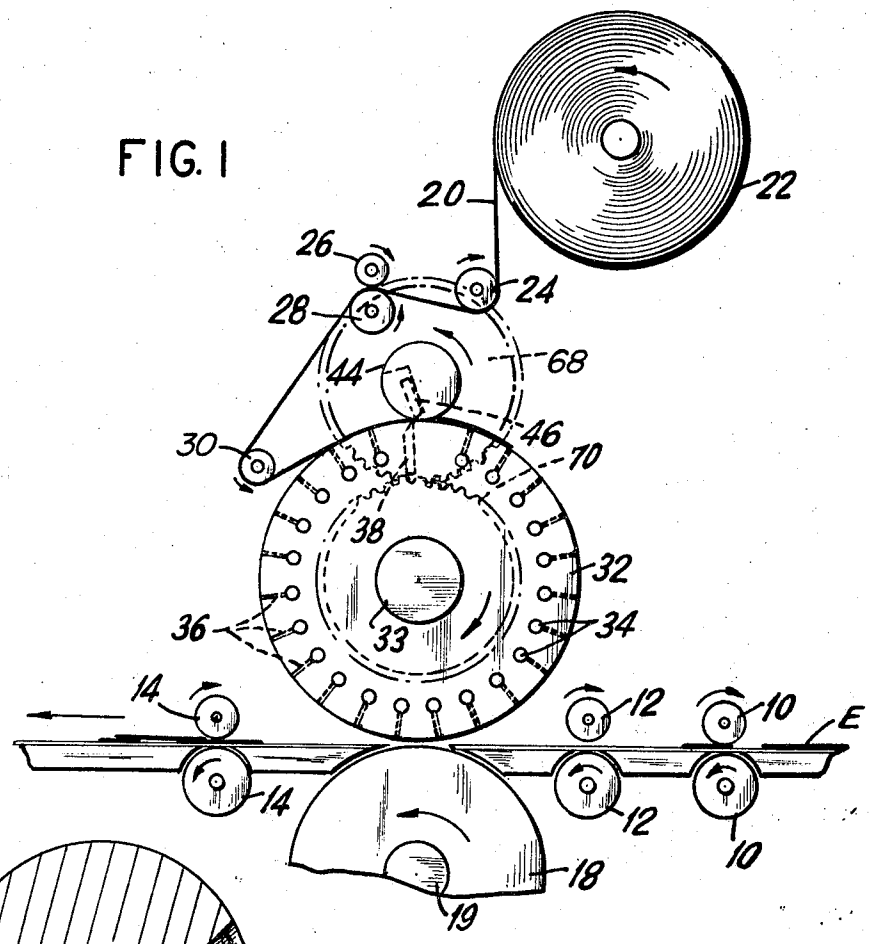
March 11, 1969 M. A. STOVALL 3,431,830

ENVELOPE PATCH CUTTING AND COLLATING APPARATUS

Filed July 25, 1967

FIG. 1



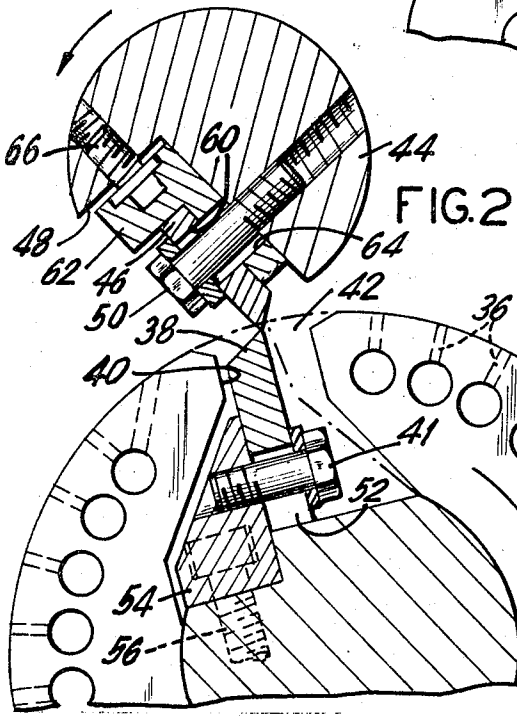




FIG. 2

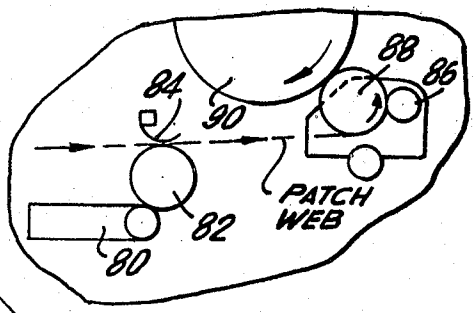



FIG. 3

INVENTOR.
MILTON A. STOVALL

BY

Nolte & Nolte
ATTORNEYS

United States Patent Office 3,431,830 Patented Mar. 11, 1969



3,431,830

# ENVELOPE PATCH CUTTING AND COLLATING APPARATUS

Milton A. Stovall, Altoona, Pa., assignor to F. L. Smithe Machine Company, Inc., Duncansville, Pa., a corporation of New York

