

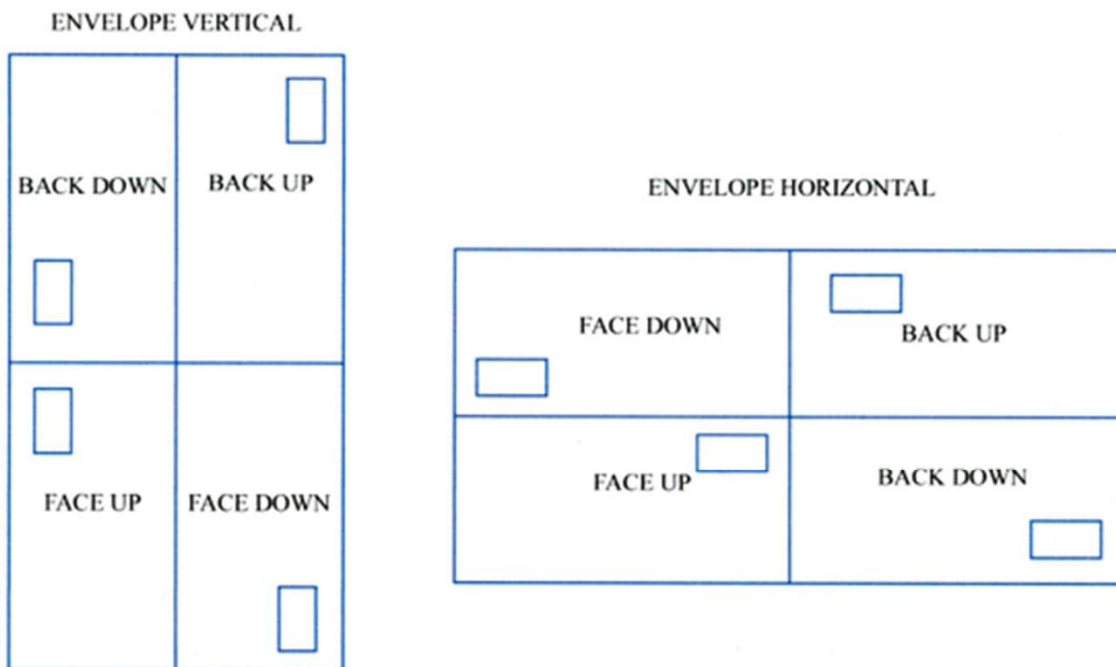
The Beginnings of Postal Automation

An overview of the development of methods of mechanical sorting of mail, from its origins in the early 1960s to the present day, including electrical conduction, phosphor tagging and an introduction to optical bar coding (zip codes). Examples of each type are shown in the form of actual stamps and covers as well as photographic images in visible and ultraviolet light.

The postal issues of Great Britain, Canada and the United States are emphasized, though similar developments were taking place in many nations.

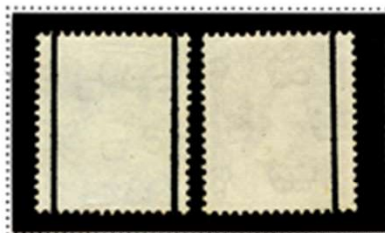
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The intent behind the automation of mail handling was to increase the speed and accuracy of facing, sorting and canceling the mails while reducing costs and manpower requirements during a period when the volume of mail had increased tremendously. To achieve this end, each item must pass through the canceling machinery with its postage located in the same position so the cancellation always hits it. There are eight possible orientations for a stamp, upright and inverted on front and back with the envelope either horizontal or vertical, assuming the stamp is on the upper right corner.



Step one, therefore, is for the equipment to detect the initial location of the postage, after which it rotates the piece to the proper position for canceling.

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There have been four methods generally used to detect the postage: the first, used by Great Britain, was measurement of the reflectivity of the stamp compared to that of the envelope. This was unsatisfactory and the next step was to imprint the backs of the stamps with electrically conductive stripes of graphite-containing ink.

The different classes of mail could be distinguished by using either one or two stripes of graphite. The stamp location and the number of stripes were detected by sensors which measured the change in the conductivity between them as the stamp passed by. In practice, however, thicker pieces of mail decreased the sensitivity and the method was discontinued, although in 1959 during a transitional period, both the graphite lines and phosphor tagging were both used on the same stamps until the detection machinery could be adapted nationwide.

The other three methods are variations on a single theme; the use of an ink which contains a compound activated to fluorescence by ultraviolet radiation, the resulting glow being detected by a sensor. Phosphorescence, fluorescence and luminescence have some technical differences, but those terms will be used interchangeably in this presentation.



