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DESIGN AND CONSTRUCTION OF A LIGHT WEIGHT USER FRIENDLY TRAVELLING MOSQUITO NET

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Abstract- *The protective device from mosquito bite is not only important in the residential living room but also in the long distance traveler, tourist peoples, adventure and business purpose, where there is no provision of mosquito protective device easily. There are many types of protective devices locally available to save from mosquito bite namely, chemical, net, electric bat, box, bell, free stand, folding, etc. This study has been emphasized the newly design mosquito frame of 24 inch original length covered with net. Smaller in size, convenience to use, light in weight, reasonable price are the main features of this device compared with available devices locally. This newly design mosquito net will ensure more comfortable and convenience to use in different places in a better way compared to the devices available in the local market.*

Keywords: Design, Construction, Mosquito net

1. INTRODUCTION

The presence of mosquito is all over the world. The negative aspect of mosquito bite is common to the people. Some of the issues related to human health like ZIKA virus, Dengue [1] Malaria, Guillain-Barre syndrome [2] and neurological problems [3] are caused due to the mosquito bite.

Research on mosquito protective devices has been conducted in an innovative manner to protect people from mosquito bite. A portable net support frame is invented by Ref. [4]. It is seen that, the frame is easy to assemble and disassemble. But it requires mattress support surfaces like bed, spring assemble. A rectangular frame with rods or tubes to support the net is invented by Ref. [5]. It is designed for military personnel. It is made of fabric net but limited to portability. A support frame for mosquito net made of electrical cover pipes is invented by Ref. [6]. The frame can be mounted on wall or attached to a stand only one point. It has minimum obstruction of view and movement.

There are different types of protective devices available in the local market to save from mosquito bite. These are chemical, net, electric bat, box, bell, free stand, folding, etc. are popular to the people. The features of available devices are summarized in Table 1.

The study of available devices shows that, there are having problems with ease of assemble, dissemble, lack of user friendly and also they are not easy to carry in small travelling bags even not suitable for outdoor use and costly.

Table 1: Features study of available mosquito protective devices locally

Sl. No.	Type of mosquito devices	Critical issues
1	Mosquito Bat	Portable and require electrical port for charge and manually operated
2	Chemical sprayer	having health hazards, not suit for outdoor use as well as infant and expensive
3	Wedges type	hang with single or twin hanging supporting points, not suit for outdoor
4	Ridge	Need hanging supporting point and not suit for outdoor
5	Box	Heavy, larger in size and need 4 supporting point
6	Bell	Supporting point is require and not suit for outdoor
7	Free standing: folding type	Heavy, larger in size and expensive

Source: Field survey

Hence, mosquito protective device with improved features is design and constructed at RUET, Bangladesh with an aim to eliminate the existing problems with locally available mosquito devices. The system is constructed using locally available materials and simple design. People will be benefited using this system specially in travelling.

2. DESIGN

The mosquito net is designed as per preliminary requirement is 24 inch in compact length, since most of the travelling beg within this length. The other design considerations are easy setup, light in weight, low cost, minimum maintenance, environmental friendly and reliability. The integral parts are flexible stick, base, middle joint, corner joint and screw. The details of the integral components are described in the following sub-sections:

2.1 Flexible stick

This is the major component of the frame is made of chromium. This component is found available in local market. The side roof of the frame comprises five parts indicated as 1a, 1b, 1c, 1d and 1e (Fig. 1) and each part is 20 cm in length. Upper roof stick has four parts. The part 1a has 7 mm diameter and thickness 1 mm. The part 1e has 3 mm diameter and thickness 1 mm.

