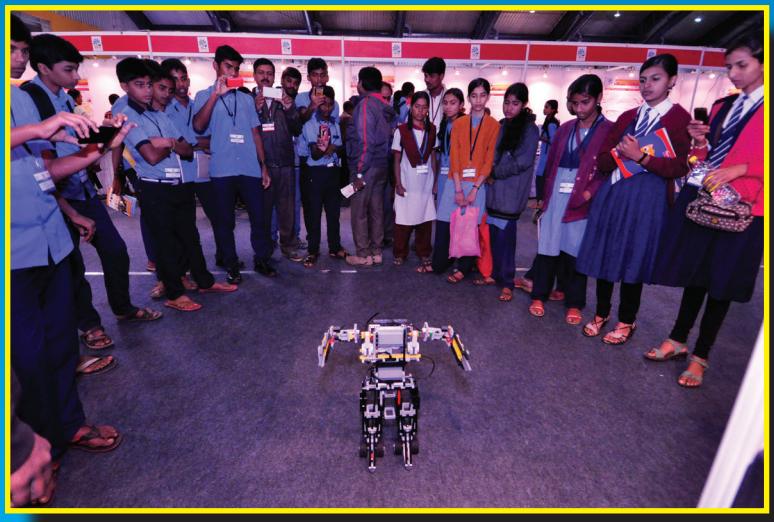
44th Jawaharlal Nehru National Science, Mathematics and Environment Exhibition for Children—2017

Structure and Working of Exhibits

Bhopal, Madhya Pradesh




स्वच्छ
भारत
एक कदम स्वच्छता की ओर

Structure and Working of Exhibits

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44th Jawaharlal Nehru National Science, Mathematics and Environment Exhibition for Children—2017

विद्यया S मृतमश्नुते
एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
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Preface

The learning of Science and Mathematics are instrumental in developing well-defined abilities and skills such as spirit of enquiry, creativity, objectivity, logical thinking and aesthetic sensibilities among children. Children learn through interactions with the environment around, nature, things and people. They actively engage with the world around them in exploring, responding, inventing, working things out and interpreting. Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) for Children offers an opportunity to children to express and exchange their creative ideas with joy of scientific investigation. It helps them to learn the methods of science and mathematics, provide them with opportunity to develop their problem-solving skills and creative abilities.

The National Council of Educational Research and Training (NCERT) organises the Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) for Children as an annual event in collaboration with a State or Union Territory. The JNNSMEE is the culminating activity of a series of exhibitions organised at school, zonal, district, regional and state levels. A large number of students and teachers participate in such events.

The present publication, 'Structure and Working of Exhibits' includes write-ups of a few exhibits selected for display in the 44th JNNSMEE–2017 which is being organised in collaboration with The Directorate of Public Instruction, Government of Madhya Pradesh. Other materials like 'List of Exhibits' which contains the titles and synopsis of exhibits selected for participation in the JNNSMEE–2017 along with information brochures stating objectives and other details

of the exhibition have also been published. It is expected that these publications will motivate and help children to participate in future Exhibitions.

The write-ups included in the present publication were selected out of the entries received from all the States/UTs and other organisations. These were reviewed and edited by an expert committee in the Department of Education in Science and Mathematics, NCERT.

Completing the task related with the editing and publishing of this booklet has been possible because of the continuous efforts of my colleagues Sunita Farkya, A.K. Wazalwar, Alka Mehrotra, Anjni Kaul, Rachna Garg, Pushp Lata Verma, Promila Tanwar, A.K. Srivastava, Rejaul Karim Barbhuiya. I also thank R.K. Parashar for coordinating the task. Further, I thank Rohit, Hari Darshan Lodhi, Rajesh Sagar, and Preeti for helping the department in bringing out this booklet.

DINESH KUMAR
Professor and *Head*
Department of Education in
Science and Mathematics
National Council of Educational
Research and Training

New Delhi
November 2017

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Empowerment of Girl Child, Responsibility of All

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सुगम ट्रॉली (नवाचारी पहिया)

विद्यार्थी

सुश्री स्नेहलता

राजकीय बालिका
उच्चतर माध्यमिक
विद्यालय, गुलाबपुरा
हुरड़ा, भीलवाड़ा
राजस्थान

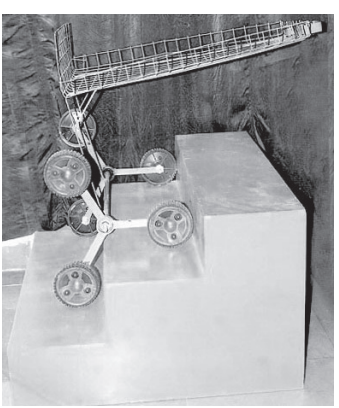
अध्यापक

डॉ. (श्रीमती) रूपा पारीक
श्रीमती नीता मिश्रा

प्रस्तावना

वर्तमान परिवेश में अपेक्षा की जाती है कि व्यक्ति अपना कार्य स्वयं करे। इसी दृष्टिकोण से हवाई अड्डों, बस स्टैण्ड, मैट्रो स्टेशन, बहुमंजिला शॉपिंग मॉल में ट्रॉलियाँ दी जाती हैं। पहिए वाले ट्रॉली बैग प्रचलन में हैं।

बहुमंजिला भवनों में विद्युत स्वचालित सीढ़ियों के निर्माण में करोड़ों रुपये खर्च होते हैं और उसके संचालन में बहुत अधिक विद्युत ऊर्जा लगायी जा रही है। इसी बात को ध्यान में रखते हुए ऐसे पहिये पर विचार किया गया जो कि सीढ़ियों पर आसानी से चढ़ सके।



चित्र 1 — सुगम ट्रॉली

वैज्ञानिक सिद्धांत

दैनिक जीवन में गणितीय समाधान के अन्तर्गत समबाहु त्रिभुज के शीर्षों पर छोटे पहियों की व्यवस्था करते हुए ऐसे नवाचारी पहिये का निर्माण किया गया है, जो तीन चक्र में सीढ़ी पर गति करते हुए ऊपर चढ़ सके।

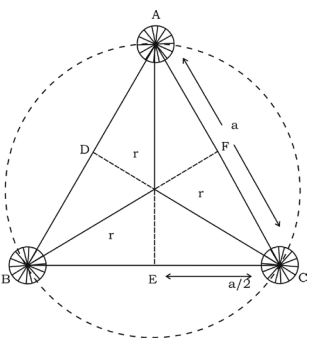
निर्माण में प्रयुक्त सामग्री

बच्चों की ट्राई साईकिल के 6 पहिए, लोहे की पत्तियाँ, लोहे की छड़, आवश्यक स्क्रू, जाली 2×1.25 वर्गफीट (ट्रॉली का सामान कैरियर बनाने के लिए)।

संरचना

चित्र 2 के अनुसार समबाहु त्रिभुज के शीर्ष पर पहिये जोड़े गए हैं। ट्रॉली परिधि के तीन बराबर हिस्से में गति करती हुई सीढ़ी पर ऊपर चढ़ेगी।

- सीढ़ी एक पद की ऊँचाई 'h'
- समबाहु Δ की भुजा 'a'
- a> h> a/2
- $r=\frac{a}{\sqrt{3}}$



चित्र 2 — सुगम ट्रॉली

उपयोग

रेलवे स्टेशन, मैट्रो स्टेशन, हवाई अड्डे, बहुमंजिला शॉपिंग मॉल में सीढ़ियों पर इस पहिये का उपयोग कर ट्रॉलियों से सामान ऊपर लाया-ले-जाया जा सकता है।

2

दमा जाँच यंत्र

विद्यार्थी
नवीन सिंह नगरकोटी

रा.इ.का. लमगड़ा
अल्मोड़ा, उत्तराखंड

अध्यापक
विनोद कुमार राठौर

प्रस्तावना

पूरी दुनिया के 115 लाख दमा रोगियों में से एक तिहाई दमा रोगी भारत में हैं। पराग कणों से एलर्जी, धूल, धुएं एवं पहले से दूषित वातावरण तथा शहरीकरण के बढ़ते दबाव तथा औद्योगिकरण के कारण लगातार बढ़ते पर्यावरण प्रदूषण के कारण श्वांस सम्बन्धी विभिन्न बीमारियों में अत्यधिक बढ़ोतरी हुई है जिसमें प्रमुख श्वांस सम्बन्धी बीमारी दमा है। दमा के कारण प्रतिवर्ष हज़ारों बच्चे विद्यालय छोड़ रहे हैं। प्रतिवर्ष हज़ारों कर्मचारी दमा के कारण नौकरी से हाथ धो रहे हैं जिसके कारण उनके परिवार के सामने रोजी-रोटी के गंभीर समस्या उत्पन्न हो रही है। एक सर्वेक्षण के अनुसार पूरे विश्व में 100 मिलियन लोग 2025 तक दमा की चपेट में आ सकते हैं जो एक गंभीर समस्या बनकर पूरे विश्व के सामने खड़ी होगी इसका प्रमुख कारण पर्यावरण प्रदूषण एवं दमा के विषय में जागरूकता का अभाव तथा लोगों द्वारा प्रारम्भ में इस बीमारी को सामान्य समस्या समझकर ध्यान न देना है। इसके अतिरिक्त ग्रामीण क्षेत्रों एवं झुग्गी–झोपड़ी क्षेत्रों में निवास करने वाले लोगों को दमा की जांच करने की जानकारी का नितांत अभाव होता है । ग्रामीण क्षेत्र के अस्पतालों में दमा की जाँच हेतु कोई उपकरण भी उपलब्ध नहीं होते हैं । इसी बात को ध्यान में रखकर हमारे द्वारा एक ऐसे उपकरण (मॉडल) को बनाने के विषय में विचार किया गया जिसके द्वारा लोगों को दमा के प्रथम चरण में ही आसानी से पता चल जाए तथा यदि उनको पता चल जाता है कि उनमें दमा होने की सम्भावना है तो समय से ही चिकित्सक से परामर्श लेकर