Phosphorescent inks were applied to the face of British stamps along the vertical perforations. The inks were activated by long-wave ultraviolet light and the residual afterglow was measured by a sensor immediately afterward. Both Great Britain and Canada, among others, originally employed this method, and Great Britain still does.

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Canada's initial trials with phosphorescent tagging were on the Wilding portrait issue and limited to the Winnipeg, Manitoba area, and it is therefore generally called Winnipeg tagging. This form, as with Great Britain, relies on the afterglow from the stamps after irradiation

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All of the varieties which exist may be seen on the 1963-66 Cameo definitive issue sheet stamps, and this discussion concentrates on that issue, though many appear also on the Wilding and Centennial series as well as many commemoratives. The fact that no coils, booklets or miniature panes until the Centennial series were tagged is a good indication that this was still in an experimental stage.



The Cameo low values were issued from 1¢ through 5¢, both untagged and with two bars of tagging on all but the 4¢, which was for the local delivery rate and had one bar.

The 4¢ value is where the fun begins. In February 1964 the 4¢ stamp was introduced with a 4 mm wide tagging stripe down the center of each vertical row of stamps. This apparently was not effective, and the next step was to move the strip to alternate rows of vertical perforations and make it 9 to 10 mm wide. This saved money, but was no more effective as misalignment of the tagging rollers sometimes missed whole columns of stamps. A decision was made to put the strip back at the center but make it 8 mm wide. This worked well, but costs went back up. By this time, Canada Post had gotten its act together as far as alignment problems and in November the sheets came out with 8 mm stripes on alternate vertical perforation rows, six rows per sheet including the selvages. By December that was changed this to five vertical rows of tagging on the perforations, but not on the selvaige rows. That gave the same number of tagged stamps using 83% of the amount of ink for tagging. This configuration remained until the Cameos were replaced by the Centennials in 1967. The varieties with the side bars can be positively identified on horizontal pairs.

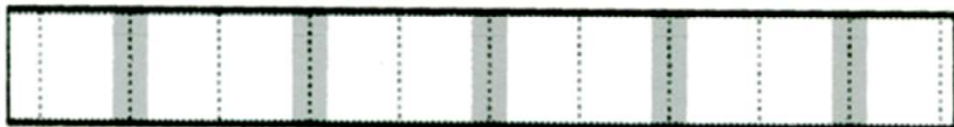
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The full extent of the tagging bar experiments can be seen using multiple stamps or in the last two cases, just the stamp with attached selvage.

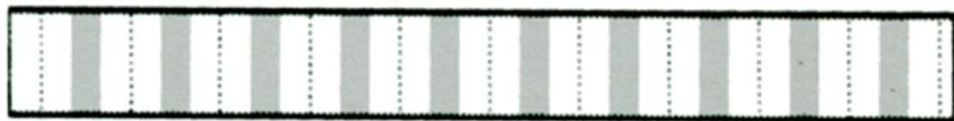
February 1963 - April 1964
4 mm vertical bars down the center of the stamps



April, 1964 - May 1964
9 - 10mm vertical bars down the perforations, 5 bars per pane



August 1964 - November 1964
8 mm vertical bars down the center of the stamps



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The same examples under ultraviolet illumination

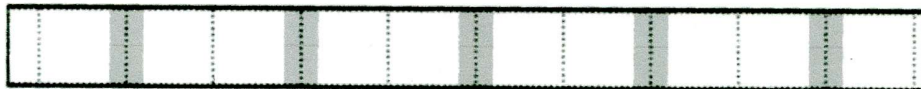
February 1963 - April 1964

4 mm vertical bars down the center of the stamps



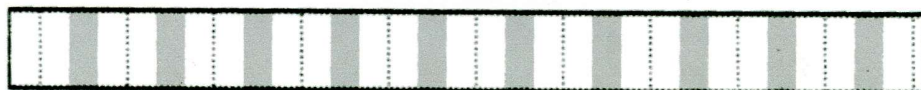
April 1964 - May 1964

9 - 10mm vertical bars down the perforations, 5 bars per pane



August 1964 - November 1964

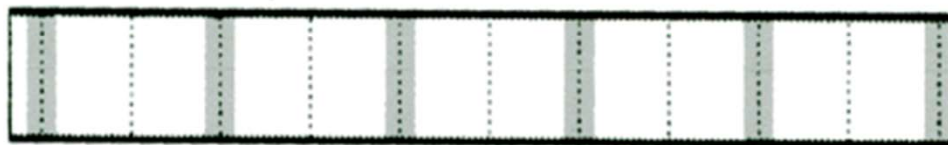
8 mm vertical bars down the center of the stamps



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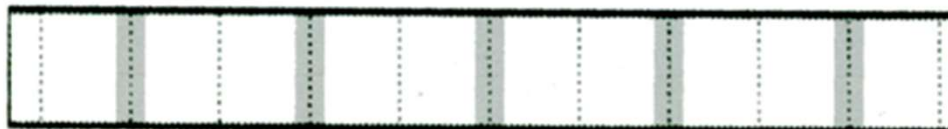
December 1964 - Undetermined

8 mm vertical bars down alternate perforations, six bars per pane
Tagging appears on the left and right selvages.