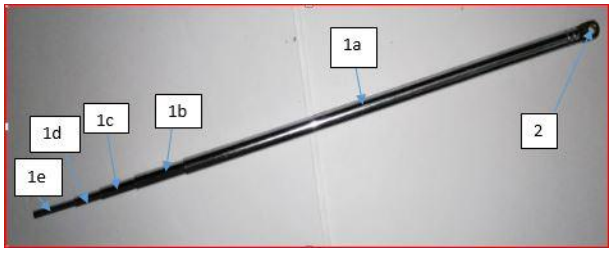
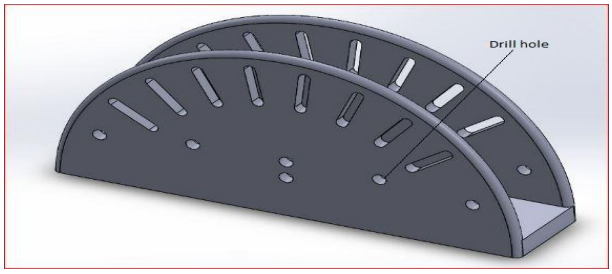


Fig.1: Flexible stick

2.2 Base

This is the supporting primary component of the frame on which the whole frame will stand on. It is made of aluminum, which is better to ensure light weight. This is a semicircular object and it has 5 drilled holes of 4 mm in diameter to join the sticks. This semicircular aluminum is joint with MS sheet folded wood inside to improve the carrying capacity of the frame and to ensure the better stability of the frame (Fig. 2).



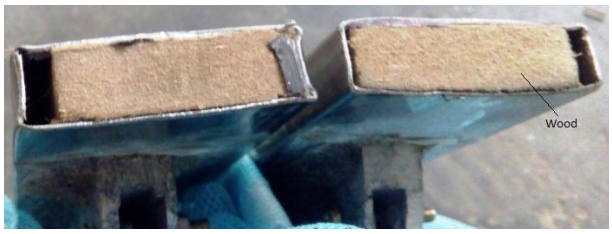


Fig.2: Base

2.3 Parts for middle joint

The two stick is joint in target to fold during expansion and compaction of the frame using an integral part (Fig. 3). It is made of aluminum. The circular part and extension part is mate using screw that allows rotating each other.

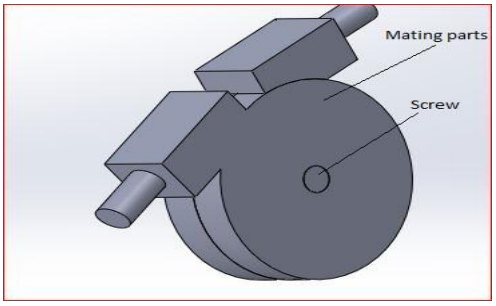


Fig.3: Middle joint

2.4 Parts for corner joint

It is made of two types of materials namely metal and plastic. To increase the strength of plastic part and joint with other part metal stick is used (Fig. 4).

Fig.4: Corner joint

2.5 Joining screw

The component parts are joint by using two types of screw are 4 mm diameter, 15 mm length and 2.5 mm diameter, 10 mm length suitable for the joint. The material of the screw is cast iron and available locally (Fig. 5).

Fig.5: Joining screw

3. CONSTRUCTION

All the integral components are assembled to construct the final frame. Firstly, one end of the four stick is connected with the base of two sides using screw. Then the stick is extended for both sides and stand.

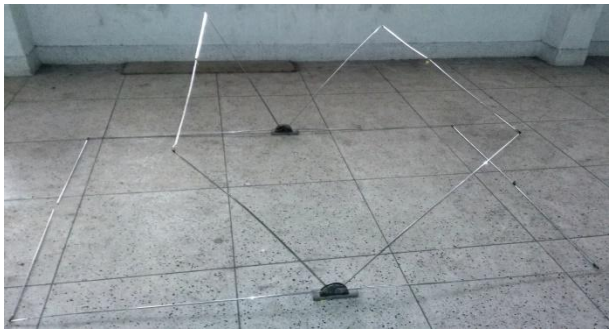


Fig.6: Final mosquito frame

Two stick is made lay down in opposite and other two stick is set around 60^{o} apart. Similar mechanism is applied for other side. The two frames are connected by corner joint and middle joint to finalize the mosquito frame shown in Figure 6.