अपना इलाज करवाकर दमा की रोकथाम कर सकते हैं। इसके अलावा बहुत कम समय में बहुत सारे लोगों की इस यन्त्र द्वारा दमा की जांच की जा सकती है।

उद्देश्य

1. हमारे इस यंत्र के द्वारा समुदाय के सभी लोगों के फेफड़ों की कार्यक्षमता आसानी से मापी जा सकती है।
2. इस यंत्र के माध्यम से दमा प्रभावित लोगों की प्रथम चरण में ही आसानी से जाँच हो सकती है जिससे उनका समय से इलाज करने के साथ बचाव भी हो सकता है।
3. एक विशेष क्षेत्र में इस यंत्र को स्थापित करके तथा इसको कंप्यूटर तथा इन्टरनेट से जोड़कर दमा रोगियों का विवरण स्वास्थ्य विभाग एवं सरकार को ऑनलाइन उपलब्ध कराया जा सकता है जिसके माध्यम से सरकार नीति निर्माण में इन आँकड़ों का प्रयोग कर सकती है तथा दमा के बचाव हेतु कार्य योजना का निर्माण कर सकती है।
4. इस यंत्र के माध्यम से बहुत कम समय में बहुत सारे लोगों की आसानी से जाँच की जा सकती है।

समविष्ट वैज्ञानिक सिद्धांत

इस प्रदर्श को बनाने में निम्नलिखित वैज्ञानिक सिद्धांत को उपयोग किया गया है–
इस यंत्र को बनाने में Spiromentry (श्वांस को मापने) की तकनीक का प्रयोग किया गया है। Spiromentry (श्वांस को मापने) की तकनीक एक आम PFT (Pulmonary Function Test) है। यह फेफड़ों की कार्यक्षमता एवं क्रियाविधि की जाँच करता है। साथ ही मुख्य रूप से श्वांस से अंदर बाहर आने के आयतन एवं गति को मापने में मदद करता है। इसी सिद्धांत को ध्यान में रखकर दमा जाँच यंत्र(Asthma Detector) का निर्माण किया गया है।

निर्माण में प्रयुक्त सामग्री

इस यन्त्र को बनाने में हमारे द्वारा कार्ड बोर्ड,कीप,रबड़ का पाइप, छोटा पंखा, मोटर, डिजीमीटर, एक शीशे का बॉक्स, सी.सी.टी.वी., वेब कैमरा तथा एक कंप्यूटर का प्रयोग किया गया है।

मॉडल की संरचना एवं कार्यपद्धति

यह यंत्र आसानी से एक स्थान से दूसरे स्थान पर ले जाया जा सकता है तथा बहुत कम समय में बहुत सारे लोगों की जाँच आसानी से की जा सकती है। इस मॉडल को बनाने में एक कीप को सर्वप्रथम एक रबड़ पाइप से जोड़ा गया है तथा रबड़ पाइप को छोटे से पंखे से जोड़ा गया है। इस पंखे को इस यंत्र से थोड़ा ऊपर जोड़ा गया है तथा पंखे को मोटर से जोड़ा गया है तथा एक डिजी मीटर जो सीधे मोटर साइड पंखे से साथ जोड़ा गया है जो दमा जाँच यंत्र के सामने दीवार पर लगाया गया है। इसके साथ ही एक सी.सी.टी.वी. कैमरा डिजीमीटर के सामने लगाया गया है जिससे आसानी से डिजीमीटर की रिकॉर्डिंग करने के साथ-साथ जिस आदमी की जाँच की जा रही है वह भी आसानी से सी.सी.टी.वी. कैमरे में कैद हो जाएगा। सी.सी.टी.वी. को कंप्यूटर के साथ जोड़ा गया है। जब जाँच करने वाला आदमी कीप के माध्यम से अपनी साँस को जोर से डालता है तो वह साँस की हवा रबड़ पाइप से होते हुए सीधे पंखे से टकराती है। जिससे पंखा घूमने लगता है। पंखे के घूमने से धारा उत्पन्न होती है। इस प्रकार जो धारा प्रवाहित होती है उसकी माप सीधे डिजीमीटर में दिखाई देती है। इस प्रकार डिजीमीटर में रीडिंग के अनुसार जाँच कर रहे आदमी की आसानी से जाँच की जा सकती है।

जाँच हेतु पैमाना

हमारे द्वारा 12 से 19 साल के छात्रों तथा 20 से 40 साल तथा 41 से 60 साल तक के कुल 190 लोगों की इस यंत्र द्वारा जाँच की गयी जिसके आधार पर एक पैमाना निर्धारित किया गया। जाँच करते समय कुछ दमा रोगियों की भी जाँच की गयी जो पूर्व से ही दमा से पीड़ित थे।

परिणाम

पैमाना तैयार करते समय एवं जाँच करने पर दमा जाँच यंत्र द्वारा निम्न परिणाम प्राप्त हुए जिनका विश्लेषण करने पर पैमाना तैयार किया गया है।

समुदाय में परीक्षण किये गये व्यक्तियों का दमायंत्र द्वारा औसत डिजीटल मान

क्र. सं.	आयु समूह (वर्षों में)	औसत डिजीटल मान कुल एम.वी.			
		1500 से अधिक	1000-1500	1000 से कम	कुल
1	12-19	60	10	7	77
2	20-40	37	14	9	60
3	41-60	22	11	20	53

जिन लोगों की रीडिंग 1500 एम.वी. से ज्यादा है या ज्यादा आती है वे बिल्कुल स्वस्थ है। जिनकी रीडिंग जाँच में 1000 एम.वी. से 1500 एम.वी. तक आई है या आती है उनकी फेफड़ों की कार्यक्षमता कमजोर है। जिनकी डिजीमीटर में रीडिंग 1000 एम.वी. से कम आती है वह दमा के मरीज़ हो सकते हैं उनको तुरंत दमा के इलाज के लिए चिकित्सक से परामर्श लेना अनिवार्य है।

उपयोगिता

इस प्रदर्श की उपयोगिता निम्न प्रकार हैं–

यह दमा जाँच यंत्र बहुत कम समय में बहुत सारे लोगों की जाँच कर सकता है। जाँच में कोई भी धनराशि व्यय नहीं होती तथा जाँच की समस्त जानकारी कंप्यूटर एवं सी.सी.टी.वी. के माध्यम से संरक्षित भी की जा सकती है तथा इस डाटा को वेबसाइट के माध्यम से ऑनलाइन स्वास्थ्य विभाग एवं सरकार को उपलब्ध कराया जा सकता है।

स्वास्थ्य विभाग एवं सरकार आसानी से दमा से सम्बंधित मरीजों की जानकारी प्राप्त कर सकती है तथा रोकथाम एवं उनके लिए कार्ययोजना का निर्माण भी कर सकती है। जिन लोगों में इस यंत्र के माध्यम से जाँच करने पर दमा की सम्भावना प्रकट होती है वह दमा की समस्या गंभीर होने से पूर्व ही आसानी से इसकी रोकथाम कर सकते हैं तथा अन्य लोगों को भी इसके विषय में जागरूक कर सकते हैं। इस उपकरण के माध्यम से बिना चिकित्सक के कोई भी आदमी अपनी दमा सम्बन्धी जाँच कर सकता है एवं रीडिंग को देखकर दमा होने की सम्भावना पर चिकित्सक से परामर्श लेकर उसकी रोकथाम कर सकता है।

