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Klingen

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[54] **METHOD AND APPARATUS FOR SLITTING MATERIALS SUCH AS ALUMINUM OR THE LIKE**

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[58] Field of Search 83/430, 500, 503, 504, 83/498, 3, 675

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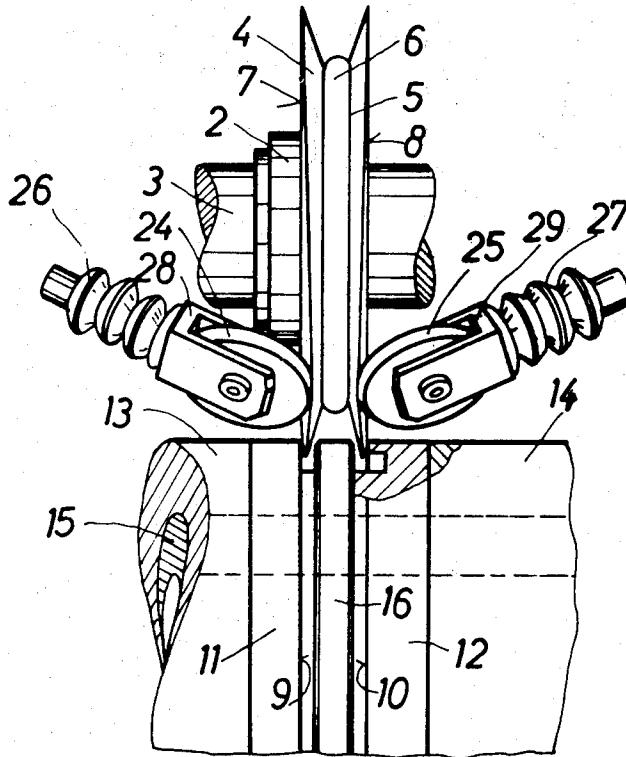
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[57] ABSTRACT

In the slitting of a web of material such as aluminum by passage of the web over at least one pair of symmetrically-arranged circular knives and respective counterknives to excise a narrow waste strip from two between newly formed sub-webs, the improvement which comprises temporarily and elastically deforming said circular knives over a portion of their peripheries downstream of their points of cut whereby said knives at such portions will be prevented from contacting the edges of said sub-webs. To this end, in an apparatus as described a pair of rotatable wheels are resiliently urged against said circular knives just downstream of the points where the knives disengage the counterknives.

6 Claims, 3 Drawing Figures



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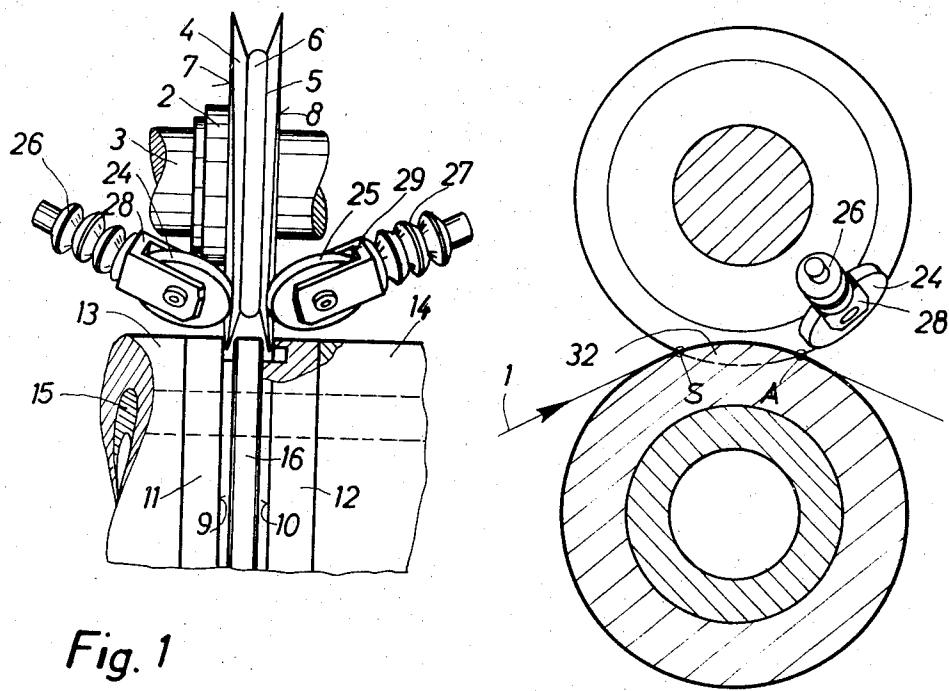


