Aug. 8, 1972 C. V. NEWTON 3,682,740

METHOD AND MEANS FOR PRE-APPLYING GLUE AND REACTIVATING IT FOR CONTINUOUS FORM COLLATING

Filed July 1, 1969 2 Sheets-Sheet 1

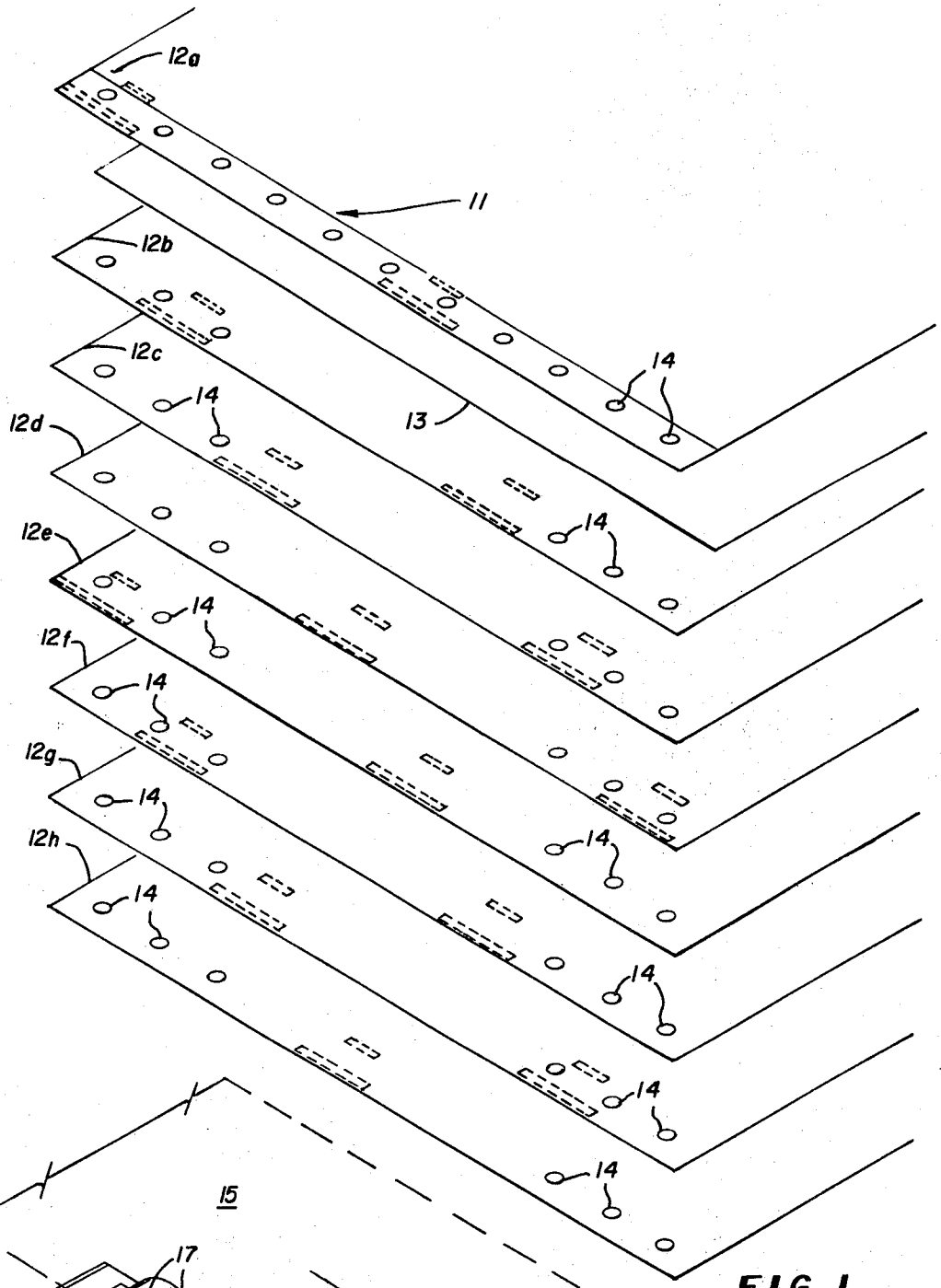

FIG. 1

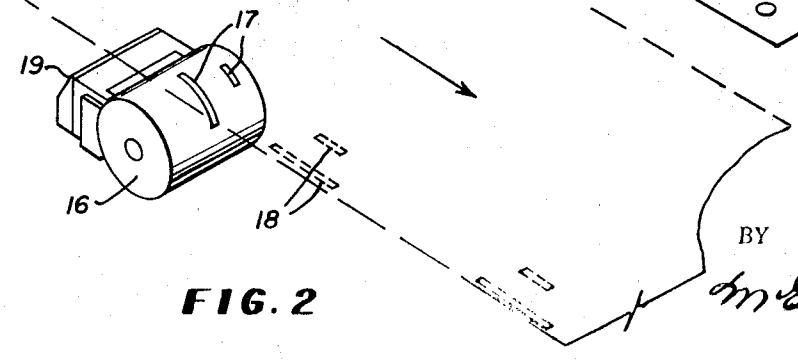

FIG. 2

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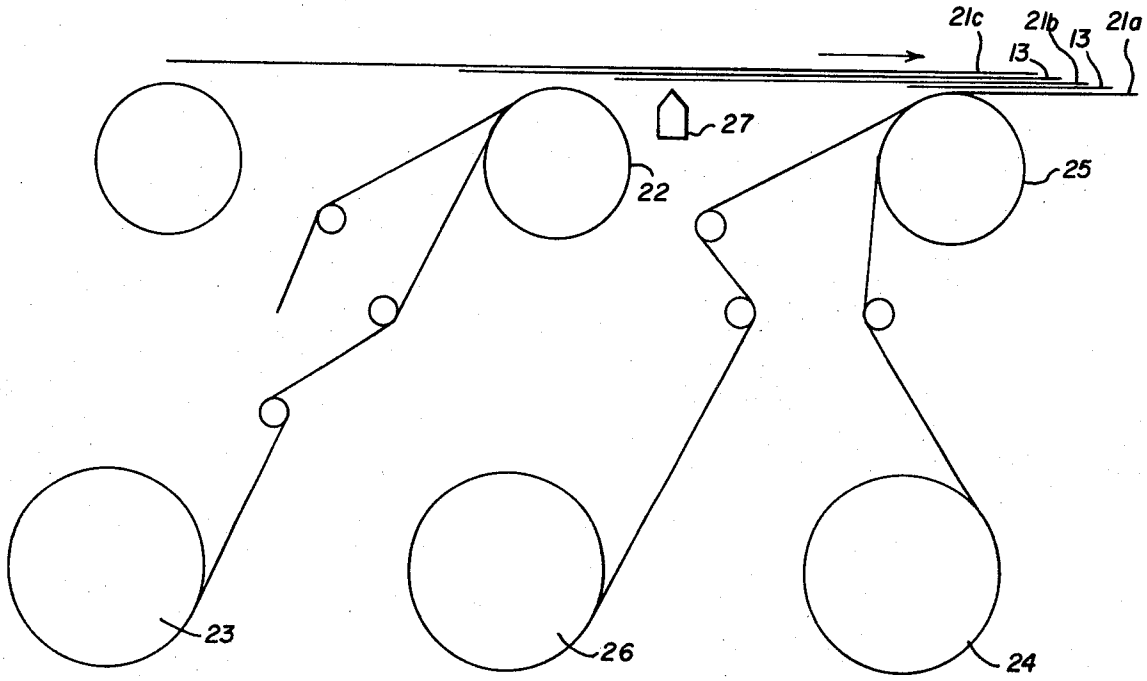