March 1965 - Undetermined

8 mm vertical bars down alternate perforations, five bars per pane
Tagging appears on neither selvaqe.

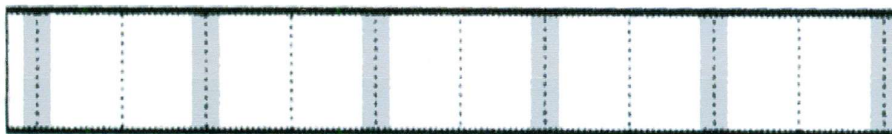


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The same examples under ultraviolet illumination

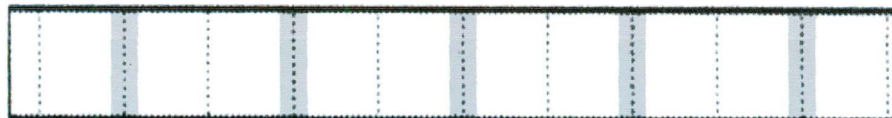
December 1964 - Undetermined

8 mm vertical bars down alternate perforations, six bars per pane
Tagging appears on the left and right selvages.



March 1965 - Undetermined

8 mm vertical bars down alternate perforations, five bars per pane
Tagging appears on neither selva.



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With the introduction of the Centennials, the tagging program was expanded and tagging was applied to the stamps from the 1¢ through 25¢ values, except the large 8¢ stamp, which had been replaced by a smaller stamp by the time tagging started. The program was still limited to the Winnipeg area, however.



Centennial low values with one bar tag - visible light



Centennial low values with one bar tag - uv light

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Centennial low values with two bar tag - visible light



Centennial low values with two bar tag - uv light

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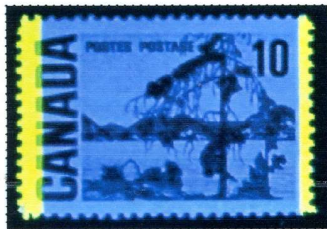


Centennial high values with two bar tag in visible light.
The large 8¢ was obsolete and tagging was believed unnecessary on the 50¢ and \$1.00 values



Centennial high values with two bar tag in ultraviolet light.

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The Winnipeg tagging was effective at the time of its introduction. However, during the 1960s and 1970s recycling of paper became common, and the non-fluorescent characteristics of the stock used for both envelopes and stamp production were often overridden by the effects of the bleaching chemicals used to treat recycled paper. This ranged from a moderate increase in brightness of the paper to an extremely bright stock called "Hibrite." At this point stamp catalogs began listing varieties with varying paper brightness, using three to seven grades, although some collectors consider up to fifteen to be more accurate.

The brightness was often so high that the detectors on the facing-canceling machinery reacted to the paper fluorescence rather than that of the relatively weak tagging ink, rendering the tagging ineffective.

The solution to the problem was the introduction of a new type of ink containing an organic phosphor which was made by GE, called OP-4. This ink produced a bright yellow-green glow under ultraviolet radiation. It was used on all low values of the Centennial series toward the end of this issue's usage except the 5¢ and 7¢, particularly the new smaller 8¢ stamp, plus the 10¢ and 15¢ denominations. It also was used on the five values between 10¢ and 50¢ of the Landscape series introduced in 1973. The new phosphor was called Ottawa tagging, or General tagging, and used nationwide though first introduced in Ottawa.

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Winnipeg tagging



Faded OP-4 tagging



OP-2 tagging



OP-2 with 4 mm bars



OP-2 with 3 mm bars

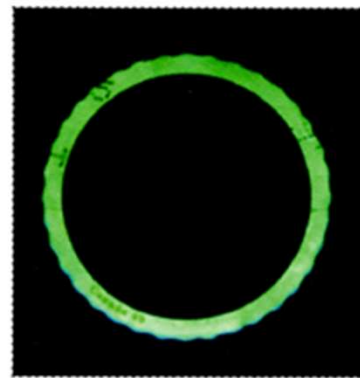
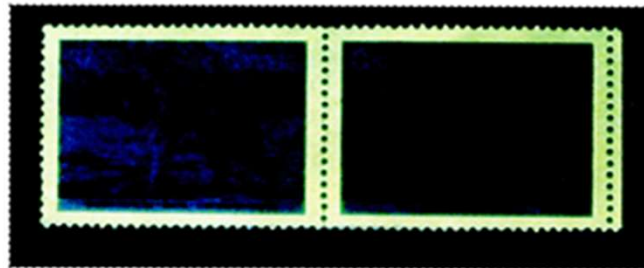
OP-4 was easily detected, however problems quickly arose, as with time it had the nasty side effect of bleeding into the other colored inks, through the paper and even some stamp mounts. The amount remaining on the perforations was much reduced in brightness as a result, leaving it no brighter than the previous Winnipeg tag.

