Uses Sound to Clean Tools, Dye Cloth, Do Other Jobs

By ANNE THOMAS

Scientist Frank Massa's laboratories of Hingham have ridden the comet-like tail of electro-acoustics to a net worth jump 300 times higher today than when he started his business eight short years ago.

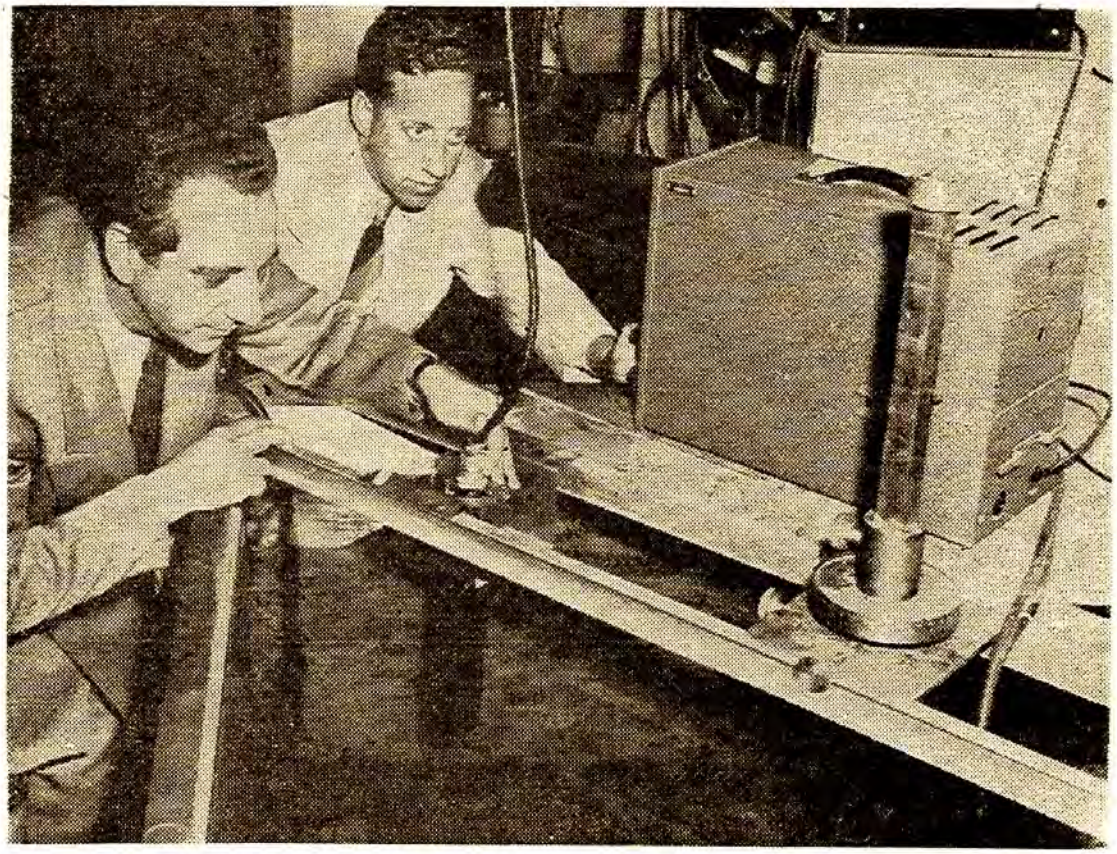
The laboratories will see in the new year, with a doubled plant capacity—from 8000 square feet to 16,000, and a doubled staff—from 55 to more than 100.

So successful has been the progressive Massa rise that last year the company instituted a profit-sharing plan with its employees, giving them 25 per cent of profits before taxes. Last year this meant a division of some $13,000 among the then 20 workers.

What makes Massa grow is the newest magic revolutionizing the world today, the magic of sound, called ultrasonics.

It's sound is so magic you can't hear it; you can't smell it; you

Frank Massa, left, and his brother Ernest compare two different types of microphones used in underwater detection.



Scientist Frank Massa, right, and his brother Ernest set up a hydrophone in an underwater test tank in their laboratories.

It's sound is so magic you can't hear it; you can't smell it; you can't see it. Yet so powerful is this sound that, faster than you can wink your eye or draw a breath, it performs feats undreamed of a decade ago.

In seconds, this sound can clean up every particle of dirt and grease in the most infinitesimal precision instruments.

It can mix unmixables like oil and water or mercury and water.

It can make new alloys—like copper-iron.

It can tin aluminum; hitherto aluminum couldn't be soldered.

It can make dyes so active that the most difficult synthetic fibres, like Orlon, can take on rainbow hues.

Value to Industry

It can do hundreds of other things. Ultrasonics is the science that will revolutionize industry, cut down on waste space in plants, do away with dangerous cleaning chemicals, cut out losses of rejected materials.

