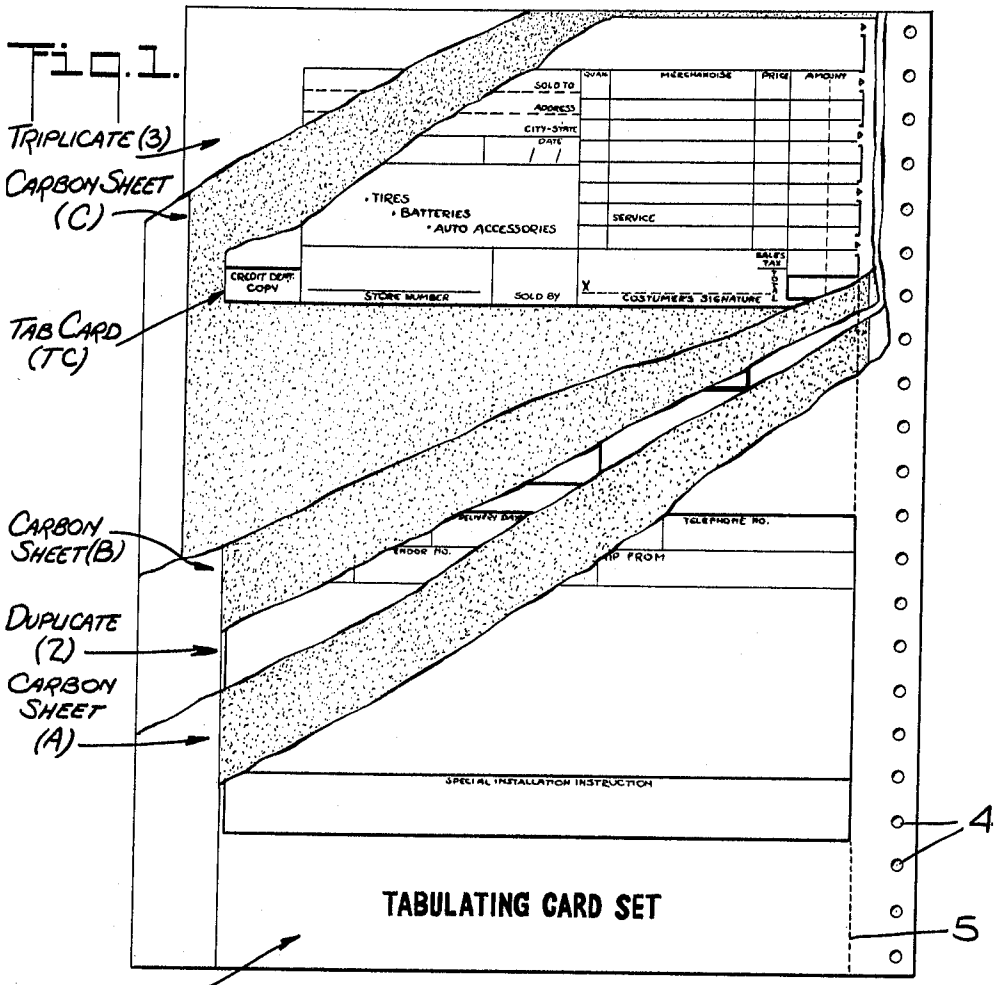
May 3, 1966 L. V. WISE 3,249,352

COLLATING MACHINE FOR PRODUCING TAB CARD SETS

Filed Jan. 21, 1965 4 Sheets-Sheet 1

Fig. 1.



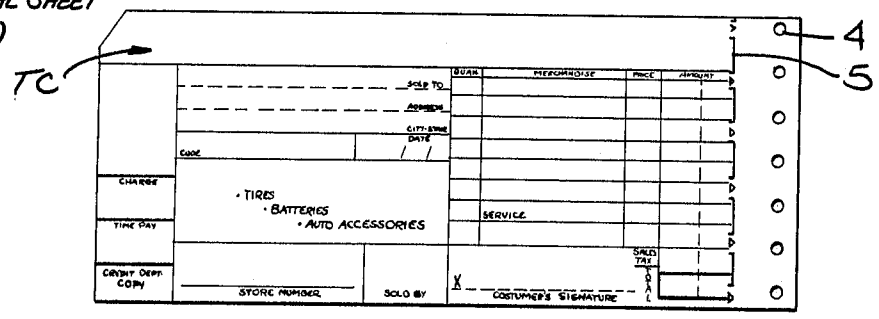


Fig. 2.