It was quickly replaced by a more stable compound, OP-2, which is brighter and continues to be used today. It has made it possible to narrow the tag lines from 4 mm to 3 mm as well, saving up to 25% of cost of the taggant previously used.



Examples of the "bleeding" on the 25¢ and 50¢ OP-4 tagged stamps.

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The OP-2 type is still in use, the only major change being a box shape rather than stripes on the stamps since about 1985. Many of the recent non-rectangular commemorative stamps of Canada have had the tagging tailored to the shape of the stamp or integrated into the inks to accommodate the odd shapes, such as the circular and irregular stamps shown above.

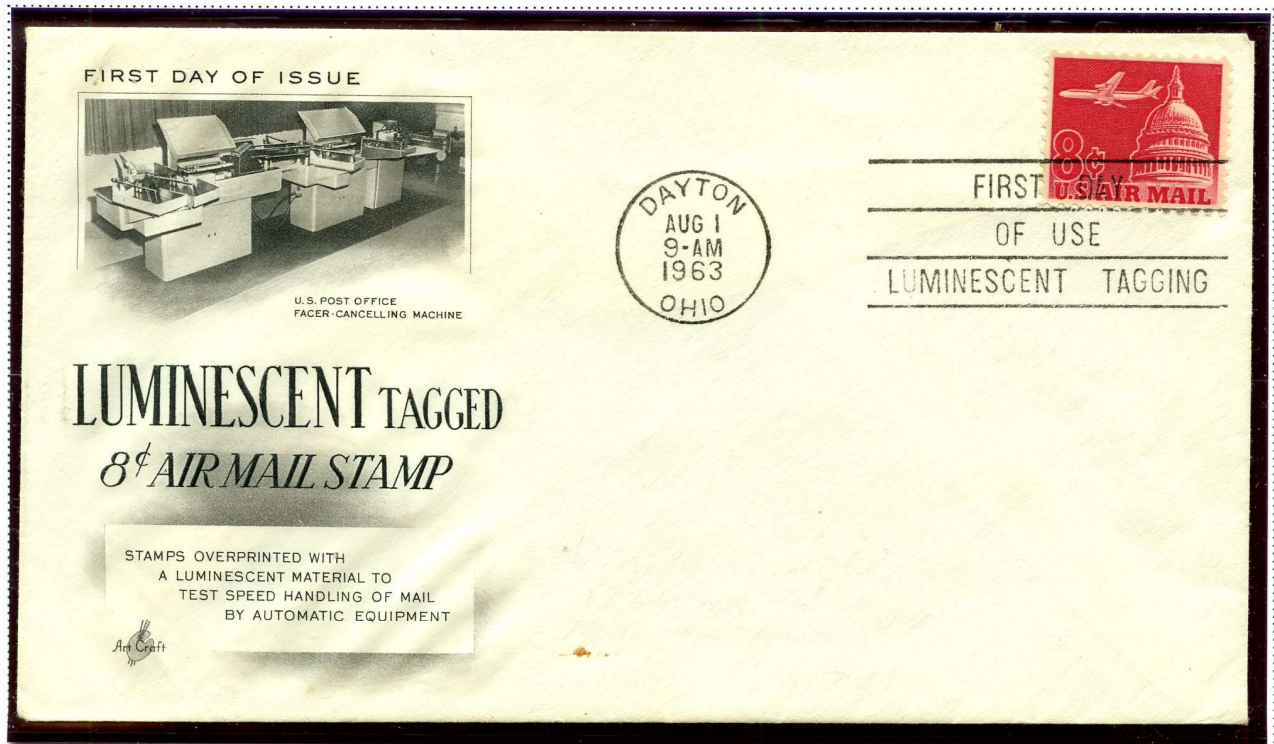
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Recent Canadian stamps have shown a bit of whimsy in the tagging, as on this \$10 whale stamp, where several waves are tagged and a small scuba diver appears at top center. The \$1.15 definitive stamp shows some small logos of Canada Post which only appear under ultraviolet.