Filed July 25, 1967, Ser. No. 655,860
U.S. Cl. 93—61 11 Claims
Int. Cl. B31b 1/82, 1/24, 1/14

## ABSTRACT OF THE DISCLOSURE

In an envelope making machine two coacting, rotary knives having the same angular velocity but different peripheral speeds shearingly cut a patch from a moving web of window material. The mounting arrangement permits only shearing engagement between the knives. The cut patch is removably secured to a vacuum drum that supports one of the knives. Rotation of the vacuum drum causes delivery of the patch thereon to one of a plurality of moving envelope blanks carried by receiving means in the form of a vacuum cylinder, a linearly moving belt or other suitable means. The patch is adhesively secured over the window opening in the envelope blank at the common tangent of the vacuum drum and the receiving means.

The invention relates generally to a method and apparatus used for manufacture of envelopes and more particularly, it relates to improved means for shearing the window patch from a web and directly applying the patch to an apertured envelope.

The present application relates in general to the kind of operation wherein a transparent patch is applied to cover the opening of a window envelope blank. It is particularly directed to a patch applying mechanism wherein provision is made for applying patches directly by a vacuum drum immediately after the patches have been cut from a web. Specifically the invention relates to an envelope window patch applying method and apparatus for use with envelope making equipment that achieves extremely high rates of production. A typical example of such equipment is that described in U.S. Patent No. 2,986,976 issued on June 6, 1961 to A. Novick for Envelope Patch Applier.

For illustrative purposes and ease of understanding, the present invention will be described as it relates to the subject matter of the above-mentioned patent. In the Novick patent, for example, envelope blanks are advanced from right to left, at a uniform peripheral speed. In approaching the patching unit, the envelope blanks pass a gumming mechanism for gumming the marginal area around the window opening of each blank. The blanks are then passed over a bed cylinder roller, which is driven uniformly at the same peripheral speed as the blank feeding members. In the prior art the patch web material was fed at a comparatively lower but uniform speed than that at which the envelope blanks are fed. The web was fed to a patch cutting cylinder and then, when running at envelope speed each cut patch was picked up by a segmented transfer mechanism, also running at envelope speed and adjacent to the cylinder roller. In this prior device provision was made for a knife to be positioned on the patch cutting cylinder, the knife extending slightly beyond the peripheral surface of the cylinder and cooperating with a second, stationary knife positioned adjacent to the patch cutting cylinder for shearing off patches of the designated sizes.

In another embodiment disclosed in the aforementioned patent, the patches were carried by the patch cutting cylinder and applied directly, by pressure, to the envelope blanks as they passed between the bed roller and the patch cutting cylinder. Because the rotating knife in the patch cutting cylinder extended beyond the surface thereof, it was necessary to provide an indentation in the surface of the bed roller in a position timed to coincide with the presentation of the knife from the cylinder. This construction prevented any shear blade contact with the passing blanks.



A different approach to the patch applying problem, U.S. Patent 2,953,071 issued Sept. 20, 1960 to Vincent E. Heywood, discloses the use of a first, large cylinder having a cutter knife positioned above a chordal surface but flush with or slightly below the diametric envelope dimension of the cylinder. The knife coacts with a second rotary cutter knife on a smaller cylinder positioned adjacent to the first cylinder. The two cylinders rotate at a ratio of 2:1 in order to permit clearance of the knife. The patch is applied directly to the envelope blank wherein the patch has been coated with glue, before cut off, rather than the envelope blank being coated as in prior practice described above.

Of particular interest in the 2,953,071 patent is the fact that both the knife cylinder and the cylinder coacting therewith are arranged to rotate in the same direction. There is no direct gearing used. Accordingly the knife must have a helix in order to provide a shearing cut. The construction of the prior art is therefore more expensive to fabricate initially and more difficult and expensive to maintain than the present invention which provides means for shear cutting with a straight knife.

In the modification with which this application is concerned, means are provided for accurately shear cutting a patch from a slow moving web by means of two coacting knives rotating at a 1:1 ratio. One of the knives may be positioned at a small, predetermined angle with respect to the rotational axis of the member supporting that knife. The patch is retained by means of suction on the full-speed drum that carries one of the shearing knives and immediately thereafter placed onto one of the fast, linearly moving or rotary fed envelope blanks. No contact is made between the cutter knife carried by the vacuum drum and the envelope blanks carried by the conveyor because the cutting edge is below the diameter of the cylinder.

Accordingly it is an object of this invention to provide improved means that both cut and apply a patch to a window envelope blank.

