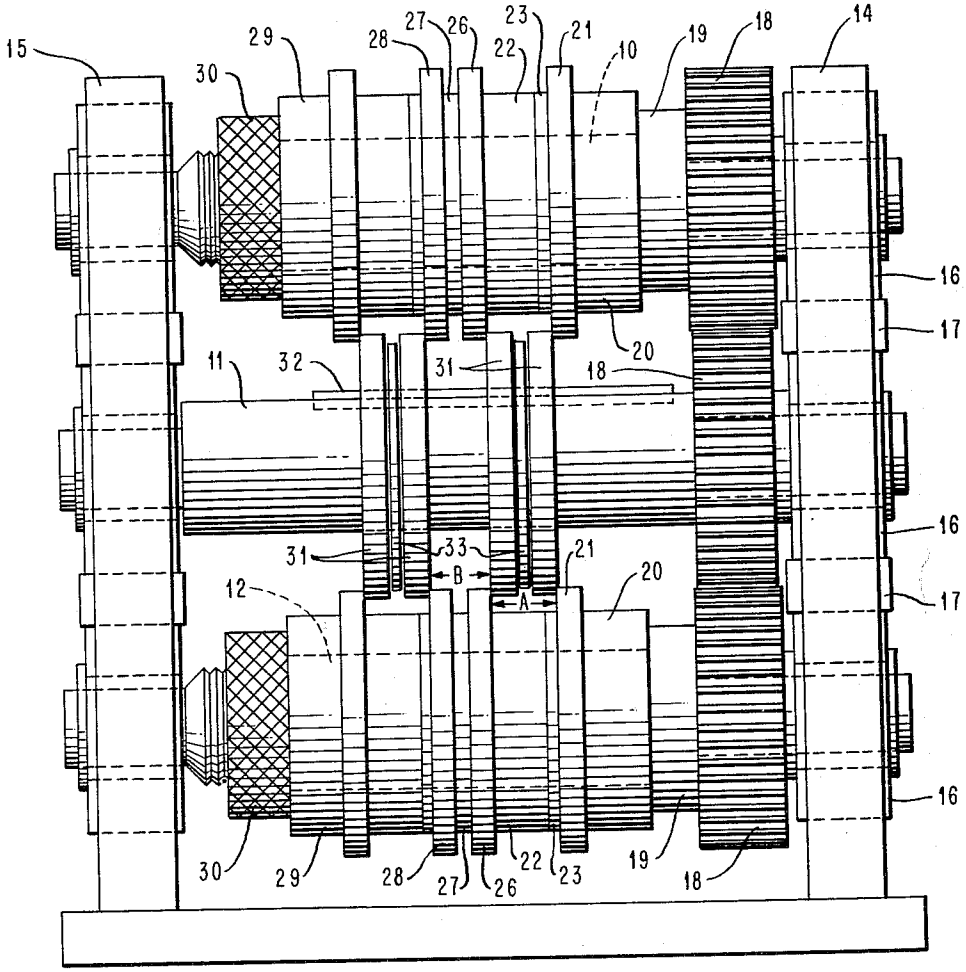
March 16, 1965 J. T. GULLIKSEN ETAL 3,173,326