The frame is then covered by net is available in the local market. The size of the net is 6ft × 4ft suitable for sleep a single or two persons. The net is fastened in several places on the frame to make better stability of the frame. The frame covered with net is well performed as mosquito net could be used in practice (Fig. 7).

Fig.7: Final mosquito net

After use the mosquito net there are technical steps for folding the system. The steps are given in Figure 8.

Folding step 1

Folding step 2

Folding step 3

Folding step 4 (Final)

Fig. 8: Folding steps of the mosquito net

Four steps are required to fold the mosquito net to bring it in its original folding size. The final folding size is 24 inches and weight is 1 kg only which is convenience to carry in a travel beg.

Hence, the newly constructed mosquito net could be used for practical purpose conveniently compared with conventional available mosquito devices.

4. COMPARATIVE STUDY

Table 2 shows the comparative study of newly design system with locally available mosquito devices using few comparative parameters. There are six key parameters are considered for comparison. The price range BDT 1,000 -1,500 is considered as reasonable price. It is seen that, locally available mosquito devices

Table 2: Comparative study of present system with locally available devices

Sl. No.	Key issues	Bat	Spray/ coil	Wedge	Ridge Box	Bell	Free stand	Present system
1	No operating cost	×	×	√	√	√	√	√
2	No health hazards	×	×	√	√	√	√	√
3	Convenience for outdoor use	√	×	×	×	×	√	√
4	Light in weight	√	√	√	√	×	√	√
5	Smaller in size	√	√	√	√	×	√	√
6	Reasonable price	√	√	×	×	×	×	√

are not complied all the key parameters, where present system has complied for all parameters. Hence, the present system is more attractive compared with available mosquito devices.

5. COST ESTIMATION

The total material cost for construction the system is lower compared with available modern travelling mosquito protective devices. The cost breakdown is shown in Table 3. The total material cost is estimated is BDT 1,400 only.

Table 3: Cost breakdown of the newly design system.

Component	Cost rate (Tk.)	Total cost (Tk.)
Stick	60/ pcs	600
Aluminum for casting small joints	600/kg	500
Nuts and bolts	5/pcs	60
Fabric for net	60/ yard	240
Total cost		1,400

5. CONCLUSION

The newly design system is attractive compared with locally available mosquito devices. The system is able to covered the length is 6 ft and width is 4 ft under protection from mosquito which is sufficiently preferable for single as well as standard double bed. It could be also used in single bed by compressing the width of the stick. The compact length and width are 24 cm and 10 cm respectively. The weight is 1 kg only. Hence, it is suitable for handle easily inside the travelling bag. In addition, it is self-supported mosquito protective device. It can be used in open field, rooftop, sea beach etc.

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7. REFERENCES

[1] Centers for disease control and prevention, Avoid mosquito bite, US department of health and services, 2016.

[2] World Health Organization, Emergencies preparedness, response, 2016. http://www.who.int/csr/don/29-march-2016-gbs-panama/en/

[3] L. Jeha, C. A. Sila, Neurologic Complications of West Nile Virus, Cleveland Clinic, 2009. http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/neurology/neurologic-complications-west-nile-virus/

[4] E. David, S. Park, H. Moon, Portable support for a mosquito net, Tropical safety research Inc., publication number EP1501392A1 2003. https://www.google.com/patents/EP1501392A1

[5] Troy Eugene Williams, Mosquito net frame , Tropical safety research Inc., publication number US6715168 B2 , 2004. https://www.google.com/patents/US6715168

[6] G. A. Jamjoomeno, M. S. Omar, Portable mosquito net support devices for indoor and outdoor use, *Journal of the American Mosquito Control Association*, vol. 6, no. 3, pp. 544-546, 1990.