Today, sound is lending its magic to industry; tomorrow, it may move into the field of medicine.

So says Boston-born Frank Massa, one of the world's pioneering geniuses in the field of electro-acoustics, the man who wrote the first engineering text on acoustics and who, in his Massa Laboratories, found the first industrial uses for sound.

The 47-year-old scientist returned to his home State three years ago bringing his baby plant with him from Cleveland, where he first started it in 1945. At Hingham now, he harnesses his knowledge of electro-acoustics and his inventive genius to discover more uses for sound in industry.

The kind of sound which Massa studies isn't the audible type that falls on human ears beginning at the rate of 12 to 15 vibrations a second and going up to 20,000 vibrations. Massa's magic sound is beyond human hearing; it begins about 25,000 vibrations a second and runs up into a couple of hundred thousand.

The first highly specialized application of sound came during World war II when the United States was bending every effort toward destroying the German submarine menace. Frank Massa was in the front line of that fight, developing sound instruments for underwater use to detect subs.

Massa's sensitive acoustic instruments measured sound under water and in the air. During the war, these instruments detected the whereabouts of subs. During peacetime, they can locate schools of fish and aid navigation.

But there was a limitation to the use of sound under water—it was just a diagnostic application. Once the sub was sighted or the fish located, its work was over. But the by-product of this effort which led to practical use of ultrasonics in industry offers an unlimited field.

"From the wartime work, it was discovered that sound vibrations could be generated in liquids giving molecules the power of striking with several thousand times the force of gravity," explained Massa.

"We found, too, that these terrifice molecular forces could be generated by several practical methods and even in the space of a few millionths of an inch. In 1945, I decided to start my own firm and begin applying my knowledge of sound for industrial use."

So Massa left the Brush Development Co. in Cleveland, where he did his wartime work for sub detection, and with his wife, the former Georgiana Galbraith of Philadelphia, he started the Massa Laboratories.

Amazing Results

Spectacular things happened when high-intensity sound was injected into a liquid solution. The molecules in the liquid began vibrating intensely, becoming like millions of bristles on a brush. Each molecule could hit with 100 times the force of gravity. Drop in your little tool heavy with its black oxide scale which would resist the most stubborn chemical cleaning, and in three seconds the oxide is gone, the metal shines.

In faster time than this, even, tiny precision parts of watches which no instruments can reach, precision ball bearings, spinerettes used in weaving, pressed lens of eyeglasses — any intrial equipment that must be dirt-free — is ultrasonically cleaned just by immersion in the liquid.

The sound Massa made most use of for industrial purposes was at the lower end of the high-scale range.

"I found that at 25,000 vibrations a second, just 5000 above what the human ear could hear, sound did its best cleaning job especially on small instruments. At that level, it could go into crevices and turn around corners with ease, never missing a spot," he explained.

Industry began testing out this ultrasonic cleaning. At the Univis Lens Co. in Ohio, manufacturers of invisible bifocals, 20 per cent of the product was being rejected due to minute dust flaws that penetrated the pressed glass.

Money Saving Unit

With the magnetostriction transducer developed by the Massa Labs, every reject lens was made perfect. Massa is now planning a large $50,000 unit for the company. In two months, says Massa, the company will save in rejects and cleaning bills the money it will spend on ultrasonic equipment.

Another contribution of ultrasonics is the fact aluminum can now be used for wiring, for oxide can be scrubbed off the aluminum permitting tin to stick, making it possible to solder aluminum wire. This will be a very inexpensive form of wiring.

High intensity sound can reduce the friction between two

surfaces, for instance, removing jerks from grinders and giving them velvet smooth movement.

It can discover oil, meter amount of fluid in tanks, detect hidden flaws inside sheets of metal.

While Massa Labs continue to broaden the industrial application of high intensity sound, it remains the only outfit making instruments that measure sound beyond the audible range.

When the armed forces wanted to study whether ultrasonic energy could damage jet-flying pilots by destroying their body cells, Massa devised an instrument that made possible a lab-controlled study of the effects of jet sound. Scientists able to control the hundreds of thousands of vibrations a second and watch their effects on guinea pigs concluded that jet-flying would not damage through sound.

Future Prospects

What's on the horizon for sound tomorrow?

"Why not in medicine?" speculates Frank Massa. "Arthritis, for instance. It is feasible that someday some type of molecular massage could dispel the calcium from the joints and cure arthritis victims.

"Perhaps high intensity sound could be used to destroy cancerous tissue. It can be pinpointed better than X-ray and it's cheaper than X-ray to use.

