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WEB PERFORATING MECHANISM WITH RESILIENT SLEEVE SUPPORTED BACK-UP ROLL

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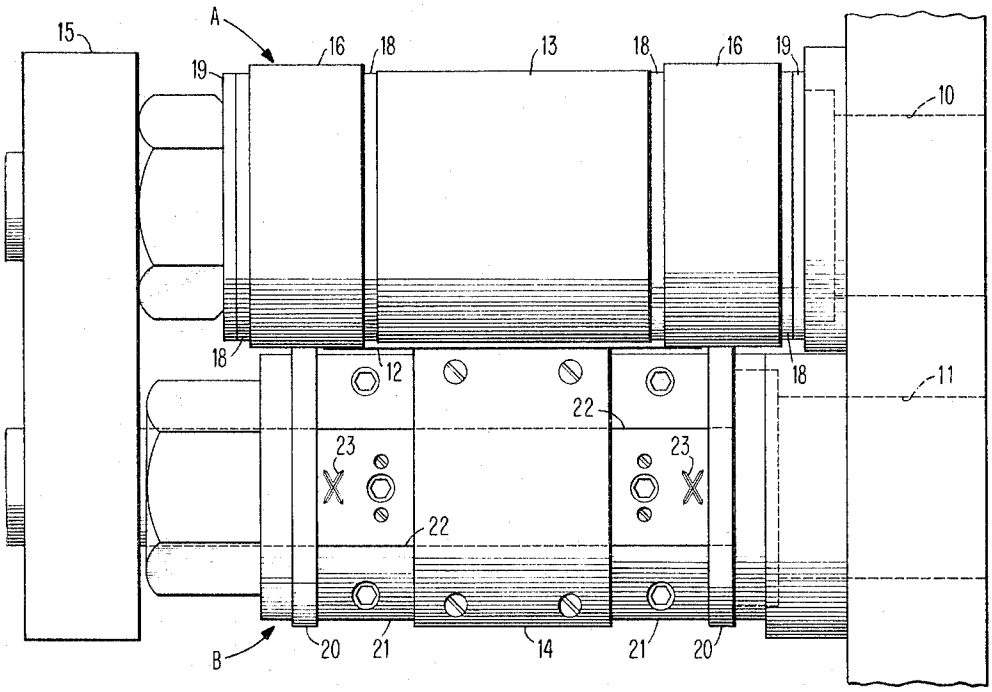


FIG. 1

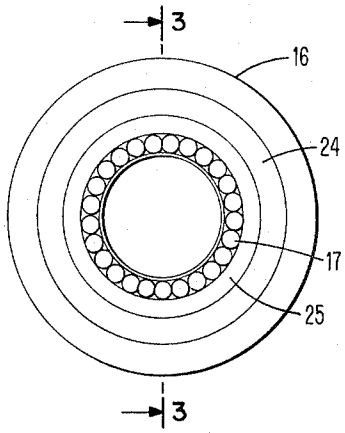


FIG. 2

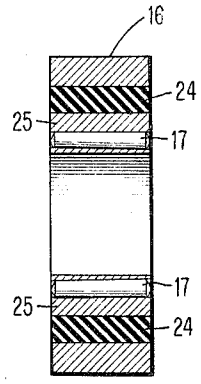


FIG. 3

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WEB PERFORATING MECHANISM WITH RESILIENT SLEEVE SUPPORTED BACK-UP ROLL

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This invention relates to a web perforating mechanism and more particularly to a mechanism for punching holes or cutting scores at spaced intervals along a web of paper or other sheet material.

The present mechanism is particularly adapted for use on a rotary card manufacturing machine and other machines which utilize feed rollers as a means to meter or progress web material as well as to score, punch, crease or in any manner alter the physical shape or condition of the web material. In machines of this type, it is generally necessary to compromise the effectiveness of the feed roller adjustments or the accuracy of web cutting characteristics. In overcoming this shortcoming, the present invention features a device which provides an accurate self-compensating tool edge relationship to its mating back-up roll independent of feed roller adjustments. A dual control is employed which will automatically provide accurate peripheral tool to back-up roll control necessary for quality cutting and at the same time the feed roller center distance adjustments are not impaired. Therefore, provision is made for adjustable feed roll web feeding as well as sustained quality cutting characteristics. This desirable feature is preferably accomplished by providing a combined feed roll and rotary tool set-up which utilizes resiliently, compressively positioned back-up rolls with respect to the axis thereof acting in conjunction with bearer rolls for accurately positioning the bearer roll and tool with respect to the back-up roll regardless of change in distance between the axis of the feed rolls.