Another object of the invention is to provide the aforementioned mechanism wherein two rotating knives coact with one another and wherein the knives are rigidly secured to their respective cylinders.

A further object is to provide two rotary coacting patch cutting knives that perform a shearing operation.

Still another object is to provide improved adjusting means for the cooperating knives in a rotary panel cutting system.

A special object of this invention is to provide improved means for shearing a window envelope patch by means of cooperating cutting elements rotating at different speeds and with the cutting knife position at an angle to the longitudinal axis of the cylinder on which it is mounted.

A particular object is to provide means for imparting the same angular velocity to the two coacting knives while at the same time providing for different relative surface speeds between the two knife edges.

These and other objects, features and advantages of the invention will, in part, be pointed out with particularity and will, in part, become obvious from the following more detailed description of the invention, taken in conjunction with the accompanying drawing, which forms an integral path thereof.

FIG. 1 is a schematic side elevational view showing the components of this invention and their relationship to each other;

FIG. 2 is an enlarged, fragmentary transverse view in section of the cooperating knives and the mounting arrangement thereof on their respective cylinders; and

FIG. 3 is a fragmentary, schematic view of an alternative patch web feed arrangement.

Referring now to FIG. 1 of the drawing, envelope blanks E are continuously advanced from right to left by means of pairs of driver rollers **10**, **12** and **14**, all rotating uniformly at the same peripheral speed. Alternatively the blanks could be delivered by a suitable rotary cylinder. The envelope blanks are advanced over a bed cylinder or roller **18** which is mounted on transverse shaft **19** whereby the cylinder **18** is driven at the same peripheral speed as the drive rollers. At some suitable point prior to roller **18**, the envelope blanks pass a gumming mechanism (not shown) for gumming the marginal area around the window opening of each blank. As will be described hereinafter the present invention can be utilized in a system in which gum is applied to the window patch web.

A web of patch material **20** is drawn downward from a supply reel **22** and over a guide roll **24** by feed rolls **26** and **28**. The web is advanced at a constant, predetermined speed, is passed around another guide spool **30** and then into the surface of a vacuum drum **32**. Transverse shaft **33**, journalled in the side frame of the machine (not shown), rotatably supports the drum **32**. The feed rollers **26** and **28** may be driven at various selected speeds according to the length of patch desired. The rate of web feed controls the length of web feed out in a patching cycle and hence the length of the patch that is cut off and applied.

The vacuum drum **32** has a plurality of longitudinal bores **34** extending through the body from end to end thereof. In turn each of the bores **34** communicate with one of a plurality of radial passages **36** extending to the periphery of the drum **32**. A knife **38** is rigidly secured in a cutout **40** in the drum **32** by means of screws **41** whereby the cutting edge of the knife is disposed in recess **42** and is at or below the peripheral surface of the drum.

The longitudinal bores **34** are closed at one end of the drum **32** but are opened at the other end of the drum and contact the inner face of the stationary vacuum and pressure distributor concentric with said roll, all of which is well-known in the art.

A cutter roll **44** carrying a second knife blade **46** mounted in a recess **48** by means of screws **50** is positioned adjacent suction drum **32** so that once in each revolution at a ratio of 1:1 blade **46** and blade **38** will shearingly bypass each other to sever a patch from the leading end of the web **20**. Roll **44** is suitably journalled in the side frames of the machine.

As shown in FIG. 2 screws **41** pass through suitably shaped notches **52** in order to secure blade **38** to block **54** which is in turn secured to the cylinder **32** by screws **56**. Screws **50** pass through an enlarged opening **60** in blade **46** and through a mounting block **62** also having an enlarged opening **64**. Block **62** is secured to cylinder **44** by the screws **50**. Blade **46** may be adjustably positioned relative to blade **38** by utilizing enlarged openings **60** and **64** together with adjusting screw **66** threadably disposed in cylinder **44**. Suitable means may be employed to lock screw **66** in place.

The open end of bores **34** communicate through a conventional distributor to a source of suction or a vacuum (not shown). The web of patching material is held by suction on the drum **32** from the time of making contact therewith until just prior to entering the nip between the vacuum drum **32** and the roller **18** including that short duration of time when the knives between drum **32**, and roller **18** shear the patch from the web. At the stage



where the patch on the underside of the drum and in direct opposition to an envelope blank the distributor is so arranged that the vacuum is cut off. When the surface of the vacuum drum is spaced apart from the surface of the advancing envelope blanks, there is no danger of the drum surface becoming contaminated with glue and no situations will develop where a patch or an envelope blank may be skipped because of improper timing of the rotating members. Alternatively, direct pressure may be used to apply the patch.

To obtain shearing of the patches without the knife **46** interfering with the peripheral surface of the vacuum drum as they rotate, the knife roller **44** is rotated at the same angular velocity as the suction drum. This insures synchronization of the two knives, the driving ratio of 1:1 being provided by meshing gears **68** and **70** secured to roller **44** and shaft **33** respectively. However, since the upper knife is mounted so that its cutting edge sweeps through a path defining a radius considerably less, for example 2:1 than the radius of the rotating suction drum knife, a relative surface speed between the two edges is obtained, thus providing the essential shearing action. Actual patch cutting takes place below the surface of roller **32** which in FIG. 2 is shown in phantom outline in the knife area.

The apparatus is driven from a power source not shown and through a series of chain drives and sprockets in a conventional and well known manner. The peripheral speeds of the driving rolls **10**, **12** and **14** are synchronized with the peripheral speed of the roller **18** and the vacuum drum **32**. As previously mentioned, the cutter roll **44** is also driven at a 1:1 ratio with respect to the vacuum drum, by selecting gears **68** and **70** respectively having a 1:1 pitch ratio. The synchronization of the delivery of the patches at the same peripheral speed as the lineal travel of the envelope blanks insures accurate registry of the patches on the envelope blanks.

Likewise, driven rolls **26** and **28** for delivering the web of patch material are driven from the same power source by means of sprockets. The ratio of the delivery of the patch material to the speed of the envelope blanks can be changed or varied depending upon the size of the patch that is required.

The first described embodiment contemplated the application of the window adhesive to the envelope blank so that it was permissible to permit the non-coated patch web to traverse rollers **24**, **26**, **28** and any other similar rollers that may be required. However it may in some instances be desirable to have the adhesive applied to the patch web instead. In this case it would be impractical to have a gummed web traverse a series of rollers that will contact either one or both surfaces of the web.

A gum box **80** is provided with a gum transfer roller **82** and the web, shown by the dashed line with arrowheads caused to pass between the transfer roller and a wiper arm **84**. Adhesive is applied to the underside of the web which is then severed by passing between rollers **86** and **88** comparable in structure and operating characteristics to knife roller **44** and vacuum drum **32** respectively. The patch is applied, at suitably timed intervals, to the apertured window blanks carried by roller **90** that is comparable to roller **18** and the assembled envelope is removed by subsequent conveyor means or the like.

From the above description it is evident that the present invention has provided a combination wherein by using the cutter roll knife coacting with a vacuum roll knife and driven at the same angular velocity it is possible to shear cut a patch from a web of patch material and deliver it directly in proper registry to an envelope blank without any of the attendant difficulties associated with the prior art devices. The present invention eliminates costly requirements for special surface configurations of drums and/or rollers, while at the same time insuring freedom from gumming up or contamination of the suction drum surfaces.

There has been disclosed heretofore the best embodiment of the invention presently contemplated. It is to be understood however that various changes and modification may be made by those skilled in the art without departing from the spirit of the invention.

What I claim is:

1. In a machine for making envelopes having window patches thereon, improved apparatus for severing patches from a supply web and for applying the patches to successive envelope blanks, said apparatus comprising:
   (a) first and second coacting knives rotatable at substantially the same angular velocity and at different surface speeds;
   (b) means to feed the supply web between said knives; and
   (c) rotatable patch transfer means arranged to receive the cut patches on the surface thereof and to deposit the cut patch on the envelope blank.

2. The apparatus in accordance with claim 1 including a rotatable member supporting said first knife and wherein said second knfe is secured to said patch transfer means.

3. The apparatus in accordance with claim 2 wherein the cutting edge of said second knife is positioned below the diametric outline of said patch transfer means.

4. The apparatus in accordance with claim 2 including means adjustably supporting said first knife.

5. The apparatus in accordance with claim 2 wherein the length of the rotational path of one of said knives is substantially greater than the length of the rotational path of the other of said knives.



6. The apparatus in accordance with claim 5 wherein the ratio of the lengths of rotational paths of said first and second knives is in the order of 2:1.

7. The apparatus in accordance with claim 2 including gear means in meshing engagement and secured to said rotatable member and said patch transfer means whereby said first and second knives rotate at substantially the same angular velocity.

8. The apparatus in accordance with claim 2 including means for applying suction to the patches to hold the patches on said transfer means for a predetermined length of travel.

9. The apparatus in accordance with claim 1 wherein the cutting edge of one of said knives is set at an angle to the rotational axis thereof.

10. The apparatus in accordance with claim 1 including means to remove the patch from said transfer means prior to depositing the patch on the blank.

11. The apparatus in accordance with claim 1 further comprising an adhesive applying means for transferring adhesive to said supply web prior to severing patches therefrom.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,953,071 | 9/1960 | Heywood | 93—61 |
| 2,986,976 | 6/1961 | Novick | 93—61 |

BERNARD STICKNEY, *Primary Examiner.*

U.S. Cl. X.R.

83—343