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Abdomen and Oblique Twister Machine

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Abstract

Trunk region of human body contains two major muscles naming, abdominal muscles and oblique muscles. These muscles can be further divided into rectus abdominis, internal oblique and external oblique. Abdominal muscle helps us to bend our torso and oblique muscles help us to rotate our torso. The current twister in gyms are free to rotate which does not provide any tension to abdominal and oblique muscles. Researches has shown that muscle grows under tension, therefore, this machine is being designed in such a way so that an optimum amount of tension is applied on concerned muscles and thus resulting in better stretching. A cable connection with additional weights is being used to create tension while rotating the twister. The cables are attached to the twister from bottom at one end and to additional weights on the other end. All the connections are firmly supported and pulleys are being used for free movement of the cable. Thus, the user is able to create tension on abdominal and oblique muscles and thus will burn fat far more effectively than the current twister machine.

INTRODUCTION

An oblique and abdomen twister machine is a kind of resistance exercise machine which uses weight - gravity mechanism and a combination of simple machines to create and convey resistance in the form of tension developed by the weight to the user operating the machine. Each of the simple machines used in the mechanism such as pulley, lever, wheel, incline etc. change the mechanical advantage of the overall machine related to the weight.

Exercise equipment are any apparatuses or devices which are used in physical activities to enhance the strength and conditioning effects of that particular exercise by providing either fixed or adjustable amounts of resistance. Such equipment also decrease the chances of injury considerably by providing necessary support wherever required thus helping in maintaining a good body posture of the user.

Abdominal muscles shape the centre of human body. These are the muscles introduce in the storage compartment or stomach zone. These muscles separated from flexing and pivoting, have other essential capacities like breathing, hacking, sniffling and keeping up a decent body act. The foremost stomach divider is comprised of four critical muscles – the rectus abdominis, the internal oblique, the external oblique and the transverse abdominis. The pivotal reason of amassing of fat, as a matter of first importance, on the sides of trunk and on the lower trunk is on the grounds that the two muscles, i.e. the internal oblique and the transverse abdominis as they react more to the increments in synthetic and volume related drive in contrast with the two outside muscles.

Practicing abs is fundamental for fortifying the muscular strength and this can demonstrate valuable for enhancing execution with specific games, to wipe out torment in back and furthermore to withstand different stomach impacts. A study in 2011 demonstrates that practicing abs are known to expand the quality and perseverance of the muscular strength. This has been an exceptionally talked about issue in the matter of whether stomach practices have any commitments in diminishing stomach fat or not. Another investigation in 2011 found that stomach practices does not lessen stomach fat extensively. Keeping in mind the end goal to accomplish that, a deficiency in vitality consumption and calorie admission must be made.

LITERATURE REVIEW

Abs frame the centre of human body. These are the muscles display in the storage compartment or stomach territory. These muscles separated from flexing and turning have other vital capacities like breathing, hacking, sniffling and keeping up a decent body act. The foremost stomach divider is comprised of four imperative muscles – the rectus abdominis, the internal oblique, the external oblique and the transverse abdominis. The vital reason of amassing of fat, above all else, on the sides of trunk and on the lower trunk is on the grounds that the two muscles, i.e. the internal oblique and the transverse abdominis as they react more to the increments in concoction and volume related drive in contrast with the two outside muscles.

Abdominal and oblique muscles have always been a topic of discussions in fitness world. Various machines have been developed to exercise these muscles in different manner which are listed in this report.

a. Abdominator: Abdomen and Oblique Exercise Machine US 7494454 B2

The proposed development portrays a particular exercise mechanical assembly and strategy for utilize that objectives the muscles in and around the stomach, angled muscles and midriff of the body. The machine is included a level stage whereupon an individual stands while getting a handle on a couple of handlebars that are situated at abdomen stature. The handle bars

are appended to the highest point of a vertical riser that stretches out downwardly and is connected to a couple of even turning turn arms. The turn arms are appended to the focal point of a pivoting power pulley evenly suspended by heading underneath the forward zone of said stage. The power pulley is associated by a belt to a protection system, for example, a flywheel or turbine fan, again suspended by course, underneath the back segment of said stage. In the flywheel adjustment of this creation, extra protection is given by a movable magnet that is controlled by a lever mounted to the side of the vertical riser. An individual stands upon the device, and keeping in mind that keeping the lower body moderately stationary, turns the handle bars, and accordingly the turn arms, from side to side up to 220 degrees of pivot and gives a movable measure of protection which creates an expanded utilization of the muscles in and around a person's middle and midriff zone.