Accordingly, a principal object of the present invention is to provide a novel and improved integral feed roller and web cutting mechanism.

A further object of the present invention is to provide an integral feed roller and web cutting mechanism having means to provide an accurate self-compensating tool edge relationship to its mating back-up roll independent of feed roller adjustments.

A still further object of the present invention is to provide in a rotary card manufacturing machine an improved web perforating mechanism which incorporates the cutting tools in the ends of the web feed rolls whereby machine space is more efficiently utilized.

A still further object of the present invention is to provide an improved integral feed roller and web perforating mechanism wherein, regardless of feed roller center distance adjustment, the peripheral tool to back-up roll contact remains the same for quality cutting.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a front elevation view of a web perforating mechanism embodying the present invention.

FIG. 2 is a side elevation view of the back-up roll used in the mechanism of FIG. 1.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2.

Referring to FIG. 1, the perforating mechanism comprises a feed roller assembly A which functions as a back-up roller matched to a feed roller assembly B which functions as a tooling roll. Both roller assemblies are mounted on parallel shafts **10** and **11** and are suitably driven to rotate in opposite directions so as to feed a paper web **12** or the like therebetween.

Feed rolls **13** and **14** are fastened to and driven by their respective shafts **10** and **11**. While not specifically shown, it will be understood that the journals for the shafts **10** and **11** are adjustable so that the feed roller assemblies A and B may be adjusted toward or away from each other to control web feeding. Parallelism is maintained by a yoke assembly **15** at the outboard end. As was previously mentioned, the present perforating mechanism is particularly adapted for use on a rotary card manufacturing machine. A preferable machine of this type is shown and described in U.S. Patent 2,181,935 which issued on December 5, 1939. Particularly, the machine operates on a blank continuous strip of material to print record forms thereon which are cut apart to form card lengths, each with a printed form. The particular record card produced is known as a tabulating card which in subsequent use is punched to control automatic accounting machines. One desirable use of the present perforating mechanism in a machine of this type is to slit or score the paper web at spaced intervals along each edge of the web so that when the web is cut apart to form card lengths, cards having rounded corners are produced. Of course, many other tyes of punching or slitting operations can be performed on the web just as well.

The feed roller assembly A includes a pair of back-up rolls **16** mounted radially on bearings **17** (FIGS. 2 and 3). Lateral thrust control is provided by four thrust bearings **18**. Thrust washers **19** control the thrust externally while bearing surfaces provided on either end of feed roll **13** provide lateral bearing support in the opposing direction. Back-up rolls **16** are free to turn independently of the feed roll **13**.

The feed roller assembly B comprises the feed roll **14**, paired bearer rolls **20**, paired tool units **21**, paired toolholders **22**, and paired punching, slitting or scoring tools **23**. The bearer rolls **20** are larger in diameter than the feed roll **14** to compensate for approximately the thickness of the web material being fed. The tools **23**, which may have any desired tool configuration, are both set to a calculated height in relation to the peripheries of the bearer rolls **20** for proper cutting action. The peripheral contact of the bearer rolls **20** to the back-up rolls **16** accurately maintain the proper tool to back-up roll relationship. It will be understood that proper web cutting by the present system, where a web of material is severed by a tool edge running in close proximity to a solid surfaced roll, requires extremely accurate control.

The back-up rolls **16** are also a calculated amount larger in diameter than the feed roll **13**. A special feature is contained in each back-up roller assembly. Referring to FIGS. 2 and 3, a regulated proportion of a selected durometer elastic material **24** is molded between the back-up roll ring and the bearing housing **25**. The inside diameter of the bearing housing is designed to commercial standards to provide preload for the proper bearing function between the back-up roll assemblies **16** and the shaft **10**.

The elastic supported, bearing mounted, back-up rolls **16**, as previously mentioned, are free to turn independently of the feed roll **13**. These back-up rolls being larger in diameter than the feed roll **13** and set-up in running contact with the bearers **20**, there is provided a small compressive deformation to the elastic material **24** molded in the back-up rolls. It is this deformation feature that makes it possible to adjust the feed rolls **13** and **14** closed together or farther apart without disturbing the close peripheral contact inter-relationship of the bearer

rolls 20 to the back-up rolls 16. This, in turn, maintains an accurate tool to back-up roll cutting function.