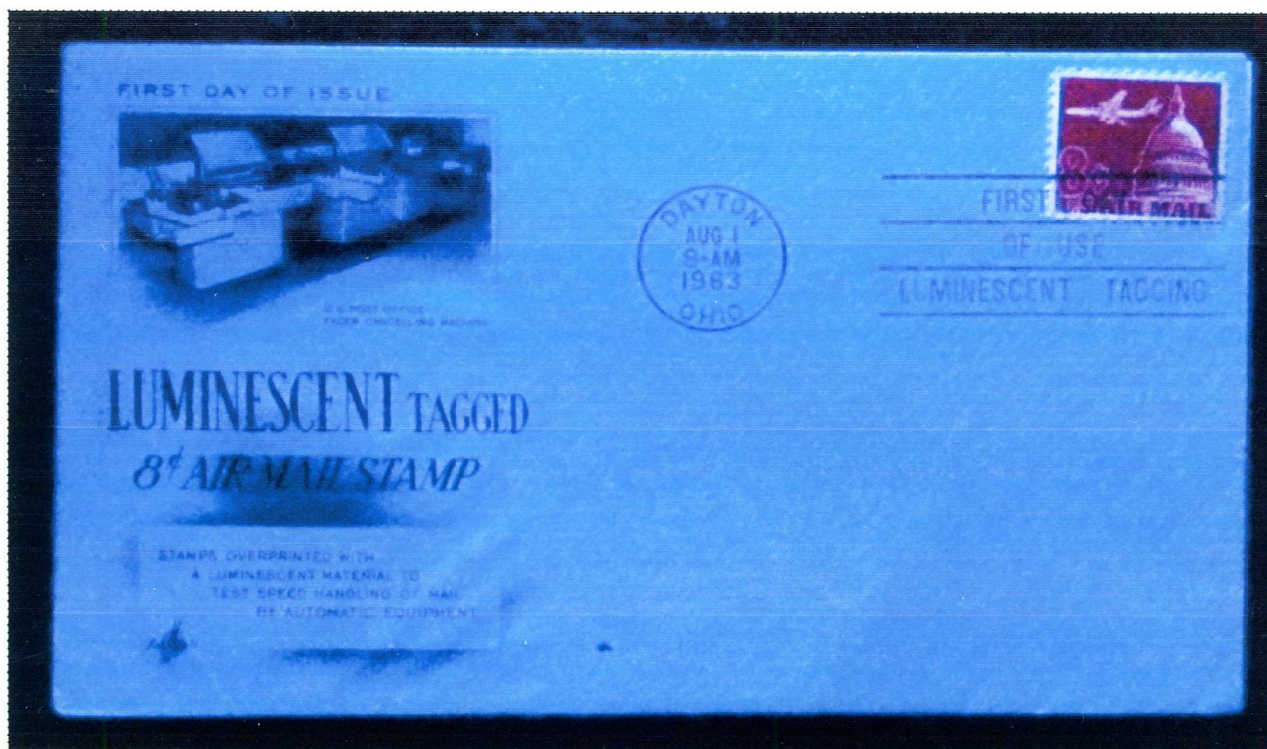
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Use of inks containing luminescent inorganic or organic materials is the third major technology used for tagging. The United States chose this method, and in 1963 issued an 8¢ air mail stamp, # C64a, coated all over with a fluorescent ink which glowed red under short-wave ultraviolet light, but lost its fluorescence as soon as the radiation ceased. Detection was by measuring the reflection off the stamp while illuminated.



C64a First Day Cover - Visible Light

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C64a First Day Cover - Ultraviolet Light

The press release for the initiation of U.S. tagging in 1963 contains a comment which is somewhat amusing over fifty years later:

“Canada, England and Germany are among other nations using these new methods. Canada prints luminescent bars on its stamps, in contrast to the U.S. experiment in overprinting the entire stamp. Bars are sufficient because Canadians affix their stamps right side up, and do not cock them or place them upside down, as American lovers sometimes do as a symbol of affection. This is so because many Canadian stamps are portraits of the monarch and no loyal subject would turn his Queen upside down or sideways.”

When viewing the tagging patterns on newer Canadian stamps, one might wonder if Canadians are as loyal as they were in 1963, or perhaps it is to cope with natives of Quebec.

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The first U.S. issue to have the entire run tagged was the City Mail Delivery stamp of 1963, #1238. Other firsts for that stamp are being the first to use a green phosphor containing zinc orthosilicate, which glows green under ultraviolet radiation, in order to enable sensors to distinguish between first class and air mail letters. The equipment diverted air mail to a different bin by identifying the red phosphor on air mail. It was also the first commemorative stamp to be tagged and the first to have missing phosphor errors discovered.