3

स्वदेशी एयर कूलर

विद्यार्थी
विश्वजीत कुमार

मारवाड़ी इंटर
कॉलेज, गया, बिहार

अध्यापक
सुष्मिता सान्याल

प्रस्तावना

जैसा कि आप सभी जानते हैं हमारा देश ही नहीं बल्कि संपूर्ण विश्व विद्युत ऊर्जा की कमी की समस्या से जूझ रहा है। जैसे-जैसे हमारा देश, हमारा समाज प्रगति के पथ पर अग्रसर हो रहा है वैसे-वैसे मानव की आकांक्षाएं बढ़ रही हैं। मानव अपने ऐशो आराम के लिए विभिन्न इलेक्ट्रोनिक उपकरणों का उपयोग कर रहा है जिससे अत्यधिक मात्रा में विद्युत ऊर्जा का दोहन हो रहा है। गर्मी के मौसम में उच्च तापमान होने के कारण गर्म हवाएं चलती हैं जो हमारे लिए असहनीय होती हैं। बाजार में बिकने वाला कूलर जिसकी कीमत ₹ 5000 से लेकर ₹ 10000 तक होती है और इसमें विद्युत ऊर्जा की भी अधिक खपत होती है इसलिए हमारा प्रस्तावित मॉडल स्वदेशी एयर कूलर जो लागत की दृष्टि से सस्ता है और ऊर्जा संरक्षण की दृष्टि से हमारे समाज के लिए बेहतर है।

समविष्ट वैज्ञानिक सिद्धांत

जब पानी से भरे बर्तन से शुष्क हवा प्रवाहित की जाती है तब मिट्टी के घड़े के द्वारा वाष्पीकरण की प्रक्रिया से हवा ठंडी हो जाती है और पाइप के द्वारा ठंडी हवा निकलकर कमरे के तापमान को कम करती है।

निर्माण में प्रयुक्त सामग्री

ढक्कन वाली प्लास्टिक की बाल्टी, ए.सी. एडाप्टर, मिट्टी का घड़ा, डी.सी. पंखा, प्लास्टिक का छोटा डब्बा (10 सेमी. लम्बा 4 सेमी. व्यास का), काटने के लिए धारदार चाकू (कटर-आरी), चिपकाने के लिए टेप, बालू

मॉडल की संरचना एवं कार्यपद्धति

सबसे पहले प्लास्टिक की बाल्टी में उसके ढक्कन पर पंखा रखकर उतनी जगह मार्कर से निशाना बना कर फिर निशान वाले हिस्से को काट कर अलग कर दिया गया है।

पंखे को बाल्टी के ढक्कन पर रखकर टेप की सहायता से चिपका कर ढक्कन को बाल्टी पर लगा दिया गया है। अब बाल्टी पर 4 सेमी. व्यास वाले तीन होल बनाकर बनाए गए होल में 4 सेमी. व्यास और 10 सेमी. लंबा प्लास्टिक डिब्बा फिट कर दिया गया है। बाल्टी में लगभग 2 किग्रा. बालू डालकर उसके ऊपर मिट्टी का बर्तन रखा गया है। इस प्रकार एयर कूलर बन कर तैयार है।

चित्र — *स्वदेशी एयर कूलर*

विशेषता

1. इस कूलर को आसानी से घर पर भी तैयार किया जा सकता है।
2. इसे बनाने में मात्र ₹450-500 का खर्च आएगा।
3. इसे एक स्थान से दूसरे स्थान तक आसानी से ले जाया जा सकता है।
4. इससे कम विद्युत ऊर्जा की खपत होगी।
5. यह कूलर बैट्री एवं ए.सी. (बिजली) दोनों से चलेगा।
6. इसका इस्तेमाल कार्यालय, स्कूल, कॉलेज और दुकान में भी किया जा सकता है।

उद्देश्य

1. माननीय प्रधानमंत्रीजी द्वारा चलाये जा रहे 'मेक इन इंडिया' अभियान को सफल बनाना।
2. भावी पीढ़ी के लिए ऊर्जा की बचत करना।
3. स्वदेशी एयर कूलर का निर्माण अपने देश में करके बेरोजगारों को रोजगार देना।
4. लघु-घरेलु उद्योग को बढ़ावा देना।

4

आई ब्लिंक सेंसर द्वारा वाहन दुर्घटना रोकना

विद्यार्थी
दीपिका बोचीवाल

टांटिया बालिका
उ. मा. विद्यालय
सरदारशहर, चूरू
राजस्थान

अध्यापक
बजरंग लाल सोनी
इंदिरा सोनी और भारती चौधरी

प्रस्तावना

देश में प्रतिदिन कई वाहन दुर्घटनाग्रस्त होते रहते हैं। आँकड़ों से पता चलता है कि अधिकांश दुर्घटनाएं – विशेष रूप से बड़े वाहनों में जो रात को यात्रा करते हैं, नींद की झपकी आने के कारण होती हैं। यदि ऐसी व्यवस्था हो कि जैसे ही चालक को नींद आने लगे तो चालक व साथ में बैठे अन्य यात्रियों को पता चल जाये। इससे दोनों सचेत हो जायेंगे और वाहन को रोक लेंगे और दुर्घटनाओं के होने में काफी बचाव हो जाएगा। इसी कल्पना को साकार करने का प्रयास इस प्रोजेक्ट में किया गया है।

समविष्ट वैज्ञानिक सिद्धांत

प्रस्तुत प्रोजेक्टर में आई ब्लिंक सेंसर प्रयुक्त हुआ है जो इन्फ्रारेड तरंगों के परिवर्तन पर आधारित है और पलकों को झपकने के समय अन्तराल पर निर्भर करता है।

निर्माण में प्रयुक्त सामग्री

आई ब्लिंक सेंसर, आई.सी., कंडेंसर, प्रतिरोध, मोटर, गियरबॉक्स, ट्रॉन्स फार्मर, सुचालक तार, नट बोल्ट , कील, प्लाई, रंग-रोगन एवं सामान्य घरेलू इलेक्ट्रिक सामग्री।

निर्माण तथा कार्यप्रणाली

साधारण रूप से जब हम जागृत अवस्था में होते हैं तो हमारी पलकें झपकती रहती हैं। इस क्रिया में पलकों के खुली रहने का समय अधिक होता है। पलक झपकने के दौरान ऊपरी पलक ऊपर से नीचे आकर 1 सेकेण्ड से भी कम समय के लिए आँखों को बन्द करती है तथा पुन: ऊपर चली जाती है परन्तु जब नींद या आलस्य के कारण झपकी आती हैं तो आँखों के बन्द रखने का समय बढ़ जाता है।

इस बढ़े समय अन्तराल को आई.आर. सेंसर डिटेक्ट करता है और आई.सी. से बने सर्किट को ऑपरेट करता है। इस सर्किट से आउटपुट में विद्युत धारा का प्रवाह होता है तथा सायरन बजता है और लाल एल.ई.डी. प्रकाशित हो जाती है। जिससे चालक व यात्री सतर्क हो जाते हैं। इस क्रिया को प्रेक्टिकल दिखाने के लिए आँखें और पलकों का मॉडल बनाया गया है तथा पलकों के झपकने का समय अंतराल सामान्य व अधिक करना दिखाया गया है। साथ ही ब्रेक की भी व्यवस्था की गई है। जब पलक आँखों को अधिक देर तक बंद रखती है तो सायरन बजता है, एल.ई.डी. जलती हैं और टायर का ब्रेक भी लग जाता है।

I.R. (इन्फ्रारेड किरणें) ट्रांसमीटर व रिसीवर में पलकों से टकराकर आने वाले समय के अनुसार इस प्रोजेक्ट का सर्किट चालू होता है जो निम्न डाटा द्वारा समझा जा सकता है।

क्र. स.	पलकों के झपकने का समय	I.R. किरणों के जाने का समय	I.R. के लौटने का समय	सर्किट से प्राप्त वोल्ट	किया गया कार्य
1.	300 मिली. सेकेण्ड	.01 माइक्रो सेकेण्ड	.01 माइक्रो सेकेण्ड	3.2 वोल्टर	रिले बन्दक
2.	400 मिली. सेकेण्ड	.012 माइक्रो सेकेण्ड	.012 माइक्रो सेकेण्ड	3.4 वोल्टर	रिले बन्दक
3.	500 मिली. सेकेण्ड	.0125 माइक्रो सेकेण्ड	.0125 माइक्रो सेकेण्ड	3.9 वोल्टर	रिले बन्दक
6.	750 मिली. सेकेण्ड	.0190 माइक्रो सेकेण्ड	.0190 माइक्रो सेकेण्ड	4.2 वोल्टर	रिले अल्प सक्रिय
7.	1000 = 1 सेकेण्ड	.2 माइक्रो सेकेण्ड	.2 माइक्रो सेकेण्ड	4.8 वोल्टर	रिले ऑन

इस प्रकार हम देखते हैं कि पलकों के झपकने में समय अधिक लगने पर विद्युत परिपथ चालू हो जाता है और सायरन बजने लग जाता है।

उपयोग

आई ब्लिंक सेंसर का वाहनों में उपयोग होने से उन वाहन दुर्घटनाओं का बचाव होता है जो चालक को नींद की झपकी आने के कारण होती हैं।

5

ECO-CRUISER

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TEACHERS
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Ajay Kumar Tyagi

Introduction

The air pollution causes chronic diseases such as cancer, asthma etc. A model has been designed and developed which can reduce the effect of air pollution in the city. This model is named as Eco-cruiser. Since bicycles are pollution-free and most efficient mode of transportation around the world, this model can be placed on a bicycle. It will be appropriate for the mine workers and the people who commute near the mines.