It follows, therefore, that as the feed rolls 13 and 14 are adjusted closer together the bearers 20 will move with the feed roll 14 a proportionate amount. The bearer rolls 20 turning in contact with the back-up rolls 16 will transfer added pressure to the elastic mounted back-up rolls which will accept this adjustment by a similar amount of deformation of the elastic component 24. The tool to back-up roll cutting characteristic is, therefore, as accurately maintained as it was prior to the feed rolls being adjusted closer together. This cutting characteristic is also accurately maintained when the feed rolls 13 and 14 are adjusted farther apart in which case the elastic component 24 is allowed to expand, which expansion is transferred to the back-up roll to compensate for the adjustment.

The total amount of required feed roller adjustment should be predetermined to provide the proper dimensioning of the bearers and back-up rolls to permit the elastic deformation to adequately compensate for the calculated total adjustment.

An additional feature of the present mechanism is that by incorporating the tools 23 in the ends of the feed rolls, space in the card manufacturing machine is not utilized that could be used for other additional operations; such as, scoring, imprinting, additional print stations, pressure roll drying and sequential rotary punching. The original cost per machine application is less than in other systems because of less tooling hardware and installation time is also less because there is less machine modification required.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a perforating mechanism for a traveling web of sheet material, the combination of;

a pair of rotatable feed roll assemblies between which the web passes;

one of said feed roll assemblies being provided with radially disposed perforating tools and bearer rolls located near said tools; and

the other of said feed roll assemblies being provided with back-up rolls each of which has an elastic sleeve for resiliently supporting same, said sleeves being compressively positioned with respect to the axes thereof and coacting with said bearer rolls for accurately positioning said bearer rolls and tools with respect to said back-up rolls regardless of change in distance between the axes of said feed roll assemblies.

2. In a perforating mechanism for a traveling web of sheet material, the combination of;

a pair of rotatable feed roll assemblies between which the web passes;

one of said feed roll assemblies being provided with radially disposed perforating tools and bearer rolls located near said tools; and

the other of said feed roll assemblies being provided with back-up rolls the peripheral surfaces of which run in close proximity to the cutting edges of said perforating tools;

said back-up rolls each including an elastic sleeve for resiliently supporting same, said sleeves being compressively positioned with respect to the axes thereof and coacting with said bearer rolls for accurately positioning said bearer rolls and tool edges with respect to said back-up rolls regardless of change in distance between the axes of said feed roll assemblies.

3. In a perforating mechanism for a traveling web of sheet material, the combination of;

first and second rotatable feed roll assemblies between which the web passes;

said first assembly being provided with a feed roll, a radially disposed perforating tool located on each side of said feed roll and a bearer roll adjacent each said tool;

and said second assembly being provided with a feed roll which coacts with said first feed roll, and a back-up roll located on each side of said second feed roll the peripheral surfaces of which run in close proximity to the cutting edges of said perforating tools;

said back-up rolls each including an elastic sleeve for resiliently supporting same, said sleeves being compressively positioned with respect to the axes thereof and coacting with said bearer rolls for accurately positioning said bearer rolls and tool edges with respect to said back-up rolls regardless of change in distance between the axes of said feed roll assemblies.

4. A perforating mechanism as defined in claim 3 wherein said bearer rolls are larger in diameter than the feed roll located therebetween and said back-up rolls are larger in diameter than the feed roll located therebetween to compensate for the thickness of the web material being fed.

5. In a perforating mechanism for a traveling web of sheet material, the combination of;

a pair of rotatable feed roll assemblies between which the web passes;

one of said feed roll assemblies being provided with a pair of radially disposed perforating tools with a feed roll located therebetween and a pair of solid bearer rolls located adjacent said tools, said bearer rolls having a larger diameter than said feed roll; and

the other of said feed roll assemblies being provided with free-running back-up rolls with a feed roll located therebetween, said back-up rolls having a larger diameter than the feed roll therebetween and having peripheral surfaces which run in close proximity to the cutting edges of said perforating tools;

said back-up rolls having an inner sleeve of elastic material which is pre-loaded with respect to the axis thereof whereby the back-up rolls will coact with said bearer rolls for accurately positioning said bearer rolls and tool edges with respect to said back-up rolls regardless of changes in distance between the axes of said feed roll assemblies.

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