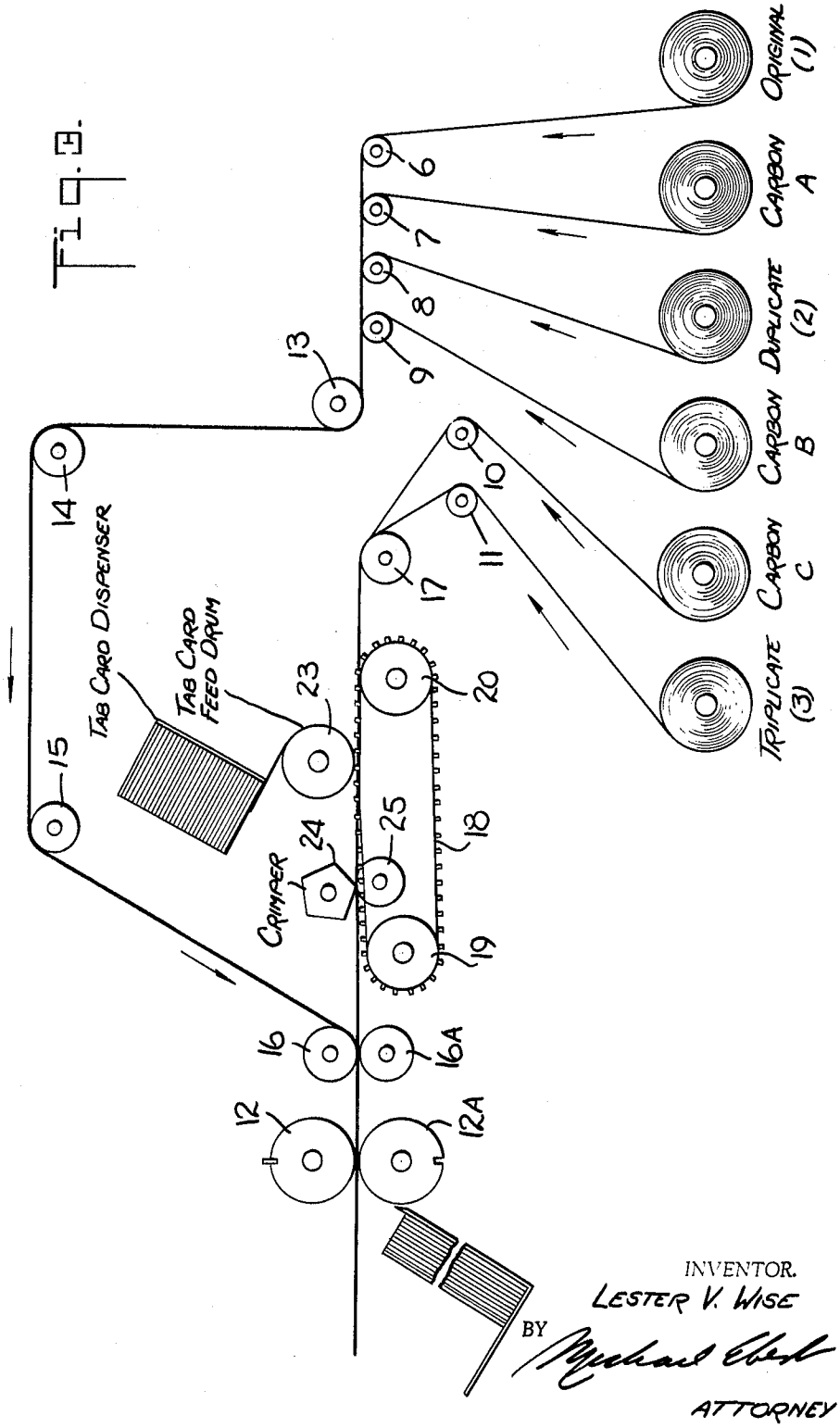
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COLLATING MACHINE FOR PRODUCING TAB CARD SETS

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FIG. 3.



