Nov. 18, 1941. H. W. BRUKER 2,262,919

TABULATING CARD PRODUCING MACHINE

Filed Feb. 24, 1941

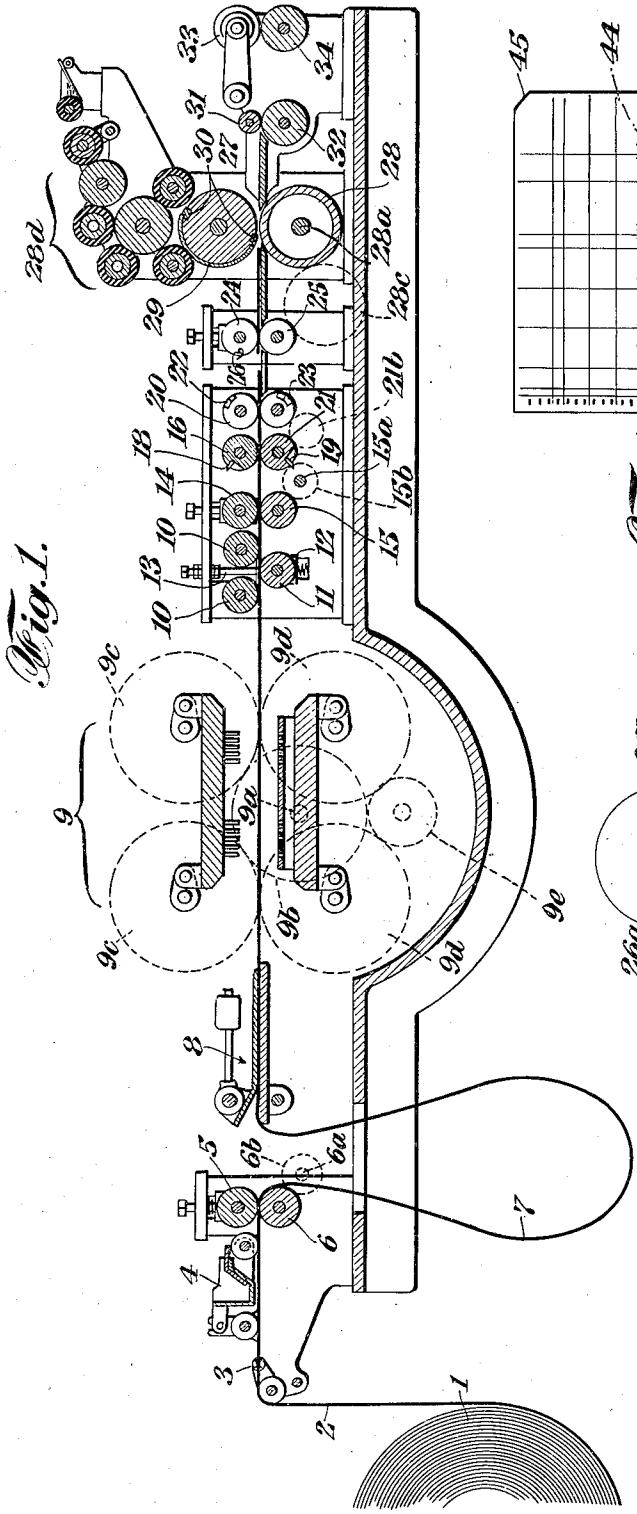


Fig. 1.

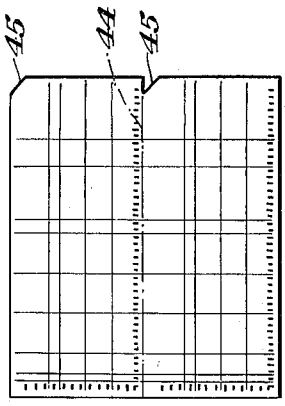


Fig. 4.

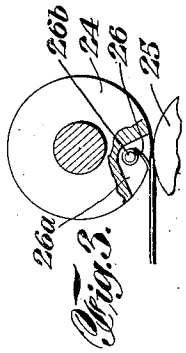


Fig. 3.

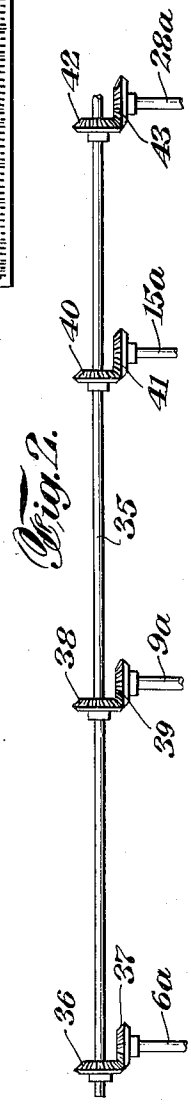


Fig. 2.