Fig. *Eco-cruiser*

Scientific Principle

The Eco-cruiser works on the principle of Electrostatic Precipitator and Fly-back Transformer.

An **Electrostatic precipitator** (ESP) is a filtration device that removes fine particles, such as dust and smoke, from a flowing gas using the force of an induced electrostatic charge minimally impending the flow of gases through the unit.

A **Fly-back Transformer** (FBT), also called a **line output transformer** (LOP), is a special type of electrical transformer. It was initially designed to generate high voltage sawtooth signals at a relatively high frequency. In modern applications, it is used extensively in switched-mode power supplies for both low (3 V) and high voltage (over 10kV) supplies. It produces high voltage at low amperes.

Material Required

Fly-back transformer, Dynamo, Bicycle, Electrostatic precipitator, Inhalation mask, Tube, Plastic bottle for insulation, 9 V Battery, Switches, Connecting wires, CFL Circuit to amplify the current

Construction and Working

A dynamo is attached to the front wheel of the bicycle; a fly-back transformer is attached to the crossbar of the bicycle. An electrostatic precipitator which is made by using waste plastic bottle and some wire mesh is attached to the handlebar. A mask is also attached to the ESP by a tube.

(i) As the rider rides the bicycle, the shaft of the dynamo attached to the wheel rotates and the dynamo produces 5 to 25 volts (1200 mA). There is a fly-back transformer attached to the frame of the bicycle, which increases the potential difference to considerable amount [5000 to 10000 volts (1-15 mA).

(ii) It requires high frequency current so a CFL circuit is placed to increase the frequency of the current.

(iii) As the bicycle moves forward the air with dust particles and particulate matter enter the electrostatic precipitator.

(iv) It comprises the first grid which filters dirt and coarse particles. Then comes the role of the second grid, in which flows the high voltage positive charge (from the fly-back transformer) and after passing through which the particles get positively charged.

(v) Aluminium foil in which negative charge (from the fly-back transformer) is flowing. All the particles that got positively charged get attracted towards it and stick/ adhere to it. All the particulate matter precipitates out of the air stream. Now at last the cleaned air, free from dust and pollutants, reaches the rider's lungs through the tube and mask and the rider can breathe in clean air.

Advantages and Applications

(i) Cycling is a non-polluting way of commuting.

(ii) The air consisting of dust and pollutants that comes in the precipitator is instantly converted to clean air.

(iii) This idea is best suited to the people who commute near the coal mines, cement factories, etc., where the particulate matter levels are considerably high in the air.

(iv) Nowadays particulate matter in air is increasing exponentially. The particulate matter which is of the size 10-100 microns is stopped in the nose by the nasal hair and cilia but less than 10 microns goes inside and sticks in our respiratory tract and causes diseases. If the particulate matter is less than 2 microns, it gets entangled in our microphages and cells and causes life threatening chronic diseases of heart, brain, lungs, blood, etc. But, our **Eco-cruiser precipitates even the particulate matter of the size 0.1 micron.**

6

Agarbatti Stick Maker

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Introduction

Agarbatti sticks are widely used in every family. To make agarbatti, it is necessary to cut a number of agarbatti sticks at a large scale. The devices which are found in the market are very costly and are beyond the reach of poor families. On the other hand, the traditional mode of cutting agarbatti sticks on a large scale is a problem. Keeping this in view, a model called Agarbatti Stick Maker is developed.

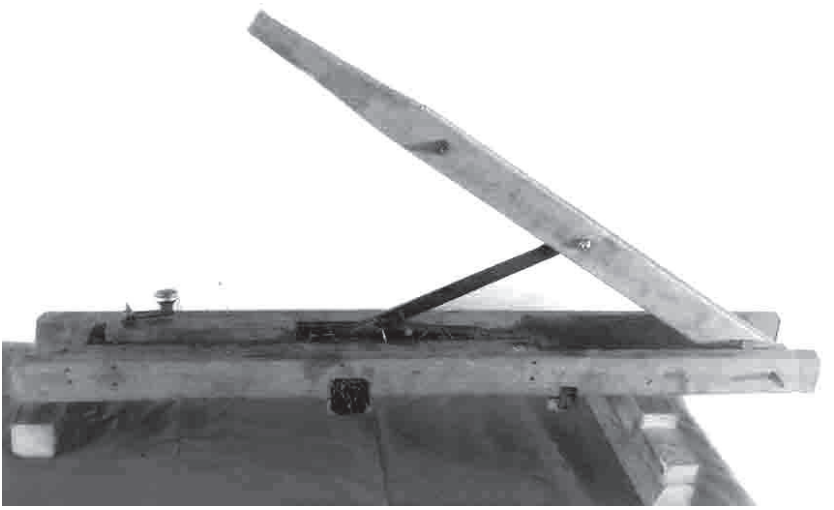

Fig. *Agarbatti stick maker*

Scientific Principle

Agarbatti Stick Maker is based on the scientific principle of lever.

Material Required

Wood, Iron rod/Steel, Bolts and nuts, Nails, Bamboo

Construction and Working

A rectangular base frame is made by using wood. A blade is fixed at the bottom of the frame so that the stick can be cut simultaneously. A rectangular box shaped chamber called 'Stick Chamber' is also made to keep the twigs of bamboo which is fixed on a lever. This chamber has a covering lid.

Working

The suitable twigs of bamboo are collected and put in the stick chamber and are covered. When the lever pushes down, the chamber comes to the sharp blade and cut them horizontally first. Then, this process is repeated after sizing the agarbatti sticks in a regular manner till we get the desired shape. Thus, the sticks are collected from the bottom of the blade. In one cycle of the movement of the lever, at one time, one can cut around 40 to 50 pieces of agarbatti sticks. Thus, cut agarbatti sticks are ready for further processing.

Advantages

(i) Agarbatti Stick Maker can cut the sticks on a large scale with minimum labour.
(ii) Chances of getting injured with this model is very less as compared to the traditional method.
(iii) Since the cost of the model is low, even a poor family can utilise it.
(iv) This model can be used by the professional agarbatti stick makers.

7

Modern Plantation and Sowing Machine

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Alka Gupta

Introduction

Nowadays it is an ardent need in the developing and agri-domained countries like India, to use innovative technology in agriculture. To overcome the major problem of decreasing manpower (workforce) in agriculture sector, this modern plantation and sowing machine is made to facilitate plantation of sugarcane, brinjal, onions and other such crops. This machine is handy and easy to operate for the farmers and henceforth nowadays it is being used on large scale for the plantation of sugarcane.

Scientific Principle Involved

According to Newton's law of Action and Reaction, when force is applied on the soil by giving pressure on the soil, it gets deformed and when the pressure on the soil is removed, the soil regains its shape.

Material Required

2½ inch pieces of pipe, 2 stand, wheels, clutch cable tray

Construction

Three small flaps are joined to the one end of the 2½ inch pipe with the help of hinges. A ring is asserted to make the flaps open and shut. This is connected to a clutch cable with the adequate tension near the handle, so that the flaps may open and shut due to the effect of tension. The pipe is again placed on the frame having wheels.

Due to use of wheels this machine can be moved easily to the desired place. With the help of the tension created by clutch cable, the pipe can be lifted up at the required height. A tray is placed to keep plants and seeds just above the pipe.

Working of the Machine

After inserting the plant/seed through the pipe, the clutch is pulled to open the flaps. The open flaps disperse the soil of plant. The pipe comes up after releasing the clutch and dispersed soil is recollected automatically near the roots and the proper process of plantation takes place. Supply of fertilizers can be done at times, if required.

Advantages

(i) More work with less manpower
(ii) Saves extra labour, time and money
(iii) Less physical excursions
(iv) *Multi-purpose use*: Fertilizer can be provided at the same time of plantation or sowing.
(v) Useful for plantation of crops as well as sowing of seeds.

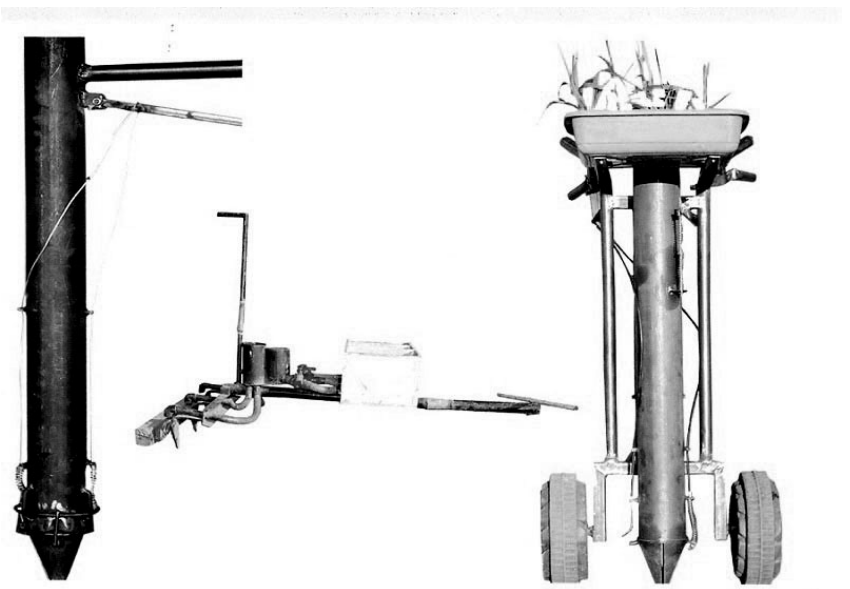

Fig. *Modern plantation and sowing machine*

8

Scaling Machine

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Introduction

A scaling machine is a drawing aid that simplifies the process of enlarged copying of pictures or figures. We can then use this machine to create reduced or inverted drawings of any shape. The instrument is turned upside down, with the heads of the bolts touching the paper, and is fixed to the paper with a drawing pin. We go over the lines of a shape with a painted piece of dowel and a pencil attached to the machine will automatically produce a transformed images. It makes a great educational toy for families with children or for people who are into craft activities like patchwork, woodworking, modelling, technical drawing, etc. With the same principle, different kinds of scaling machines are used for other forms of duplication in areas such as sculpture, minting, engraving and milling.