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COLLATING MACHINE FOR PRODUCING TAB CARD SETS

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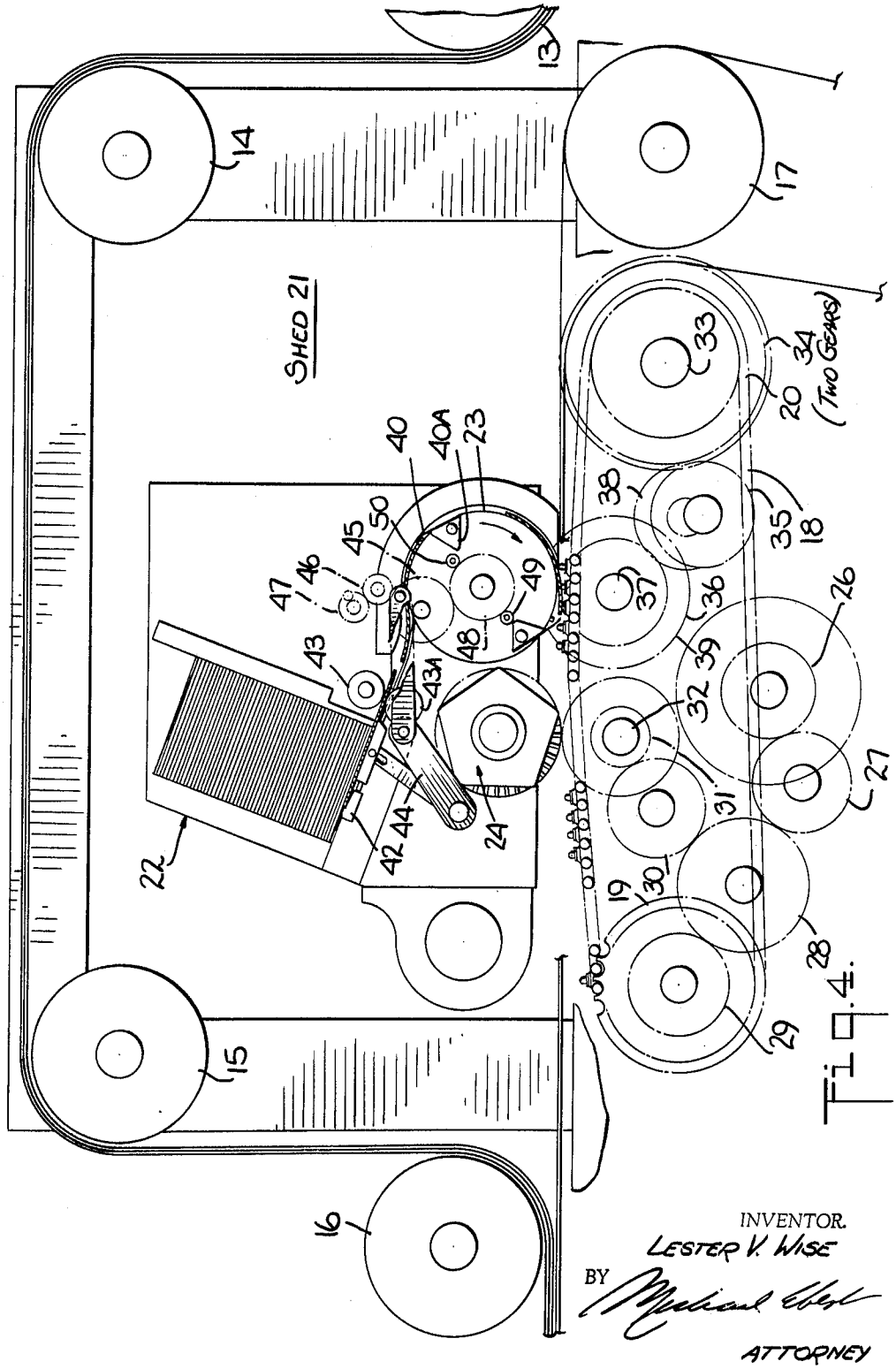


Fig. 4.

