

May 29, 1945.

H. L. COHEN

2,377,130

SLITTING AND SCORING MACHINE

Original Filed Aug. 7, 1940

3 Sheets-Sheet 1

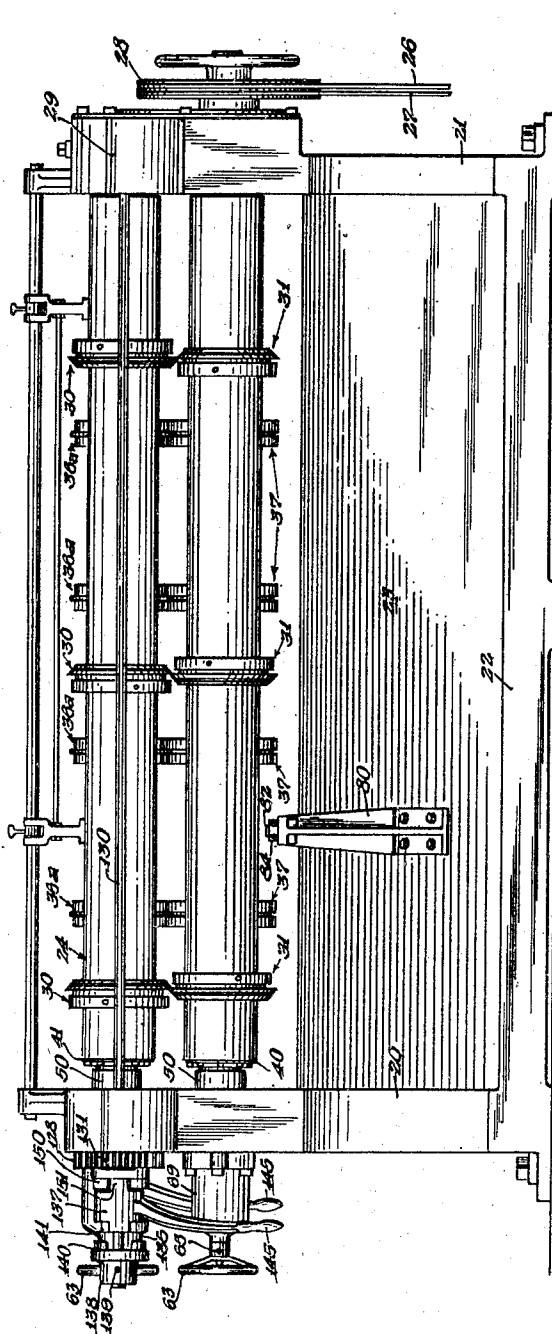


FIG. 1

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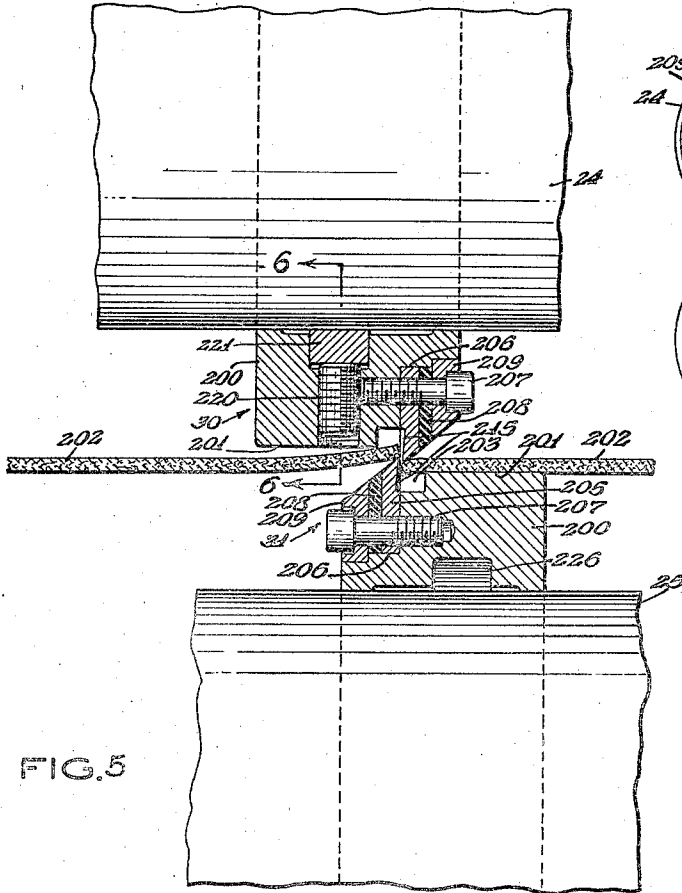