TAPE SLITTING MECHANISM

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FIG. 1



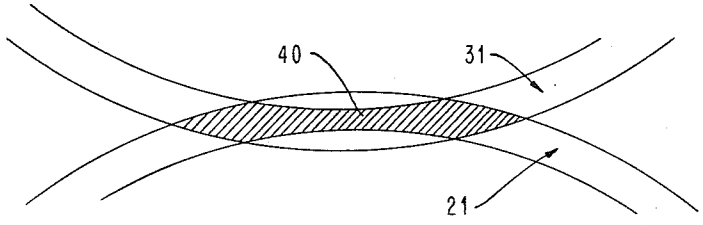


FIG. 2

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FIG. 3

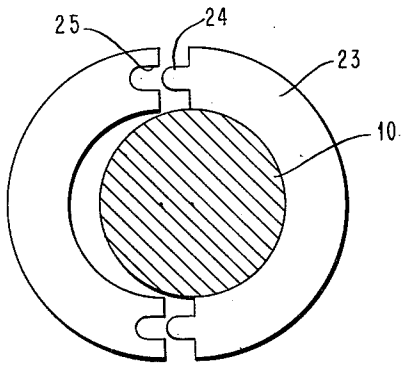


FIG. 4

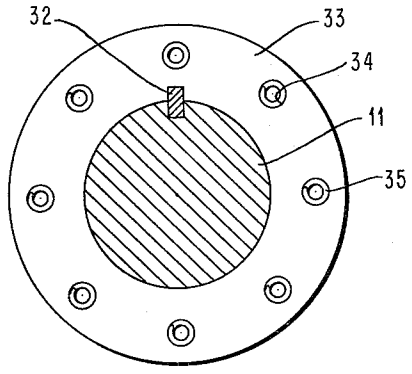


FIG. 5

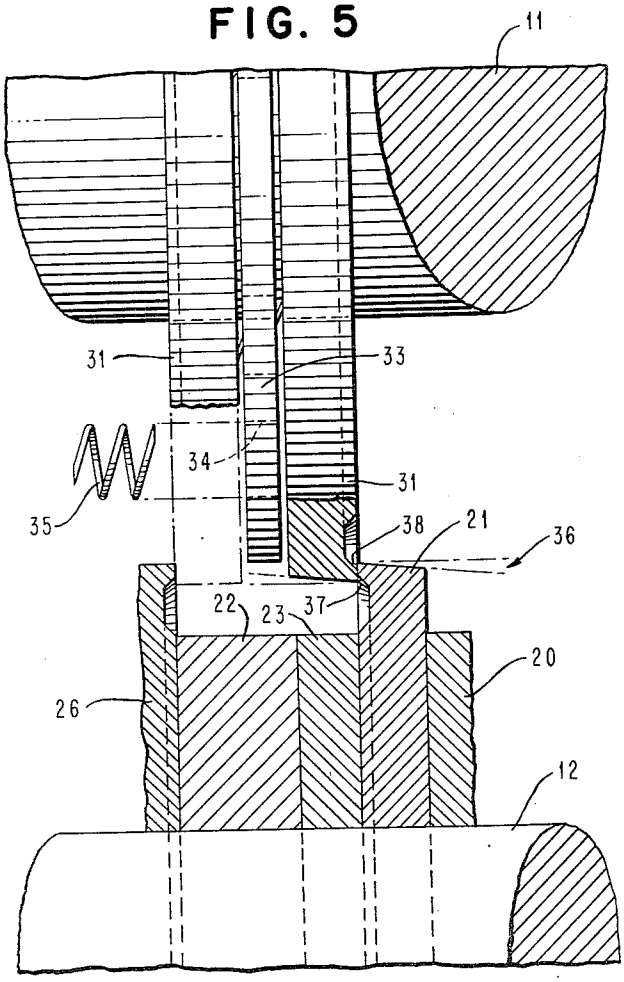


FIG. 6

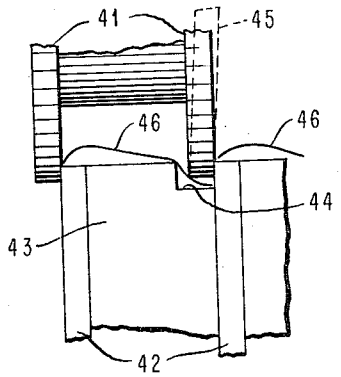
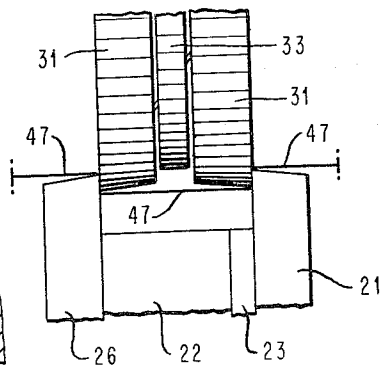


FIG. 7



United States Patent Office 3,173,326 Patented Mar. 16, 1965

3,173,326

TAPE SLITTING MECHANISM

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1 Claim. (Cl. 83—501)

This invention relates to devices for cutting web material into tapes and more particularly to improvements in the arrangement of the shearing knives.