Fig. 1

Fig. 2

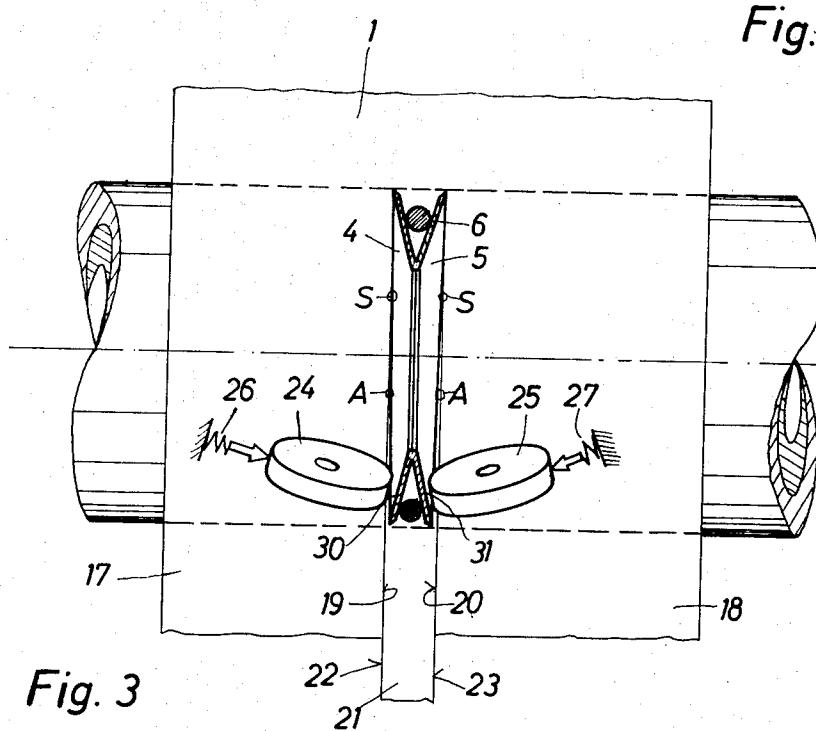


Fig. 3

METHOD AND APPARATUS FOR SLITTING MATERIALS SUCH AS ALUMINUM OR THE LIKE

The invention relates to a method for slitting materials in continuous web form, such as aluminum or the like, by means of axially parallel pairs of circular knives which excise a narrow strip of waste, and additionally the invention relates to an apparatus for the practice of this method.

More and more frequently, paper and cardboard slitting apparatus is being used also for cutting aluminum sheets and bands, because the cutting conditions involved, such as thickness of the material, cutting angles and knife arrangement are comparable.

One important difference between paper and aluminum slitting is that the deformations produced during the slitting operation along at least one of the cut edges are within the elastic range in the case of paper, but in aluminum a permanent deformation of the cut edge remains in the form of a burr or waviness. Through suitable arrangement of the circular knives it has been possible, especially in edge trimming operations, to locate the permanent deformation along the marginal strip of the aluminum, that is, the waste strip. This is not possible when slitting for division of the material, for in that case both parts of the web must be usable. For this reason the attempt has been made to place two circular knives back to back on a common shaft and, with corresponding counterknives, to excise a narrow strip from the aluminum web. In this manner it became possible to locate both permanent edge distortions along the waste strip.

This simple design, however, has the disadvantage that the shearing angle essential to perfect slitting cannot be maintained in circular knives arranged in this manner. As a result the cutting edges of the knives rub against the cut edges of the sub-webs at the points where they run out of the cut, thereby damaging the cut edges to a greater or lesser extent.

The invention is addressed to the problem of controlling the circular knives such that, after the dividing cut, a sufficiently great distance will be left between the knives and the cut edges.

This problem is solved in accordance with the invention in that, in the initially described slitting system, the circular cutting knives are temporarily and elastically deformed over a portion of their peripheries downstream of their points of cut whereby said knives at such portions will be prevented from contacting the edges of said sub-webs. The method is such that the temporary deformation of the cutting edges is achieved by an application of pressure to the portions of the cutting edges which are downstream of the points of cut, this application of pressure being performed directly behind the run-out point of the circular knives. For the practice of this method an apparatus is proposed which is so constructed that the pressing forces required for the deformation are applied to the desired cutting edge area by means of adjustable, rolling pressure members in the form of pressure wheels. In further development of the apparatus, provision is made for the adjusting motion of the pressure wheels to be opposite, and at an acute angle to the axis of rotation of the circular knives, and for the force required for the application of pressure to be supplied by cup springs or the like. It is furthermore proposed to arrange the pressure wheels so as to be adjustable independently of one another so as to

enable each of the circular knives to be adapted to the particular cutting conditions involved.

The advantages achieved with the invention consist especially in the fact that a slitting system for paper, cardboard or the like, of the prior art, can be transformed at only slight additional material cost to a trouble-free and correctly operating aluminum slitting system. At the same time it is especially significant that the cutting results heretofore achieved with a slitting machine of the initially described kind can easily be improved by the apparatus of the invention such that each of the two cut edges of the product sub-webs will remain free of roughness and of any permanent edge deformation.