FIG. 5

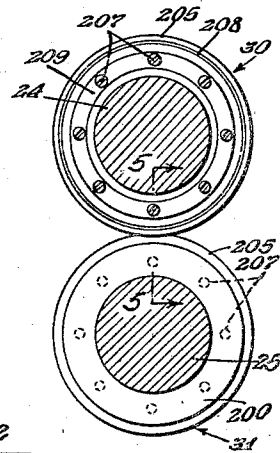


FIG. 4

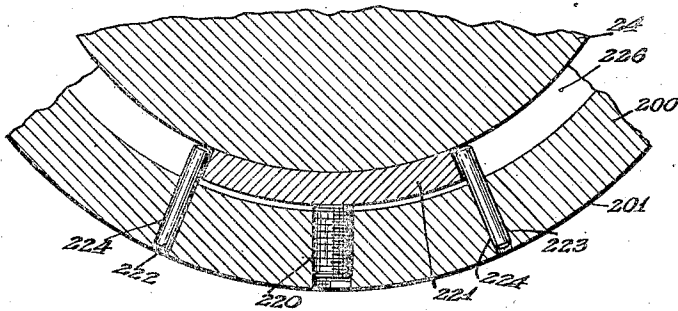


FIG. 6

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# UNITED STATES PATENT OFFICE

2,377,130

## SLITTING AND SCORING MACHINE

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Original application August 7, 1940, Serial No. 351,749, now Patent No. 2,307,452, dated January 5, 1943. Divided and this application November 28, 1942, Serial No. 467,175

4 Claims. (Cl. 164—70)

This invention relates to novel circular knives primarily adapted to slitting and scoring machines and to a novel type of mounting for the shafts which carry the slitting knives so that circular or continuous slitting knives may be applied to the shaft.

In the ordinary operation of slitting and scoring machines one pair of juxtaposed shafts carries sets of circular knives mounted thereon. These circular knives preferably are arranged so that they may be moved to different positions on the shaft in order to permit different settings for various types of cuts, and likewise these knives are removable for regrinding and also in the event that a change in the number of cuts is desired.

Heretofore it has been difficult if not impossible to make the knives and their mounting members truly circular, but instead it has been necessary to use a pair of segments which have been clamped in juxtaposed relationship. The reason for this was that the only way truly circular knives and mountings might be removed from the shaft was by dismounting the shaft from the machine itself. Owing to the fact that the shafts and other members of slitting and scoring machines are massive, such an operation would be costly and indeed impractical.

However, the circular knives when split into segments and mounted and clamped on the shaft in this manner tended to produce uneven cuts owing to the fact that it was very difficult, if not impossible, to obtain a perfect joint or seam between the two segments of the knife members.

In my present invention I have devised a method by which one end of the shaft may be disengaged from the main frame with a space left between that end of the shaft and the main frame while the shaft nevertheless remains in desired relationship to the main frame, so that truly continuous circular cutting knives and their mountings may be placed upon and removed from the shaft without requiring dismounting of the shaft.

Owing to the fact that it is possible by the construction of my invention to use a simplified completely circular knife which may readily be placed upon or removed from the shaft, I may give the knife any construction which may be necessary and proper in order to produce a perfect cut.

