RELOCATED VIRTUAL IMAGE DIGITAL GLASSES for ADVANCED ARMD

THE low vision solution for the digital age

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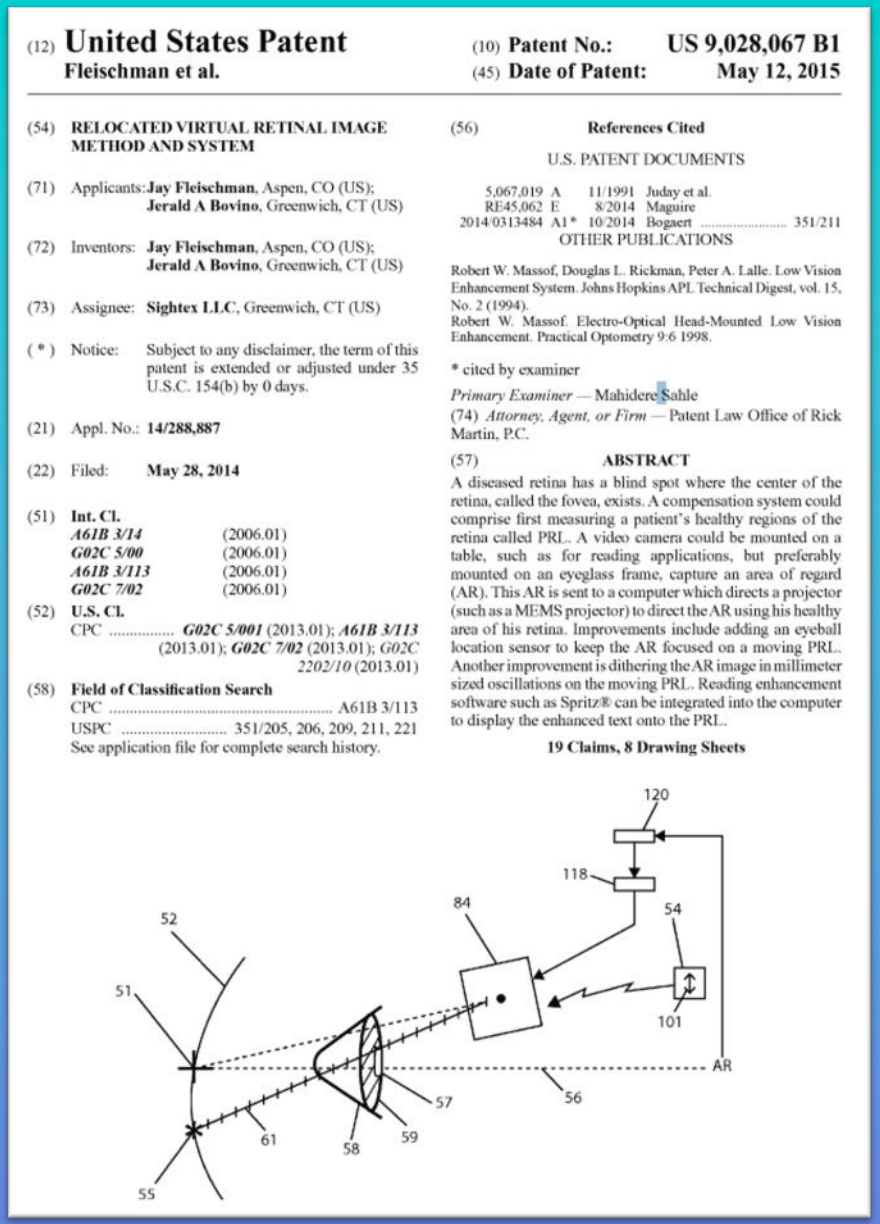
OUR SYSTEM IS A COMPLETELY NOVEL APPROACH

UNITED STATES PATENT GRANTED 9,028,067 B1



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(54) **RELOCATED VIRTUAL RETINAL IMAGE METHOD AND SYSTEM**

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(51) **Int. Cl.**

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G02C 5/00	(2006.01)
A61B 3/113	(2006.01)
G02C 7/02	(2006.01)

(52) **U.S. Cl.**
CPC ***G02C 5/001*** (2013.01); ***A61B 3/113*** (2013.01); ***G02C 7/02*** (2013.01); *G02C 2202/10* (2013.01)

(58) **Field of Classification Search**
CPC A61B 3/113
USPC 351/205, 206, 209, 211, 221
See application file for complete search history.