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TABULATING CARD PRODUCING MACHINE

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6 Claims. (Cl. 101—227)

The invention relates to a machine for cutting to size and printing tabulating cards, which are required to be so precisely accurate as to length and position of the printed matter that ordinary printing and cutting machines have not been found to satisfy the requirements. Machines have been designed to meet the above requirements which utilize a rotary printing cylinder having the type engraved in its cylindrical surface, the operation of cutting to length being performed on the printed web as it passes from the printing cylinder. In these machines the periphery of the cylinder must be precisely coordinated as to length with the card to be printed, so that the proper formation of the printing cylinder and positioning of the type thereon is a difficult and expensive matter. In machines of this type the relatively inexpensive electrotype printing plates cannot be used, since it is not practical to make electrotypes with sufficient accuracy to coordinate the resulting peripheral length of the printing cylinder to the length of the card with the required precision, nor to bend electrotypes into the required complete cylindrical form. Other machines for the above purpose have been designed which involve the use of a flat bed printer in conjunction with step by step feed of the paper web to the printer and then to a cut-off mechanism, but these machines are objectionably slow in production.

The present invention aims primarily to provide a rotary tabulating card producing machine of a construction and mode of operation making it practical to use an inexpensive electrotype plate on the printing cylinder and yet meet requirements as to accuracy, thus avoiding the expense of the engraved printing cylinders above referred to, and making possible a rate of production much higher than has been possible with the flat bed printers above referred to. The cutting operation may be performed with precision by simple rotary cutters operating in advance of the printing rolls and in conjunction with feed rolls which pass the web through the cutters and then to the printing cylinder in proper timed relation, the machine as a whole being simple and economical in construction, rapid in operation and yet producing the cards with the required accuracy, which as above stated, has not been true of printing and cutting machines used for general sheet cutting and printing purposes.

Further objects and advantages of the invention will be in part obvious and in part specifically referred to in the description hereinafter contained which, taken in conjunction with the accompanying drawing, discloses a tabulating card producing machine constructed to operate in accordance with the invention; such disclosure, however, should be regarded as merely illustrative of the invention in its broader aspects.

In the drawing—

Fig. 1 is a schematic longitudinal vertical sectional view of a machine constructed to operate in accordance with the invention.

Fig. 2 is a fragmentary plan view showing detached a driving mechanism appropriate for the machine.

Fig. 3 is a fragmentary cross sectional detail view.

Fig. 4 is a plan view showing in a general way a type of card which may be produced by the machine.

In accordance with the present invention the paper web after passing through a punch if desired, is fed by suitable feed rolls through a pair of cut-off knives, these knives traveling at paper speed as they cut, and being timed to operate periodically to cut the blanks to the desired length. The required accuracy in length may be obtained by using simple rotary cutting knives of proper diameter and speed of rotation so selected with respect to the speed of feed of the web that the cutters sweep along substantially at web speed while cutting and make a complete revolution while the web is advancing between the cutters a distance equal to the length of the card to be produced. The paper web thus cut may be then fed past rotary so-called corner-cutters, by the feeding rolls above referred to, in instances where cards with cut-off corners are desired, the corner cutters being likewise coordinated as to speed and length of cut. The cut blanks will then be ready to pass to the printing cylinders. In order to make it practical to use an electrotype printing plate as above described, I employ a printing cylinder which is timed to have the same number of R. P. M. as the cut-off knives above referred to, but is of diameter two or three times as large as the cut-off knives. The electrotype printing plate thus extends only part way around the printing cylinder, and the surface speed of the printing plate is two or three times faster than the speed of feed of the web at the time when the latter is passing through the cutters. As the cut blanks are released from the feeding rolls as previously described, they are picked up by further feeding rolls which operate at the much higher surface speed of the printing cylinders

and feed the cards between the printing cylinders in proper timed relation to the rotary movement of the arcuate electrotype plate.

The data on the electrotype being spaced with respect to each other within permissible tolerances, as may be done by known processes, it is not necessary that the electrotype be finished to any precise length either with respect to the periphery of the printing cylinder or the length of the tabulating card. The length of the electrotype will ordinarily be slightly greater than the length of the card, and it will extend about one-half or one-third the way around the printing cylinder, the remainder of the periphery of the printing cylinder being idle, in contrast with previously known rotary tabulating card printing machines as above referred to, wherein precise coordination was necessary between the peripheral length of the printing cylinder and the length of the card. Also since in the present machine the electrotype is wrapped only part way around the printing cylinder, excessive strains and distortions are avoided in bending it from flat to arcuate form.