Scientific Principle Involved

It is based on the principle of Pantograph.

Material Required

The material used in this exhibit are:

(i) A rectangular wooden board with dimensions 40 cm × 59.5 cm.
(ii) Four aluminium bars with lengths 30 cm (two), 15 cm (two).
(iii) Four screws, one nail pointer, a pencil, a pencil fixing screw and anchor point.

Construction and Working

A scaling machine is a drawing aid that simplifies the process of enlarged copying of pictures or figures. It makes a great educational toy for families with children or for people who are

into craft activities like patchwork, woodworking, modelling, technical drawings, etc.

The design we built enables magnifications of the order of 2,3,4 and 5 to be obtained by simply relocating two screws.

The major components were made quite easily from aluminium bar using nothing more than a hacksaw and drill, and a file to smoother off any burrs. The four key pieces (the arms) are held together by a few round-headed screws and a variety of nuts. A pencil-holder that is made by bending a surplus piece of aluminium bar riveted to one arm is used. It can equally be screwed in place if there is no access to a pop rivet gun.

The design is based on 30 cm long arms and is capable of doubling a 15 cm picture or magnifying a 8 cm picture by 5. For copying larger pictures the dimensions of the four "arms" must be made proportionately larger and the hold spacing can also be proportionately increased. Alternatively, this size can be used by magnifying the picture one section at a time.

The aluminium bar 12 mm wide by 3 mm thick and 2.4 m in length can be purchased from a local hardware store. It is long enough to make two pantographs. The screws, nuts, dome nuts and wing nuts are all 5/32 inch and cost about ₹150 per scaling machine. 5/32 inch has been used because of the variety of nuts available but an equivalent metric size may be used if available.
The lengths of the four arms are:

- Arm A-31.2 cm
- Arm B-31.2 cm
- Arm C-25.2 cm
- Arm D-16.2 cm

A hand drill can be used to make the holes, but as drill press was so accessible it was possible to gang drill all four arms at the same time. The most important part here is to accurately mark the location for the holes and ensure that they are not oversized and that they should be drilled in the right place. Ensuring that they are drilled in the middle of the arm and correctly spaced it will provide accuracy of the final scaling machine to make consistent enlargements.

The Scaling machine is shown set up for threefold expansion (note that when the set up is correct Arms A and C are parallel and Arms B and D are also parallel, if it is wrong it will not move). Pivots 1 and 2 are permanent and do not need to be undone. Pivots 3 and 4 are moved to select the magnification required (×2, ×3, ×4 or ×5) — the nearer Pivot 2 is to the anchor point fever greater is the expansion. The pencil used is a cheap mechanical

type, locked into the end of Arm B with a screw passing through the bracket and a nut between the bracket and the pencil.

The bracket holding the pencil has four 2 cm long legs, two holes for rivets or screws attaching it to Arm B, one hole for the pencil securing screw (with nut between bracket and pencil), and one hole large enough to pass the pencil.

Using the scaling machine is simple. The drawing surface should be about 60 cm square with the anchor point located in the bottom left hand corner and taped down. With the scaling machine in its closed position, the picture to be copied is placed so that the tracing point (pivot 2) is just on the left hand bottom corner of the picture and the picture is then taped down. Place the blank drawing paper so that the pencil sits just on its bottom left hand corner. Move the pencil end so that the tracing point moves to the top right hand of the picture and ensure that the pencil is still on the blank paper. If so, tape down the drawing paper. Sometimes, depending upon the size of the picture, it may be necessary to overlap the picture and drawing paper and copy the picture one half at a time.

APPLICATIONS

- It can be used as a toy of school-going children.
- It can be used as a teaching aid for mathematics.
- Basic concept of pantograph used by architects can be introduced to young minds.
- It is low cost and portable.

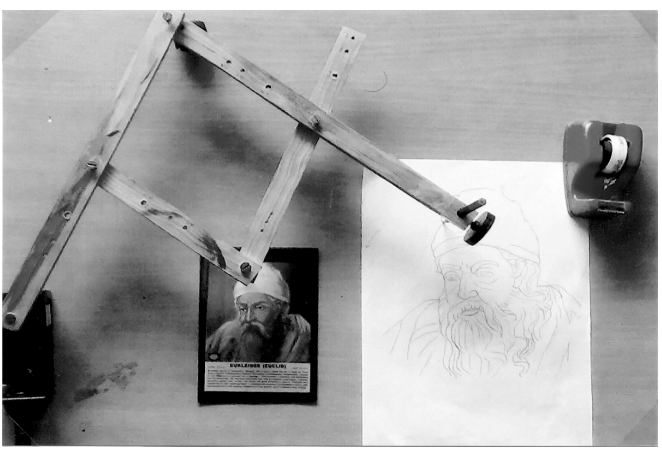

Fig. *Scaling machine*

9

Solar Plate Summer Helmet

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Introduction

It is an ordinary helmet with extraordinary features. We can say that it is a multi-purpose helmet with features that are constructed and programmed to provide benefits to the customer in scorching heat and a medium to provide safe driving.

Scientific Principle Involved

Use of Solar Energy as a source and transforming that heat energy into electrical energy to provide running small devices attached to the helmet.

Material Required

Helmet, Solar Panel, Computer Exhaust Fan, Small Metallic Protection Cover (Jali), Motor, Bluetooth Device, USB Port for charging and Remote

Construction and Working

(i) A fan has been attached to the helmet to provide cooling to the person who is wearing the helmet.
(ii) A USB is also attached in case urgent charging is required.
(iii) A Bluetooth connectivity which facilitates navigation that is connected through cellphone of the person driving.
(iv) As a precaution measure, in order to provide safe driving, without the helmet the bike would not get started.

This helmet uses solar energy from the attached solar plates for performing various operations like running of fan or charging of mobiles by USB.

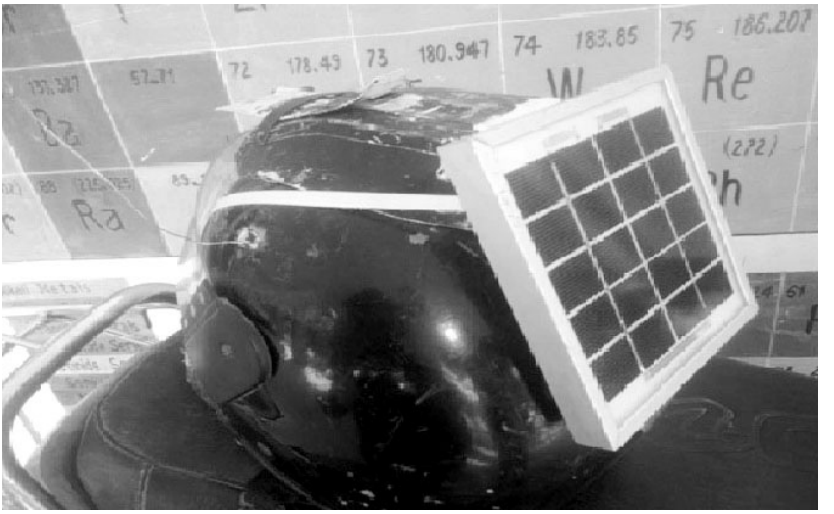

Fig. *Solar plate summer helmet*

ADVANTAGES

(i) As without helmet the bike would not start so it would eventually lead to decrease in the stealing of two. wheeler vehicles in the country.

(ii) Since it is necessary to wear the helmet in order to start the bike, it would ultimately be a safe journey for the rider.

(iii) Saving of valuable human life.

10

Seed Extraction Machine

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Introduction

Nowadays our lifestyle becomes very fast and hasty. It affects our health in many ways. Polluted food items is one of the reasons. There are many adulterated food items that are available in the market, for example, wet and nasty groundnut seeds.

