

Development of dual purpose treadmill bicycle model

Omkar Vadam

*Department of Mechanical engineering
MITSOES
MIT Art, Design & Technology University
Pune, Maharashtra
Omvadam2627@gmail.com*

Tejas Ghangrekar

*Department of Mechanical engineering
MITSOES
MIT Art, Design & Technology University
Pune, Maharashtra
ghangrekar.tejas01@gmail.com*

Piyush Ramanujam

*Department of Mechanical engineering
MITSOES
MIT Art, Design & Technology University
Pune, Maharashtra
piyush06ramanujam@gmail.com*

Nikhil Yadav

*Department of Mechanical engineering
MITSOES
MIT Art, Design & Technology University
Pune, Maharashtra
nikhily513@gmail.com*

Nitin D. Pagar

*Department of Mechanical engineering
MITSOES
MIT Art, Design & Technology University
Pune, Maharashtra
pagardn@gmail.com*

Bhushan Nandre

*Department of Mechanical engineering
MESCOE
MES Wadia College of Engineering
Pune, Maharashtra
bhushan.nandre@gmail.com*

Abstract— The work for this project involves modifying a treadmill such that it better meets the needs of users. The human beings who enjoy running outside are the target audience for the treadmill bicycle. The combination of a treadmill with a bicycle frame result in a significant innovation that has been dubbed the "TREADMILL BICYCLE." This bicycle features electronic components and operates flawlessly when propelled forward by human momentum. The rider walks on a treadmill, which causes the belt to rub against the bike's rear wheel, which in turn causes the bike to go ahead. Running and cycling are two of the best forms of exercise, and the treadmill bicycle combines the two for a low-impact, high-performance workout that can be done outside. This equipment is created specifically for runners as the ultimate treadmill device. In our opinion, it is the most suitable piece of equipment for fit runners. It provides an experience that is more analogous to running than any other form of exercise that is currently on the market.

Keywords— *Treadmill, Walking Belt, Wheels, Rollers, Bearing, Flywheel, Sprocket*

I. INTRODUCTION

The treadmill bicycle is a completely novel kind of exercise that was developed especially for people who go for runs. Running, hiking, or walking on a treadmill is practically the same thing as doing it on a treadmill. Think back to the last time you rode a bicycle across challenging terrain, whether it was through train tracks, potholes, or speed bumps. It's possible that when negotiating the challenge, you stepped on the pedals to give yourself a little more stability. [1]

The user is responsible for maintaining a balanced stance at all times while riding the treadmill bicycle.[1] Because of the cooperation of a DC motor and a great many additional components, you are now able to walk considerably more quickly. Because it does not require the use of any fuel, it has become a popular method for people who have a lot on their plates to take care of their health. Even people who have a lot of things going on in their lives can maintain their physical and mental health. A typical treadmill, on the other hand, can only be used inside of enclosed spaces, while a treadmill bicycle can be ridden on public highways. This makes the treadmill bicycle more versatile than a traditional treadmill. This innovation addresses a common criticism levelled against conventional treadmills, namely that they are fixed in

place and deny users the opportunity to simulate running in natural environments. The proposed method offers a comprehensive solution by completing the task in its entirety through the addition of wheels to the treadmill bicycle and the subsequent transformation into a walking cycle. [2]

A. The Treadmill

The frames of treadmills that are marketed in their normal configuration are often constructed of steel, although the frames of newer, more expensive models are typically made of aluminium. These are the two most common sorts of materials that are utilised in the building of frames. If you plan to maintain your treadmill for a very long period of time or if your weight is extremely close to the machine's maximum capacity, you should consider purchasing one with a frame made of aluminium because it is more durable than other varieties. When beginning and stopping the treadmill, you should make use of the treadmill rails, which are also referred to as bars or grips.[2] Handles are another name for the rails that go along the top of a treadmill. Because the handrails are not meant to be held throughout the entirety of your workout on the treadmill, you will need to position them in a location that is not only convenient but also out of the way to avoid getting in the way of your workout. When you do find yourself in a position where you require the grips, you want them to be not only comfortable but also simple to get access. [3-5]

B. Walking Belt

The walking surface of a treadmill is composed of a narrow belt that is continuously moving and a rigid plate that is maintained in place between the two surfaces of that belt. As can be seen in Figure 1 When the transverse load of footfalls is applied to the walking surface of the treadmill, this plate will provide support so that the treadmill may continue to function properly. Before commencing your workout, it is imperative that you take into mind the belt size of your treadmill if you intend to run or jog on it. If you plan to spend the most of your time walking, the size of the belt you wear won't matter as much as it would otherwise. The conventional width for belts is 19 inches, and their length is typically 50 inches. Despite the fact that this appears to be a suitable width and length, you need to bear in mind that the belt fits onto a deck, which integrates a section of the frame in addition to your console. This is something that you need to keep in mind at all times.

Therefore, even though the measurements of your belt are 19 inches by 50 inches, the dimensions of the place in which you will be running may be 16 inches by 45 inches. To restate, if the only activity that you want to perform on your treadmill is walking, then the size that you have should be fine. If you want to give running a try, however, you will require a belt that is both wider and longer than what is typically worn since when we run, our bodies have a propensity to sway slightly from side to side. [6,7]

The augmented width will enable individuals to sway without encountering any obstructions from the frame, while the augmented length will allow for jogging with a normal stride without the potential hazards of tripping or falling off the treadmill.



FIGURE 1 TREADMIL BELT

C. Wheels

A wheel is a component that has a circular shape and may rotate freely. It is held in place by an axle bearing and has a graphical representation that can be found in Figure 2. The wheel is a crucial component of one of the six basic machines, which is known as the wheel and axle, and it is also the machine's namesake.[5] Axles and wheels are essential parts of the machinery that enables the transportation or movement of huge objects while simultaneously supporting a load or carrying out mechanical labour. The usage of wheels involves a wide variety of applications, some of which include, but are not limited to, the steering wheel of a ship, the potter's wheel, and the flywheel. The use of axles and the ability of wheels to allow motion through rolling both contribute to a significant reduction in friction.

The requirement that the wheel must have a moment applied about its axis in order for it to circle can be met by gravity or by the application of some other external force or torque, but only one of these possibilities can meet the need.[6] In a single statement, the outline can be summed up as follows: "the outside edge of a wheel will be retaining the tyre." When applied to vehicles such as automobiles, it will produce the outer circular design of the wheel on which the inner edge of the tyre is fixed. This design may be seen from the outside of the vehicle. Because of this, the vehicle will be able to travel with less resistance. A large hoop, for instance, is the component of a bicycle wheel that is exposed to the outside and is attached to the extremities of the spokes. The bicycle's tube and tyre are both housed within this section of the wheel of the bicycle. [8-10]



FIGURE 2 WHEEL

D. Rollers

Even if the bicycle does not go forward when being ridden on bicycle rollers, which are a specialist sort of bicycle trainer, it is nevertheless feasible to ride a bicycle indoors using these devices. As may be seen in Figure 3, Because rollers, unlike other forms of bicycle trainers, are not attached to the frame of the bicycle in the same manner that other types of bicycle trainers are, the rider needs to be able to keep their balance while exercising on the rollers.[7] The rider of the bicycle moves forward and backward on top of the bicycle rollers, which normally come in sets of three for the front wheel. Because one of the back rollers is connected to the front roller of the bicycle through a belt, the movement of the pedals on a bicycle will cause the front wheel to spin when the bicycle is being ridden by a human. In most cases, the spacing between the rollers of a bicycle can be adjusted to correlate with the length of the wheelbase of the bicycle. The front roller will typically be adjusted in such a way that it is positioned some distance in front of the hub of the front wheel. This is the case in the majority of cases. [11-13]



Figure 3. Rollers

E. Bearing

One moving machine portion that acts as support for another moving machine element is referred to as a bearing. The moving machine has a component known as the journal.[8] Bearings allow for relative movement between the contact surfaces of the various sections while still effectively transferring the load. The process of reducing or removing frictional resistance results in a loss of power. It is possible to utilise a lubricant to decrease the amount of frictional resistance, the amount of wear, and the amount of heat that is produced. Lubricant use is a common application for mineral oil that has been processed further from crude petroleum.

The bearings are held in place by a bearing block that is a part of it. Cast iron is the material that is used to produce it . Every bearing that is made use the machine frame in some way. [14,15]



FIGURE 4. BEARINGS

A lubricant may be used to reduce frictional resistance, wear, and to dissipate the heat produced. Mineral oil that has been refined from petroleum is frequently used as lubricant. It has a bearing block to hold the bearings. Cast iron is used to make it. The machine frame is used to produce every bearing.

