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Design and Manufacturing Variable Resistance Biceps Curling Machine

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Abstract: *For above purpose firstly, the mild steels are carburized under the different temperature range as stated above and then it is tempered at 2000 C for half an hour after these the carburized and tempered mild steels are subjected for different kind of test such as abrasive wear test, hardness test, tensile test and the toughness test. The results of these experiment shows that the process of carburization greatly improves the mechanical and wear properties like hardness, tensile strength and wear resistance and these properties increases with increase in the carburization temperature but apart from this the toughness property decreases and it is further decreases with increase in carburization temperature.*

I. INTRODUCTION

A good working knowledge of the biomechanics of the elbow is fundamental for planning of biceps exercise. The three types of muscle contraction are Isometric, Isotonic, and Isokinetic. Isometric is defined as that type of contraction where muscle tension and muscle length remain constant. This type of exercise provides muscle strength gains but only at the joint angle held during the exercise. Isotonic contraction is defined as that where the muscle tension remains constant and muscle length varies. Isokinetic contraction is defined as varying tension and length. In each exercise there are four main functions of the associated muscles, Agonists (prime movers), Antagonists, Stabilizers and Assistors. The Agonists is generally the muscle we are exercising.

The Antagonist is the opposing muscle and acts in contrast to the agonist. The Stabilizer muscles are those that hold a joint in place so that the exercise may be performed. The Assistors help the Agonist muscle doing the work. The stabilizer muscles are not necessarily moving during exercise, but provide stationary support. For example, when doing biceps curls, the biceps are the agonists, the triceps are the antagonists and various muscles including the deltoids are the stabilizer muscles.

II. LITERATURE SURVEY

Liliam F. Oliveira et al [1] studied that to identify changes in the neuromuscular activity of biceps brachii long head for IDC, DPC and DBC exercises, by taking into account the changes in load moment arm and muscle length elicited by each dumbbell curl protocol. A single cycle (concentric-eccentric) of DBC, IDC and DPC, was applied to 22 subjects using a submaximal load of 40% estimated from an isometric MVC test. The neuromuscular activity of biceps brachii long head was compared by further partitioning each contraction into three phases, according to individual elbow joint range of motion. Although all protocols elicited a considerable level of activation of the biceps brachii muscle (at least 50% of maximum RMS), the contribution of this muscle for elbow flexion/extension varied among exercises. The submaximal elbow flexion (concentric) elicited neuro muscular activity up to 95% of the maximum RMS value during the final phase of IDC and DBC and 80% for DPC at the beginning of the movement. All exercises showed significant less muscle activity for the elbow extension (eccentric). The Incline Dumbbell Curl and the classical Dumbbell Biceps Curl resulted in similar patterns of biceps brachii activation for the whole range of motion, whereas Dumbbell Preacher Curl elicited high muscle activation only for a short range of elbow joint angle.

A. de Souza Castelo Oliveira et al. [2] identified the right biceps brachii and left biceps brachii obtained from repetitive elbow flexions at each 10% of total time. Nine healthy subjects performed the exercise named biceps curl until exhaustion with 25%, 35%, and 45% of one repetition maximum, in three different days. EMG amplitude (root mean square – RMS) was obtained for concentric contractions during these load levels and correlated with time to determine the slope values for each

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load and they determine the EMGFT. The EMGFT was obtained within of each 10% of total time and they were compared by analysis of variance. The results showed a progressive increase in RMS with time, for both muscles in all loads, characterizing the muscle fatigue process, and for the EMGFT values ware not found predominantly significant differences between the execution time, as well as between muscles. This protocolallowed identifying the EMGFT to both muscles during the biceps curl, which was similar at different percentage of total time, indicating the possibility to reduce the length of the contraction test without the need to maintain the contraction until exhaustion. Further studies are needed to evaluate the applicability of this method to determining the effects on performance.

Lee Cabell and Carole J. Zebas et al [3] examined against the strength curves of the elbow flexors. The Nautilus machine resistive torque (MRT) values were compared to the maximal human torque capability (HTC) curve generated via isokinetic elbow flexion testing by 10 subjects. Measurements of the MRT and HTC values were made with a Cybex II isokinetic device at 3 different angular velocities. The values were normalized to percent of maximum torque and were graphically illustrated. Analysis of a 2-sample independent t-test showed a significant difference between the HTC and MRT curves in the extreme positions of the range of motion (ROM) (p, 0.05). It was concluded that the resistance of the NBM did not match the strength curves of the elbow flexors throughout the entire.

Giovanni L. Fabian [4] introduced a new concept in the generation of strength curve profile in resistance training equipment's. Rather than of using the conventional spiral off centered cam commonly used in current resistance training equipment's, this study focuses on using a DC motor to be controlled by a micro controller to generate the strength curve as well as the resistance in resistance training equipment's. Unlike the spiral off centered cam, the method in this study will not be hampered by the limitations imposed by using a mechanical component that usually lack flexibility in this equipment's. The concept of this study will be demonstrated in a barbell curl exercise, although the concept can also be applied to other forms of resistance training equipment's. With this study, a new and flexible alternative in the generation of strength curve profiles in resistance training equipment's can be offered.

Joseph J Knapik et al. [5] described and examined variations in maximal torque produced by knee extension, knee flexion, elbow extension, and elbow flexion through a range of joint motion. Subjects were young, healthy men (n = 16) and women (n = 15). Torque was measured iso-metrically and iso-kinetically using a modified cybex apparatus. Isotonic torque was calculated from a one-repetition maximum using a modified N-K® device. Joint angles were monitored with an electro-goniometer. Torque-joint angle curves were constructed for both men and women for each muscle group. Isometric torque was highest, followed by isotonic and iso-kinetic torque. Torque declined with increasing iso-kinetic velocity. The angle of peak torque was found to be highly variable in individual subjects. Variations in torque curves were explained in terms of mechanical characteristics of the musculoskeletal system. Muscle group capability was generally found to be well matched to the mechanical requirements of the movement.

III. Existing System

Academic research was done earlier, it used different nomenclatures including abusive, flame, personal attack, bullying, hate speech, etc., often grouping more than a single category under a single name Efforts to moderate user generated content on the internet started very early, smoky is one of earliest works on classifying insulting post on labelled comments from web forms, In the existing system, large number of datasets cannot be compiled. Detection of shaming comments are not accurate. One major concern about it would be the finding of the comments which are about sarcasm which may not be detected by the normal algorithm as it may not look like an abusive comment but this would still bring down the mental health of the user.

IV. Problem Statement

The conventional biceps curling machine offers constant resistance throughout the elbow motion during the exercise but as per anatomy and biomechanics of muscles is concerned, the curling machine must offer variable resistance.
Proper workout cannot be obtained by conventional biceps machine because it offers same resistance in strong as well as weak position of muscles.

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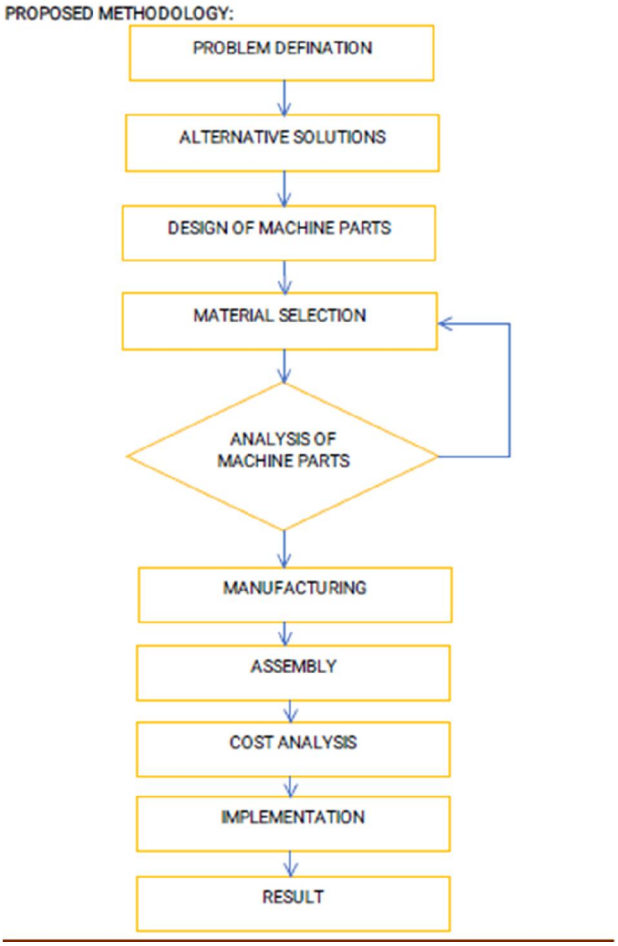
V. MOTIVATION

To ensure the equipment's efficiency as well as the safety of the end-user. Cost reduction due to free weight carriage. Time required for desired result is comparatively less since workoutefficiency obtained is high.

VI. SYSTEM ARCHITECTURE



VII. CONCLUSION

The objective of the biceps machine was to provide variable force at different angles according to the biomechanics of elbow. This requirement was fulfilled by using cam which has different radius at different angles. Change in radius allowed the machine to exert different resistance as and when required. The application of cam in the machine helps in proper workout for the user. Since the cam profile is generated on the basis of strength curves of biceps, efficient workout is obtained. This reduces the workout time approximately three times as compared to conventional biceps machine.

In this bicep machine relatively large diameter Nylon pulleys are used which helps in maintaining life of rope. This is because with the help of large pulley diameter the angle of contact increases which reduces the friction between the pulley and rope. This biceps machine uses free weight carriage concept instead of using dead or stack weights and nylon pulleys instead of steel pulleys. In machining equipment's, the major concern for cost is these stack weights and as these stack weights are eliminated the cost of machine is reduced about 30% of the conventional machines.

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