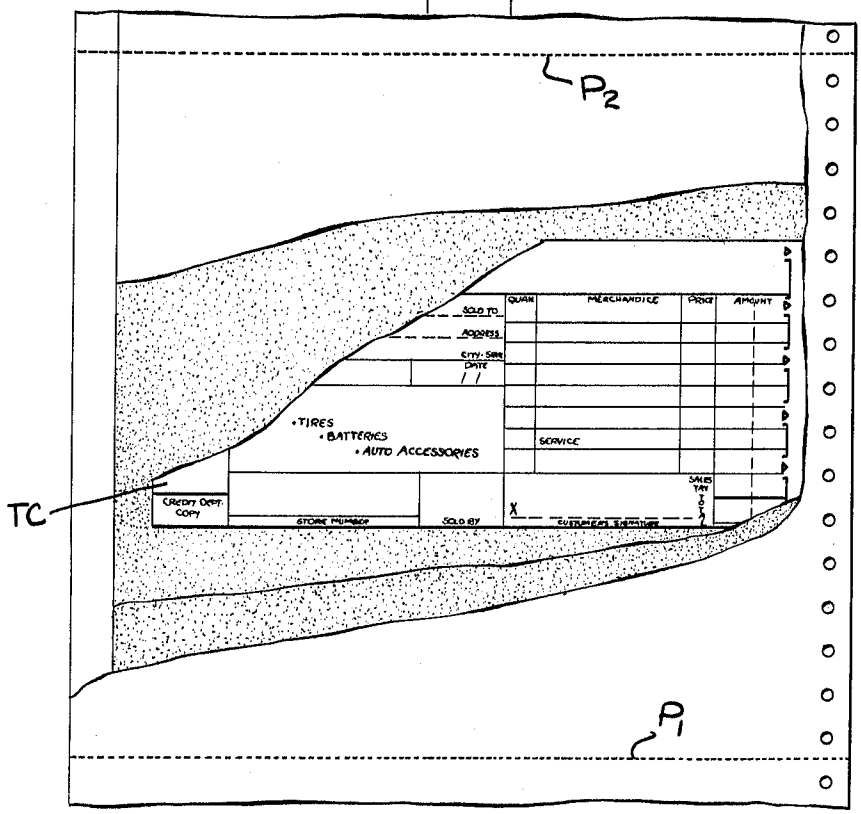
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COLLATING MACHINE FOR PRODUCING TAB CARD SETS

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Fig. 7.



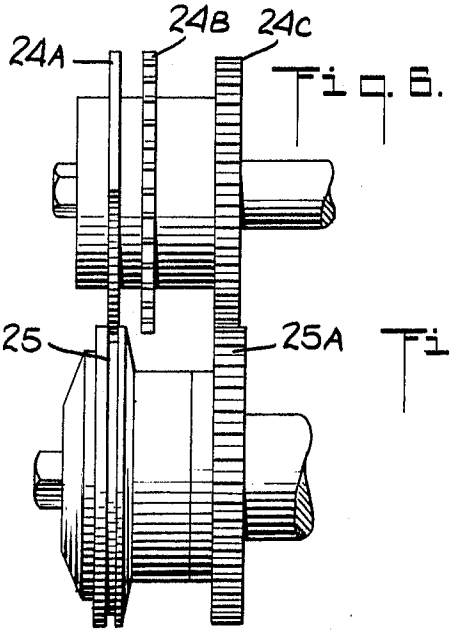


Fig. 6.

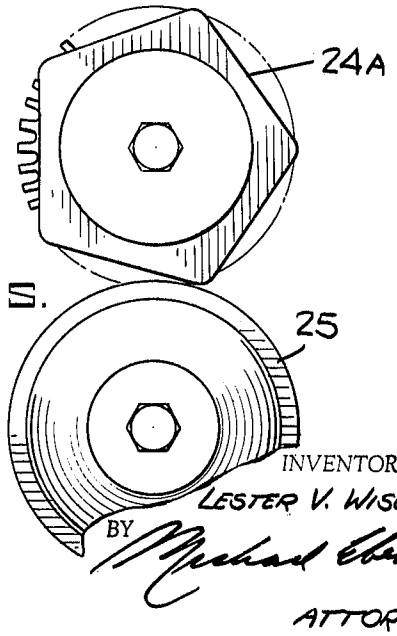


Fig. 5.