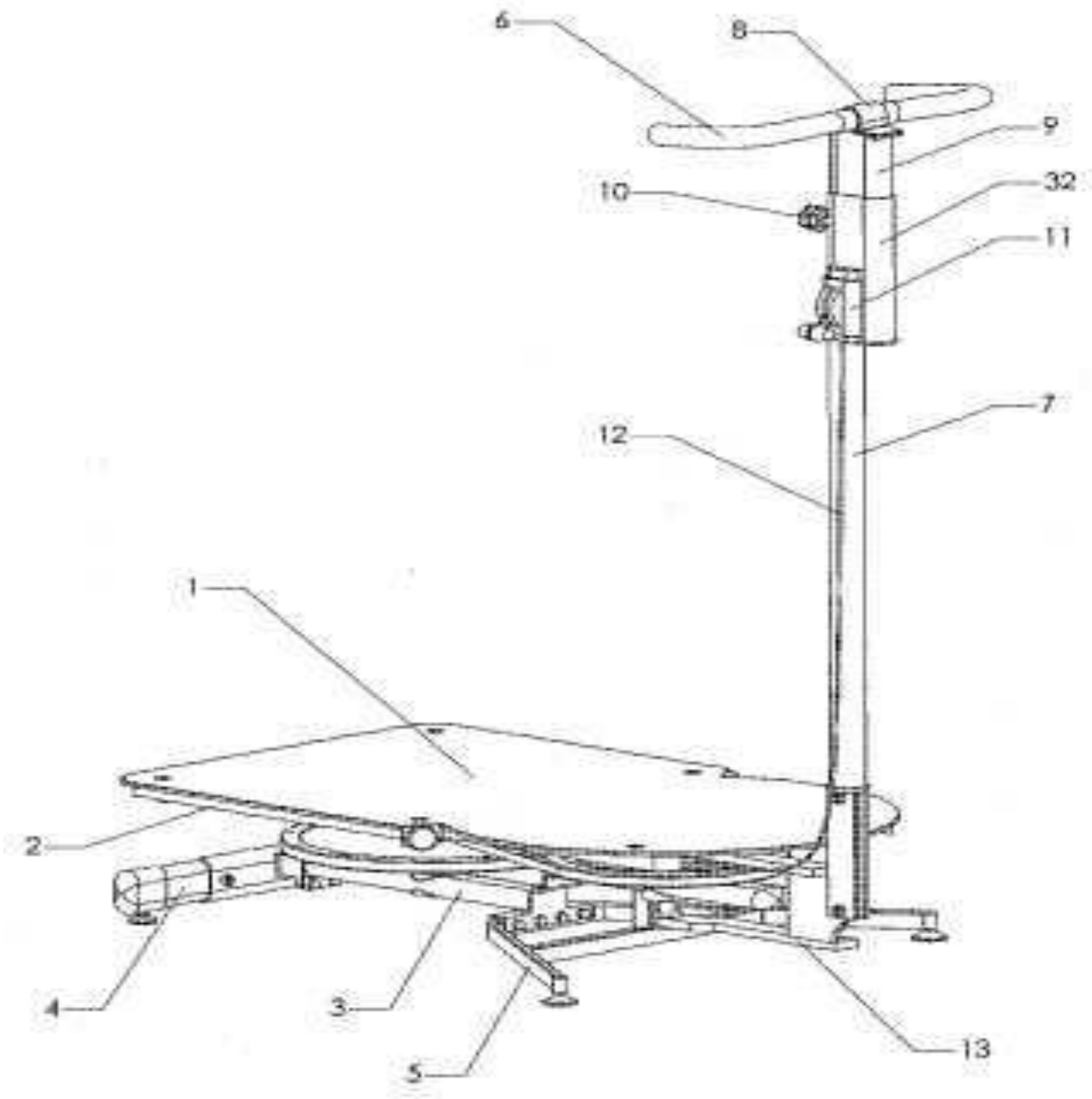

Figure 1. Abdominator: Abdomen and Oblique Exercise Machine

b. Abdominal Exercise Machine
US 6896643 B2

In the proposed machine, the actuator has been mounted on the seat to pivot about a vertically extending axis which permits the user to rotate upper torso and vary the muscle groups being exercised to enhance the beneficial effects. A rotational connection between a shoulder harness element and the actuator arm facilitates this side crunching motion. A second feature which may be used separately or in conjunction with the rotational actuator, is an actuator arm with both a shoulder socket and an elbow joint that pivot, the elbow joint requires additional force to break over. This dual-pivot actuator arm permits the user to perform abdominal crunches with a predetermined resistance.

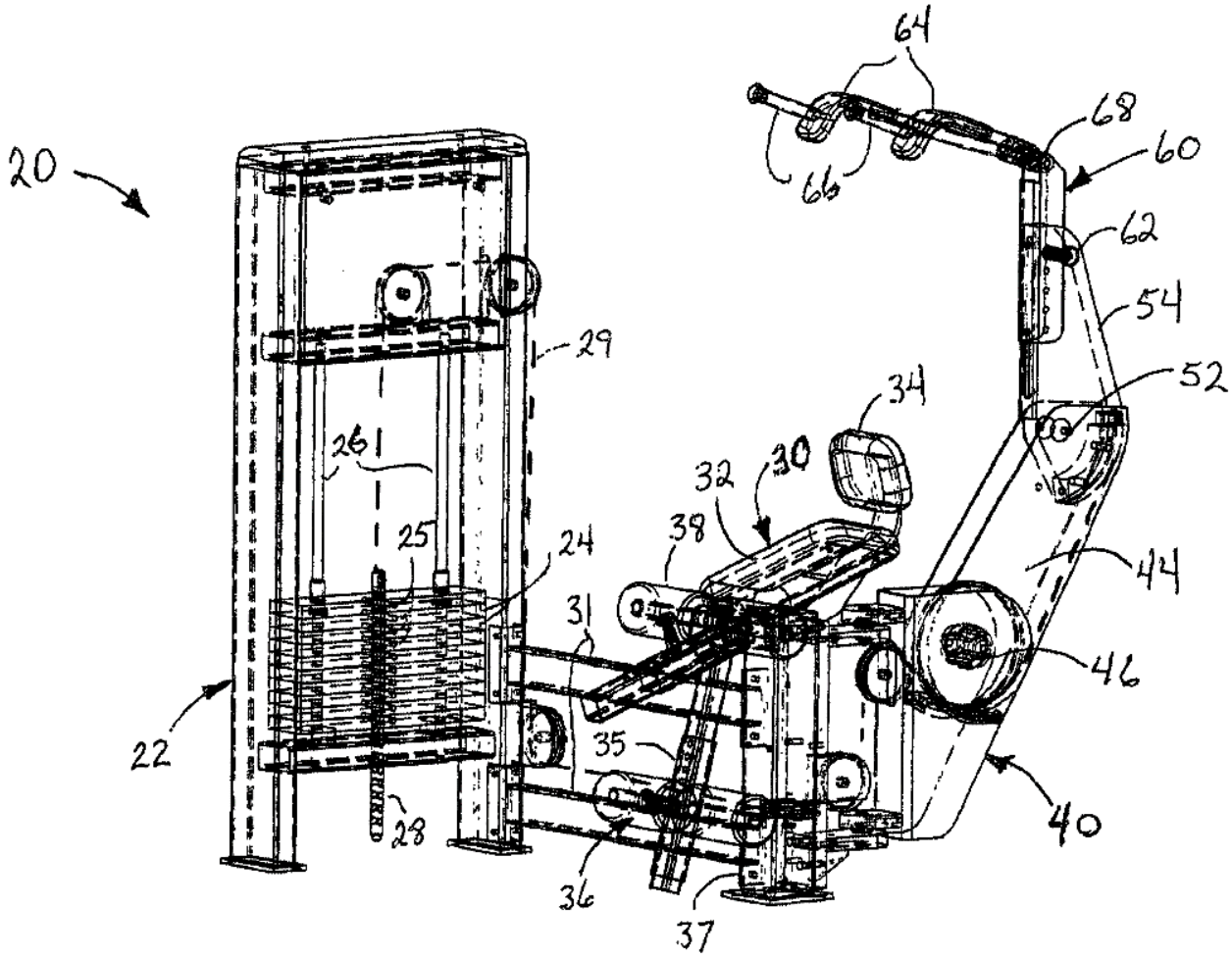

Figure 2. Abdominal Exercise Machine

c. Exercise Apparatus for Abdominal Exercises
US 5094449 A

In the proposed machine, a client while situated on a settled seat of a settled casing can practice his/her stomach muscles gather especially. Isolate mobile casings, i.e., a crunch outline, an influence outline, and a turn outline are given which enables the client to exclusively or all the while practice muscular strength while crunching (bowing forward), influencing (bowing from side-to-side), or winding (pivoting his middle). Protection can be added to the development of the casings by utilizing weights and pulley blend which is associated with a link.

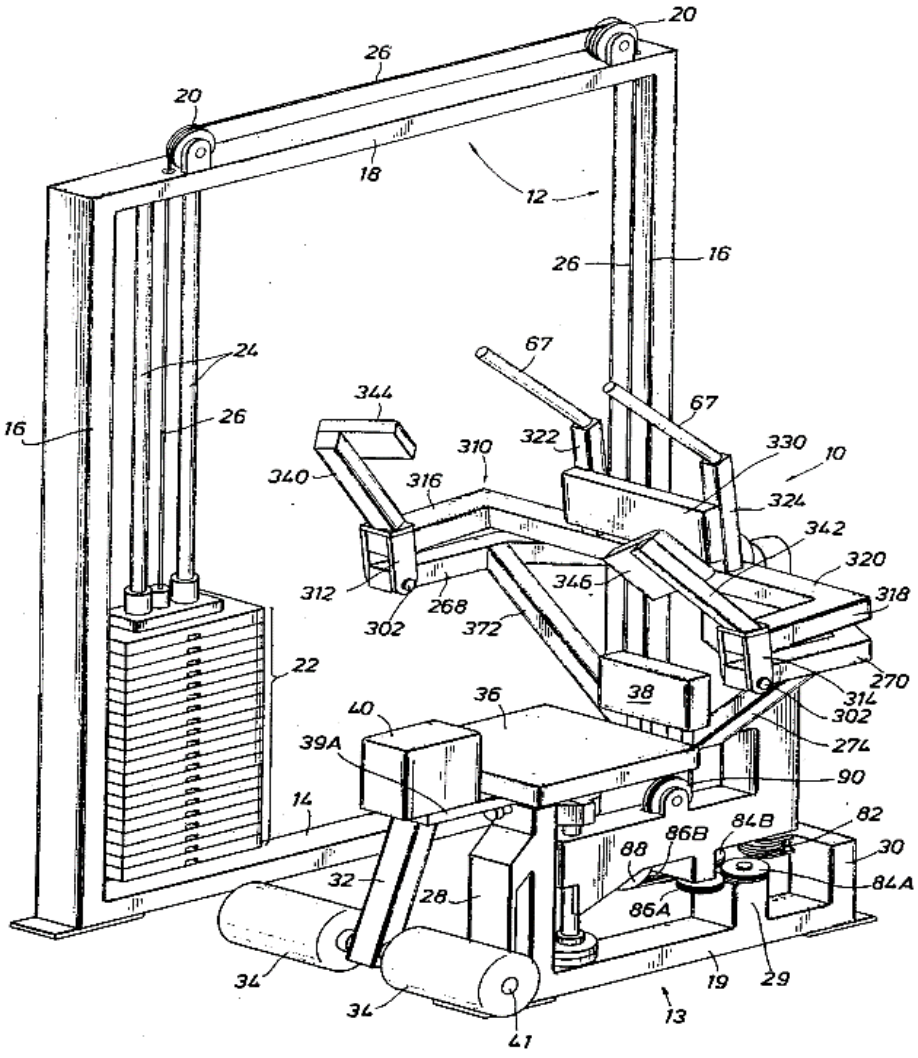

Figure 3. Exercise Apparatus for Abdominal Exercises

d. Exercise apparatus
US 6485398 B1

An exercise apparatus to strengthen the abdominal and oblique muscles in a relaxed state by kneeling and twisting the lower torso. An embodiment configured according to principles of the invention includes a height-adjustable, contoured knee rest rotating mounted on a base. Handles extend from the base to where a user may comfortably grasp the handles while kneeling on the knee rest. The user exercises with the present exercise apparatus by urging the user's lower torso to rotate the knee rest. Rotation may be resisted by increasing the inertia of the knee rest with weights suspended from weight arms connected to the knee rest.

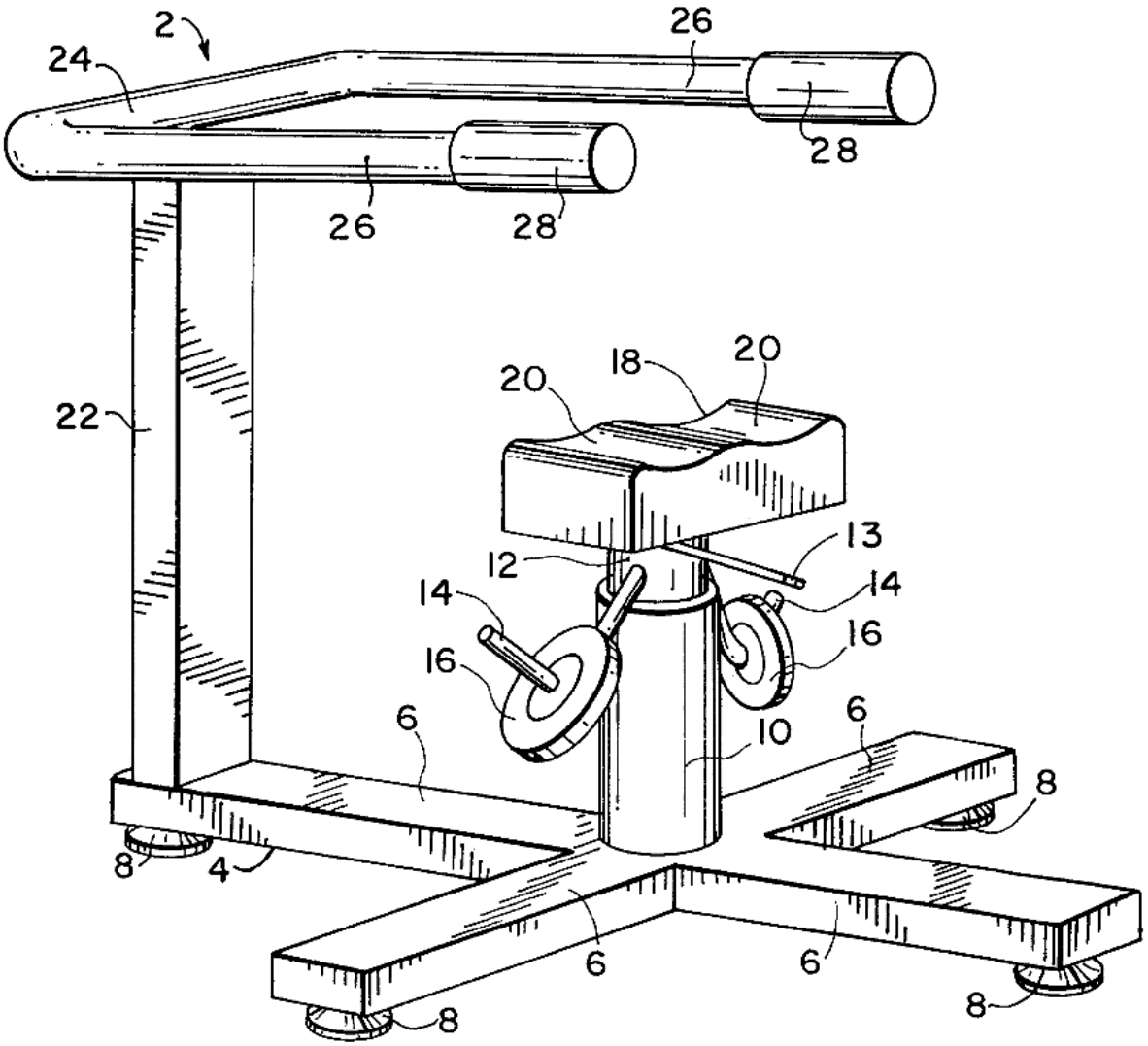

Figure 4. Exercise apparatus

The current twister in gyms are free to rotate which does not provide any tension to abdominal and oblique muscles and the ones which have used weights as a source to provide tension allows user to exercise in sitting position. Researches have shown that muscles grow under tension and a constant contraction and expansion is necessary. Therefore, this machine is being designed in such a way so that an optimum amount of tension is applied on concerned muscles and a constant contraction and expansion is provided.

Differences from the machines mentioned in literature

1. Philippbar TR, Abdominator, US 7494454 B2.

a. In the proposed machine, a weight stack is being used to produces tension.

b. Also, the proposed machine can also be used in no load condition.

2. David LDJ, Abdominal Exercise Machine, US 6896643 B2.

a. In proposed machine, the subject will be in standing position but not sitting. This position enables user to exercise more effectively.

3. Kenneth WS, Exercise Apparatus for Abdominal Exercises, US 5094449 A.

a. In proposed machine, the subject will be in standing position but not sitting. This position enables user to exercise more effectively.

4. Paul H, Kreft, US 6485398 B1

a. In proposed machine, the subject will be in standing position but not sitting. This position enables user to exercise more effectively.

PROPOSED DESIGN

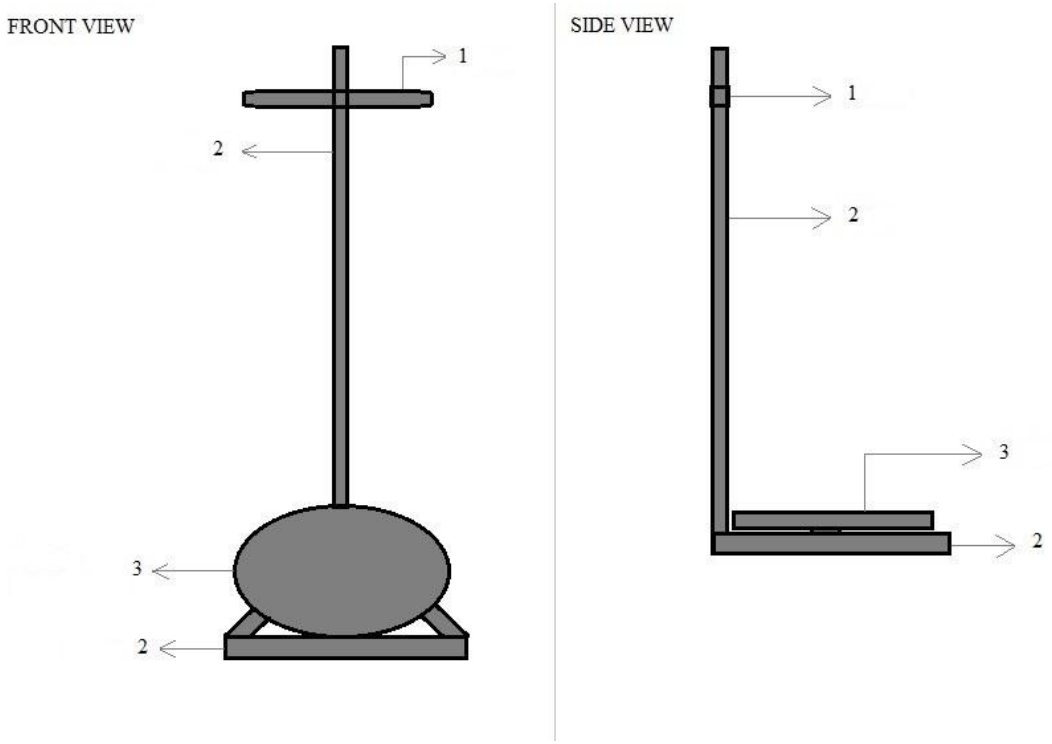

Figure 5. Front view and side view of proposed machine

Figure 5 represents Arm Handle 1, Frame of twister machine 2
and Circular rotating disc 3.

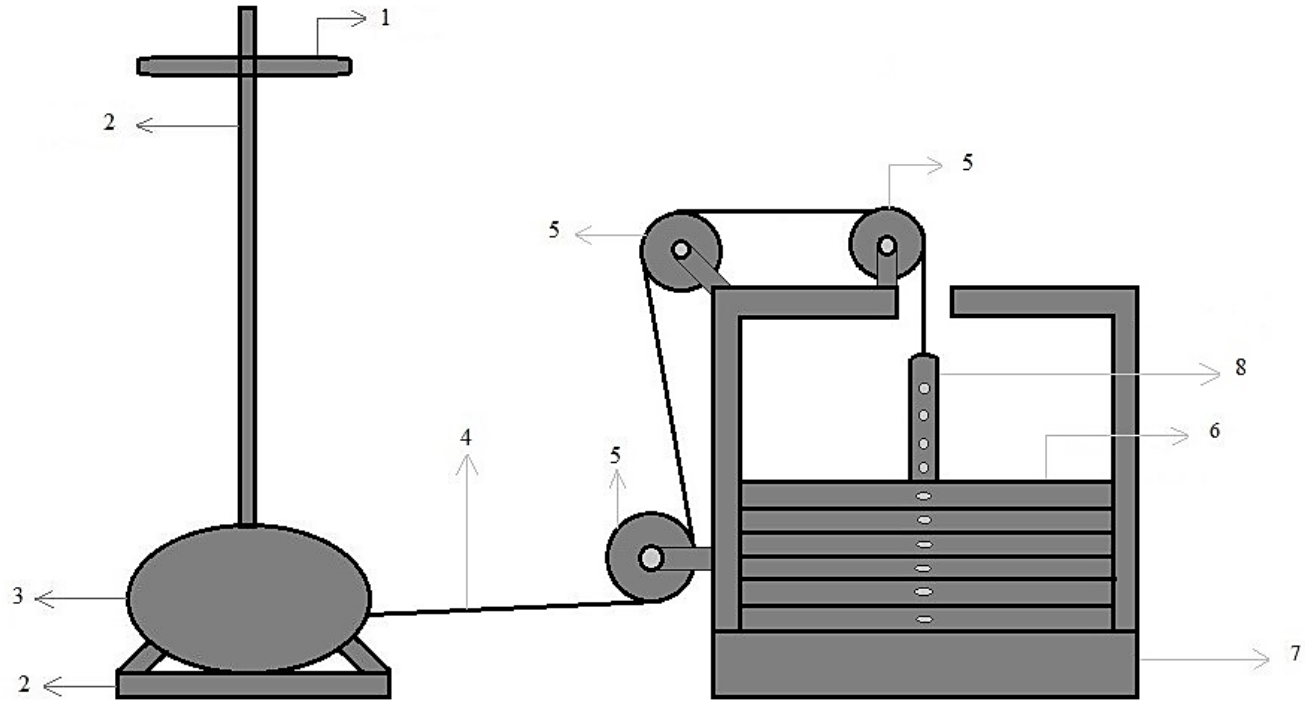

Figure 6. Proposed design of machine

Figure 6 represents Arm Handle 1, Frame of twister machine 2, Circular rotating disc 3, Cable 4, Pulleys 5, External weight plates 6, Weight stand 7, Selecting rod 8.

Figure 7. Original picture of machine

METHODOLOGY

a. Equipment

Proposed machine comprises of Arm Handle 1, Frame of twister machine 2, Circular rotating disc 3, Cable 4, Pulleys 5, External weight plates 6, Weight stand 7, Selecting rod 8.

b. Connections

Arm handle 1 is connected to the frame of twister machine 2 which goes downwardly on which the circular rotating disc 3 is mounted. Circular rotating disc 3 is connected with cable 4. Cable 4 is connected to selecting rod 8 through which external weight plates 6 can be selected accordingly. External weight plates 6 are being kept on weight stand 7 safely. Pulleys 5 are mounted on weight stand 7 to ensure smooth movement of the cable 4.

c. Functionality

User will stand on the circular rotating disc 3 grasping arm handle 1 firmly which is mounted on the frame of twister machine 2. Using selecting rod 8, user can select appropriate external weight plates 6 accordingly. Using oblique and abdominal muscles, user will rotate the circular rotating disc 3 in clockwise and anti clockwise direction alternatively. Rotation of circular rotating disc 3 will pull the cable 4 attached to it. Cable 4 attached to the circular rotating disc 3 is connected

to the external weight plates 6 on the other end which will lift the external weight plates 6 in vertical direction. Pulleys 5 have been used to make movement of cable 4 smooth. Weight stand 7 has been provided to accusotm the external weight plates 6 safely. This process of lifting external weight plates 6 will apply tension on the oblique and abdominal muscles of the user.

BIOMECHANICAL ANALYSIS

Trunk Flexion

Trunk flexion is free in the cervical district, constrained in the thoracic locale and free again in the lumbar area. Flexion of lumbar spine is made by the abs with help from the psoas major and minor. The flexion power of the abs likewise makes what little flexion there is in the thoracic vertebrae.

The interior and outer angled muscles and the transverse abdominis connect into the thoracolumbar sash covering the back area of the storage compartment. When they contract, they put pressure on the belt, supporting the low back and lessening the strain on the back erector spine muscles. The angled muscles are dynamic in erect stance and in sitting, settling the base of spine. The action of slanted drops off in a stooped standing stance as the heap is exchanged to different structures.

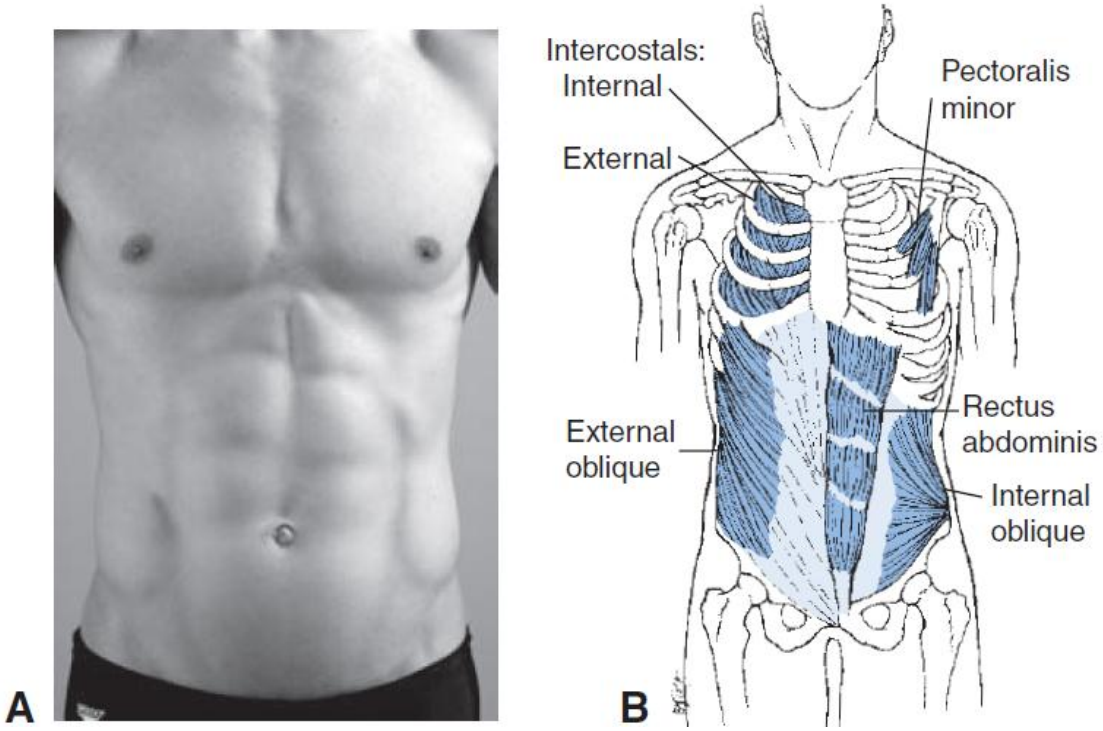

Figure 8 Overview of abdominal muscles

The transverse abdominis wraps around the storage compartment like a help belt and backings the storage compartment while helping with relaxing. The transverse abdominis applies pressure to the direct alba which is a sinewy connective tissue which keeps running down the front that isolates rectus abdominis into right and left parts.

Trunk Lateral Flexion

Sidelong flexion of the spine is made by compression of muscles on the two sides of the vertebral section, with most movement as an afterthought to which the parallel flexion happens. The most action in horizontal flexion of the storage compartment happens in the lumbar erector spine muscles and the profound between transverse and between spinals muscles on the contralateral sides.

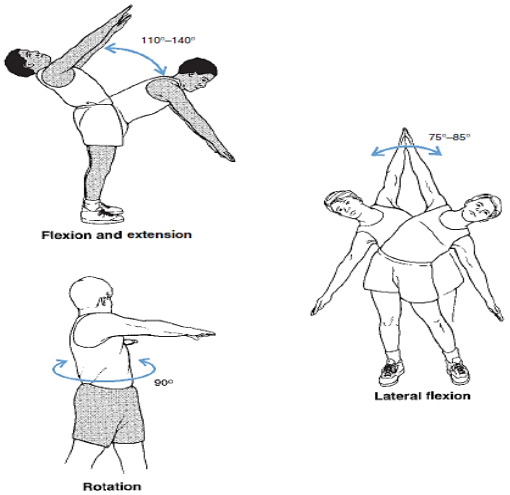

Figure 9. Flexion, lateral flexion and trunk rotation

Trunk Rotation

The storage compartment revolution is more muddled as far as muscle activities since it is created by muscle activities on the two sides of the vertebral segments. In the lumbar area, the multifidus muscles as an afterthought to which the revolution happens are dynamic, similar to the longissimus and iliocostalis on the opposite side. The abs display a comparative example on the grounds that the inner angled in favor of the turn is dynamic and the outer diagonal on the contrary side of the pivot is likewise dynamic.

Strength of the Trunk Muscles

The best strength yield in the storage compartment can be produced in augmentation, averaging estimations of 210 Nm for guys. Announced trunk flexion quality is 150 Nm, or roughly 70% of the quality of the extensors.