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(57) **ABSTRACT**

A diseased retina has a blind spot where the center of the retina, called the fovea, exists. A compensation system could comprise first measuring a patient's healthy regions of the retina called PRL. A video camera could be mounted on a table, such as for reading applications, but preferably mounted on an eyeglass frame, capture an area of regard (AR). This AR is sent to a computer which directs a projector (such as a MEMS projector) to direct the AR using his healthy area of his retina. Improvements include adding an eyeball location sensor to keep the AR focused on a moving PRL. Another improvement is dithering the AR image in millimeter sized oscillations on the moving PRL. Reading enhancement software such as Spritz® can be integrated into the computer to display the enhanced text onto the PRL.

19 Claims, 8 Drawing Sheets

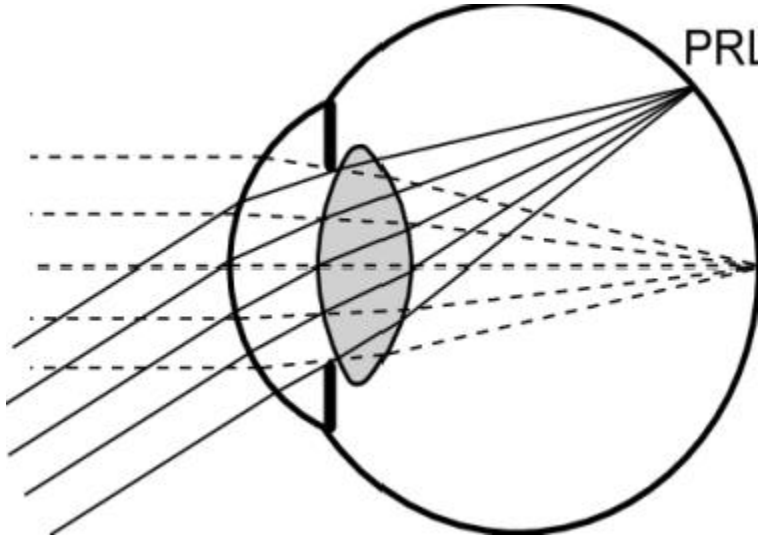
THE PROBLEM

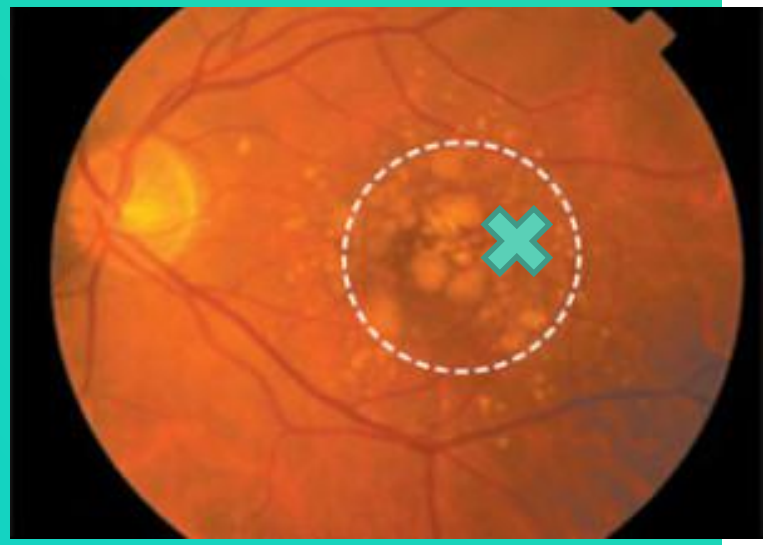
Retina specialists have heard from many patients, and families of patients with poor binocular central vision, “most of the time I can’t see anything.”