The usual type of slitter for web or sheet material is not required to maintain too strict a distance between blades as it is cutting blanks for boxes or slitting paper for packing and the like. However, since the advent of magnetic tape which may be either plastic or metal, the requirements are more stringent. The width must be within narrow limits and the edges must be clean and square. To meet these requirements it is necessary that the knives be sharp at all times and held perpendicular to the face of the web.

It is the principal object of this invention to provide a slitter in which the knives are maintained in vertical and parallel alignment with the surface of the web being cut.

A further object of the invention is to provide a resilient spacer that will individually load the knives and thus hold them in close self sharpening engagement.

Another object is to provide a spacer that can be easily and quickly replaced to compensate for knife wear.

A still further object is to provide an arrangement of knives on a plurality of arbors such that there is no misalignment of the knives during cutting.

Still another object is to provide an arrangement of knives such that there is a minimum of distortion of the material being slit.

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

In the drawings:

FIG. 1 shows the invention in front elevation.

FIG. 2 shows the shear area effected by the overlap of the knives.

FIG. 3 shows a spacer disc.

FIG. 4 shows a resilient spacer disc.

FIG. 5 is an enlarged detail partially in section showing the shearing relation between the knives.

FIG. 6 is a detail view showing the tape in the usual two knife machine and does not constitute a part of the invention.

FIG. 7 is a detail view showing the relation of the tape with respect to the knives when cut by the invention.

According to the invention the above objects may be attained by the manner in which the knives cooperate. The rotating knives are mounted in pairs on three arbors carried in journals adjustably mounted in end frames. Preferably the upper and lower arbors carry shearing knives that are separated by spacers or shims equal in accumulated width to that of tape or strip to be cut. The knives on the upper arbor are in exact vertical alignment with those on the lower arbor. The inner knives are slidably mounted on the center arbor and are separated and individually loaded by a resilient member that forces these knives into equal engagement with the knives on the upper and lower arbors thus insuring self sharpening and consequently a clean even cut without distortion of the material.

As the knives wear, the distance between blades is adjusted by replacing the spacers. These spacers or shims

are evenly and exactly matched having been lapped simultaneously and are split to permit easy replacement on the arbor.

The slitter comprises three arbors **10**, **11** and **12** on which are secured a plurality of disc shaped knives. Each arbor is journalled in two side frames **14** and **15**, the journals **16** being slidably mounted to permit vertical adjustment of the arbors. Carefully machined blocks **17** between the journals space the arbors a predetermined distance apart to insure correct shear overlap of the knives. Gears **18** drive the three arbors at the same speed simultaneously.

Arbors **10** and **12** are each provided with a shoulder **19** that is so machined that when the arbors are assembled in the machine, the inner or left hand faces (FIG. 1) are in exact vertical alignment. This provides a reference point for locating the remainder of the spacers and knives.

It may be well to mention here that the spacers and knives are all lapped in pairs to very exacting measurements of thickness and degree of flatness. This insures that knives and spacers on the upper arbor have a mirror counterpart on the lower arbor and thus all vertical faces will be in strict alignment.

Positioned next to the knife **21** on each arbor **10** or **12** are two spacers **22** and **23**, the sum total of whose thickness equals the width of the strip to be cut. For example, if the tape is to be cut to a width of .465 of an inch, spacers **22** will be equal to the greater dimension, i.e., .400 of an inch and spacers **23** will be equal to the lesser dimension, i.e., .065 of an inch. Spacers **22** are full discs while spacers **23** (FIG. 3) are split and one half being provided with ears **24** that engage slots **25** in the other half to facilitate assembly on an arbor.

