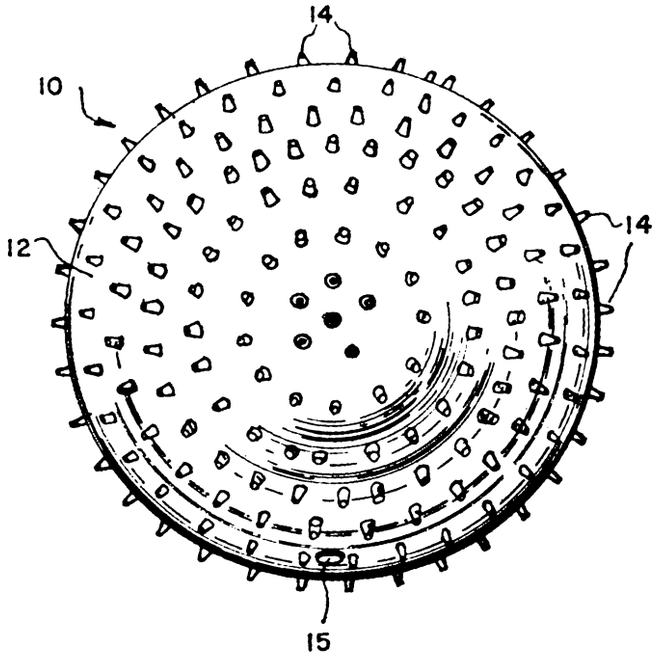
Current Patents

METEOROLOGY

Bumpy Balloons for Smooth Sailing

When the National Aeronautics and Space Administration decided some years ago that it needed a detailed profile of the winds above Cape Kennedy, balloons were the obvious choice as a cheap, easy way to draw it. A large radar antenna was set up to track a few preliminary balloons as they bobbed upward, and the resulting data were analyzed.

Unfortunately, as NASA soon found out, wind changes are much more violent in a vertical direction



than they are horizontally. In fact, differences in wind speed over relatively small distances are often 50 or more times greater vertically than they are at any given altitude. An ordinary spherical balloon, the space agency discovered, will not rise vertically even in a calm atmosphere.

One solution, already in use by the space agency and for which it has just received a patent, is simply to make the surface of the balloon rougher. Small cones, perhaps three inches high for a six-foot balloon, are molded into the balloon's surface, and provide a more stable ascent by stabilizing the point at which the air separates to flow around the balloon. This in turn stabilizes the drag forces that would otherwise make the balloon climb more slowly and follow an erratic course.

The chief U.S. user of weather balloons, however, the Environmental Science Services Administration, does not use the bumpy balloons because they are too expensive for day-to-day use—more than twice as costly as smooth ones. PATENT: 3,340,732

RADAR

Chaff-proof Missile Tracker

As missiles become a more important part of the world's arsenals, they must be prepared to survive increasingly sophisticated countermeasures. An important defense of many missiles is chaff, clouds of reflecting material that are released into the surrounding sky over vast areas to confuse enemy radar.

Chaff, however, floats and falls erratically, while a missile, once outside the damping effect of earth's dense lower atmosphere, tends to gyrate, or wobble, around its center of gravity at a fairly regular rate. This difference is the Achilles heel that makes possible a way of tracking missiles as though their chaff clouds were not even there.

The system was designed in the late 1950's by Leonard Kings and Donald Reiser, two engineers then with Melpar, Inc., a research and development organization in Falls Church, Va. In essence it is a radar system which will "fail completely to track any target which does not have a wobble frequency, such as may be expected of a true missile." Secret from the time it was designed, the system waited nearly nine years to be declassified so that it could be patented.

Getting through chaff can mean great advantages in reliability and cost, the designers point out. A missile located somewhere in a chaff cloud 80 miles wide, 20 miles high and 20 miles deep, for example, might reenter the atmosphere anywhere in a huge ellipsoid 60 miles high, 168 miles deep and 1,300 miles wide. On the other hand, they maintain, if the missile itself could be tracked, the reentry region would shrink to .92 miles by .28 miles by 9.4 miles, well within the capabilities of nuclear anti-missile missiles. PATENT: 3,341,850

SAFETY

Tritium Reveals Hydrogen Leaks

Liquid hydrogen, one of today's most efficient rocket fuels, is also one of the most dangerous, not only because of its extreme cold (minus 423 degrees F.) but because it is highly explosive when mixed with air in concentrations from 75 percent down to as little as 4 percent. An unusual technique for spotting leaks from liquid hydrogen tanks well before the gas reaches even the minimum dangerous concentration has been developed and patented by Aerojet-General Corp., Azusa, Calif.

Present techniques, in which a continual spectrographic analysis is made of the atmosphere outside the tank, are neither sensitive nor fast enough, according to Drs. Joseph Winkler and George V. Melnikov, both of whom were with Aerojet when the patent was applied for about three years ago. As a result, they say, "there have been numerous explosions in recent years resulting in loss of both life and property."

Aerojet's remedy, which has already been put into use by the company, is to mix a tiny amount of radioactive tritium, or heavy hydrogen, with the liquid hydrogen. It doesn't take much—as little as one part in 10 billion by weight will do—although the company says that up to 60 parts per billion can be used. A geiger counter can readily detect the tritium, and can trigger an alarm or a large fan to dispel the hydrogen.

Since tritium's boiling point (minus 418 degrees F.) is almost as low as that of ordinary hydrogen, the two gases are completely compatible; in addition, tritium has a half life of about 12.5 years, which means it could be used over long storage periods. PATENT: 3,340,398