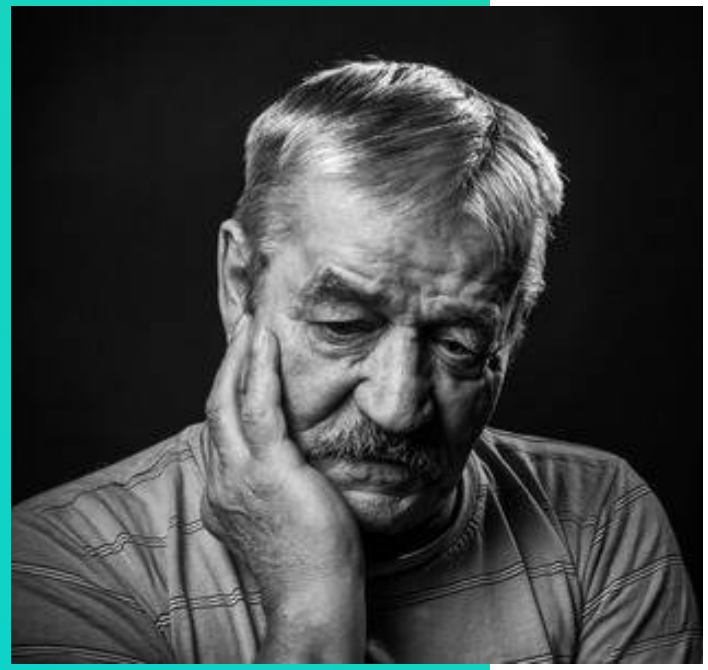
However, there are RARE moments when they, surprisingly, see a small object, such as a needle on the floor only to be frustrated, a moment later, that the same object “disappears” from view.

ECCENTRIC FIXATION

Eccentric viewing in macular disease is well known, whereby the patient can momentarily use a region of peripheral healthy retina.







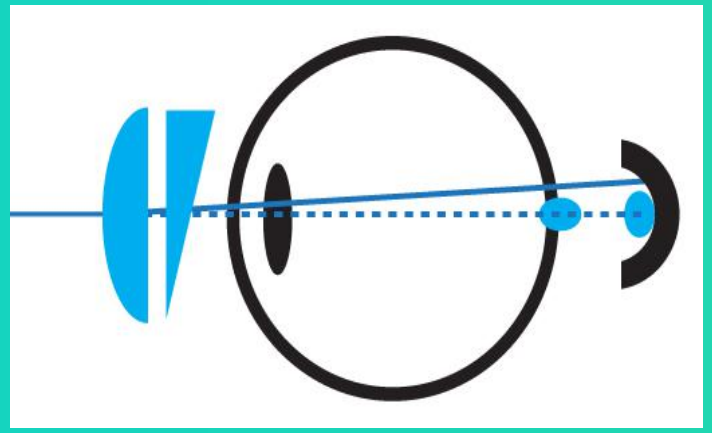
After a moment, the patient always loses the object they wish to find. It disappears in the center of their scotoma.

Only through random body positional and/or eye movements might the object be momentarily seen again.

These random retakes of the image do not provide the patient with any practical degree of visual capability.

WHAT IS CURRENTLY OUT THERE?

To date, all attempts to enhance/improve vision for patients with bilateral end stage disciform macula degeneration have centered around various strategies that utilize



Optical Magnification (± prisms)

Video imaging with or without electronic displays, that only magnifies images.

OMG Driving!

COMPETITION

Expensive
Video Magnification

Optical

Good Price
Video Magnification

VUZIX
??? Price
???Availability

Adding features such as contrast enhancement, color shifting, image warping, or negative transformation (ex: white text on black background) have not added significantly toward their utility and to date **no device** has gained widespread acceptance or has made significant entry in the market place.