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COLLATING MACHINE FOR PRODUCING TAB CARD SETS

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7 Claims. (Cl. 270—53)

This invention relates generally to the manufacture of multiple-copy or manifold business forms, and in particular to a collating machine for assembling snap-out sets or continuous business forms, and adapted to interleave a tab card with the sheets in the set or form.

Because of the complexity of modern business practices, transactions are usually recorded on multiple-copy forms, the various copies being intended for distribution to different branches of the organization. Such forms are conventionally made by collating together original, duplicate, triplicate and further copy sheets with carbon paper, each such combination producing a complete set.

It is now also common practice to include a so-called tabulating or tab card in each set. A tab card is intended to receive the data impressed on the original sheet of the set, for later use in conjunction with IBM, Remington Rand or other types of punch card systems to process data for accounting or other purposes.

Since all of the sheets in a set are of the same length, they are relatively easy to collate. The tab card, on the other hand, has smaller dimensions. Hence the only feasible way by which it has hitherto been possible to insert a tab card in the set, was at a position in registration with the upper or lower edge of the associated sheets, the corresponding edge of the card being aligned in a guide with the edges of the sheets. Since in some instances it may be necessary to place the tab card at a selected intermediate position with respect to the associated sheets, this creates practical difficulties when using conventional collating techniques.

In the case of continuous business forms which are made by combining webs of paper and carbon which are divided into forms by spaced transverse lines of perforation, it has not heretofore been possible to insert tab cards therein in that no edges exist against which the card can be registered.

Accordingly, it is the main object of this invention to provide a collating machine for assembling snap-out sets or continuous business forms, and adapted automatically to insert tab cards therein at any selected position.

More specifically, it is an object of the invention to provide a machine of the above type which acts to interleave moving webs of roll carbon with webs of roll paper and to dispense tab cards periodically between two of these webs at a predetermined position, whereby the cards are interleaved therewith. Thus the insertion of tab cards is not limited to sets, and may take place with continuous forms as well.

Yet another object of this invention is to provide a machine of the above type which operates efficiently at high speed, thereby effecting significant economies in the cost of producing the snap-out sets or continuous forms.

Briefly stated, these objects are accomplished in a collating machine operating in conjunction with paper and carbon rolls, the several webs travelling toward combining rolls. By means of roller or other guide means, an open shed is formed in advance of the combining rolls between those carbon and paper sheets which are to appear above the tab card and those below the card, and within this shed there is disposed a tab card dispenser acting periodically to lay down tab cards on the lower sheets of the webs. The dispensing operation is so timed with respect to the movement of the sheets as to place the cards at a selected position with respect to the associated forms.

For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a plan view of a complete snap-out set in accordance with the invention, incorporating a tab card, the sheets being cut away to expose underlying sheets;

FIG. 2 is a separate plan view of an individual tab card;

FIG. 3 is a schematic diagram of a collating machine in accordance with the invention;

FIG. 4 is an enlarged schematic diagram showing the card-inserting and crimping section of the collating machine;

FIG. 5 is an elevational view of the crimping wheels;

FIG. 6 is an end view of the crimping wheels; and

FIG. 7 is a plan view of continuous business forms in accordance with the invention, incorporating a tab card, the sheets being cut away to expose underlying sheets.

Snap-out sets and continuous forms

Referring now to the drawing, and more particularly to FIG. 1, there is shown a sample tabulating-card snap-out set constituted by an original sheet 1, a first carbon paper A, a duplicate sheet 2, a second carbon paper B, a tab card TC, a third carbon paper C, and a triplicate sheet 3. All of the sheets as well as the tab cards are provided on the right margin with sprocket holes 4, and parallel thereto is a line of perforations 5. The sheets and papers are all of the same length, but the carbon papers are wider to provide uncoated margins M to facilitate separating the carbons from the sheets. The various sheets and tab card are glued together to prevent their separation until such time as they are snapped off the margin along the line of perforation.