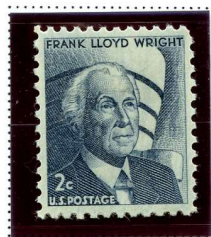
The first definitive stamp to have the entire production run tagged was the 2¢ Frank Lloyd Wright stamp of the Prominent Americans series, #1280, and the first air mail was #C69, the Robert Goddard issue.



#1238



Ultraviolet Light Photo



#1280



Ultraviolet Light Photo



#C69



Ultraviolet Light Photo

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#1057b - The *Look Magazine* Coil



Ultraviolet Light Photo

An unusual event in the history of tagging was the issue of #1057b, the 3¢ Liberty series definitive, which only appeared in tagged condition as a coil stamp used by *Look Magazine*. When first discovered, demands for it from collectors caused the Post Office Department to buy back all remaining stocks from *Look* for distribution, and a philatelic reprint was made which can be easily distinguished from the originals by the brightness of the tagging. Rubber mats were used to apply the phosphor on the original, while steel plates were used for the reprint, giving a much lighter coating.



When the Postal Service initiated its "all up" policy under which the maximum amount of mail was sent by air, the red phosphor was discontinued and green has since been used on all tagged postage.

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As time passed, excessive wear was discovered on the perforating pins attributable to the abrasive nature of the crystalline zinc and calcium-based materials used in the phosphor inks. The response was to print the tagging ink in blocks on the stamps from rubber mats which avoided the rows of perforations, as on these examples from the *Great Americans* series.

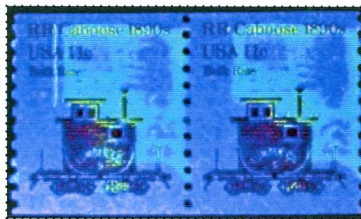


*Large Block Small Block All-over Mottled on
Prephosphored Paper*

Varieties showing this are frequent in the *Transportation* coil series and *Great Americans* definitives as are stamps with “mottled” tagging, caused by the type of roller applying the ink. All these types are *Scott* listed. Large block, small block, all-over and mottled tagging from the *Great Americans* are shown here.

Many newer issues are printed on prephosphored paper, which has been coated with phosphor or had it incorporated during manufacture. It eliminates a step in the printing process, but use of darker colored inks over the phosphor sometimes diminishes its brightness enough to cause detection problems.

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Using the mats to apply tagging ink to the stamps was highly successful in reducing wear on the perforator pins, but no adequate method assured that the tagging overprint was aligned with the visible inks since it was invisible to the eye under normal lighting. Misalignments are common, such as that on the tugboats above, misaligned vertically and horizontally, and horizontally on the cable car stamp. Signs of wear on the mats were generally ignored, leading to examples like the cabooses pair and the Richard Russell stamp. Collecting of these and especially specimens totally missing tagging are a sub-specialty of this area of philately.



Block Tagging

Pre-phosphored Paper

The introduction of pre-phosphored paper was a big breakthrough in the production of tagged stamps, since it eliminated a whole step in the printing process and the need for another “color” ink. Stamps printed this way can be determined because the entire surface is phosphored and the colored ink is on top of the phosphor. One problem is that stamps with very dark designs sometimes leave so little uninked space that sensors do not detect the phosphor. The 25¢ *Honeybee* coil of 1987 on pre-phosphored paper is an example, and its production was discontinued because of this problem.

The two coil stamps above have different types of tagging. The one on the left has the standard 1985 block tag, while the other is on pre-phosphored paper, the small “T” at the bottom indicating it is for test purposes.

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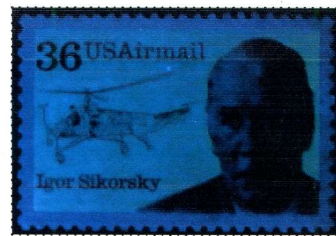
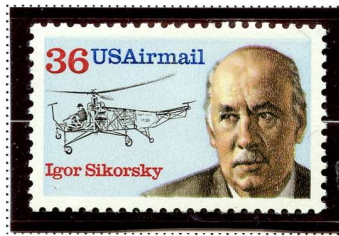


One of variations in the tagging method was the mixing of the phosphor in another color ink. This was done on the Leif Erikson stamp, #1359, where the tagging material was mixed into the gray-brown background ink.

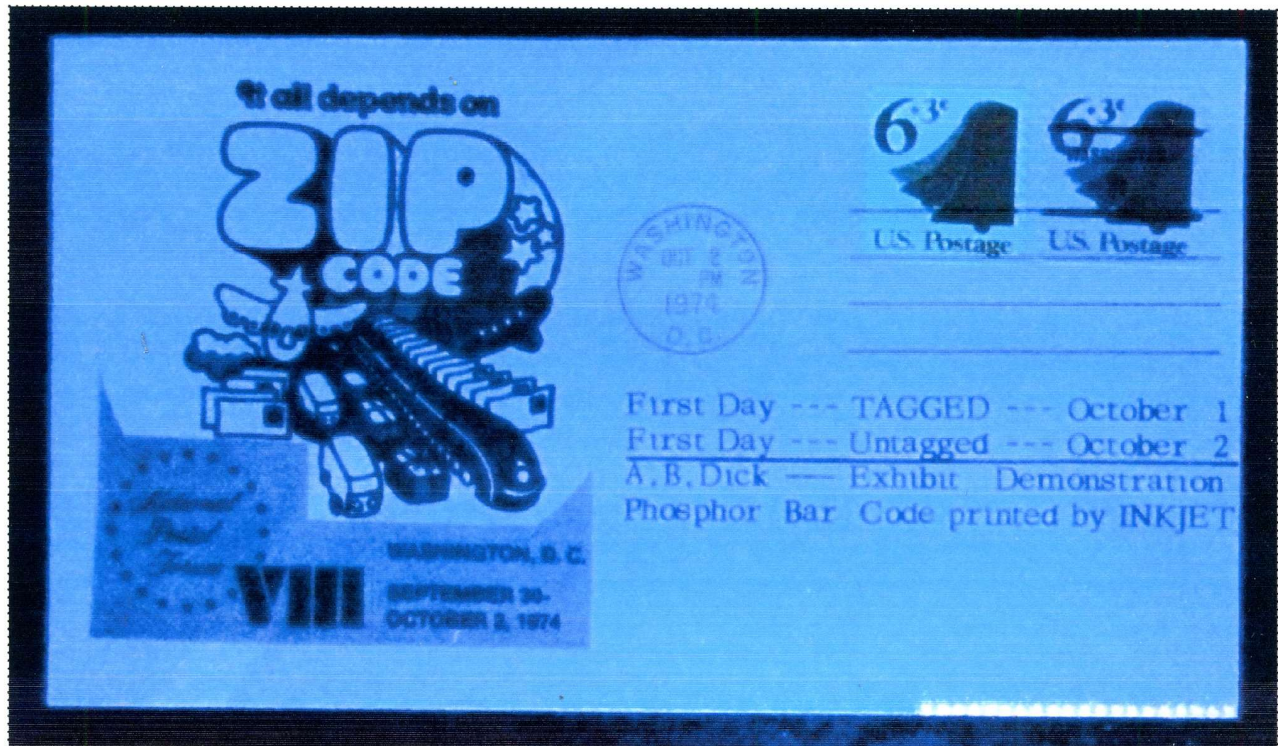


A similar approach was taken on the Classic Cars booklet pane. The only part of the design that is tagged is the white surface beneath each automobile

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The Igor Sikorsky airmail tried a combination of methods. The selvages were not tagged in order to reduce perforator wear, and the phosphor was integrated into the background ink, similar to the Erikson issue.



The Postal Service realized it was wasting a lot of material by tagging all stamps, and ceased tagging Bureau precancels, which of course were never intended to go through the canceling machine, and also all stamps below the postcard rate, which would be expected to be used only as rate make-up stamps except by stamp collectors.

At the lower right edge is one of the first trials of applying a postal code with phosphorescent ink, a method which eventually was considered unsuitable. Some other countries, including Canada and Australia, still use phosphors for coding.

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Postal Stationery did not escape tagging, as on this postcard. An image of the indicia area under ultraviolet light shows a block of tagging over the picture.