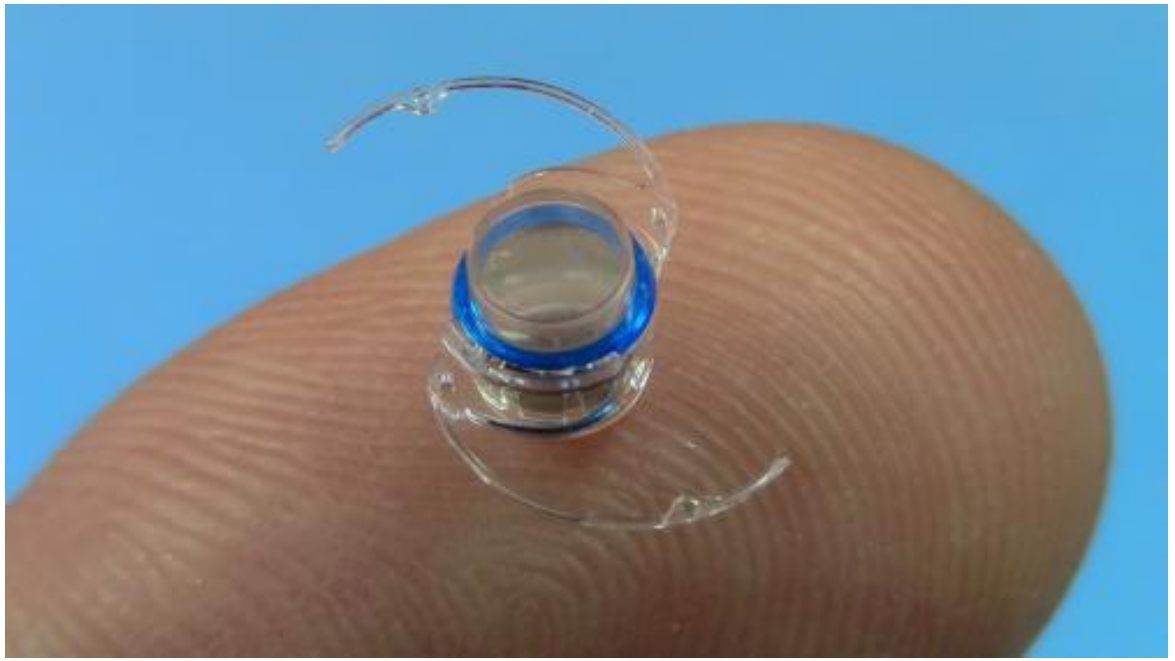
TELESCOPIC PCIOL

Yet another magnification ‘solution’

Surgically invasive
Essentially irreversible
Cannot be modified to varying needs

Have not gathered widespread use likely because of the same image limitations of wearable telescopes

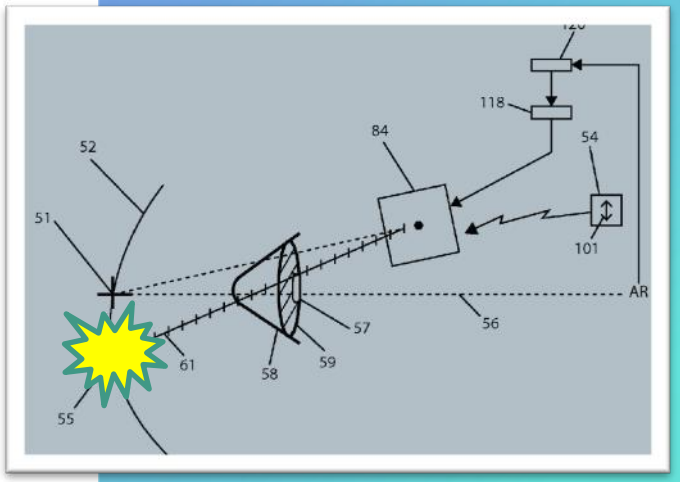
Great concept but . . .
Are there any happy patients out there ?