FIG. 3

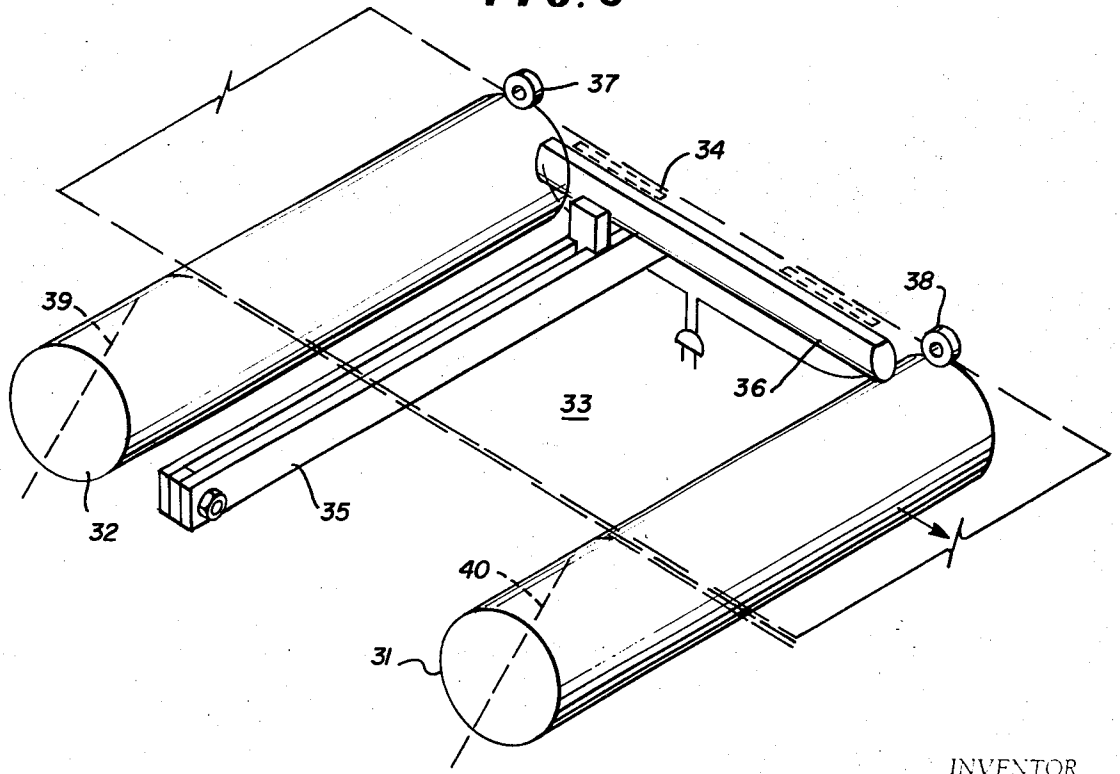

FIG. 4

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METHOD AND MEANS FOR PRE-APPLYING GLUE AND REACTIVATING IT FOR CONTINUOUS FORM COLLATING

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U.S. Cl. 156—291 9 Claims

ABSTRACT OF THE DISCLOSURE

A hot melt system and a remoistening cold glue system are provided for adhesive application to collated forms on printing machines in short lengths and in staggered arrangement with alined relation established infrequently for thin superposed strips. Perforation lines are not crossed in staggered printing pattern, and after drying, heat source between two collator rolls softens pre-applied glue to required tackiness and makes bond on following roll. Low solvent resin glue applied in similar pattern on printing machine dries before discharge from printer. Water is applied through metering head disposed between collator rolls for re-moistening and reestablishing its bonding properties.

This invention relates to a method and means for pre-applying adhesive material to collated forms and reactivating the adhesive during movement of a stack of collated forms over a collator roll.

At the present time, multi-part printed forms are incorporated in continuous arrangement for use in tabulators, data processing machines and similar business machines. These forms are made by printing the appropriate width paper roll to roll in one operation and in a second operation, the various copies are combined at the same time with interleaving carbon paper on continuous web collator machines. The collator incorporates equipment for putting in cross perforations intended for later separation of sucessive forms from each other. It also permits making a rectangular stack of the still connected forms so that they can be put into shipping containers in numbered quantities.