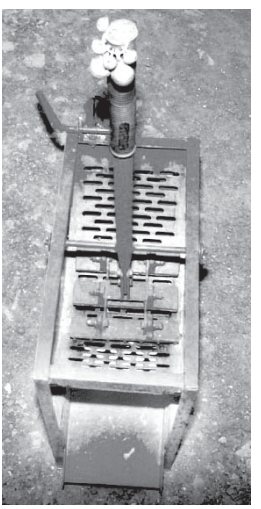

Fig. *Saving electric power by using manpower*

When we use such groundnuts to prepare food, it affects our health. Therefore, we planned to prepare a machine that helps to separate nasty nuts from groundnuts.

Principle: Using manpower to operate the level the specific arrangement tooth at the bottom, Crushes the different types of nuts which separates the seeds.

Material Required

Different type of metal sheets, hollow metal sheets, L-shaped mild steel rods, screw-bolt, metal pipe, steel tooth, etc.

Construction and Working

A hollow metal plate of size 78 cm is taken and bended into 'U' shape. This plate is fitted inside the box of 51 cm length and 26 cm breadth. To apply pressure for crushing nuts, tooth are welded on a steel plate which is attached to the lever. The pressure will be built up between the plate and tooth which eventually crush the nuts. Both seeds and shells will fall through the hollow plate. Then seeds are separated by hand-picking. Three tooth are attached which are also useful for peeling coconut.

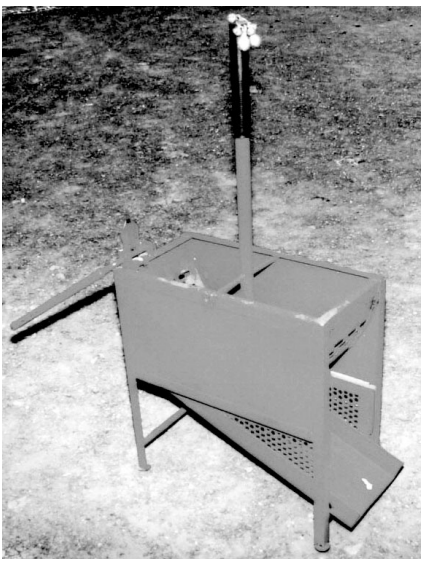

Fig. *Seed extraction machine*

Applications

(i) It is useful for getting seeds out of nuts, e.g., Groundnut, Tur, Moong, etc.
(ii) Saves electric power by using manpower which saves environment.
(iii) It can be used to separate different types of seeds.
(iv) It is useful for peeling coconut.

11

An Automatic Machine for Cleaning and Storing Wheat

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TEACHER
Gurbinder Sing

Introduction

Agricultural commodities have to undergo a series of operations such as harvesting, threshing, winnowing, grading, bagging/ packing, transporting and being stored before they reache the consumers and hence provide economic benefits to the farmers. There is significant loss at every stage of the above said operations along with wastage of money, time and power, and moreover if any of the steps are not performed properly it amplifies the loss.

A majority of farmers belongs to average economic class who cannot afford the adequate though costly machines and proper manpower; and as a result, bear greater economic loss. There is a need of joint venture between farmers and government to save our crop production to provide meals to the huge population of our country.

Scientific Principle Involved

So Keeping in mind the losses during wheat production, consumption of manpower, time, money, an effort has been made to create an automatic improvised machine which can carry out many of the steps of wheat cleaning and storage.

Material Required

Wheel for movement, conveyor belt, fan for winnowing, sieve platform, heating fan, cooling fan and grain outlet for storage.

Construction and Working

A hollow metal plate of size 78 cm is taken and bended into 'U' shape. This plate is fitted inside the box of 51 cm length and 26 cm breadth. To apply pressure for crushing nuts tooth are welded on a steel plate which is attached to the lever. The pressure will be built up between the plate and tooth which eventually crush the nuts. Both seeds and shells will fall through the hollow plate. Then seeds are separated by hand-picking. Three tooth are attached which are useful for peeling coconut.

Method

The cleaning of wheat starts with its transportation from fields by lift trolley which pours wheat into a big open container from where grains are being carried by a conveyor belt which not only carry grains but also spread it in the front of fan to carry out the process of winnowing. The strong current of wind by fan remove light unwanted chaff-chaff and grains fall over net which is showing to and fro movement to extract various unwanted material by the process of sieving and gradation of seed could be carried out at the same place itself. Wheat from the sieving is poured into the heating pan which also shows to and fro movement to facilitate proper heating of the grains to remove the extra moisture content and killing the eggs of insects in order to protect wheat from spoiling. The hot wheat grains exposed to

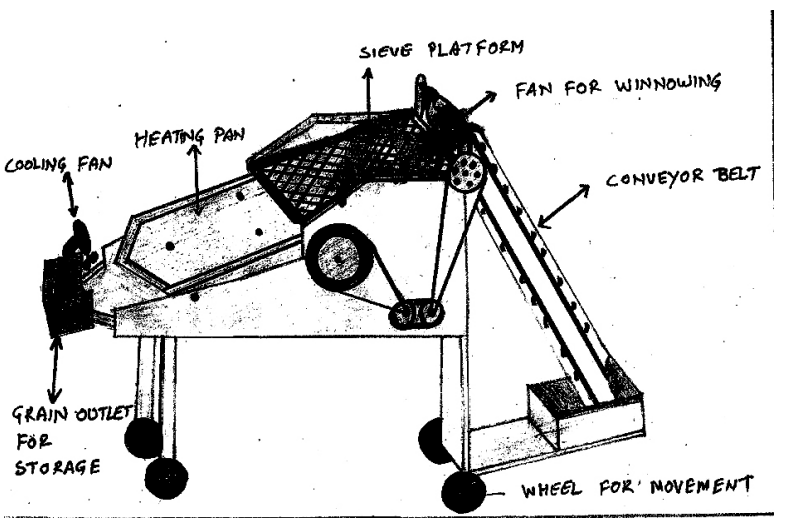

Fig. *An automatic machine for cleaning and storing wheat*

air for cooling down are then directed to fall into the bags with dry ice or oxygen absorbent for proper storage of wheat with less oxygen content which hinder the growth of insects.

References

(i) Wheat production in year 2014–15—Agricultural statistics at a glance 2015 (88).

(ii) B. Sinha et al.: Assesment of crop yield losses in Punjab and Haryana using 2 years of continous in situ ozone measurement. Atmospheric Chemistry and Physics (2015).

(iii) Vicklynn, H.: Preserve and store grains with dry ice; Real food living (1) 2016

(iv) Bruce, A. et al. (95). Managing dry grain in storage. Agricultural Engineers' Digest, Purdue University. (1). 2015.

12

ANTI STORM UMBRELLA

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Mrutyunjay Mohanty

INTRODUCTION

Very often we find that the umbrellas get inverted when wind velocity is more than 20–25 km/h. We feel uncomfortable and loose balance with umbrella in one hand at the time of riding a bicycle. The pillions sitting on a bike also feels uncomfortable with umbrella. I have tried to solve all these problems by my "**Anti Storm Umbrella**".

SCIENTIFIC PRINCIPLE INVOLVED

It works on Bernoulli's principle, which states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure.

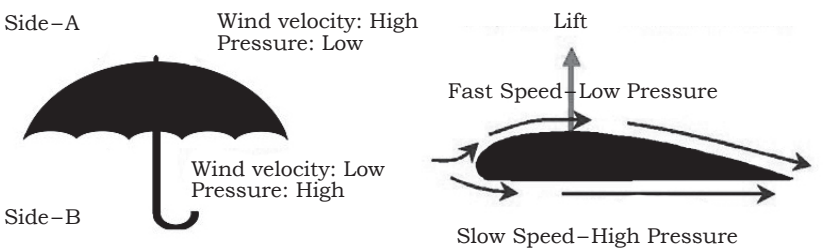

Fig. 1: *Anti Storm Umbrella*

Why traditional umbrella get inverted before wind–
Fig.1 shows a picture of a traditional umbrella. Due to its special shape when we move with this umbrella, wind velocity in the upper side (side- "A") becomes high and it results in low pressure there. At the same time, wind velocity on lower side of the umbrella (side- "B") becomes low and it results in high

pressure. When the pressure difference between sides "A" and "B" becomes very high, it creates a net upward force/lift. As a result the umbrella gets inverted. It happens when the wind velocity increases above 20—25 km/h.

Construction of Anti Storm Umbrella

I have designed a new shape of the umbrella by which the pressure difference between the two sides of an umbrella can be decreased. For that I have changed the shape of the umbrella by varying the length of its spokes. I bought an umbrella having spokes of length 71 cm on each side. It has 8 spokes. I have changed the length of six spokes out of eight spokes as given below.

a) Two Spokes: 71 cm each (Full Length)
b) Four Spokes: 51 cm each (Length Reduced)
c) Two Spokes: 35.5 cm (Length Reduced)

If the user puts smaller spokes side in the direction of motion, then due to its special aerodynamic shape the air flows both over and under the umbrella with nearly equal speed, therefore the pressure difference between the two sides minimizes. My umbrella gives total coverage of 106 cm length, which is equal to the coverage provided by the standard umbrella available in the market.