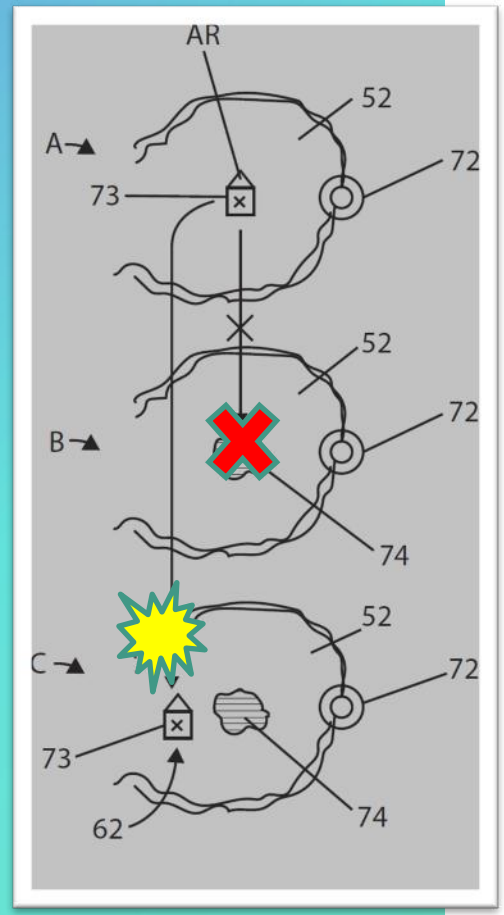


WE PATENTED A DISTINCTLY NEW SOLUTION

In essence we stimulate a new “fixation mechanism” that the patient can use for visual improvement

We present video images consistently and reliably to available functioning retina





THE ESSENCE OF OUR TECHNOLOGY. . .

FIND A PREFERRED RETINAL LOCUS AND PROJECT THE CENTER OF A CAPTURED VIDEO IMAGE TO THAT PLACE

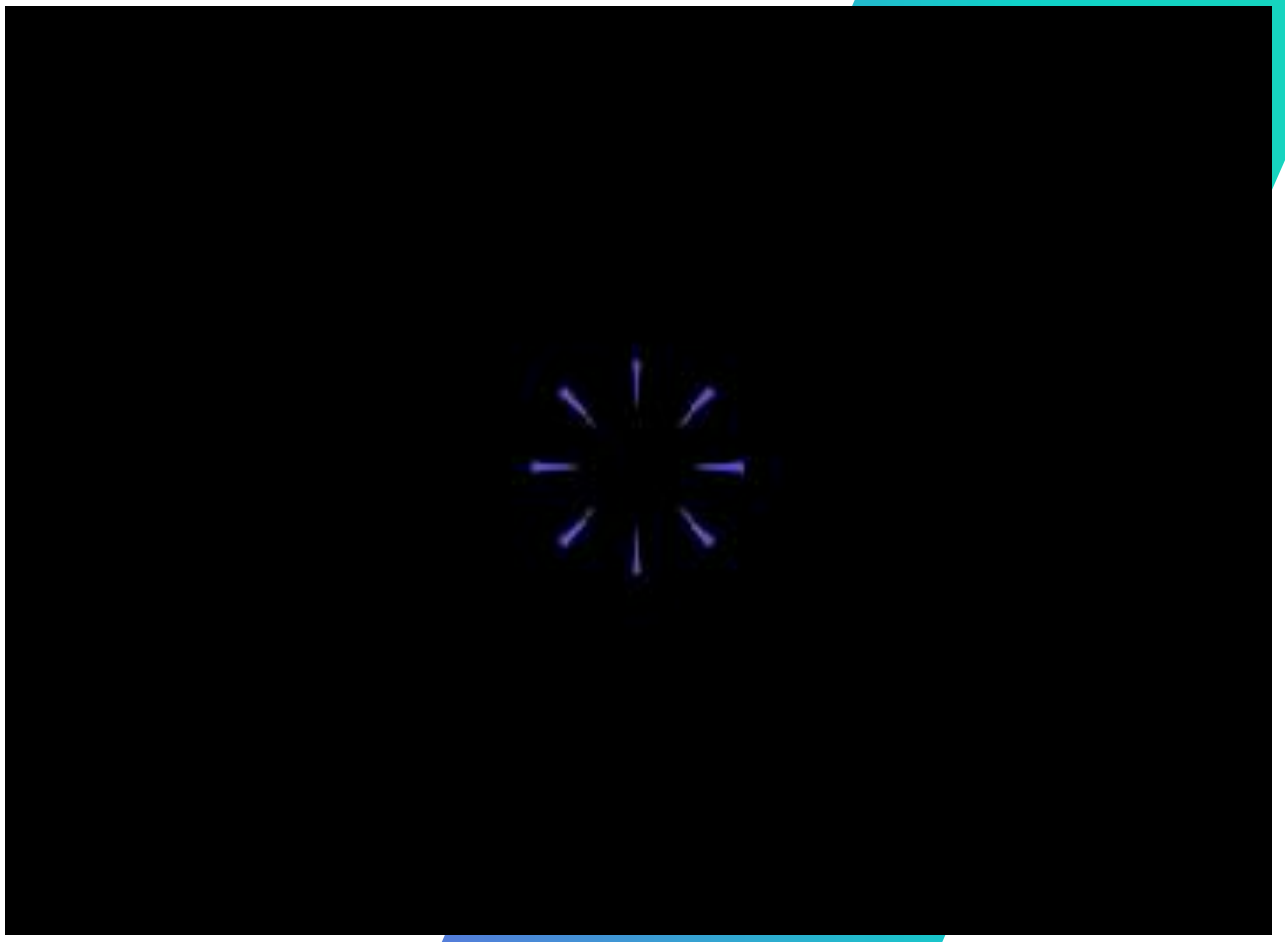
Our system is designed to consistently place a remapped video image on the user's preferred retinal locus (PRL) utilizing the patient's real-time subjective interaction.

The patient's own innate brain/eye tracking system is stimulated by a target image ("landing lights") that the patient himself controls, via a touchpad.

We superimpose an animated-target-image (layered over the video image, and with variable transparency, as needed).

THE PATIENT FINDS HIS PRL. . .

Animated “landing lights”, coming from the periphery, are manipulated by the patient, until he sees the tiny central target



Once the patient sees the central target and accepts its position the current real world video image, now remapped and centered at this same prl point, is turned on.

SIMPLY PUT . . .

WHAT SETS US APART FROM ALL OTHER APPROACHES

Our high-tech, patent protected technology . . . reliably, and predictably moves the image to an area of healthy retina

PROTOTYPE DEVELOPMENT AND VALIDATION

To date, we have early proof of significant benefits of our remapped image video technology:

24pts tested (with bilateral Geographic Atrophy or with bilateral advanced Macular Degeneration)

significant improvments

ranging from as poor as CF 10 ft to 20/100 to 20/40 for those with better starting vision

% improvement = fxn(scotoma size)

	GA or ARMD	Before	After
1	G	20/150	**20/50**
2	G	20/200	**20/50**
3	G	20/200	**20/60**
4	G	20/200	**20/40**
5	G	20/100	**20/50**
6	G	CF 10'	**20/100**
7	G	20/100	**20/40**
8	G	20/150	**20/50**
9	A	CF 6'	**CF 6'**
10	A	20/400	**20/150**
11	A	20/200	**20/70**
12	A	20/200	**20/60**
13	A	20/200	**20/60**
14	A	20/250	**20/60**
15	A	CF 10'	**20/100**
16	A	20/100	**20/40**
17	A	20/80	**20/70**
18	A	20/150	**20/70**
19	A	20/100	**20/60**
20	A	20/100	**20/40**
21	A	CF 10'	**20/100**
22	A	20/300	**20/80**
23	A	20/250	**20/60**
24	A	20/250	**20/50**

KEY ECONOMIC DRIVERS

We are mostly dealing with a senior population with limited income resources.

We would strive for the lowest price point possible.

In quantity we anticipate our product cost of goods (COGs) to come in around $500 per unit.

A healthy revenue (see next) can be generated at 5 times COG or about $2500 per unit. Accordingly, margins will be substantial and sustainable.

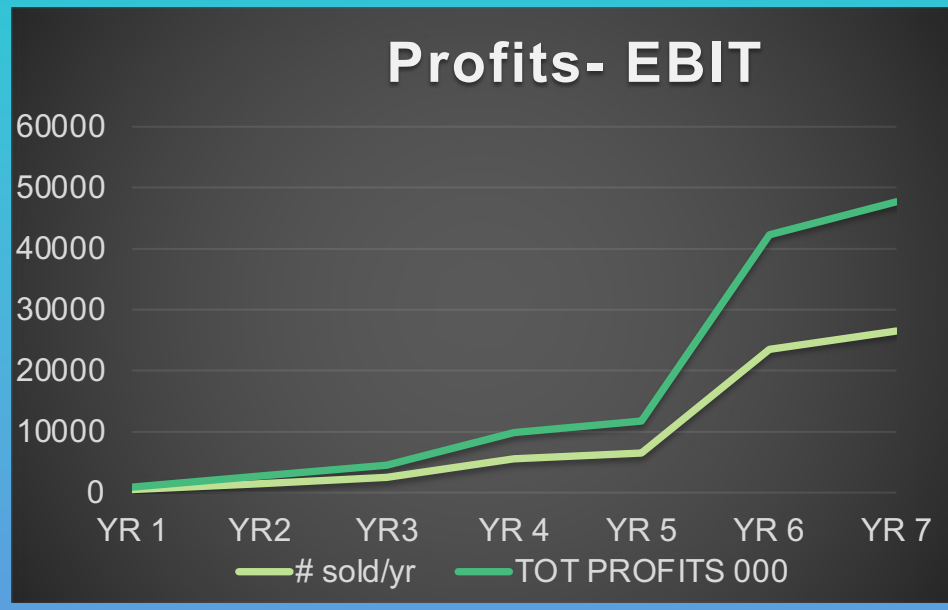
US MARKET FORECAST ASSUMPTIONS

2 million affected, assume 1 million maximum market
manufacture cost ~ $500 per unit
sales price $2500 per unit

by year 7 just 1 in 20 likely pts will have device

	YR 1	YR2	YR3	YR 4	YR 5	YR 6	YR 7
% tot market-1MM	0.05	0.2	0.4	0.8	1.2	3	5
# sold/yr	500	1500	2500	5500	6500	23500	26500
COG K's	250	750	1250	2750	3250	11750	13250
TOT SALES K's	1250	3750	6250	13750	16250	58750	66250
EXP/marketing K's	225,000	275,000	300,000	325,000	375,000	400,000	500,000
TOT EXPENSES	475,000	1,025,000	1,550,000	3,075,000	3,625,000	12,150,000	13,750,000
TOT PROFITS	7,750,00	2,725,000	4,700,000	10,675,000	12,625,000	46,600,000	52,500,000

$52,500,000



DISTRIBUTION, SALES,& REIMBURSEMENT

Direct sales via internet would be initial effort. At some point a strategic partner could participate
(example might be an eyeglass company with optometric market penetration).

Leasing option possible

It's likely, as with hearing aids, that insurance reimbursement could play a role.