Parallel flexion is 145 Nm, or 69% of the extensor quality, and revolution quality is 90 Nm, or 43% of the extensor esteems. Female quality esteems are roughly 60% of the qualities recorded for guys.

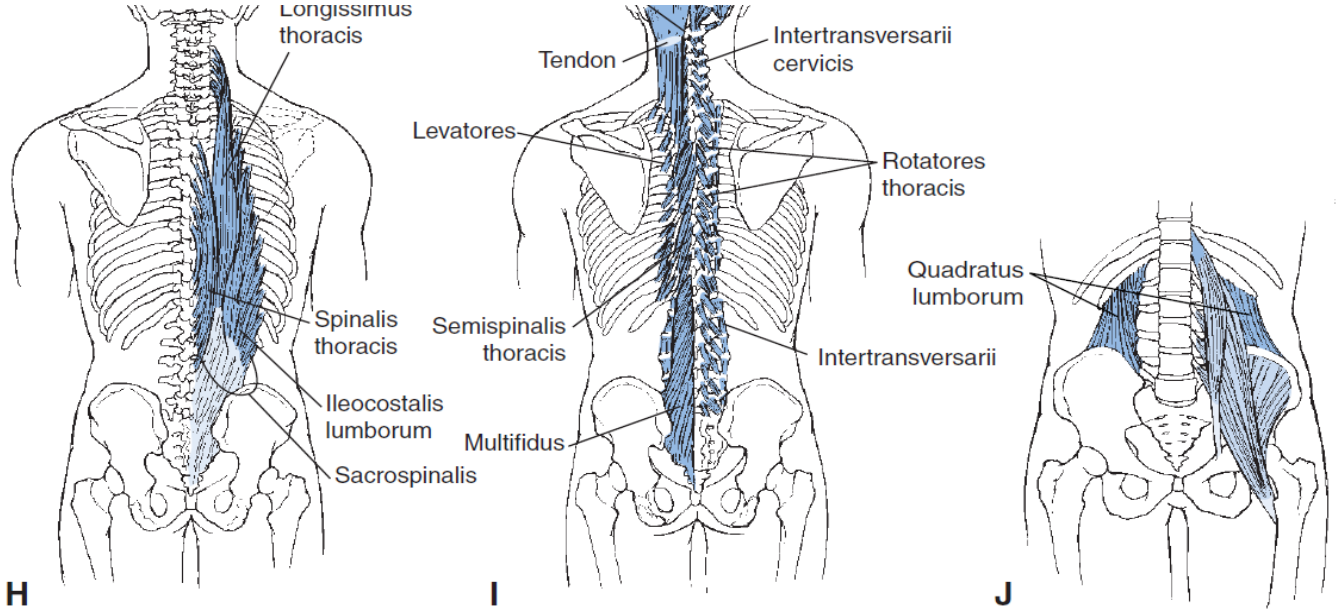

Figure 10. Overview of trunk muscles

ANALYSIS OF BIOMECHANICAL DATA

Both left – handed and right – handed subjects were analysed and data was collected and interpreted in a consistent manner. Therefore, to make data relevant and clear, right rotation and left rotation values were categorised as "dominant" and "non-dominant."

"Dominant" rotation was categorised as right torso rotation for right-handed subject, while left torso rotation was categorised as "non-dominant" rotation.

Right torso rotation for a left – handed subject was referred to as "non-dominant" rotation.

Axial Rotation Torque (Nm)						
	Initial Test Session			Follow-up Test Session		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Dominant Rotation (n=12)	135.5 ±26.1	135.1 ±29.6	128.7 ±26.5	132.1 ±27.1	130.4 ±25.8	132.3 ±26.6
Non-dominant Rotation (n=12)	139.7 ±25.9	140.0 ±23.9	132.2 ±23.3	133.0 ±31.3	134.1 ±27.0	130.5 ±25.1

Figure 11. Strength test reliability data (Mean ± SD)

	Peak Torque (Nm)	
	Non-dominant Rotation*	Dominant Rotation
Control Normals (n=40)	141.4 ± 27.5	138.2 ± 24.8
Control Golfers (n=33)	138.8 ± 28.6	130.7 ± 28.4
LBP golfers (n=7)	129.8 ± 28.8	111.6 ± 27.7

* left trunk rotation in a right-hand dominant subject

Figure 12. Peak rotational torque (mean ± SD) of subjects in dominant and non-dominant rotation at 90 degree/sec

RESULTS & CONCLUSIONS

a. From the data of provided in 'biomechanical analysis and data analysis', it can be concluded that the proposed machine is safe to use as the tension produced by the vertical movement of external weight plates 6 is within safe limits for an average user.

b. Proposed machine exercises external and internal oblique muscles better than other machines and traditional methods.

c. User is able to apply tension on the required muscles. Also, the user is able to exercise while being in standing position.

d. Proposed machine makes exercising targeted muscles easier for beginners as a user can also perform exercise in zero load condition.

e. User can also gradually increase tension with the help of external weight plates 6.

f. Weight training must be incorporated in workout as muscle grows under tension thus burning glycogen stored in muscle fibres.

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