 330-337, 2005.
3. Asthma control or severity: that is the question M Humbert, S Holgate, L-P Boulet, J Bousquet Allergy 62 (2), 95-101, 2007.
4. Assessment of asthma control and its impact on optimal treatment strategy B Lundback, R Dahl Allergy 62 (6), 611-619, 2007.
5. Increased risk of asthma attacks and emergency visits among asthma patients with allergic rhinitis: a subgroup analysis of the improving asthma control trial J Bousquet, S Gaugris, V Sazonov Kocevar, Q Zhang, DD Yin, PG Polos, Leif Bjermer Clinical & Experimental Allergy 35 (6), 723-727, 2005.

BIOGRAPHIES



GUDISE SANTOSH KUMAR

Technical Student, Graduated from Mechanical Engineering is now PG Scholar pursuing M.Tech in Mechatronics Engineering.



PALAKONDA NANDITH KUMAR

Technical Student, Graduated from Mechanical Engineering is now PG Scholar pursuing M.Tech in Mechatronics Engineering.



BALMOOR SREELEKHA

Technical Student, Graduted from Mechanical Engineering is now PG Scholar pursuing M.Tech in Mechatronics Engineering.