Thus I employ a resilient washer between the knife plate and the knife mounting in order to ease the shock upon the knife plate. I may also place a shoulder on the knife holder to support the sheet as it is cut and I may also place a

groove between the sheet supporting shoulder of the mounting of the knife and the knife itself in order to provide a sufficient clearance for the complementary knife blade; and, in order to avoid marring the shaft, I may place a resilient washer which may, owing to the hardness of the other structures, be made even of cast iron, in order to provide a resilient protective surface between the locking nut of the knife mounting and the shaft itself.

These and many other objects of the present invention will in part be apparent and in part pointed out in the following description and drawings, in which:

15 Figure 1 is a front view of the novel slitting and scoring machine of my invention.

Figure 2 is an enlarged complementary view corresponding to the left hand end of Figure 1, showing the ends of the shafts arranged and supported for placement or removal of the cutting members.

Figure 3 is a cross-sectional view, partly in elevation taken along the line 3—3 of Figure 2.

20 Figure 4 is a cross-sectional view, partly in elevation, taken along line 4—4 of Figure 2.

Figure 5 is a cross-sectional view taken along line 5—5 of Figure 4.

Figure 6 is a cross-sectional view taken along line 6—6 of Figure 5.

30 Referring now to Figures 1, 2, and 3, I have here shown my novel form of cutting and scoring machine which comprises the side frame members 20 and 21 which are interconnected in any suitable manner as, for instance, by the base plate 22 and the connecting or bracing member 23.

35 The cutting shafts 24 and 25 are rotatably supported in suitable bearings in the side frame members 20 and 21.

Motive power is transmitted for the purpose of 40 rotating the shafts 24 and 25 from any suitable power source (not shown) by means of the belts 26 and 27 to the pulley 28.

Each of the shafts 24 and 25 carries thereon a plurality of knife carrying members 30, 30 and 45 31, 31 which are arranged to complement each other in order to produce a cut in the manner hereinafter described. The material to be cut is fed between the shafts 24 and 25, being suitably positioned while it is passed therebetween, 50 and the circular cutting members 30 and 31 produce the desired cut in the selected portions of the sheet, these portions being predetermined, of course, by the spacing of the knives 30 and 31 on their respective shafts.

55 The cutting shafts 24 and 25 are mounted in

such a manner that the ends 40 and 41 of each thereof may readily be disconnected from the side frame 20 while the shafts 24 and 25 maintain their predetermined fixed relationship with the remainder of the machine and while these shafts are supported in such predetermined relationship (compare Figure 1 with Figures 2 and 3).

The reason for seeking this result is to permit the mounting and dismounting of circular cutting knives upon the shaft.

As is seen in Figure 2, both of the stub shafts 54 and the blocks 50 have been removed or retracted into the end frame 20 and the shafts 24 and 25 are no longer supported from the end frame 20.

A substitute means of support is shown more specifically in Figures 1, 2 and 3 in which a post or bracket 80 is mounted in any suitable manner, as for instance by the bolts 81, upon the cross-brace 23 and has means at the top thereof for supporting the shafts 24 and 25.

These means comprise the screw 82 which is supported by the top 83 of the post or bracket 80 and the nut 84 which is in threaded engagement with the screw 82. The nut 84 has a series of holes 85 therein in which a rod may be inserted in order to rotate the nut.

A semi-circular supporting bracket 86 is provided which has an opening 88 in the bottom thereof. When it is desired to remove the supporting block 50 in the stub shaft 54 from the end 40 of the shaft 25, then the nut 84 is rotated on the screw downwardly until it is close to the top 83 of the supporting post 80.

The semi-circular supporting bracket 86 is then placed beneath the shaft 25 so that the hole 88 therein is in engagement over the end of the screw 82. The nut 84 is then rotated in a suitable direction in order to raise the semi-circular supporting member 86 upwardly until it is in tight supporting engagement with the shaft 25.