"Because ultrasonics can degas liquids, it would be valuable for heart operations. Now, when the heart is disconnected for an operation and the blood bypassed into a mechanical heart, the danger is that bubbles of gas form in the bloodstream when oxygen is added artificially. Ultrasonics could completely dissolve the gas in the blood, permitting the mechanical heart to function longer for serious operations. But that's the job for medical men to check."

Frank Massa has the brilliant mind of a scientist and the temperament of an artist. When he is considering a scientific problem, his mind operates with logical judiciousness. Outside of science, though, he is volatile and excitable.

He has the scientist's pure disregard for public adulation. National magazines have done stories on him and his contributions and he doesn't even have file copies of the articles. He answers the questions of reporters with honest frankness.

As Boy in Revere

Massa looks like a bigger, more virile, slightly modified Einstein with thick black bushy hair, heavy features and a Roman nose. His hands are strong, big, well-shaped, but sensitive-looking. He has a rich, heavy Italian baritone and the disarming ingenuous gaiety and sometimes quick impatience of his Latin ancestry.

The little Italian boy—oldest of eight fatherless children—has come a long way since the days he did all sorts of odd jobs to help out his mother and make it possible to continue his schooling.

Afternoons, he worked for an electrical contractor. Nights, he busily repaired the roller coaster at Revere Beach. Frank was a brilliant student in high school with a decided flair for engineering. His mother, Maria, who emigrated to this country from Naples, ambitious for her son, wanted him to continue his education through college. She consulted his part-time boss about it.

"Phsaw!" said the boss. "Even if he is smart enough to get into M. I. T., it takes money to go there. Frank's too poor to dream about it. He might as well give it up and come to work for me full time. You need the money."

Maria Massa began to weep at the thought her son's talents might be lost.

"When I saw my mother cry, that did it," Frank recalls. "I vowed I'd go to M. I. T. and finish, no matter what happened."

Worked His Way

He went, earning scholarships all the way for his brilliance. At the same time, he continued working. His earnings helped his mother, paid his carfare and lunches.

His senior year, Frank Massa was honored by being selected as a Swope Fellow—the most outstanding graduate of his class in engineering.

"I was waiting for the street car to go to school when the mailman came along and handed me the letter telling me about the fellowship and the $1000 that went with it," reminisces Frank.

"I forgot all about the street car. I ran home fast as I could to tell my mother. The next year, I used the $1000 to get a master's degree at M.I.T."

The future was unlimited. In 1929, Frank joined Victor Talking Machine Company in New Jersey; this later became RCA. For 10 years, he applied his ingenuity to developing good loud speakers, pioneering in radio and talking pictures. In 1939, he went to the Brush Development Company in Cleveland and there worked on the problem of underwater sound detection during the war.

At RCA, he met his Irish wife, Georgiana, whom he considers

In a test pool on the laboratory grounds the Massa brothers simulate underwater conditions. Here they test their equipment in 15 feet of water.

his most valuable aide in his business. She still acts as a highly confidential secretary for him, despite raising a family of five children, for two-thirds of the work at Massa Laboratories is

Holds 50 Patents

Maria Massa's little boy inventor has done all right. He holds 50 patents on discoveries, many of them outside the field of ultrasonics. A little gadget he invented to put under pillows and give private radio reception brought him nearly $100,000 from two years' royalties, enough to help him get his company rolling at the start. He also invented a pick-up arm for phonographs.

One of his dreams was stamped with a patent just this week. If it ever gets going—and Frank Massa is confident that it will—it will revolutionize shopping for every housewife in the land. It's a press-button type of shopping from start to finish.

"I think this is the first workable idea for push-button shopping," he says. "There aren't any bugs in it. When you go to the super-market, you're given a key, say, number 25. Walk along the aisles and pick out what groceries you want. Soup. Stick the key into the hole under the kind of soup you want and the can pops out. Put it in your cart and wheel along.

"When you put the key into the hole, the price is automatically registered on an adding machine at the front of the store. By the time your shopping is done, the machine has totalled up what you owe. You come to the cashier, turn in your key, pay your bill and leave. This saves time on the customer's part and will reduce food costs, too, for it lowers distribution costs and eliminates pilferage."

Considering push-button shopping, his mind soars on. He envisions areas in which charge customers are given a permanent key which will open the door of the store any hour of night if they are in need of a load of bread or something. The customer lets himself in, goes to the bread counter, sticks in his key, out pops the loaf, the price is registered with the number of his key automatically on the adding machine. He goes home.

What happens, though, if the customer loses his key? Well, bugs can be ironed out when they turn up!

With Frank in his business is his younger brother, Ernest, also a graduate of MIT. Before the war, Ernest worked with Dr. V. K. Zworykin at RCA in developing the iconoscope, the TV pick-up tube. Then he went to war. He joined his brother as vice president of Massa Laboratories in 1951.