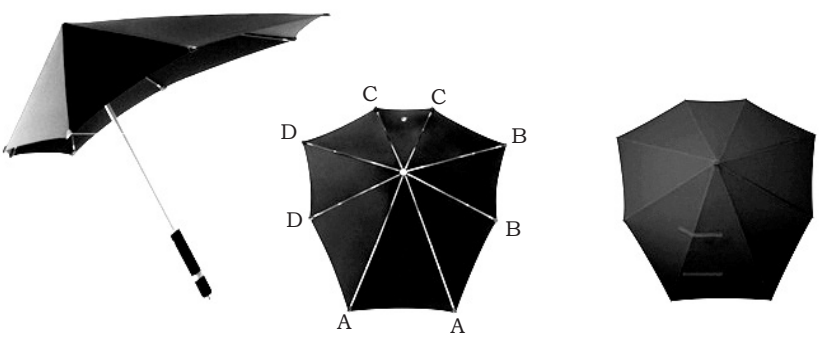

Fig. 2: *Anti Storm Umbrella*

Field Trial of the Umbrella

To test the wind resistance of the umbrella I made a field trial and made its video as proof. I sat on the motorcycle of my guide teacher holding umbrella and he drove at a speed of 80 km/h. I found it very comfortable to hold the umbrella due to its special aerodynamic shape.

Applications

(i) We can use this umbrella easily during rain with storm like wind and dust storm.
(ii) We can fix this umbrella on the handle of the cycle and ride cycle comfortably with more balance.
(iii) The pillion on bike can hold the umbrella easily.
(iv) It saves our time.

References

(i) Down to earth magazine (February 2015)
(ii) Material from Internet
(iii) Fundamental of aerodynamic SI (John D. Anderson)

13

Border Surveillant Robot

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Introduction

This working model "Wireless Border Surveillant Robot" is constructed to keep surveillance at the infiltration of the terrorists across borders of our neighbouring countries.

Scientific Principal Involved

Wireless Border Surveillant Robot is a surveillant Robot which is operated by wireless technology. It is controlled by a remote. Using this, laser detection of bunkers is also possible.

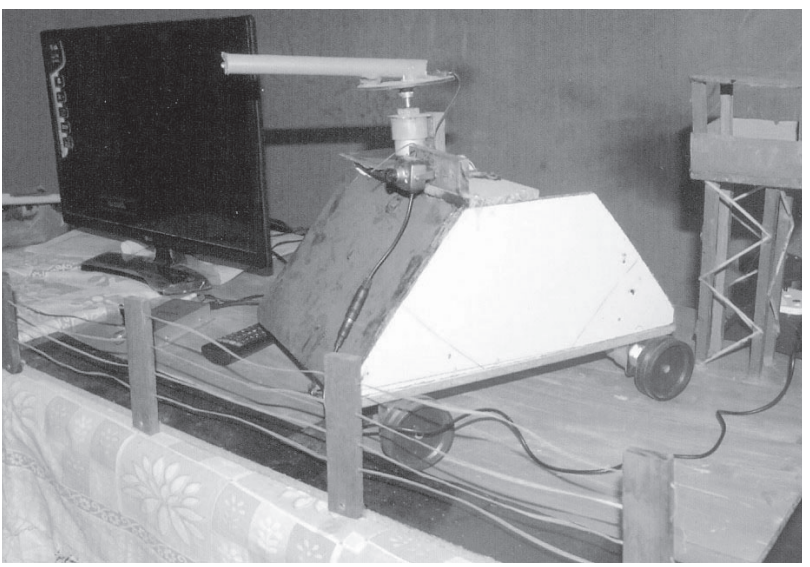

Fig. *Border surveillant robot*

Material Required

IR Remote, IR Receiver, Micro-controller (at 89c 2051), Motor driver (1293d) and DC gear motor 30rpm, Music Generator, Led Sensor, Wireless Camera, Metal Detector, Solar Cell

Construction and Working

It consists of blocks namely IR transmitter, IR receiver and micro-controller as bit selector, motor driver, motor and camera. IR sensor module receives the IR signal from the IR remote. The output of the IR receiver is not very high. So, an amplifier amplifies the signal to digital from 1 and 0 level. Now, the micro-controller stores the bit pattern of the IR transmitter and compress with pre-defined bit pattern and then control Robot.

It is mounted on a set of wheels attached to DC geared motor. The gear teeth is so chosen for suitable torque and speed. The camera is provided with a very high sensitivity microphone which picks up murmuring sounds also. The camera has manual focus adjustment.

The Robot has two wheels and is driven using differential drive mechanism. The rear end is provided with a free wheel for balancing the robot. The robot is remotely controlled by using an Infrared remote. The various functions assigned to the remote are move forward, backward, right, left, stop, etc., by using 2,4,6,8,5,1,3 and 7 keys. All the motors are controlled by micro-controller based embedded system. LM293 based H bridge motor driver is used to drive the geared DC motors.

This Robot acts as a Rover. This rover can be controlled by infrared electromagnetic wave. The solar panels used in the rover provides required energy to the rover which enables the Rover to move.

Applications

(i) It can detect enemy soldiers and terrorists.
(ii) It has a 360^0 rotating camera, that can record the scenes of the border and can send pictures to the surveillant satellites.
(iii) The metal detectors used in the Rover can easily detect landmine hidden in soil.
(iv) Laser detection technology can detect the location of attack.

14

Solar Rice Husk Smokeless Multipurpose Chulah

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Introduction

Fuel is one of the most important requirements of all. The fuel use should be easily available, cost effective and environment-friendly. Rice is one of our major carbohydrate food in India and cultivated widely. The rice husk is simply thrown out uselessly. This rice husk can be used as fuel for heating and cooking purpose.

Scientific Principle Involved

Oxygen is required for proper combustion of fuel. Rice husk can produce higher temperature without smoke if proper air supply is being provided.

Material Required

1 mm metal sheet 1½ft × 8 ft, a 6 volt inlet fan of 3 inches diameter, a 6 volt rechargeable battery, a solar panel to charge the 6 volt battery, one regulator switches to adjust the RPM of the Fan, a 'L' shape 2½ inches diameter 6 inches long for chimney, one solar cable socket, 4 no. 8 bolt nut, a perforated, (jali) metal cylinder of 7 inches diameter, a metal cylinder of 8 inches diameter 1½ ft tall.

Construction

A box of iron sheet 1 ft × 1½ × ½ ft is made by welding. Turn holes of 6 inches and 4 inches diameter are made on the upper part of the box. The metal pipe of 4 inches long is fixed to the lower part of the cylinder inserting from the side to fix the

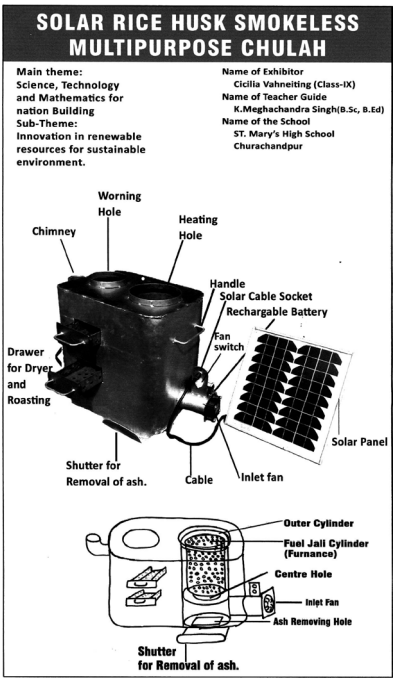

Fig.1 *Smoke rice husk chulas*

inlet fan along with a regulator switch and solar cable socket. A circular platform is made just above the inlet fan 2½ inches pipe inside the 8 inches cylinder having a 3 inches diameter hole at the Centre on which the removable perforated (jali) cylinder of 7 inches diameter will be placed.

The upper part of the 8 inch outer cylinder has a gap of 1 inch with the upper surface of rectangular box heating hole. Two perforated (jali) drawers are fixed at the lower part of 4 inches diameter worming hole. An 'L' shape 2½ inches diameter pipe is fixed at the side of worming hole.

WORKING

Rice husk is placed in the perforated (jali) cylinder and placed inside the heating hole platform. Put a few drops of kerosene on the upper surface of the husk. Switch on the inlet fan regulator and ignite fire. The husk start burning with blue flame without smoke and ready for heating or cooking. Both the holes, i.e., the heating and worming hole perforated (jali) drawer for drying and

roasting are ready for use. The harmful unwanted gas product from combustion is passed out through the side chimney and the ash is removed from the down shutter. The rate of combustion is adjusted with the regulator of the inlet fan.

Fig.2 *Solar rice husk smokeless chulah*

Conclusion

(i) Rice husk is generally found everywhere and can be used for cooking and heating purpose without pollution with new technology.

(ii) It is highly economic.

15

STOVE WATCHES

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INTRODUCTION

While boiling any liquid like milk, water, tea or cooking any food, due to lack of attention it sometimes overboils and spills out or gets overcooked. So, to overcome this issue we can use stove watcher to turn off the gas automatically, when the liquid is boiled without the spilling out of the same and can be used to set the timer to turn the gas off. It can be used to dim the gas as per your requirement but without the fear that food will be burnt. It also prevents unpredictable fire caused due to burners.