We anticipate that Medicare would approve reimbursement

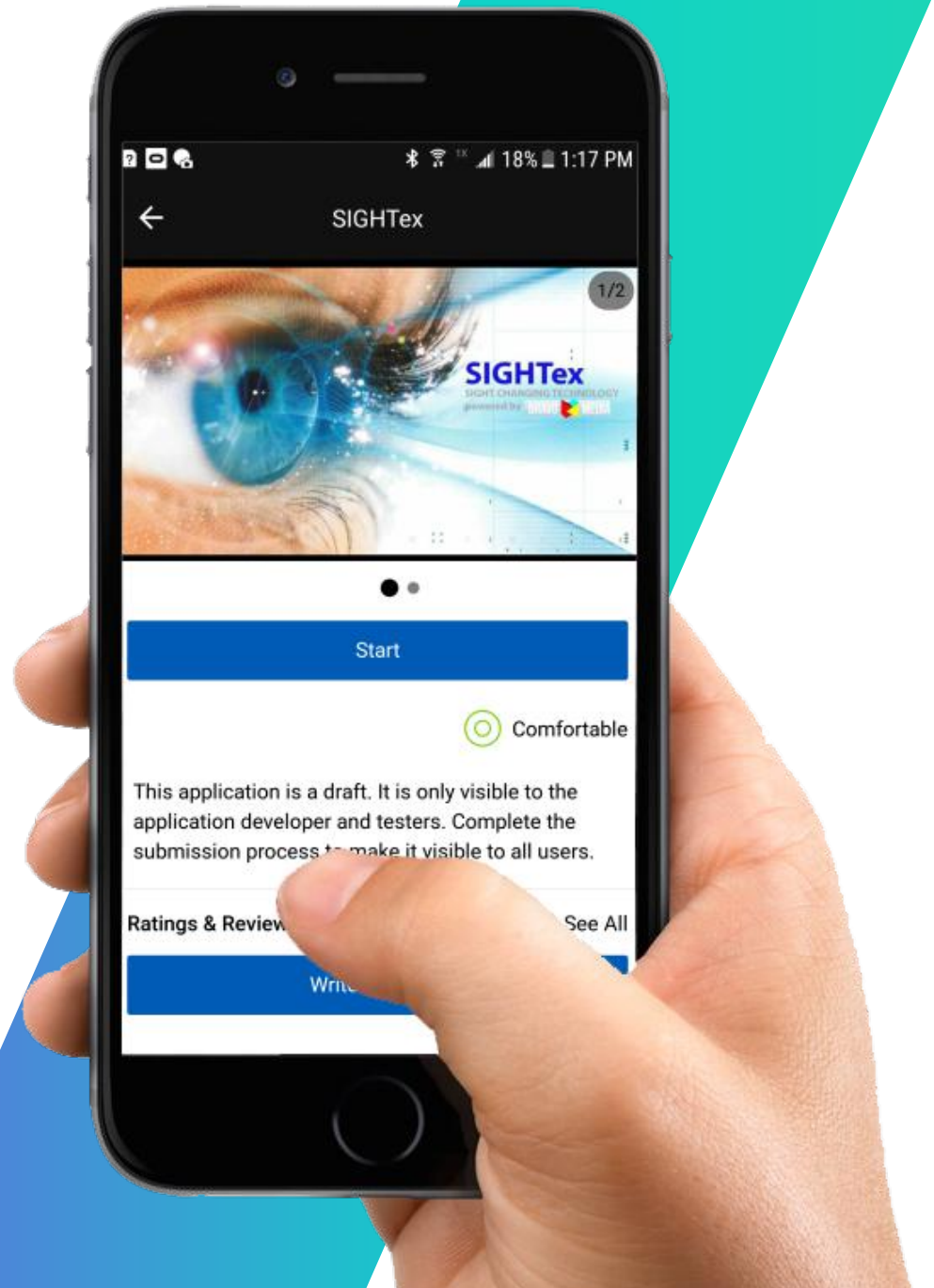
MARKETING

Initially, the message will be carried on our web site including testimonials from our patients, technical news channels that pick up on our unique innovations:

- explain the nature of the scotoma problem
- problem with current magnification-only “solutions”
- show the relocation and remapping of an image on healthy retina

The press is hungry for news regarding “useful” and important applications of virtual reality technology. Early on we would be involved with direct sales.

As sales mature it may be possible, perhaps with a profit sharing model, to partner with distributors who widely market to optometrists.



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