The invention is illustrated as applied to a machine having a roll 1 from which the web of paper 2 to be cut and printed is fed through a decurler 3 of known construction and past a striping device 4 which also may be of known construction. At this stage the web is fed forwardly by feed rolls 5 and 6 which produce a loop 7 in the web as shown. The web then passes through a friction brake 8 of known construction and through a punching mechanism denoted generally by numeral 9, which punches holes in the web if desired, and which will not be described in detail as its construction may be as described in the patent to George W. Swift, Jr., No. 846,362, March 5, 1907.

From the punching mechanism 9 the web passes through a register device consisting of upper idler rolls 10 and a lower idler roll 11, which latter is mounted in bearing plates 12 adjustable vertically by means of screws 13. The purpose of the register device is to bend the paper web more or less as may be required to bring the holes punched out by mechanism 9 to the proper distances from the edges of the blank as determined by the cut-off knives 18, 19 hereinafter described. At this stage the web then passes between a set of feed rolls 14 and 15 which thus determine the speed of travel of the web as it passes between the next succeeding cut-off rolls 16 and 17 having transverse cut-off knives 18 and 19 respectively thereon. From thence the web passes to further rolls 20 and 21 having corner cutting dies 22 and 23 thereon, which obliquely cut off one corner of the forward edge of the paper web, as the latter advances beyond cut off rolls 16, 17 under the action of feed rolls 14, 15.

The feed rolls 5, 6 and 14, 15 are of course positively driven at proper coordinated speeds such that their surface speed equals the rate of feed selected for the paper web while passing through the above mentioned parts of the machine, and the mechanism 9 and cutters 18, 19 and 22, 23 operate on such a radius, and at such a rate of rotation, that as they contact with the continuously moving web, their operating parts travel along with it substantially at its rate of feed at this stage.

Just after a card has been cut off and its corner severed as above described, it of course passes out of the zone of action of the feed rolls 14, 15, and immediately comes into the zone of operation of a further set of feed rolls 24, 25, the roll 24 being preferably provided with a spring finger 26 which comes into action just ahead of the bite of rolls 24, 25, and just at the time the cut-off operation has been completed by knives 18, 19, to insure that the cut blank will be drawn into the bite of rolls 24, 25, which act to feed the cut blank between printing cylinder 27 and a pressure cylinder 28. In Fig. 3 I have shown the spring finger 26 as located in a recess 26*a* within the roll 24, and mounted upon a stud 26*b*.

As previously mentioned the printing roll 27 is timed to the same R. P. M. as the cut-off rolls 16, 17, but is two or three times larger in diameter, so that its surface speed is two or three times faster than the rate of feed of the paper web before reaching feed rolls 24, 25. These feed rolls take hold just after the cut blank is fed from its previous feed members, and are positively driven at such rate that their surface speed is equal to the surface speed of printing roll 27.

An electrotype 29 processed in known manner is shown as arcuately bent to conform to the surface of printing cylinder 27, and detachably engaged therewith by clamps 30. This plate 29 of course will carry the configurations conforming to the data to be printed on the card and is inked by rolls which are indicated diagrammatically in the drawing but which need not be described in detail. In the form shown the printing cylinder 27 is about twice the diameter of the cut-off rolls 16, 17 and therefore the electrotype 29 which will be of slightly greater over-all length than the card, extends only about half way around cylinder 27. The configurations on plate 29 which are to be printed of course must be spaced properly with respect to each other (which can be accomplished by known processes) but the accuracy of the printing is in nowise dependent upon any precise relationship between the over-all length of plate 29 in its bent form, and the length of the cut blank. Also, the length of the electrotype is only a fraction of the peripheral length of cylinder 27 so that in conforming it to the cylinder the electrotype does not have to be bent so severely as to distort or otherwise injure it. Thus it becomes practical to use the inexpensive electrotypes in the machine, and it has been found that the machine produces the cards rapidly and within permissible tolerances as to length and position of the printed data with respect to each other and the edges of the card. In comparison with previous rotary machines as above mentioned which have been capable of meeting tabulating card requirements, the essential distinctions are that in the present machine the cutting operation is done in advance of and separately from the printing operation, and that the printing step is performed by a cylinder which operates at substantially higher surface speed, the detachable printing plate extending only part way around the printing cylinder and operating intermittently and having the cut blanks fed to it intermittently in timed relation. In other words, although the rotary parts move continuously and the web is continuously fed to the cut-off, the cut blanks are fed intermittently to the printing cylinder and the printing operation is intermittent.

If desired the machine may be readily arranged to cut and print webs of double the width of the cards, the double width blanks being fed from the printing cylinders 27, 28 by feed rolls 31,

32 to slitter rolls 33, 34 which cut the blanks up into separate cards. In Fig. 4 I have shown a blank of the width of two tabulating cards, in the form it will assume before being cut by slitter 33 along the dot and dash line 44 of Fig. 4, the cut corners of the blank being indicated at 45.

As indicated in Fig. 2, the various positively rotated parts of the machine may be driven from a shaft 35 which may be understood as running alongside the machine. The feed rolls 5, 6 may be driven by a bevel gear 36 on shaft 35, meshing with a similar gear 37 on a shaft 6a which carries a gear 6b (Fig. 1) which drives the rolls 5 and 6. A cross shaft 9a likewise driven through the gears 38 and 39, may be used to drive the hole-punching mechanism 9; Fig. 1 shows a gear 9b on shaft 9a which drives gears 9e, 9d and 9c for this purpose. The feed rolls 14, 15 may be driven by a cross shaft 15a connected to shaft 35 by bevel gears 40, 41, Fig. 1 showing a gear 15b on shaft 15a which drives the feed rolls 14, 15 and also the cut-off knives 18, 19; a gear 21b (Fig. 1) may be used to drive the corner cutters 22, 23. A cross shaft 28a driven from shaft 35 by bevel gears 42, 43 may drive the printing rolls 27, 28, a gear 28c being indicated in Fig. 1 for the purpose of driving the feed rolls 24, 25 from this cross shaft 28a. Except to the extent above stated, I have not described or illustrated the various shafts and gear trains used to drive the moving parts above referred to since power connections and driving mechanism suitable for the purpose are known to those skilled in the art, and likewise as to the details of construction of the various rolls, etc. which are used in the machine, and while the invention has been disclosed as carried out by the above described machine it should be understood that changes may be made therein without departing from the invention in its broader aspects, within the scope of the appended claims.

I claim:

1. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including positively acting feed rolls positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a rotary cut-off knife located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder being timed to rotate at the same rate as said cut-off knife but being constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length, said second mentioned feed rolls being driven at a surface speed substantially equal to the surface speed of said printing cylinder.

2. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including feed members positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a cut-off located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder rotating in timed relation with said cut-off, but being constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length.

3. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including feed members positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a cut-off located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder rotating in timed relation with said cut-off, but being constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length, and a blank gripping device rotating with one of said feed rolls and yieldably urged to frictionally engage the forward edge portion of the blanks just prior to the bite of said feed rolls.

4. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including feed members positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a cut-off located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder rotating in timed relation with said cut-off, but being

constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length, and rotary corner cutting dies interposed between said cut-off and feed rolls and positively driven at a surface speed substantially equal to the speed of travel of the paper web.

5. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including feed members positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a cut-off located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, a blank punching mechanism positioned ahead of said cut-off and constructed to travel with the web at substantially the speed of travel of such web during the punching period, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder rotating in timed relation with said cut-off, but being constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length, said feed rolls being driven at a surface speed substantially equal to the surface speed of said printing cylinder.

6. A machine of the class described constructed and arranged to produce printed cards within tabulating card requirements as to accuracy, said machine including feed members positioned to advance and determine the speed of travel of a paper web to be cut up into cards, a cut-off located in the path of travel of such web and operating periodically to cut such web into blanks of the desired length, positively acting feed rolls positioned to receive the advancing blanks directly between them immediately after such blanks are severed from the advancing web by said cut-off, a rotary printing cylinder positioned to operate upon the cut blanks after passing said feed rolls, said printing cylinder having means for detachably attaching to a portion of its periphery an arcuately shaped printing plate of length approximating the length of the blank to be printed, said cylinder rotating in timed relation with said cut-off, but being constructed and arranged of such large diameter that its surface speed is substantially greater than the aforesaid speed of paper web travel and such that the printing plate receiving portion of said cylinder is confined to an arcuate fraction of its peripheral length, said cut-off, feed rolls and printing cylinder being positioned to produce a substantially plane path of travel of said web and blanks during the cutting and printing operations.

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