This is the idea and it can be provided in low cost which will help in saving time and resources like gas or food as well.

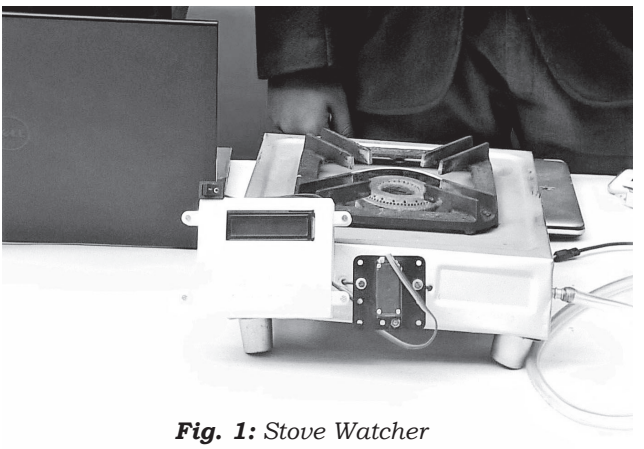

Fig. 1: *Stove Watcher*

Scientific Principle Involved

- Resistance change due to temperature.
- Resistance change due to conductivity of different liquids.
- Mechanical gear system (controlled by servo motor).
- IR radiation at different levels of heat.

Material Required

Micro-controller, Servo motor, Battery, LCD

Construction

(i) The sensor is fit at the rim/surface of the container and connected to the micro-controller.
(ii) A servo motor is fixed with the gas knob and connected to a micro-controller.
(iii) When any liquid boils and reaches the rim/surface of the container, the sensor detects that and sends signal to the micro-controller.
(iv) On receiving signal, the micro-controller processes the same and gives command to the servo motor for initiating rotation which leads to the turning off of the gas knob.
(v) In addition, a provision for timer is also given for cooking and when used, it replaces the activity of the sensor thereby the gas knob turns off.
(vi) Can be used to set a timer for cooking.
(vii) Can be easily fitted in any gas stove with knob.
(viii) Can be used in domestic devices of daily use.
(ix) Can be used to make quick dishes like tea, etc., with just one click of button.

Applications

(i) It saves time, so other work can be done during this time without fear of burning or spilling of food.
(ii) It saves your resources like unnecessary wastage of gas for keeping things for long hours.
(iii) It saves food from spoiling or burning.
(iv) It is very useful for physically challenged and old age people.
(v) It is easy to use.
(vi) It can be a life saver as well.

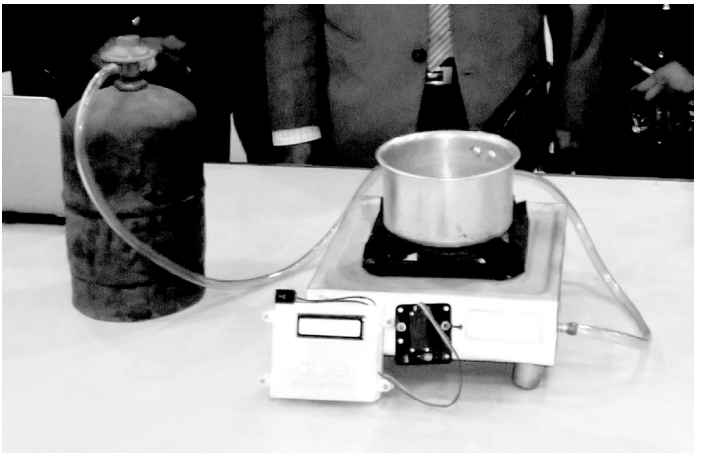

Fig. 2: *Stove Watcher*

FEATURES

(i) Can be easily fitted on any gas stove with knob.

(ii) Interactive system with
- the LCD Screen
- preset for quick setting
- led reference for different modes and functions.

(iii) It beeps when the timer set is over.

(iv) There are some quick features installed like to make tea, boil milk, warm water, etc.

(v) It is cheap and cost effective.

(vi) It can be operated by specifying the volume of container, the meal and the time by which it will be made.

COST

Estimated cost 300 INR.

16

AUDIO OPTIC

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INTRODUCTION

In this exhibit, a device has been designed to assist visually impaired to carry out their day-to-day tasks.

AIM/OBJECTIVE

Assisting the visually impaired with the help of a visual aid embedded with computer vision (CV) and artificial intelligence (AI)

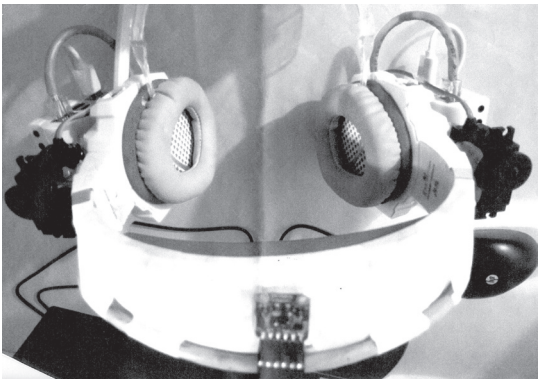

Fig. 1: *Audio optic*

SCIENTIFIC PRINCIPLE INVOLVED

The Audio Optic is an application-based project. It uses the ability of a credit card sized single board computer and a micro-controller to assist the visually impaired to perform various

tasks . The device has been embedded with artificial intelligence (AI), computer vision (CV), sensors and modules so that it can judge the surroundings to produce a verbal guidance using TTS (text to speech) technology.

Material Required

Raspberry Pi, Camera Modules, GPS Module, GSM Module, Voice Recognition Module, Magnetometer, Ultrasonic Sensors

Construction and Working

Device uses speech recognition to enable different modes and TTS engine interact with the user. The 2 SC computers enable the cameras and process different visual and geolocation algorithms and goes on image processing and application of neural networks and deep learning algorithms provided by the Google Cloud Platform API'S to produce verbal assistance for the visually impaired. The cameras collaborate with ultrasonic sensor and the same relation between the magnetometer and GPS enables the device to assist the user for navigation. The visual processing algorithms help in reading, object detection, identification and recognition, facial recognition. The GSM enables voice operated calling and voice operated SMS feature; and the Internet also avails email facility.

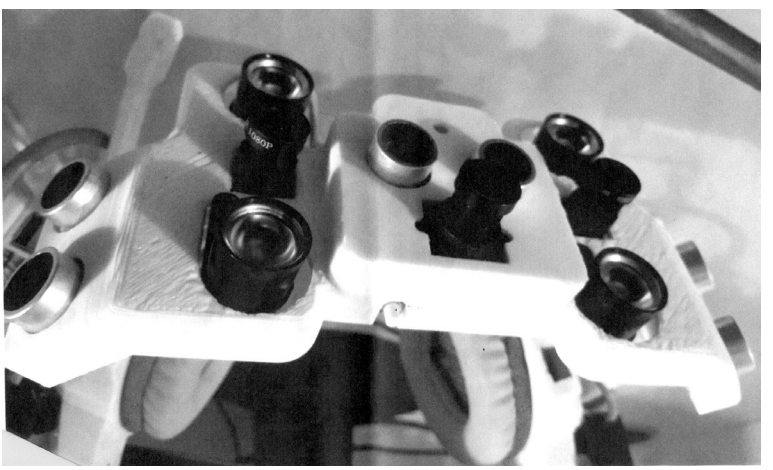

Fig. 2: *Audio optic*

Application

A visually impaired person can easily perform his/her day-to-day activities using this device.

For Further Improvement

(i) Improvement in artificial intelligence
(ii) Improvement in processing speed
(iii) Development of sensor technology, e.g., as fire sensor
(iv) For verbalising and installing familiar apps

References

(i) Sensor Technology Handbook, Jon S. Wilson
(ii) www.tutorialspoint.com
(iii) www.ardnino.cc
(iv) www.raspberrypi.org

Notes

Hello Children!

If you feel uneasy about someone touching you inappropriately, you should not keep quiet. You must

1. Not blame yourself
2. Tell someone whom you trust
3. You can also inform National Commission for Protection of Child Rights through the **POCSO e-box**.

When you get an unsafe touch, you may feel bad, confused and helpless
You need not feel "bad" because it's not your fault

POCSO e-box available at NCPCR@gov.in

नए समाज की ओर
Towards a new dawn

If you are below 18 years of age, and are troubled or confused or abused or in distress or know some other child who is...

*Call **1098**...because some numbers are good!*
They change lives!!!

CHILDLINE 1098 - a national 24 hours toll free emergency phone service for children in distress is an initiative of CHILDLINE India Foundation supported by Ministry of Women & Child Development

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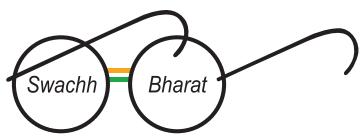

Ek Kadam Swachchhta ki or

विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING