Uludağ University Technology Transfer Office ,Turkey

UU-TTO provides the necessary resources and services to bring research and commercial expertise together to address the market needs. UU-TTO is responsible for developing the collaboration between the university and the industry, organizing launch meetings, contributing to the formation of any Commercial and Consultancy Projects, supporting the university and company researchers for the Projects in collaboration with respect to IP disclosures, evaluations, patent applications and the referral of product-related outputs to commercialization process and develop, strengthen entrepreneurs and entrepreneurial enterprises.

Services

Uludağ University Technology Transfer Office (UU-TTO) was founded in 2012, December and established in 50% partnerships of Uludağ University and ULUTEK Technology Development Zone. UU-TTO creates suitable environment for better entrepreneurship and incorporation ecosystem and provides support services on converting an innovative idea or a competitive invention into a product with commercial value. UU-TTO provides support for development and commercialization of innovative projects, entrepreneurial trainings for academics and students, promotes culture of entrepreneurship in the region, provides information about support programs and platforms, provides physical infrastructure to entrepreneurs and consultancy on the basics of a successful venture to allow entrepreneurs develop their innovative projects in the best possible way, offers opportunities to achieve funds and seed capital, establish start-up and/or spin-off companies and helps Turkish start-ups for their reaching funds and customers through international acceleration programs and foreign offices

- **Sector :**Technology Transfer

Team

- SENAY VATANSEVER, TTO Uzmani

Flocking Machine For Manufacturing Yarn With Special Effects

Sector : Manufacturing

The patented invention is a flocking machine for manufacturing of yarn with special effect which contains an adhesive vessel and an adhesive application unit with an application roller provided within the adhessive vessel which contains at least one guiding roller around the adhesive vessel and this guiding roller moves downward and upward in x direction in order to determine the contact rating of the application roller with the carrier materials.
The present invention relates to a yarn flocking machine improved for manufacturing fancy yarns with the aim of eliminating above-mentioned disadvantages and providing new advantages in the related technical field.

Description

Fancy Flocked Yarn Machine, shown in Figure 1, basically consists of six units: a creel (11), a flocking unit(12), an adhesive application unit(20), a drying unit(13), a removal unit (14), and a winding unit(15).

Figure 2 shows adhesive application unit (20) which has been modified to produce fancy flocked yarn (50) during application. As can be seen in Figure 2, adhesive application unit is comprised of a comb (21), a delivery unit (22) supplied after the comb (21) and an application unit supplied (25) after the delivery unit (22). A yarn guide(23) and a guide roller (24) exist between the delivery unit (22) and the application unit.(25). The delivery unit (22) contains a fixed drawing roller (221) and a moving drawing roller (222) positioned over the fixed drawing roller (221). The application unit (25) consists of an adhesive vessel (251), an application roller (252) provided within the adhesive vessel(251) and a press roller (253) which is in touch with the application roller (252). Glance blades (254) have been placed in the application unit (25) in such a way as to provide contact between the surface of the press roller(253) and that of the application roller (252). Grooves, not shown in the figure, are made on the application roller (252).

Carrier materials (30) are loaded onto the creels (11) concerned. The carrier materials(30) come to the adhesive application unit (20) from the creels (11). Adhesive (40) is applied over the carrier materials (30) in accordance with a pattern report determined beforehand in the adhesive application unit (20).The carrier materials (30) coated with the adhessive (40) are passed through the flocking unit (12), and they are covered with flock fibers. The yarns coming from the flocking unit (12) are passed through the drying unit (13) and the removal unit (14) respectively. The adhesive (30) layer on the yarn is dried in the drying unit (13). The yarns which come from the drying unit (13) are cooled and the flock fibers which are not bonded to the adhesive (30) are removed from the yarn surface by vacuuming in the removal unit (14). The material which come from the removal unit (14) is fancy flocked yarn (50) and it is wound on a bobbin or a cop in the winding unit(15).

Fancy flocked yarn (50) production has differences from standard flocked yarn production. It is possible to obtain fancy flocked yarn (50) by making changes in the operating structure of the adhesive application unit (20) so that random or periodical irregularites can be created in the yarn structure.

The carrier materials (30) which come from the creel (11) are sent to the delivery unit (22) after they have been passed through the comb(21). The comb (21) allows the carrier materials (30) to be moved through the adhesive application unit (25) in a controlled way. The controlled movement of the carrier materials (30) is also provided by the delivery unit (22).The carrier materials (30) are directed towards the application unit (25) after being passed between the fixed drawing roller (221) and the moving drawing roller(222). The fixed drawing roller (221) provides forward motion of the carrier materials (30) by rotating at a constant speed. The moving drawing roller (222) is positioned above the fixed drawing roller (221) and starts rotating by getting drive from the rotation of the fixed drawing roller. The pressure that moving drawing roller (222) applies onto the fixed drawing roller (221) can be changed by moving the moving drawing roller (222) forward and backward in a s direction. The tension value which takes place on the carrier materials (30) when they are sent into the application unit (25) can be changed by altering the pressure between the fixed drawing roller (221) and the moving drawing roller (222).