It will be seen that the tab card TC, also shown separately in FIG. 2, has the dimensions of a so-called IBM card, and that it is aligned adjacent the upper edge of the set. Hence entries are made on the tab card corresponding only to entries made on the upper portion of original sheet 1, whereas entries made on the remaining portion of the original are reproduced on the duplicate 2 and triplicate 3. The problem to which the present invention is addressed is the insertion of the tab card at a position in registration with the appropriate portion of the associated sheets.

It is to be understood that the tab card, while shown adjacent the upper edge of the sheets, may in accordance with the invention be placed adjacent the lower edge or at any intermediate position between these edges. In practice, the tab card is never brought closer than about one-eighth of an inch to the top or bottom edge of the set, rather than aligned therewith, for otherwise when the sheets are cut by a knife to form a set, the knife might cut into the card and spoil its very accurate dimensions.

In the continuous form shown in FIG. 7, the tab card TC is at an intermediate position between the ends of each set. Instead of individual sets which are made by collating and gluing the various sheets in continuous web form and then sectioning the combined webs into separate sets, the sets remain interconnected by transverse lines of perforation P_1, P_2, etc., whereby the sets may be fed uninterruptedly into an accounting machine and separated only after the data is recorded thereon.

The number of paper sheets and carbons shown in FIGS. 1 and 7, is for purposes of illustration only, and it is to be understood that a machine in accordance with the invention, while shown herein in a form adapted to make a snap-out set of the FIG. 1 or FIG. 7 type, is also capable of making sets or forms with any desired number of paper copies and carbons.

The collating machine system

Referring now to FIG. 3, there is schematically shown a collator in accordance with the invention, the machine being arranged to make snap-out forms of the type shown in FIG. 1, or continuous forms of the type shown in FIG. 7. Thus the machine is provided with a series of unwind rolls carrying the rolls of original paper **1**, duplicate paper **2**, and triplicate paper **3**, as well as carbons A, B and C. All of the papers (not the carbons), as pointed out previously, are marginally punched. The carbon sheets are not ordinarily marginally punched unless there is a pattern of carbonization thereon which must be registered with the printed material on the sheets. In the ordinary case (full carbonizing) only friction carries the carbon webs.

The machine is adapted to interleave the roll carbon with the roll paper, to glue the sheets together, to cut off to size, and to deliver the resultant sets in counted stacks. In the case of continuous forms, in lieu of cut-off rolls, the machine is provided with a perforating device to impress transverse lines of perforations between succeeding forms. Many of the components of the machine are standard in the industry, and hence will not be spelled out in detail. These details are found in such standard commercial machines as the snap-out collators manufactured by Schriber Machinery Company of Dayton, Ohio, and identified as "Six-Part Continuous Gluing Collator" or "Eight-Part Unit Set Collator." However, such machines have no provisions for inserting tab cards.

Each paper and carbon web, after leaving the unwind roll, goes through a suitable guide over a pin cylinder. Pin cylinders **6** to **11** are provided for the respective webs. These cylinders preferably incorporate disappearing pins to permit the associated web to strip clean from the pins without tearing the holes when leaving the cylinder. The machine is equipped with gluing devices (not shown) to apply a continuous line of glue adjacent the longitudinal line of perforations for holding the sheets together in set form. At the output end of the machine, after the sheets and tab card are combined, the continuous web goes through cut-off rolls **12** and **12A** which section the web into individual snap-out sets and feed them to a discharge table. Instead of a cut-off roll, the webs may be perforated at this point.

The four webs derived from original roll **1**, carbon roll A, duplicate roll **2**, and carbon roll B, which ride over pin cylinders **6**, **7**, **8** and **9**, respectively, travel in the horizontal plane and come together under a roll **13**, from which point they travel upwardly until they reach an elevated roll **14**. The four webs ride over roll **14** and again travel in the horizontal plane toward a roll **15** at the same elevation as roll **14**, thus raising these webs with respect to the remaining webs. From roll **15** the four webs travel downwardly toward combining rolls **16** and **16A** where they join the two lower webs drawn from the carbon roll C and the triplicate roll **3**. From the combining rolls the combined webs which, as will be later explained, have the tab cards interleaved therewith, go to the cut-off rolls **12** and **12A** for sectioning.

The lower webs from carbon roll C and triplicate roll **3** travel over their respective pin cylinders **10** and **11** and then over a roll **17** which is horizontally in line with combining roll **16A**. The gluing devices to apply glue to the various sheets are not shown, for they are entirely conventional and are not pertinent to the salient aspects of the present invention. Such gluing devices may be found in the machines manufactured by Schriber Machinery Company.

The combined carbon web C and triplicate web **3** travel in the horizontal plane toward the combining rolls **16** and **16A** and their sprocket holes are engaged by the pins of a continuous sprocket chain **18** supported between sprocket wheels **19** and **20**. The space opened up by rolls **14** and **15** between the horizontally moving webs C and **3** and the elevated webs **1**, A, **2** and B, constitutes an open shed **21**. Within this shed there is supported a tab-card dispenser, generally designated by numeral **22**, which periodically supplies tab cards TC to a feed drum **23**, the drum in turn laying down the cards one at a time onto the web of carbon C, the pins on the sprocket chain entering the sprocket holes on the tab card. The timing of this dispensing action, as will be shown in greater detail in FIG. 4, is such as to place the card in its desired position of registration.

In the system shown, glue is applied marginally to the surfaces of the webs before they enter the combining rolls. Since the glue applied to the upper surface of carbon C is still wet and the tab card TC lying thereover may fail to remain in its proper place after it leaves the sprocket chain **18**, a crimper wheel **24** operating in conjunction with a platen wheel **25** serves to mechanically lock the tab card TC to the webs therebelow to prevent displacement of the tab card.

Thus the essential features of the invention reside in a collating arrangement wherein the webs of paper and carbon which in the final set, appear above the tab card, are first combined and then conveyed along a path which is elevated relative to the combined webs of the paper and carbon appearing below the tab card, thereby defining an operating shed for accommodating a card dispenser. The cards are laid down periodically on the combined lower webs moving within the shed, and thereafter the combined upper webs and the combined lower webs enter the combining rolls to form the complete combination containing the tab card.

The card inserter

Referring now to FIG. 4, showing the card inserter arrangement within shed **21**, it will be seen that tab cards TC, which are stacked in the dispenser **22**, are fed one by one to the card feed drum **23** which in turn lays down the tab cards over the combined webs of carbon C and triplicate **3**, at a position in line with the sprocket holes therein. These combined webs travel under the drum **23**, the sprocket holes in these webs being engaged by the pins in the sprocket chains **18** running between sprocket wheels **19** and **20**.

The main drive gear **26** of the machine engages idler gear **27** which, through an intermediate gear **28** meshing with gear **29** on the shaft of sprocket wheel **19**, operates the sprocket chain **18**. Gear **28** in this train also meshes with idler gear **30** engaging the gear **31** on the shaft **32** of the anvil wheel, thereby driving the crimper blade wheel **24** through a set of gears to be later described. The gear ratio of this arrangement is such that anvil wheel **25** is caused to rotate at a faster surface speed than that of the paper web, to ensure that the anvil will pull the paper from the crimper blade and also reduce wear on the anvil in that the blade generally strikes the anvil at a different point thereon with each rotation, and in a practical embodiment only hits the same spot once per 41 revolutions.

Supported on the shaft **33** of the sprocket wheel **20** are two identical gears **34**, one of which engages an idler gear **35** intermeshing with a larger gear **36** on a shaft **37**, and the other of which (not shown) engages an idler gear **38** intermeshing with a smaller gear **39** on shaft **37**. The two gears **34** have set screws thereon so that it is possible to key one of these gears to the shaft while the other remains inactive, thereby selecting the effective gear ratio between shaft **33** on the sprocket wheel and shaft **37**. Shaft **37**, by means of a suitable gear train (not shown), is operatively coupled to the feed drum **23**, whereby the drum is caused to rotate at a rate synchronized with the advance of the paper webs over the sprocket chain **18**.