Such forms are used on both slow and high speed tabulators and accounting machines. A serious problem is encountered with high speed machines when the glue lines put on by the collator stiffen the edge of the forms. In such condition, they do not conform to the tabulator rolls and come off the drive pins. Another difficulty is encountered if the fold line is prevented from straightening quickly and completely. The resulting hump hits a machine clearance limit switch and shuts down the machine. Also, when the glue does not set tightly before the fold is made, the copies may move in relation to each other, misaligning the drive pin holes and making a hump at the fold line. Both of these defects are not tolerated by the tabulator. Further, a thick glue line causes the fan folded stack to stack unevenly and slope sharply to one side.

Ideal specifications for glue application for collating are:

(1) The forms must be held firmly together, preventing shifting during folding. Carbon paper must be held in place sufficiently well to avoid wandering while the form is being run through the tabulator.

(2) The glue and its handling system must provide fast "tack" so that the full speed of the collator can be used.

(3) The amount of glue applied must be minimal to minimize thickness build-up where the forms are joined and to minimize stiffening effect. The glue cost also must be held to a minimum and the collated forms must not show "tenting" at the fold line, but must straighten easily and completely.

The practice of the present invention incorporates a number of innovations in the production of collated forms. The adhesive applied to the sheets comprising the stack is applied when the individual sheets are on the printing machine because there is not enough space on existing collators to install the right kind of applicator and a collator would require many more applicators than a printing machine. Actually, the collator woud have to have the number of applicators less one of the number of parts it can collate, whereas the printer requires only one applicator, or may have a maximum of two, to allow two-edge gluing on collator if called for.

Another innovation of the present practice is the provision of a choice as between use of a hot melt adhesive system and a cold glue system. Two families of adhesives are known which are capable of giving the proper bond in the time available. These include the ethylene-vinyl-acetates (thermoplastic adhesives for pre-application) and the cold glues which are resin gums that can be reactivated by moistening.

Still another innovation of the present invention is the patter of application of the adhesive to the collated forms. The adhesive is applied as short strips of very thin tacky adhesive to the successive sheets comprising a stack while moving on a printing machine with the progression of strip applications arranged in staggered or stepped relation through a predetermined sequence before repetition of such sequence in the given stack. In this way, only a small plurality of strips of each stack are placed in superposed alinement and the stack is only slightly thicker than the total thickness of the sets comprising the stack.

Two methods of reactivating the adhesive are disclosed. When the hot melt adhesives are employed, a heat source is provided between collator rolls which directs the heat in such a way that the tacky condition is restored within a relatively brief time interval in passage between collator rolls so that bonding occurs in the passage of the stack over the collator roll following the heat application.

Similarly, when the cold glue system is employed, a remoistening action is provided between collator rolls, usually by continuous moistening of the sheet surfaces in which the strip occurs so that as the moistened adhesive reaches the following collator roll, its tacky condition has been restored and bonding occurs in the passage of material over such roll.

Accordingly, it is an object of my invention to provide a simple, economical and efficient method of pre-applying adhesive bonding elements on a stack of collated forms and reactivating the adhesive applied at a desired stage in the movement of the collated forms through the collator.

Another object of my invention is the provision for pre-applying adhesive to selected surfaces of forms to be collated while on a printing machine with small increments of applied adhesive arranged in a staggered pattern on successive forms so that repetitions of such increment in superposed relation occur infrequently through the stack, usually not exceeding three occurrences in a stack.

A further object of the invention is the provision of a novel applicator for adhesive on a printing machine which is simple, durable and efficient and easily installed on such a machine.

Still another object of the invention is to provide a simple, durable and efficient reactivating means for collated forms having hot melt adhesive strips pre-applied for bonding.

Yet another object of my invention is to provide a novel circulating arrangement for the application of cold glue in short segments to the collated forms being moved on a printing machine.

Other objects reside in novel details of construction and novel combination and arrangements of parts, all of which will be fully described in the course of the following description.

The practice of my invention will be described with reference to the accompanying drawings illustrating in essentially schematic form, the printing pattern employed and the equipment arrangements at the various stages of the procedure. In the drawings, in the several views of which like parts bear similar reference numerals,

FIG. 1 is an exploded view of an 8-part collated form with only one carbon interleaf shown and the others omitted, which view shows a preferred pattern for the staggered arrangement of adhesive strips in spaced relation to drive pin holes forming rows of infrequent repetition;

FIG. 2 is an isometric view of the arrangement of a hot melt glue applicator on a printing machine applying strip patterns of the type shown in FIG. 1;

FIG. 3 is a schematic side elevation of part of a web collator with certain parts omitted to better show the essential operating components for reactivating previously applied adhesive;

FIG. 4 is an isometric view of a preferred arrangement of reactivating means for the hot melt strips of collated forms passing between successive collator rolls.

Two systems are disclosed for pre-applying a glue or other adhesive followed by drying and subsequently by reactivating the dry adhesive surfaces for continuous form collating. One such system is what is designated as a hot melt adhesive system in which the adhesive is brought to a tacky condition by heating before it is applied to the sheets forming the stack in a printing stage of the operation. At a later stage, it is reactivated by heat application and performs its bonding function during passage of the stack over a collator roll. The other system is called the cold glue system and employs a glue or adhesive that becomes tacky from wetting and is air dried. It can be reactivated by moisture application.

In preferred practice, the pre-applying procedure involves the application of the adhesive in short strips in a staggered pattern on opposite sides of the row of drive pin holes in the sheet. Through changing the strip position on successive sheets, a substantial number of such sheets will be produced before there is a duplication of the strip pattern and only a small plurality of duplications, such as two or three, will occur at any selected position adjoining the row of drive pin holes.

FIG. 1 illustrates the preferred practice described above. To avoid unnecessary detail in the drawing, a typical stack has been shown with only one carbon interleaf included, but it will be understood that there is a carbon sheet provided for each printed sheet comprising the stack. As shown, the stack is designated generally by the reference numeral **11** and comprises in top-to-bottom sequence a top printed form or sheet **12***a*, an interleaf carbon sheet **13**, a second form **12***b*, a third form **12***c*, a fourth form **12***d*, a fifth form **12***e*, a sixth form **12***f*, a seventh form **12***g* and an eighth form **12***h*. Each form sheet has a row of drive pin holes **14**, only portions of which have been illustrated. Glue lines are applied on each side row **14** in strips as previously described, and the staggered or stepped effect is obtained by a lengthwise advance of the strips along the row on successive sheets until the pattern reaches the midpoint of the sheet, and thereafter the earlier patterns are repeated in sequence. Thus, form **12***e* is a repeat of form **12***a*, and **12***f* is a repeat of form **12***b*, for example. The glue strips are applied to the underside of the sheet as represented by the dash line pattern shown on the form.

It will be obvious from the showing of FIG. 1 that with the glue applied to the form as a thin strip and with just a limited position duplication of the strips in the stack, only an insignificant increase in thickness of the stack results from the total glue application on the forms of the stack and does not produce stiffening of the edge of the form. Consequently, such a stack is capable of good tracking in its subsequent movement over the tabulator rolls.

FIG. 2 discloses in more or less schematic form an arrangement for intaglio shaping of glue patterns on a strip **15** similar to the sheets **12***a* through **12***h*. The glue application roll **16** is arranged for application of a hot melt adhesive to the strip **15** and has its circumference in size relation to a printing machine basic cut-off and its multiples. The roll **16** is mounted for rotation so that a portion of its circumferential surface bears against a portion of sheet **15** adjoining one of its sides and the intaglio shapes **17** are formed in the periphery of roll **16** to apply the hot melt glue in short strips **18** of any desired dimension. In order to keep the adhesive fluent so that it may be applied in a thin strip, a glue supply tank **19** adjoins roll **16** and is heated under suitable temperature controls so as to maintain the adhesive at a desired temperature through periods of continuous operation. It will be apparent by comparison of FIGS. 1 and 2 that the strip pattern of FIG. 2 is essentially the same as the patterns disclosed in FIG. 1.