An example of the embodiment of the invention is represented in the drawing wherein:

FIG. 1 shows the slitting machine looking upstream;

FIG. 2 is a side elevational view of the slitting system seen from the left of FIG. 1; and

FIG. 3 is a horizontal cross section taken through the upper pair of slitting knives with shaft 3 omitted.

The slitting system represented in FIGS. 1 to 3 for the slitting of the aluminum web 1 consists of two upper circular knives 4 and 5 disposed by means of a clamping boss 2 on the upper knife shaft 3, the cutting edges 7 and 8 of the said knives being urged by a rubber ring 6 against the cutting edges 9 and 10, respectively, of the bottom cutting rings 11 and 12. These bottom cutting rings 11 and 12, which with the adjacent sleeves 13 and 14, respectively, are mounted on the bottom cutter shaft 15 and form a virtually closed cylindrical roll, are held at an invariable distance from one another by a spacer ring 16.

In order to sever the aluminum web 1 into two sub-webs 17 and 18 such that their cut edges 19 and 20 will be undeformed and free of burring, a strip of material—a so-called waste strip 21—is excised in a known manner, its width corresponding precisely to the distance at which the cutting edges 9 and 10 of the bottom cutting rings 11 and 12 are held apart on the bottom cutter shaft 15 by the spacing ring 16. The excision of this waste strip 21 is necessary because in plain slitting with a pair of overlapping circular knives the aluminum sheets or bands undergo a permanent deformation at at least one of the two cut edges owing to the depth of penetration of the knives. In the case of the present double-cut slitting the disadvantageous permanent edge deformation is shifted to the cut edges 22 and 23 of the waste strip 21, and therefore the cut edges 19 and 20 of the product webs 17 and 18, respectively, will satisfy the quality requirements described above.

Owing to the fact that two circular knives 4 and 5 are now arranged symmetrically on a common upper knife shaft 3, it is no longer possible for the two circular knives 4 and 5 to maintain simultaneously the cutting angle, in the form of axes of rotation of the cutter shafts 3 and 5 intersecting at an acute angle, which is required for a proper double-cut slitting procedure. The resultant lack of clearance between the circular cutter pairs 4 and 11, and 5 and 12, respectively, downstream of the cutting point S, results in friction with the cut edges 19 and 20 and the spoiling thereof in the run-out area A (FIG. 2), so that precautions have to be taken to maintain the high cut-edge quality first achieved.

The preservation of this quality is achieved by the provision of the pressure wheels 24 and 25 which are

held by the wheel forks 28 and 29 and urged against the outer sides 30 and 31 of the upper circular knives 4 and 5 by the cup spring sets 26 and 27 supported by mounting means which are not shown. The pressure of the cup spring sets 26 and 27 may be adjusted by means of adjusting means which are not shown, so that the cutting edges 7 and 8 of circular knives 4 and 5, respectively, will undergo a slight, transient deformation in back of the cutting point S and form a constantly increasing clearance between themselves and the cutting edges 9 and 10 of the bottom cutting rings 11 and 12 corresponding to a relief angle. Through this deformation the contact that spoils the cut edges 19 and 20 of product webs 17 and 18, respectively, is prevented by the cutting edges 7 and 8 of circular knives 4 and 5, respectively, emerging from the overlap area 32 (FIG. 2).

It will be appreciated that the instant specification and examples are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention.

I claim:

1. In the slitting of a web of material such as aluminum by passage of the web over at least one pair of symmetrically-arranged circular knives and respective counterknives to excise a narrow waste strip from between two newly formed sub-webs, the improvement which comprises temporarily and elastically deforming said circular knives over a portion of their peripheries

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downstream of their points of cut whereby said knives at such portions will be prevented from contacting the edges of said sub-webs.

2. The process of claim 1 wherein said web is aluminum.

3. In an apparatus for slitting a web of material such as aluminum including means for advancing said web over a pair of spaced symmetrically-arranged counterknives, and a pair of spaced symmetrically-arranged circular knives for cutting said web against said counterknives to excise a narrow waste strip and form two sub-webs, the improvement which comprises a pair of means respectively bearing against each cutting knife over a portion of its periphery downstream of where said cutting knife ceases to contact its counterknife, whereby said cutting knife is prevented from contacting the edge of its sub-web.

4. An apparatus according to claim 3, wherein each of said bearing means comprises a rolling pressure member.

5. An apparatus according to claim 4, wherein said rolling pressure member comprises a rotatable wheel contacting its circular knife at said portion of its periphery, the plane of said wheel making an acute angle with the axis of its circular knife, and means resiliently urging said wheel into contact with its circular knife.

6. An apparatus according to claim 5, including means for independently adjusting the urging of each wheel against its respective circular knife.

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