The stub shaft 54 and the block 50 may then be removed from the end 40 of the shaft 25 in the manner previously described and the shaft 25 will then be supported by the semi-circular bracket 86 which in turn is supported by the nut 84 and the screw 82 which are carried by the post 80.

When it is desired at the same time to free the end 41 of the shaft 24 from the frame 20, then the additional semi-circular member 90 may be mounted upon the shaft 25 in the manner shown, this additional member carrying the screw 91 and the nut 92 which has the same formation and operation as the nut 84. The part circular supporting member 93 is then placed beneath the shaft 24 so that the opening 94 in the said supporting member 93 is in registration with the end of the screw 91 and the nut 92 is rotated until it forces the supporting member 93 against the shaft 24, in which case the shaft 24 is now fully supported and the stub shaft 54 and the block 50 may be withdrawn from the end 41 of the shaft 24, thus freeing that end of the shaft and making it possible to remove the knives 30.

In the operation of the apparatus for this purpose all of the knives 30 and 31 are loosened upon the shafts 24 and 25 and slid to the position shown in Figure 2, where they all are placed between ends 40 and 41 of the shafts which are to be disconnected and the support afforded by the brackets 93 and 86 so that when the ends 40

and 41 of the shafts are disconnected, these knives may readily be removed.

After these knives are removed, other knives may be put in place or the same knives may be reground and replaced. Then after the ends 40 and 41 are re-connected to the frame 20 in the manner previously described, the supporting members 88, 90 and 93 may be removed, and then the knives 30 and 31 may be moved to their appropriate positions upon their shafts when once more the appearance of the shafts will be that shown in Figure 1.

The ends of the shafts 24 and 25 opposite the ends 40 and 41 may be stabilized by appropriate bearings which will prevent longitudinal movement of the shafts along their axes without inhibiting rotation of the shafts.

By the apparatus above described, it is thus possible to mount a series of knives 30 and 31 upon the shafts 24 and 25 without removing the shafts from the machine. By this operation it thus becomes possible to utilize circular knives instead of matching segments which may not line up exactly.

As is seen more particularly in Figures 4 and 5, each of the circular knives 30 and 31 has exactly the same form but are simply reversed with respect to each other. Each of the knives comprises an annular mounting member 200 which has a shoulder 201. When the knife is used as a knife 31 on the lower shaft 25, then the shoulder 201 serves to support the web 202 while it is being cut.

A groove 203 is provided in the mounting 200 adjacent the shoulder 201 in order to provide effective clearance for the knife plate. An annular knife plate 205 is mounted in a recess 206 in the mounting plate 200 and positioned and secured therein by bolts 207.

A resilient annular ring or washer 208 is positioned outside of the knife 205 and a securing plate 209 is mounted thereover. The bolt passes through the securing plate 209, the resilient ring 208 and the knife 205 into the mounting ring 200.

By using a large number of closely spaced bolts, the knife may be securely attached to the mounting ring and be made virtually integral therewith.

In order to provide effective clearance for cutting and to improve the cutting, the cutting faces 215, 215 of the knives 205 may be dished or bevelled as shown in Figure 10 preferably to approximately  $\frac{1}{2}$  a degree.

The mounting ring 200 of the knife assembly 31 may be secured on the shaft by means of a set screw 220 passing through the mounting ring 200 and pressing against the shaft 24.

In order, however, to avoid marring the shaft 24, I prefer to mount a relatively soft bearing plate 221 between the set screw 220 and the shaft 24. While the set screw 220 may be of hard steel and the shaft 24 may also be of hard steel, the bearing plate 221 may be of cast iron or any other metal or material which is softer than steel and which is sufficiently wide to provide a bearing surface.