FIG. 3 illustrates in schematic arrangement a convenient installation for applying cold glue to the form sheets of a collator stack to show how printed sheets and carbon paper are put together to form the stack. In this arrangement, form sheets **21***a*, **21***b* and **21***c* are shown as making up an incomplete stack and carbon sheets **13** are shown as being in interleaf relation with said sheets. The operating assembly includes a drive roll **22** drawing lengths of paper from a printed paper roll **23** and a second printed paper roll **24** also provides a paper supply to a second drive roll **25** with carbon paper withdrawn from a supply roll **26** being disposed in interleaf relation as the sheet **21***a* and first interleaf **13**, for example, pass from the drive roll **25** to assume their positions at the base of the stack being formed. A remoistening applicator **27** is disposed between the drive rolls **22** and **25** and applies a fine spray of water to dried glue strips on the sheet material passing above it which usually is a continuous strip of adhesive previously applied by a printing machine to the undersurface of the sheet passing above the applicator **27**.

It is also possible to have an arrangement in which the cold glue will be applied in the printing machine to provide a pattern effect such as shown in FIG. 1, but with the moisture application as shown providing the required reactivating effect, a generally satisfactory bonding effect will be obtained through use of the continuous strip provided the total adhesive so applied to a pack does not increase its overall thickness to any substantial degree.

FIG. 4 illustrates a reactivating system for hot melt adhesives which are traveling between collator rolls after a pre-apply treatment. The arrangement is essentially schematic and illustrates a drive roll **31** in spaced relation to another drive roll **32** in an arrangement similar to rolls **22** and **25** of FIG. 3. A sheet of continuous printed material **33** having a strip pattern **34** produced in a pre-apply treatment is shown as moving from drive roll **32** toward drive roll **31** and another sheet **40** is being drawn by drive roll **31**. Intermediate said rolls a support bracket **35** carries an elongated heater **36** over which sheet **33** rides in its movement from drive roller **32** to drive roller **31**. Pressure rollers **37** and **38** are arranged to compress the sheets moving over rolls **31** and **32** so that a firm bond is made. The heat thus applied is sufficient to reactivate the applied adhesive to a tacky state and as it passes over drive roll **31**, it is forced by pressure roller **38** into bonding relation with another sheet, such as the sheet or strip **39** which is brought in contact with sheet **33** during their passage over drive roll **32**.

From the foregoing, it will be apparent that the practice of the present invention provides simple and efficient mechanical systems for pre-applying an adhesive to the sheets of a collator stack at the printing stage and subse-

quently when the stack is passing through the collator stage, the dry adhesive is reactivated by application of externally applied matter or energy to bring it again to a tacky condition and in its passage over the next roll in its course of movement, a bonding with adjoining material is effected. The present invention provides for use of either cold glue application to the sheets or a hot melt adhesive and a convenient means of reactivating each has been disclosed.

I claim:

1. A method for pre-applying and reactivating adhesive bonding elements of a stack of collated forms, which comprises applying such adhesive selected from the group consisting of thermoplastic adhesives and cold glues as short strips of thin tacky consistency on a plurality of sheets comprising such a stack while each sheet is moving on a printing machine, arranging a progression of strip applications in stepped relation through a predetermined sequence of forms before repetition of said sequence in a given stack, whereby only a small plurality of strips of each stack are placed with the strip pattern in superposed alinement in the formed stack, drying the strips of each sheet so formed before discharge from the printing machine, moving the formed stack over spaced rolls of a collator, altering the dried adhesive surfaces during travel between collator rolls by restoring the tacky quality to said surfaces of the strips, and bonding adjoining stack surfaces on the reactivated tacky strip during progress of the stack over a following collator roll.