The feed drum **23** is provided with two sets of pivoted grippers **40** and **41** disposed 180° apart. Both sets of grippers operate at all times, but deliver and place cards only when cards are fed from the card stack by a card

feed actuator **42**. Card feed actuator **42** is adapted to engage the lowermost card in the stack and to slide this card out of the stack through feed rolls **43** and **43A** onto the drum, where the card is then clamped to the periphery of the drum by the operative gripper. The actuator is reciprocated by linkage arms **44**. The end of the linkage arms is pivoted at an eccentric on wheel **45**, whereby rotation of this wheel causes the actuator to reciprocate. Wheel **45** is operated at a desired speed through a train of gears **46** and **47**. Wheel **45** also engages a wheel **48** provided with opposing cam triggers **49** and **50**, which as the wheel rotates engage the cams **40A** and **41A** on the grippers **40** and **41** to open each gripper when the drum carries a card onto the pins of the chain and to close the gripper when a card is fed into the drum.

The crimper assembly temporarily holds the tab cards on the paper while the glue which has been applied dries firmly. In this assembly, as is best seen in FIGS. 5 and 6, the crimper wheel generally designated by numeral **24**, includes a pentagon-shaped crimper blade **24A** and a notched wheel **24B** which is designed to mesh with the pins in the sprocket chain **18**, thereby ensuring a line-up of the cards to pins. The crimper blade **24A** is received within the anvil wheel **25**. The anvil wheel includes a gear **25A** which interconnects with gears **24C** on the crimper wheel to drive same as the anvil wheel is rotated.

While there has been shown and described a preferred embodiment of my invention, it will be appreciated that many changes and modifications may be made therein without, however, departing from the essential spirit of the invention as defined in the annexed claims. For example, while the shed is formed by raising some webs with respect to the others, the shed may be formed by separating the webs in other planes to provide the necessary space for the tab card insert.

What I claim is:

1. A collating machine for producing business forms composed of interleaved paper and carbon sheets within which a tab card is interposed, said sheets being derived from a plurality of alternately arranged paper and carbon webs, said machine comprising:

(a) means to convey some of said webs in superposed relation along a first path,

(b) means to convey the remainder of said webs in superposed relation along a second path separated from said first path to define an open shed therebetween,

(c) a tab card dispenser disposed within said shed,

(d) means coordinated with the conveyance of said webs to actuate said dispenser to cause it to deposit a tab card on the superposed webs conveyed along the first path at timed intervals to place each card at a predetermined position with respect thereto, and

(e) combining rolls to combine the superposed webs from said first path with the card-carrying superposed webs from the second path.

2. A machine as set forth in claim **1**, further including means to apply glue to said webs before they reach said combining rolls.

3. A machine as set forth in claim **1**, further including means to crimp said tab card to said superposed webs in said first path before the card enters the combining roll.

4. A machine as set forth in claim **1**, further including means to section the webs after they leave the combining rolls into individual sets.

5. A machine as set forth in claim **1**, further including means to transversely perforate said webs at spaced positions after they leave the combining rolls to provide a continuous form.

6. A collating machine comprising:

(a) means for supporting a plurality of paper and carbon sheet rolls in alternate arrangement, said paper sheets having marginal sprocket holes,

(b) a like plurality of pin cylinder means engaging said sprocket holes to draw webs continuously from said rolls,

(c) a pair of combining rolls,

(d) means including a continuous sprocket chain having pins engaging said sprocket holes to convey some of said webs in superposed relation along a first horizontal path and into said combining rolls,

(e) roller means conveying the remainder of said webs in superposed relation along a second path elevated above said first path and into said combining rolls, the space between said paths constituting an open shed,

(f) and means disposed within said shed sequentially to lay down tab cards at timed intervals onto said superposed webs in said first path, said card having sprocket holes engaged by the pins in said sprocket chain, whereby said tab card when entering the combining rolls is inserted between the superposed webs of the first and second paths.

7. A machine as set forth in claim **6**, wherein said last-named means is constituted by a tab card dispenser and an inserting drum having card grippers thereon, said dispenser feeding individual cards to said drum, and further including means to cause said drum to rotate in synchronism with said chain to lay down the cards thereon.

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