The carrier materials (30) which come from the delivery unit (22) are passed through the yarn guides(23). Yarn guides (23) make it possible for the yarn to be directed towards the desired position. The eyes of the yarn guides (23) through which the carrier materials (30) are passed are made of ceramic in order to prevent the abrasion of the carrier materials (30) due to friction. After being passed through the yarn guide (23), the carrier material (30) is passed over the guide roller (24) on to the application unit (25). The guide roller (24) *moves downwards and upwards in the x direction, thus enabling the carrier threads (30) to be conveyed to the desired position in the application unit (25).* The grooves (not illustrated in the figure) are cut on the guiding roller (24) and the carrier materials(30) enter these grooves. The axis of the grooves on the guiding roller (24) overlaps that of the grooves on the application roller (252). With the upward movement of the guiding roller (24) in x direction, the carrier materials (30) move out of the grooves of the application roller (252). With the downward movement of the guiding roller (24) in x direction, the grooves on the guiding roller (24) allow the carrier materials (30) to enter the grooves of the application roller (252) again.

The application unit (25) is the place where the adhesive (40) is applied onto the carrier materials (30). Adhesive material (40) is in the adhessive vessel (251). The application roller (252) is positioned as partly immersed in the adhesive(40). The press roller (253) is located above the application roller (252). The press roller (253) is also able to move downwards and upwards in x direction. Downward and upward movements of the press roller (253) and guiding roller (24) in x direction are synchronous with each other. When the press roller (253) and the guiding roller (24) move upwards in x direction, the contact of carrier material (30) with the application roller (252) is cut off. In this case, the application of the adhesive (40) onto the carrier material (30) is not carried out. When the press roller (253) and the guiding roller (24) move downward in x direction, the carrier material (30) enters the grooves of the application roller (252). This situation allows the application of the adhesive (40) onto

the carrier material (30). The carrier materials (30) which are sent towards the application unit (25) by means of the guiding roller (24) are passed between the application roller (252) and the press roller (253). The application roller (252), by rotating in the adhesive vessel (251), realizes the application of the adhesive (40) onto the carrier material (30) as well as making it possible for the yarn to be moved forward. Any excess adhesive (40) that accumulates on the surfaces of the press roller (253) and the application roller (252) is removed by means of the glance blades and sent back to the adhesive vessel (251).

When the application roller (252) conveys the adhesive (40) onto the carrier material (30), the press roller (253) is allowed to come into contact with the application roller (252) at a fixed application pressure. Thus, the press roller (253) covers up the grooves existing on the application roller (252). As a result of this, the carrier material (30) is prevented from moving out of the grooves, and uniform application of the adhesive (40) is carried out. The guiding roller (24) and the press roller (253) are in the downward position under normal operating conditions. Standard flocked yarns are produced through such an operation. The guiding roller (24) and the press roller (253) move upward in x direction in accordance with a pattern report program determined beforehand in order to produce fancy flocked yarn (50). Thus, the carrier material (30) is allowed to move out of the grooves of the application roller (252). Adhesive-free areas are formed on the carrier material (30) depending on the period of time that the guiding roller (24) remains in upward position. The guiding roller (24) and the press roller (253) move to the downward position after a certain time, thus allowing the carrier material (30) to be coated with the adhesive. These downward and upward movements of the guiding roller (24) in x direction are repeated at very short time intervals for standard or variable periods of time during the entire production process depending on the pattern of the fancy flocked yarn (50) effect desired to be obtained. Thus, adhesive-coated and adhesive-free areas which are repeated at regular or irregular intervals are formed on the carrier material (30) which comes from the adhesive application unit (20). When a yarn which is subjected to above mentioned operations is passing through the electrostatic flocking unit (12), the areas coated with the adhesive (40) on the yarn are coated with flock while other areas remain as they are. As a result, the production of fancy flocked yarn, (50) some parts of which is flocked while in some parts of which the carrier material (30) itself is visible is carried out. The production of fancy flocked yarn (50) of more different structures can possibly be achieved by employing the aforementioned production principle together with other fany flocked yarn (50) production principles.

Besides, the carrier materials (30) concerned can be materials such as standard yarn and cordon while they can alo be chosen from those which contain fancy yarn effects. Accordingly, it is possible to use the yarns such as chenille yarns, boucle yarns, nope yarns, standard flocked yarns, etc. as carrier materials (30) of fancy yarns. When the standard type of flock yarn is used on the invention " fancy flocked yarn machine" (10) as carrier material (30), the yarn structure obtained is what is called "flock on flock" structure. Also, it is also possible to obtain fancy flock effects on this machine by means of complete standard flocking of the carrier materials which are already fancy-flocked.

Primary Benefits

The main objective of the present invention is to introduce a fancy yarn flocking machine improved in such a way as to provide irregularities in the yarn structure.
The invention contains a press roller placed over application roller in such a way as to provide up-and down motion synchronially with the guide roller concerned in the x direction.
It contains at least one glance blade placed at the adhesive application unit concerned and contacts with the surface of the press roller concerned.
The contact of the carrier yarn with the application roller is provided the downward motion the press roller concerned in the x direction.
The application and guied roller has grooves cut on its surface.
The present invention relates to a yarn flocking machine improved for manufacturing fancy yarns with the aim of eliminating disadvantages with previous inventions and providing new advantages in the related technical field.

Development Status

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

Market & Competition

The target market of the invention is the textile sector, particularly for the automotive and home textiles as well as the sub-sectors that produce knitwear and outerwear fabrics.
A significant increase has taken place recently in the use the yarns with irregular effects rather than the standard yarns for the development of textile products with high added values. As a result of this, the fancy yarns with irregular effects have become more important than they were in the past.
The invention is going to be the first method for the production of fancy flocked yarns on the national and possibly international platforms.
It will be possible to manufacture fancy flocked yarns through different methods.
Besides, the invention will allow the manufacturing of fancy flocked yarns with unlimited number of irregular effects by using different core yarns and different flock fibre.
Therefore it is essential that new fancy yarns with different irregular effects should be devoloped and offered to the use of designer in addition to the known standard fancy yarns.
Standard flocked yarns are obtained by covering core yarns with short flocked fibres employing electrostatic method. A yarn which is obtained this way has a cylindrical structure which keeps same diameter along its length. Since they don’t have any irregularities, they do not conform to the description of fancy yarn. We haven’t been

able to reach any knowledge about the production and use of fancy flocked yarns in our review of literatüre.

Potential Sectors	**Potential Regions**
Manufacturing	EU
Other	Turkey

Interest In

All the designs and studies have been completed. Financial support is needed, TUBİTAK 1505. A prototype of flocking machine for manufacturing yarn with special effects will be built on an industrial scale with the financial support to be provided and efforts will be sent on its commercialisation.

Sandwich Composite Materials Containing Aerogol Spacers

Sector : Materials

Sandwich composite materials are generally used instead of composite plate in order to provide protection against explosion or to provide high energy absorption. The main function of the composite layers is to hold particles and fragments accelerated during the explosion or to hold the projectiles cast from firearms. The system consist of honeycomb core material and can be polymeric or metallic based. The basic function of this material is to be deformed and absorb energy during the impact.

Description

During explosion, the air that expands at very high speed brings a shock wave at high pressure and speed, and this wave turns into a voltage wave that spreads at high speed on the object it touches. At the same time, explosives and fragments from the environment are scattered around with high kinetic energy during the explosion and become a serious ballistic threat. Protecting against bullets and trailers, which are normally produced from firearms, fabric layers made of high performance fibers such as aramid, glass and high modulus polyethylene are provided by composite plates and ceramic plates produced from such fabric layers. Such systems, however, are designed to stop the bullet or the fragment, and are not capable of absorbing the bursting shock and very high energy. For this reason, sandwich composite materials are generally used instead of composite plate in order to provide protection against explosion or to provide high energy absorption. The proposed system consists of 3 basic elements. The first of these is the composite layers that surround the core material from below and above. The main function of the composite layers is to hold particles and fragments accelerated during the explosion or to hold the projectiles cast from firearms. It also provides strength and strength to the core material. In addition, the composite layers have energy absorption and function. The second basic element of the system is honeycomb core material. This material can be polymeric or metallic based. The basic function of this material is to be deformed and absorb energy during the impact. The third basic element is the special fill. This element increases the energy absorption capacity of the honeycomb core material.

Primary Benefits

1. In the case of using special filler, the property of absorbing energy is increased by at least 50% compared to the case without special filler.
2. This structure has a cavity, because the core material is used, it is totally wetter than the solid composite plate.
3. Production is a simple and inexpensive solution.
4. The ballistic resistance is significantly increased.
5. Ballistic protection of military helmets will be increased by at least 50% without increasing the weight.
6. Improving safety criteria by providing mitigation in vehicles.

Development Status

- **Stage of Development :** Commercially ready
- **Time to Market :** Less than 1 year

Market & Competition

The proposed invention not only protects against explosion, but also protects against bullets and fragments which are other ballistic threats. For this purpose, since the two armor forms a spacer layer between the layers, it absorbs the energy of the bullet and the fragment to a great extent and deflects the direction by deflecting the direction. In addition, the filler material can be used in foam to be used in helmets and work safety equipment that provide protection against impact. The use of these structures in the automotive sector, especially in the crush box, will have the advantage of increasing impact damping, increasing collision safety and reducing vehicle stiffness. A project work has been started for this purpose.

Potential Sectors	**Potential Regions**
Materials	United States
Automotive	EU

Interest In

Crush box application in automotive sector. Shield material application in defence sector.

Use Of Glycyl Glutamine Against Depression

Sector : Medical

Our patent is using Glycyl-glutamine molecule in the treatment and/or prophylaxis of depression and anxiety via increasing serotonin levels in the brain. Glycyl-glutamine can be synthesized in our body endogenously, which is extremely safe with its adverse effects. Depression and anxiety are the most common psychiatric disorders all around the world and its prevalence in developing countries at high levels as 21%. Glycyl-glutamine reveals a novel and harmless treatment option to depression/anxiety patients all around the world.

Description

Depression and anxiety are the most common psychiatric disorders all around the world and its prevalence in developing countries at high levels as 21%. Depression is 4th leading cause of disability and death all around the world and it is expected that will be the 2nd cause after 2020. Globally, more than 300 million people of all ages suffer from depression. The treatment of depression and anxiety is of a great importance because they shall be one of the disorders, which shall extensively influence the World in the future.

Various antidepressants are used for treating people developed depression and anxiety. However, the high rate of patients who still have not responded to treatment makes it necessary to continue to search newer, stronger and faster treatment approaches on that field. The current medications used in depression treatment are also very troublesome drugs in respect of adverse effects they cause. Today, the risks and adverse effects of antidepressants used for depression treatment spread in a large range from sexual problems to drug addiction and increasing suicidal tendency among young people. Briefly, in current depression treatment;

- There are patients, who cannot get any response,

- Adverse effect potential of current drugs is high,

- Response term is very long.

As a result, due to negative issues stated above and insufficiency of current solutions on the issue, it has been made mandatory to make technical developments related with improving and treating the people with depression and anxiety disorders. The purpose of our invention is to use Glycyl-Glutamine (Gly-Gln) in the treatment and/or prophylaxis of depression and/or anxiety via its effects in the brain. Gly-Gln generates antidepressant effects by increasing serotonin levels in the brain. Gly-Gln does not have any known adverse effects since it can be endogenously synthesized in the body

and exist during normal operation of it. Thus, this will be an advantage of Gly-Gln against current therapeutic agents use in depression and/or anxiety disorders, which have several side effects.

Glycyl-Glutamine reveals a novel and harmless treatment option to depression/anxiety patients all around the world. Also, it exerts a contribution to nations economy by ameliorating the economic burden (approximately 200 billion USD globally) due to depression s job loss.

Primary Benefits

The current medications used in depression treatment are also very troublesome drugs in respect of adverse effects they cause. Today, the risks and adverse effects of antidepressants used for depression treatment spread in a large range from sexual problems to drug addiction and increasing suicidal tendency among young people. Gly-Gln does not have any known adverse effects since it can be endogenously synthesized in the body and exist during normal operation of it. Thus, this will be an advantage of Gly-Gln against current therapeutic agents use in depression and/or anxiety disorders, which have several side effects. It is already shown that the defects on serotonergic functionality play a role in the etiopathology of depression and anxiety. Due to serotonergic deficit; depression and anxiety might occur. The most important serotonergic receptors for depression and anxiety are 5-HT1A, 5-HT1C and 5-HT2. Thus, selective serotonin reuptake inhibitors (SSRI) are widely in use for the treatment of depression: However, these drugs have several side effects such as uneasiness, motor dysfunction, sexual dysfunction and diarrhea. Despite the developing knowledge on depression pathophysiology and impact mechanisms of antidepressants, the preclinical studies performed on that field still maintain their importance even gradually increases due to clinical problems such as not being able to receive high positive results and receiving delayed results. The high rate of patients who still have not responded to treatment makes it necessary to continue to search newer, stronger and faster treatment approaches on that field.

Development Status

- **Stage of Development :** Pre-Commercial use
- **Time to Market :** More than 5 year

Market & Competition

Depression and anxiety are the most common psychiatric disorders all around the

world and its prevalence in developing countries at high levels as 21%. Depression is 4th leading cause of disability and death all around the world and it is expected that will be the 2nd cause after 2020. Globally, more than 300 million people of all ages suffer from depression. The treatment of depression and anxiety is of a great importance because they shall be one of the disorders, which shall extensively influence the World in the future. According to the report, “Depression Drug (Benzodiazepines, SNRIs, TCAs, TeCAs, Atypical Antipsychotics, Monoamine Oxidase inhibitors and Others) Market: Global Industry Perspective, Comprehensive Analysis and Forecast, 2014 – 2020”, the global depression drug market was valued at USD 14.51 billion in 2014 and is expected to generate revenue of USD 16.8 billion by end of 2020, growing at a CAGR of 2.50% between 2015 and 2020. Also, it exerts a contribution to nations# economy by ameliorating the economic burden (approximately 200 billion USD globally) due to depression#s job loss. Thus, any drug industry company would be a partner of our innovation.

Potential Sectors	**Potential Regions**
Medical	United States
Pharmaceutical	EU

Interest In

Our aim is to finish pre-clinical studies, which are funded by a TUBITAK 1001 grant in the next 2 years. Afterwards, Phase 0 clinical trials will be performed. Completion of the whole process is expected to take more than 6-7 years.

Adhesion Barrier With Nanofibers

Sector : Medical

Adhesions are described as abnormal adhesions that are not normally associated with each other in the intra-abdominal region, and that the organs surrounded by the serous membrane are involved with each other's and / or adjacent organs following injury or surgical operations. The present invention is about an alternative product that is easier and more efficient to use than commercial adhesion barriers used in the market.

Description

Adhesions are described as abnormal adhesions that are not normally associated with each other in the intra-abdominal region, and that the organs surrounded by the serous membrane are involved with each other's and / or adjacent organs following injury or surgical operations. The main causes of adhesions are surgical procedures. Adhesions are common after chest, heart and abdominal operations. Postoperative intraabdominal adhesion formation rates are between 64% and 97%. Abdominal adhesions, which are one of the most important problems of both surgeons and patients, lead to chronic abdominal and pelvic pain, organ obstructions (bowel, ovarian tubule, kidney drainage channels, etc.) and functional disorders. As a result, it causes new operations to be performed. In surgical studies, it t is seen that adhesions are responsible for one third of all intestinal obstructions and two-thirds of small intestinal obstructions. For complications due to adhesions, only 400,000 adhesion operations are performed annually in the USA. Adhesion opening operations are long-running operations. During these operations, anesthesia and the length of stay at the hospital are prolonged. Therefore, prevention of intra-abdominal adhesion is a very important issue during surgical interventions.

The main approaches proposed in the literature to prevent or reduce adhesion are divided into three categories: the development of surgical techniques, the use of anti-adherence drugs, and the separation of tissues in the healing process. The basic surgical principles that all surgeons must apply in order to prevent adhesion are to reduce surgical trauma as much as possible, to avoid unnecessary and excessive manipulations, to remove foreign bodies and dead tissues, to prevent dryness due to inadequate blood supply and loss of water in the tissues and to keep bacterial invasion to a minimum level. However, considering the adhesion-forming nature of the intra-abdominal region to protect the organism during the healing process, it is suggested that the therapies and technological developments to be made with the surgical technique may not prevent adhesion formation but only reduce it. Drugs used to prevent adhesion are either directed to inflammatory processes or to agents that cause adhesion (infection, endotoxine, exudate, etc.). The drug should be specific to adhesions and not affect normal wound healing. However, the clinical and experimental efficacy of these drugs is questionable and has side effects such as adverse effects on the immune system and delayed wound healing. Another method of separating tissues from each other during the healing process is the use of adhesion barriers. Adhesion barriers allow the surfaces in the injured intra-abdominal region to be separated from each other and freely heal and thus prevents the formation of adhesion. Today, physical barriers used as adhesion inhibitors are divided into two

main groups as liquid barriers and membrane barriers. These barriers are often used with a mesh material. Composite mesh structures consisting of a combination of mesh and adhesion barriers are also available. However, these materials are very expensive and cannot be used in any part of the body.

An ideal adhesion barrier should not affect wound healing, be non-reactive, be effective in the presence of body fluids and blood, be easy to use, and be biodegradable. In addition, it should not cause infection and inflammation, should be antibacterial, be stable in the initial phase of adhesion formation, then metabolize and be economical. A lot of material was used to prevent adhesion formation until today but it has not been precisely shown that no one blocks the intra-abdominal adhesion. Studies continue to reduce or prevent intra-abdominal adhesions with used materials and with the products put forward constitute the million-dollar health market.

The natural polymers hyaluronic acid (HA), sodium alginate (NaAlg) and carboxymethyl cellulose (CMC) are used in mixture with different polymers or purely as a gel, film, membrane or fiber / nanofiber in biomedical field. Previously, however, no nanofiber surface was produced by electrospinning from the HA/NaAlg/CMC polymer mixture. In addition, no nanofiber surfaces have been produced from these polymers, either alone or in admixture, for use as an adhesion barrier.

The present invention is concerned with a nanofiber adhesion barrier which meets the above-mentioned requirements, removes all disadvantages and adds some additional advantages.

The primary object of the invention is to obtain a nanofiber surface from a mixture of hyaluronic acid (HA), sodium alginate (NaAlg) and carboxymethyl cellulose (CMC) polymer solutions suitable for use as an adhesion barrier in biomedical field. The invention aims to provide a nanofiber surface by means of electrospinning from a mixture of hyaluronic acid (HA), sodium alginate (NaAlg) and carboxymethyl cellulose (CMC) polymer solutions.

Primary Benefits

• Nanofiber adhesion barriers solve the problem of adhesion of tissues or organs more effectively than conventional barriers such as gel, solution or film.
• Nanofiber adhesion barrier has flexible and strength structure.
• It has a thin and porous structure.
• It can be easily used with small surgical instruments.

• Nanofiber adhesion barrier prevents infiltration or migration of blood and cells thus, it shows anti-adhesion properties.
• While preventing adhesion, it does not affect the wound healing process.
• Easy to use due to ease of folding and bending.
• It does not tear or break when you fold.
• It is made of natural polymers, it is biodegradable and biocompatible.

Development Status

- **Stage of Development :** Prototype
- **Time to Market :** 3-5 year

Market & Competition

Adhesion barriers which have recently been developed and found to be the most widely used in clinical practice are the oxide regenerated cellulose membrane (Interceed®), e-polytetrafluoroethylene membrane (Gore-tex®) and carboxymethyl cellulose / hyaluronic acid membrane (Seprafilm®). The first two are used only in gynecology, and the latter are widely used both in general surgery and in gynecology. However, the existing barriers, it requires special skills to use, despite its beneficial effects in preventing the adhesion, to give rise to complications, they cannot be used in every region and most importantly, their use is limited because they are expensive (one of them is 400 USD on average and 2-3 units are used in each operation). In addition to being expensive, other disadvantages are to lead to the separation of blood vessels, the risk of abscess formation, the tendency to break when sharp edges are bent due to film structures, and the difficulty of applying them to tissue.

Potential Sectors	Potential Regions
Medical	United States
Materials	EU

Interest In

For commercialization of the present invention, primarily clinical and certification studies should be completed. Medical professionals can guide and help in this stage. Afterwards adhesion barrier will be present to attention of surgeons and medical professionals.

Baykara Stur Free Skleral Intra Oculer Lens

Sector : Medical

With this lens, in case of ruptured capsular bags during the operation, the surgeon, thanks to the special leg design, can place the legs to sclera or behind the iris with no stitching, or easily stitch it to sclera without the general hassle of sutures and not needing to change the type of IOL to be used.
Special leg design prevents the lens to be malpositioned or dislocated during or after the operation, thus reducing the related risks as well as eliminating the need for a second operation.
The longer length of the legs compared to traditional ones removes the need of stretching the lens, thus preventing the problem of optical tilt.
In cases where scleral fixation is required, the notches at the legs allow the surgeon to easily stitch the lens to sclera without lengthening the operation time,thus reducing the risks of infections and loss of vision.

Description

Globally the number of people of all ages visually impaired is estimated to be 285 million, of whom 39 million are blind.

Cataract is the clouding of the lens of the eye, which initially prevents clear vision and eventually progresses to blindness if left untreated. The World Health Organization (WHO) estimates that nearly 20 million people are bilaterally blind from cataract in the world, representing almost half of all global cases of blindness.

Visual impairment in 2010 is a major global health issue: the preventable causes are as high as 80% of the total global burden.

As a global statistics, 3% to 7% of all cataract operations have special requirements emerging during the operations:

Ruptured / Broken Capsular Bag: Ophthalmologists make every attempt to maintain the integrity of the capsular bag so that the intraocular lens can be positioned correctly within it. But the capsular bag is extremely thin — approximately the thickness of a single red blood cell — and can sometimes rupture or break, raising the necessity of the lens implant to be sewn in place to sclera, or special type of lens to be implanted.

Keeping supplies of different lenses may not be feasible at certain conditions. If there is no supply of the special lense at hand during the operation, a second operation will be necessary.

1. *Malpositioned / Dislocated Intraocular Lenses:* Sometimes the capsular bag itself may dislocate due to weakness or breakage of the fibers (zonules) that hold it in place, resulting in a condition known as zonular dialysis. This condition places the patient at risk of malpositioning or dislocation of the lens implant.

Even without underlying complications, intraocular lenses can still dislocate — especially if one of the springy "arms" holding the lens in place is positioned improperly inside the capsular bag or becomes malpositioned later on.

1. *Need of Second Operation:*

When an intraocular lens implant is malpositioned or dislocated, the cataract surgeon can probably reposition it in a second procedure, bringing additional costs.

1. *Stitching Lenses to Sclera “Scleral Fixation”:* When the need arises for sewing the lens to sclera, the standard lens, of 12.5 mm diameter, will have to be stretched from the sides in order to be sewn to sclera which generally has a 14.5 mm diameter. This causes a condition called “optical tilt”, meaning myopic shift of the spherical equivalent value and error in prediction.

Scleral fixation also lengthens the operation time, increases the trauma in the eye and adversely affect the recovery. In late stages, it can cause infections and even loss of vision.

Solution:

A special lens leg (haptic) design that can be placed either in the capsular bag or behind the iris or to sclera, with or without stitching, giving surgeon the option of completing the operation free of worrying if a special lens would be needed.

This leg design can be adopted to any existing intraocular lens produced by IOL manufacturers.

In case of ruptured capsular bags during the operation, the surgeon, thanks to the special leg design, can place the legs to sclera or behind the iris with no stitching, or easily stitch it to sclera without the general hassle of sutures and not needing to change the type of IOL to be used.

Special leg design prevents the lens to be malpositioned or dislocated during or after the operation, thus reducing the related risks as well as eliminating the need for a second operation.

The longer length of the legs compared to traditional ones removes the need of stretching the lens, thus preventing the problem of optical tilt.

In cases where scleral fixation is required, the notches at the legs allow the surgeon to easily stitch the lens to sclera without lengthening the operation time,thus reducing the risks of infections and loss of vision.

Primary Benefits

Intraocular lens (IOL) is inserted in the eyes of the patients suffering from myopia or cataracts. The lenses are inserted inside the eye, after removal of cataract crystalline. After the cataract surgery intraocular lens replaces the focusing power of natural lens. For the surgeon, the major benefit of intraocular lenses with the new leg design is that he will not need to switch to any other special lens due to complications during the cataract surgery. This is especially important for regions where keeping stocks of various types of lenses may be difficult or costly. Another benefit is that even problematic cataract surgeries can be executed by less experienced surgeons with good results and minimum post-op complications.

Development Status

- **Stage of Development :** Prototype
- **Time to Market :** Less than 1 year

Market & Competition

The global market for Intraocular Lenses, projected to exhibit a CAGR of over 8% during 2015 - 2020 is expected to reach US$ 4.7 billion by 2020, driven by the rising prevalence of cataract among the aging population and strong adoption of premium IOLs, according to a report by Global Industry Analysts Inc. Year 2015 is estimated to close with nearly 21.6 million operations, corresponding to ca. US$ 3.5 billion.
Various key players contributing the global market share of intraocular lens market includes Abbott Medical Optics, Carl Zeiss, Bausch & Lomb, Eyekon Medical, Lenstec, Humanoptics, Novartis AG, Morcher GmbH, Ophtec BV, Oculentis BV, Ophtec USA, PowerVision, Physio SA, Rayner Intraocular Lenses, Staar Surgical Company, Santen Pharmaceutical and Wavelight AG among others. The market is expected to be driven by the increasing adoption of premium IOLs such as multifocal, accommodating and toric IOLs.
Moreover, WHO’s Vision 2020 program against blindness targets 32 million cataract surgeries by year 2020.
There is an escalating shift from the use of standard monofocal IOLs to premium IOLs resulting in higher revenue generation. Although, the majority of surgically implanted IOLs, to replace the clouded lens and restore vision, are the standard monofocal lenses, premium IOLs are gaining increased adoption because of their enhanced clinical outcomes. The adoption level of premium IOL units was 13% in the US in 2010. However, the revenue contribution from these premium IOL units made 39% of the total IOL segment. The higher revenue generation from the premium IOLs is because of their higher price, a factor that will significantly contribute to the growth of the IOL market.

Formation of cataracts is a part of the natural aging process and is therefore on the rise among the rapidly aging world population. Key factors driving growth in the market include growing awareness over the benefits of early interventions, and easy

access to new technologies. Despite initial lethargy in adoption by surgeons, intraocular lens (IOL) implants are considered the standard treatment of care for cataract.

The IOL market is also benefiting from the development of premium intraocular lenses, adoption of which is driven by factors such as superior visual outcomes, and long-term safety, efficacy, and rotational stability, as seen in Figure 6 above. While improved access to superior medical technologies drives growth in developing countries, the continued shift towards premium IOLs including toric, accommodative and multifocal IILs, is fueling demand in developed countries. Premium IOLs are forecast to witness strong growth aided by their effectiveness and ability to offer patients superior spectacle-free vision post cataract procedure.
The market for IOLs is characterised by incremental improvements in lens design and materials, and patient outcomes. Established monofocal technology continues to dominate the market, supported by superior patient outcomes and reimbursement benefits. New-generation presbyopia-correcting multifocal and accommodative lens are also witnessing strong growth. Rapid developments have also assisted in reducing size of the lens enabling their use in microincision surgeries, which are growing in popularity, encouraged by benefits such as reduced post-operative trauma and faster patient recovery. From monofocal lenses to aspheric accommodative IOLs, and from the use of hard, non-foldable materials to the present day’s acrylic materials, there have been significant innovations in IOLs to enhance visual outcomes.

The United States represents the largest market worldwide. Society of Cataract and Refractive Surgery (ASCRS) estimated that around 3 million cataract surgeries are performed in the U.S. every year, the average cost for surgery being $3,279. Growth in this country mainly comes from the aging population, higher penetration of premium IOLs, favourable reimbursements for cataract procedures using standard IOLs, and the relatively greater expenditure on healthcare.

Europe represents the second position in the global market of intraocular lens due to the presence of large geriatric population in European region. More than 3 million cataract surgeries are performed each year in Europe. In addition, initiatives taken by government for the benefit of people to perform cataract surgery also propel the growth of intraocular lens market in this region. In Germany, over 0.8 million cataract surgery procedures are performed each year, while in France, the figure is over 0.5 million.

Asia-Pacific and RoW represents the third and fourth position in the global market for intraocular lens due to lack of proper healthcare facilities (refractive surgery) in few remote areas of Asian (India, Bangladesh, Pakistan) and African countries (Egypt, Libya, Sudan). Asia-Pacific is forecast to emerge as the fastest growing market with a CAGR of 8.3% until 2020. In India, over 5 million cataract surgeries are performed annually, making it the top country in the world for such surgeries, but not the largest market in terms of monetary value.

The global market for intraocular lens can be segmented as follows:
• By materials

- Poly Methyl Meth Acrylate (PMMA)
- silicone, hydrophobic acrylate
- hydrophilic acrylate
- collamer
- By product types
- Aphakic
- Pseudophakic
- Phakic

Statistics in Turkey related to the number of cataract surgeries is not available before 2010 and after 2012. However, through extrapolations based on data available for only 3 years and interviews with market professionals, annual total number of cataract operations in 2016 is estimated in a range of 400,00 to 450,000. Based on interviews with active ophthalmologists and various hospitals, SOM “Serviceable Obtainable Market” size, which will be attacked immediately after trial operations are completed, is estimated to be 25,000 for the first year. Price range of the product will be within US$ 50 to US$70 band.

Based on the hefty procedures for FDA approval, the new lens design will target cost sensitive IOL segment among EMENA region.

Competition in the local market generally runs over distributors that sell various brands at varying prices. However, there two major local manufacturers, VSY Biotechnology and Anadolu Tıp Teknolojileri A.Ş. (ZARACCOM) that hold around 70% of the market with almost equal shares. Their IOL sales are 165,000 (2011) and 150,000 (2012) respectively. Known international brands as well as cheap products of Indian manufacturers share the rest of the market.
Barriers:
The major barrier to market entry is the high investment costs for manufacturing plants. Tens of millions of dollars are needed for establishing a new production facility. However, there are already two well-established high-tech lens production facilities in Turkey, and our researcher have signed an MOU with one of them for the production of intraocular lenses with the new innovative leg design.

With the rapidly growing aged and geriatric population who are at high risk of myopia or cataract, the global market for intraocular lens is also expected to grow. In addition, technological advancements in intraocular lens market also further accentuate the market growth. However, high costs associated with surgical procedures for the placement of intraocular lens inside the eye might restrict the global market of intraocular lens, especially in the developing and underdeveloped countries in the Asian and African continent. This difficulty brings an opportunity for the lenses with our new innovative leg design, as this design will reduce costs due to shorter operation times, reduction of need for stitches, and suitability for various conditions where stitches are needed.

Another threat to the demand of intraocular lens market is the increasing number of post-op lens dislocation incidents coming from the operations committed 15+ years ago, when some of the technologies still used today were at their early stages. This may put some people off from cataract operations.

Stringent and mandatory FDA Pre-Market Approval process t also causes an important barrier against entry to the US market. There are only 5 FDA approved intraocular lenses as at the date of this report.

Potential Sectors	**Potential Regions**
Medical	United States
Healthcare	EU

Interest In

• Investors to finance a sales & distribution company.
• International business partners to distribute our product worldwide.
• Licensees to adopt the leg (“haptic”) design for their own lenses.
The main and expected exit scenario is acquisition by a strategic investor, either a local brand for inorganic growth or worldwide known brand that targets to penetrate the Turkish market. As an example, Valeant EMENA recently agreed to acquire assets from the Zaraccom Focus Force line of intraocular lenses (IOLs) . Zaraccom, a.k.a. Anadolu Tıp, is a Turkish IOL manufacturer that produces hydrophobic IOLs using a cost-effective and differentiated technology by generating its own raw material. The partnership brings four new hydrophobic IOL brands to the Bausch + Lomb surgical portfolio, which hold 10% market share in Turkey and have a presence in more than 20 countries. The deal has been completed by 14th of October. The deal size, although not specifically declared, is believed to be around US$ 15m or slightly less