2. A method as defined in claim 1, in which the tacky quality of the strips is restored by wetting.

3. A method for pre-applying and reactivating adhesive bonding elements of a stack of collated forms, which comprises applying such adhesive selected from the group consisting of thermoplastic adhesives and cold glues as short strips of thin tacky consistency on a plurality of sheets comprising such a stack while each sheet is moving on a printing machine, arranging a progression of strip applications in stepped relation through a predetermined sequence of forms before repetition of said sequence in a given stack, whereby not more than three strips of each stack are placed with the strip pattern in superposed alinement in the formed stack, drying the strips of each sheet so formed before discharge from the printing machine, moving the formed stack over spaced rolls of a collator, altering the dried adhesive surfaces during travel between collator rolls by restoring the tacky quality to said surfaces of the strips, and bonding adjoining stack surfaces on the reactivated tacky strip during progress of the stack over a following collator roll.

4. A method for pre-applying and reactivating adhesive bonding elements of a stack of collated forms, which comprises applying such adhesive selected from the group consisting of thermoplastic adhesives and cold glues as short strips of thin tacky consistency on a plurality of sheets comprising such a stack while each sheet is moving on a printing machine, arranging a progression of strip applications in stepped relation through a predetermined sequence of forms before repetition of said sequence in a given stack, whereby not more than two strips of each stack are placed with the strip pattern in superposed alinement in the formed stack, drying the strips of each sheet so formed before discharge from the printing machine, moving the formed stack over spaced rolls of a collator, altering the dried adhesive surfaces during travel between collator rolls by restoring the tacky quality to said surfaces of the strips, and bonding adjoining stack surfaces on the reactivated tacky strip during progress of the stack over a following collator roll.

5. A method as defined in claim 1 in which the stepped strips are applied in patterns disposed inwardly and outwardly of the plane through the drive pin holes in the respective sheets.

6. A method for pre-applying and reactivating adhesive bonding elements of a stack of collated forms, which comprises applying short strips of thin hot melt adhesive on a plurality of sheets comprising such a stack while each sheet is moving on a printing machine, arranging a progression of strip applications in stepped relation through a predetermined sequence of forms before repetition of said sequence in a given stack, whereby only a small plurality of strips of each stack are placed in superposed alinement in the formed stack, drying the strips of each sheet so formed before discharge from the printing machine, moving the formed stack over spaced rolls of a collator, subjecting the dried adhesive surfaces during travel between collator rolls to an externally applied heating action capable of restoring the tacky quality in the strips, and bonding adjoining stack surfaces on the reactivated tacky surface during progress of the stack over a following collator roll.

7. A method as defined in claim 6, in which a linear heat source is disposed between collator rolls so as to heat the area over which the strip pattern passes in its progression between said collator rolls.

8. A method for pre-applying and reactivating adhesive bonding elements of a stack of collated forms, which comprises applying short strips of thin, fast-acting cold glue on a plurality of sheets comprising such a stack while each sheet is moving on a printing machine, arranging a progression of strip applications in stepped relation through a predetermined sequence of forms before repetition of said sequence in a given stack, whereby only a small plurality of strips of each stack are placed in superposed alinement in the formed stack, drying the strips of each sheet so formed before discharge from the printing machine, moving the formed stack over spaced rolls of a collator, subjecting the dried adhesive surfaces during travel between collator rolls to the action of a water spray capable of restoring the tacky quality of the glue in the strips, and bonding adjoining stack surfaces on the reactivated tacky surface during progress of the stack over a following collator roll.

9. A method as defined in claim 8, in which the strips are subjected to continuous wetting in the travel of the stack between rolls.

References Cited

UNITED STATES PATENTS

3,320,109	5/1967	Braner	156—252
3,303,083	2/1967	Hedenstrom	156—513
3,255,679	6/1966	Eckels	93—1
3,196,065	6/1965	Liszewski	156—291
3,112,125	11/1963	Darrow	282—11.5

FOREIGN PATENTS

898,484	6/1962	Great Britain	16—A8 N

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U.S. Cl. X.R.

156—306, 320