The bearing plate 221 is slightly loose in its mounting so that the set screw 220 may press against the bearing plate 221 and thus press the bearing plate 221 tightly against the shaft 24, thus serving to secure and position the knife assembly 30 or 31. The bearing plate 221 may be secured in position on the mounting ring 200 by a pair of dowel pins 222 and 223 which are securely held in the perforations 224, 224 of the

mounting ring 200 and which extend beyond the inner periphery of the slot 226 in the mounting ring 200.

By reason the angular displacement of the dowel pins with respect to each other and the thickness of the bearing plate 221, the bearing plate is held in position by the dowel pins 222 and 223. The bearing plate 221 is held within the slot 226 cut out of the inner periphery of the mounting ring 200. The remainder of the mounting ring bears directly against the shaft 24 but it should be noted that here it is the entire surface of the mounting ring 200 which is pressed against the shaft 24 and not simply the lock screw 220 and hence no additional bearing surface is required between the remainder of the mounting ring 200 and the shaft 24.

By the construction of my invention it is possible to use circular knives mounted on continuous rings and constituting themselves continuous rings without making it necessary to remove the mounting shaft from the machine in order to place the knives thereon.

I have provided a novel type of cutting knife which is made possible to a great extent by the fact that the knife may be readily placed upon and removed from the shaft.

This knife inherently by its formation and the mounting thereof provides a support for the sheet that it being cut, means for clearing the edge of the knife and a means for mounting the knife on the shaft in such a manner that it will not mar the shaft.

Many variations of the device above described and discussed will now be obvious to those skilled in the art and many other adaptations and uses thereof should now be clear. I prefer, therefore, to be bound not by the specific disclosures herein, but only by the appended claims.

This case is a division of my application Ser. No. 351,749, filed August 7, 1940, for Slitting and scoring machines.

I claim:

1. In an apparatus for cutting sheet material, a circular cutting knife assembly for a rotatable shaft, said assembly comprising a circular mounting member, and a circular knife blade securable thereto, said circular mounting member and said circular knife blade having registering central openings therein to receive the shaft, said mounting member having a peripheral regular cylindrical shoulder portion for positioning the sheet to be cut over the entire area of said shoulder in a plane adjacent the cutting edge of the knife, and an annular groove in said mounting member between said knife and said shoulder.

2. In an apparatus for cutting sheet material, a circular cutting knife assembly for a rotatable shaft, said assembly comprising a circular mounting member, and a circular knife blade securable thereto, said circular mounting member and said circular knife blade having registering central openings therein to receive the shaft, said mounting member having a peripheral shoulder portion for positioning the sheet to be cut in a plane adjacent the cutting edge of the knife and an annular groove in said mounting member between said knife and said shoulder, said knife edge being bevelled at a substantial angle on the side opposite said groove and being dished at a slight angle on the side forming one of the walls of said groove.

3. In an apparatus for cutting sheet material, a circular cutting knife assembly for a rotatable shaft, said assembly comprising a circular mounting member, and a circular knife blade securable thereto, said circular mounting member and said circular knife blade having registering central openings therein to receive the shaft, and means for securing said assembly on said shaft, said means comprising a locking screw held in a threaded radial perforation in said mounting, and a plate carried on the interior of the shaft receiving opening of said mounting, said screw being rotatable against said plate; rotation of said screw against said plate forcing said plate against said shaft and distributing the locking pressure of said screw over a substantial area of said shaft; and additional means carried by the mounting member securing said plate to said mounting member and positively positioning said plate with respect to the mounting member.

4. In an apparatus for cutting sheet material, a circular cutting knife assembly for a rotatable shaft, said assembly comprising a circular mounting member, and a circular knife blade secured thereto, an annular securing ring exteriorly of said knife and an annular washer between said knife and said securing ring; said circular mounting member; said circular knife blade; said washer and securing ring having registering central openings therein to receive the shaft, said knife blade being an integral continuous circular unit, said knife blade, mounting member, washer and securing ring having a plurality of openings therein; said openings being tapped and in registration with each other; and bolts passing through said openings to secure said knife blade to said mounting member.

HARRY L. COHEN.