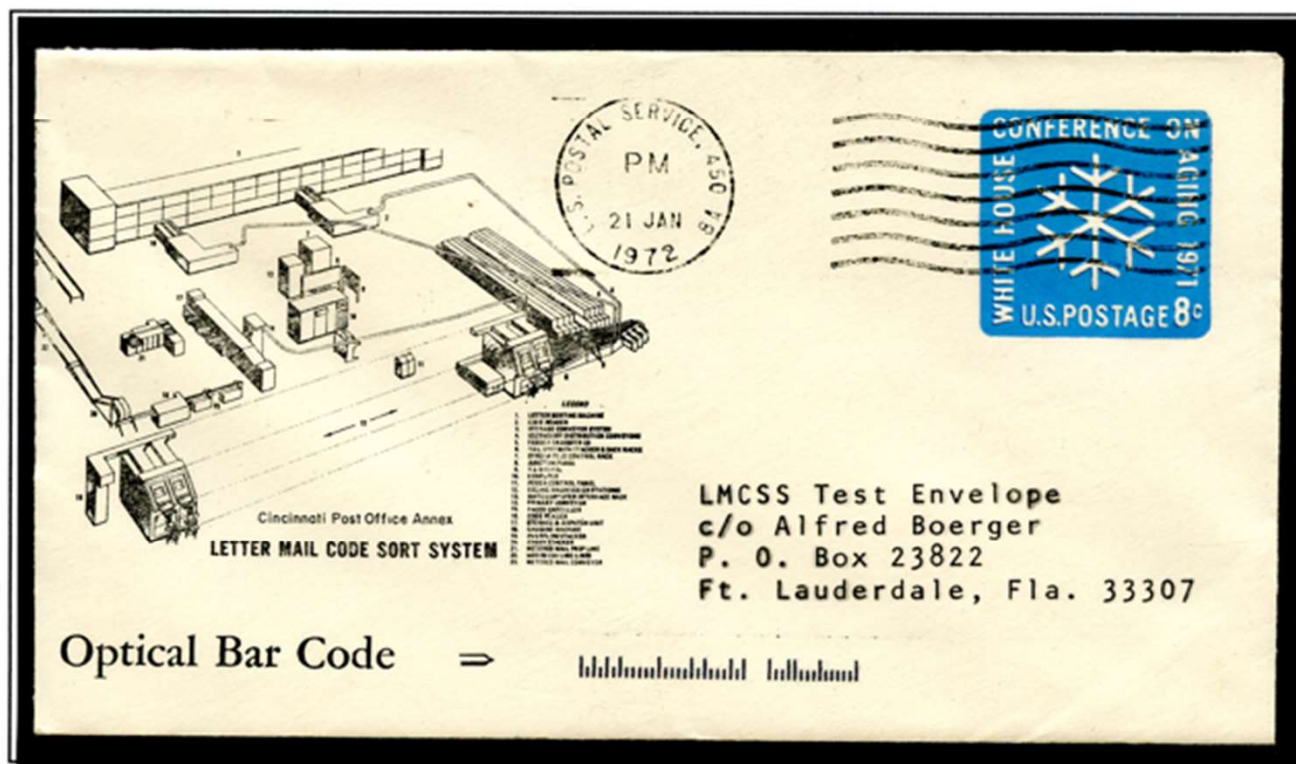
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This tagged airmail postcard has its tagging placed in a small rectangle at the left of the indicia, and it is red, as appropriate for the time period.



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This cover displays the layout of the facing, sorting and canceling equipment used in the Cincinnati post office as used to apply a visible bar code. The code, applied by a spray unit, is shown at the bottom. The cover is also an example of tagging applied in the indicia ink, leaving the embossed area untouched, as shown below.



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The technique using phosphor embedded in the paper before printing has shown increasing frequency, which eliminates one more step in the production process. It can often be detected by the other inks being printed over the taggant. Essentially, this is the direction in which U.S. tagging is heading today.

U.S. stamps are also being more creatively tagged, as shown by the Batman stamp above. Designs in which the phosphor follows the visible design by using cutouts to allow tagging to show through dark inks or simply overprinting using mats with the design on them are becoming more common.

For a number of years, U.S. stamps, especially commemoratives, frequently were issued with both tagged and untagged versions. At present, many of the low denominations, or "make-up" values are not tagged, since they are expected to be used in conjunction with other postage which has had tagging applied. This is an effort to reduce costs, as it does on precancels.

Occasionally, untagged copies of stamps from issues that were supposed to be all tagged are found. They are quite collectible, as in a sense, they are just another "missing color" error, and often bring a healthy premium when sold. When purchased, care must be taken to be sure they have not been chemically treated to remove the phosphor.

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By the use of phosphor tagging and the application of Zip codes, almost all of the manual labor in the sorting and canceling of mail has been eliminated by using automated machinery. It would simply be impossible to handle the volume of today's mail stream using traditional methods.

The first fully automated U.S. post office was opened in Providence, Rhode Island in 1960, and its significance in improving mail handling methods is indicated by the release of a commemorative stamp for the event.

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Over fifty other countries now use phosphor tagging to speed up their mail delivery, and a few examples are shown here from different nations.

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The examples from the preceding page shown under ultraviolet light. Most countries use a phosphor which shows up green. The Belgian and Philippine stamps above both have two different phosphors. These stamps were picked randomly from a bulk mixture and certainly do not represent the full range of phosphor types in use.

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English

Chinese

This selection from the previous page shows the extra effort some postal administrations have gone to to prevent forgeries. The words “Hong Kong” are printed in phosphor ink in English surrounding the portrait of Queen Elizabeth and the same in Chinese ideographs on top of it.

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An Australian automation experiment involved printing a phosphor dot code in a pattern on the back of the cover. An example is shown under ultraviolet light, with the glowing dots across the surface.