Next the second knife **26** of the pair is positioned together with a spacer **27** which together with a knife **28** must be equal the exact width of a second tape. Spacer **27** is similar to spacers **23**. A similar set of knives and spacers is assembled on the lower arbor in strict vertical alignment. A number of pairs of knives may be assembled on the arbors, thus permitting the cutting of a plurality of tapes. All knives and spacers are keyed to their respective arbors. When the required number of knives and spacers have been assembled on either arbor **10** or **12**, a collar **29** is positioned against the last knife and entire assembly locked in place on an arbor by a knurled nut **30**.

The center arbor **11** has knives **31** mounted in pairs between the pairs of knives on the other arbors. Knives **31** are slidably secured on the arbor by a key **32**. Between each pair is mounted a spacer **33** (FIG. 4) that is provided with equally spaced apertures **34** in which coil springs **35** are positioned. These springs, of which there are preferably four or more, bear on the faces of knives **31**, individually loading them into shearing engagement with the coacting upper and lower pair of knives **21** and **26**.

Knives **21**, **26**, **28** and **31** are preferably of one design in an individual slitter. However, knives **21**, **26** and **28** are usually harder by about 4 R.C.

In slitting certain types of material it is desirable that the surface of the tape be free from scratches. It has been found that a scratch free tape can be had if the periphery of the knife is relieved approximately five degrees as shown in angle **36** in FIG. 5.

As shown in FIG. 5 the knife is relieved by a groove **37** forming a shear face **38** which when engaged by a second disc (FIG. 2) will form a shear area **40**. Unless the faces of these two discs are maintained in parallel relation, uneven wear will occur resulting in rough slitting and dulling of the knives. If, however, the knives are mounted as in our device with the center pair of knives

held in parallel relation with those pairs of both upper and lower arbors, an even lapping action will be effected on all shear faces thus giving a self sharpening action.

In the usual two knife slitter the knives **41** and **42** (FIG. 6) are not slidably mounted on an arbor or held in parallel relation. The knives, once they wear, only the smallest amount, are no longer self sharpening and after further wear they merely bend the web **46** without cutting. Also in this form of slitter, if the spacers **43**, formed with groove **44**, are not exactly the same in dimension, any loading will cause a distortion as indicated by dotted lines **45**. This will result in a rapid deterioration of the blades and a distortion of tape as shown.

With the knives arranged as shown in FIG. 1, that is with all faces in exact vertical alignment, there can be no distortion or twisting of the inner knives **31**. The knives on the lower arbor hold the knives **31** in a vertical plane with relation to those on the upper arbor. The arrangement of the knives in our device is such that little if any distortion of the tape can occur and since the knives are mounted in pairs and in vertical alignment, the edges of the tape **47** are squarely cut and the tapes will fall evenly between the knives as shown in FIG. 7. It is obvious that with this arrangement of knives, two webs may be cut into tapes simultaneously.

As the knives wear due to the forced engagement of knives **31** with knives **21** and **26** by the action of the springs **35**, the dimension "A" between knives **21** and **26** will increase. In certain forms of tape such as that used in magnetic memories, the tape width is critical and must be maintained. In order to maintain this dimension it is necessary to replace spacers **23** with a thinner one to compensate for wear. It is only necessary to loosen the nut **30**, remove spacers **23** and replace with those that are narrower by an amount equal to the wear on the knives. It is obvious that wear on the knives **26** and **28** will vary the dimension "B" necessitating the replacement of the spacer **27** with one of greater width.

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 the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

An apparatus of the class described for slitting a continuously moving web into tape comprising:

a frame,

two arbors mounted in axial alignment in said frame,

a pair of knives secured on each of said arbors,

spacers equal in width to said tape separating the knives of each pair,

one of said spacers between each pair of knives being easily replaceable to compensate for wear in said knives, means for securing said knives and spacers from axial displacement,

a third arbor mounted in said frame between said first arbors in axial alignment therewith,

a third pair of knives mounted on said third arbor in overlapping relation between said first pairs of knives, and

resilient means between said third pair of knives maintaining constant pressure between the knives on all three arbors whereby said third set of knives is maintained at right angles to the surface of the moving web.

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