F. Flywheel

The term "flywheel" refers to a rotating mechanical device that is employed for the purpose of storing the energy that is generated by rotation. Flywheels have something called the moment of inertia, which gives them the ability to withstand changes in the speed at which they are turning.[9] The amount of potential energy that may be collected from a flywheel is proportional to the cube of its spinning speed. When a torque is applied to a flywheel, the flywheel's rotational speed increases, and the quantity of energy that the flywheel stores as a result of this increase is increased. On the other hand, a flywheel makes use of speed in order to release energy that has been accumulated. [16,17]



FIGURE 5 FLYWHEEL

G. Sprocket

A sprocket refers to a wheel that has been specifically shaped and furnished with tooth structure, cogs, or additional sprockets, intended to engage with a chain, track, or any other perforated or indented material. This wheel can also be referred to as a sprocket wheel. Sprockets and the wheels that they spin on are both capable of being referred to as gears in certain contexts. As can be seen in Figure 6, A "sprocket" is

generally understood to refer to any wheel that has radial projections and is designed to support a chain that runs over it. This particular application of the word "sprocket" occurs quite frequently. In contrast to a gear, a sprocket is never directly coupled to another sprocket, and whereas a pulley does not have any teeth, a sprocket does. A sprocket also has teeth, whereas a pulley does not. Even though they rotate in the same direction, sprockets and gears are never actually connected to one another in any way. The illustration can be found in figure 6.

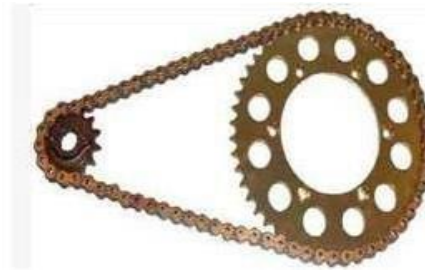


FIGURE 6 SPROCKET

II. WORKING PRINCIPLE

When a bicycle is converted into a treadmill, the rider moves forward by walking or running on a surface designed for walking. This causes the bicycle's rear wheel to turn, which in turn moves the bike forward. The moving belt that serves as the walking surface on a treadmill has a rigid plate sandwiched in between its two surfaces in order to provide additional support. When the walking surface of the treadmill is subjected to a transverse load from footfalls, this plate acts as a backup to support it. The original treadmill had a support plate that was an unaltered sheet of pressed particle board that was 0.75 inches thick. This support plate was not modified in any way.[12] This was fastened to the frame of the treadmill in four different locations using wood screws that were positioned in close proximity to the sheet's four corners. The plate was supported vertically when it was lying on the rails in a depressed position by two rubber pads that were positioned so that they were centered under the longest edge of the surface and halfway between the two places of rigid installation.

According to the paperwork that was included with the treadmill, the flexible multi-point mounting system was developed with the intention of lessening the plate's overall rigidity by providing more support than would be feasible with a direct attachment to two solid rails. This was done in an effort to make the treadmill more user-friendly. This support was intended to serve as an alternative to the support that would be provided by a direct attachment. Both the thickness and the stiffness of the surface of the particle board were significantly higher than what was required to entirely eliminate any and all perceptible deflection in the system. In order to mitigate the compliant impact of the rubber supports, additional aluminium reinforcements were introduced intermediate the sheet and the rails, users were unable to identify the change in stiffness that happened as a result of the modification. This was because the change

occurred so quickly after the adjustment was made. We came to the conclusion that in order to develop the optimum impact-absorbing walking surface that is also capable of lowering the impact forces that are associated with running and walking, there will need to be certain adjustments made.

In addition to that, the bottom face of the sheet of particle board featured two metal brackets that were oriented outward in a direction away from the sheet. When the system was operational, they were arranged in such a way that the conveyor belt would pass over them in the order listed above, one after the other. In the event that the belt moved away from the centred position of its rollers, this had the effect of automatically maintaining the belt's alignment by generating a restoring force.[18-21]

If the belt was shifting away from its centre while it was resting on its rollers, this resulted. As soon as we start using the treadmill, the back wheel will begin to move, which will cause the flywheel to build up momentum. Once the flywheel has gained initial momentum, the bicycle will continue to go forward due to the momentum that is created by the flywheel. In addition to that, we used a gear system to attach a dynamo to the rear wheel of the vehicle. As a consequence of this, the dynamo spins and generates electricity each time you use the treadmill. This power can then be stored in a battery and used at a later time. The design model can be seen in Fig.7.



FIGURE 7 3D DESIGN OF BICYCLE

CONCLUSION

It performs its duties admirably both on the inside and the outside of the house. This makes use of technology that decreases the amount of petrol that is consumed, which is an absolute requirement in the modern world. It is viable to utilise it as an infrastructure for an indoor locomotive device in retail malls, warehouses, open marketplaces, vast offices, and other conditions that are analogous to these kinds of locales. The employment of a device such as this one helps to ensure that pedestrian law enforcement officials do not become exhausted during the course of their shifts. Pedestrians moving through expansive campuses may also find that the use of this product is to their advantage. In future we can able to develop a fuel-saving car for people who do not ride bicycles.

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