

Oct. 30, 1945.

R. E. J. NORDQUIST

2,387,767

SHEET CUTTING MACHINE

Filed June 19, 1944

3 Sheets-Sheet 1

FIG 1

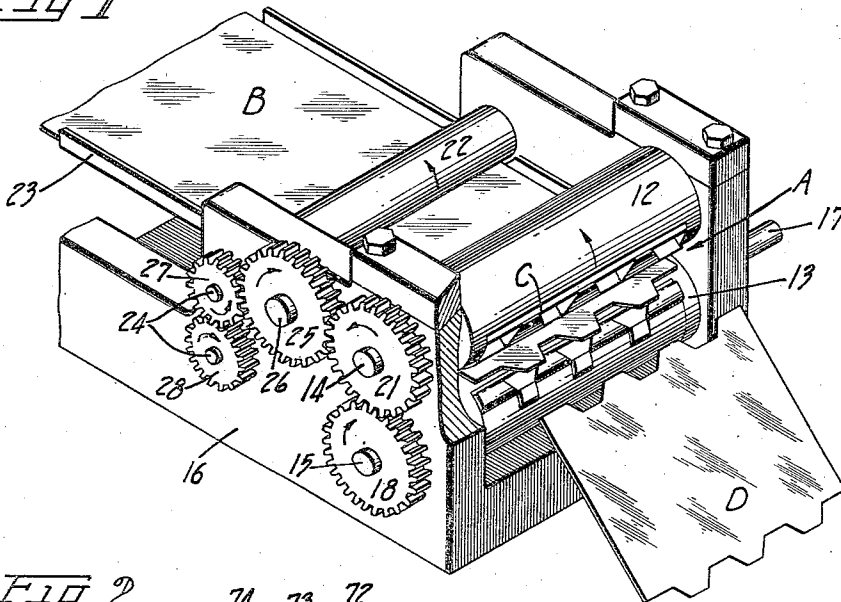
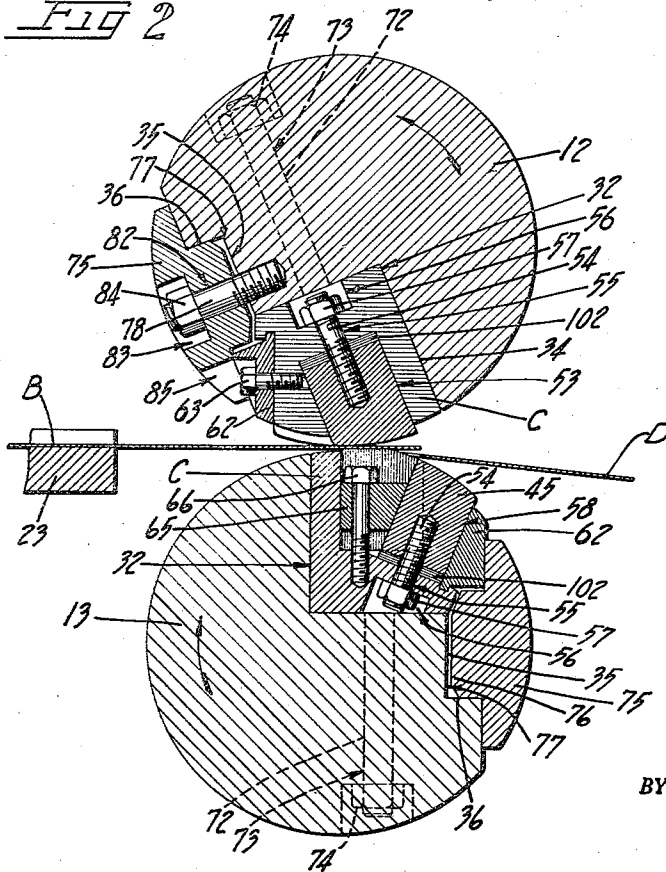


FIG 2



INVENTOR.
Ronald E. J. Nordquist
BY *Juan D. Thornburgh*
Charles H. Erne
ATTORNEYS

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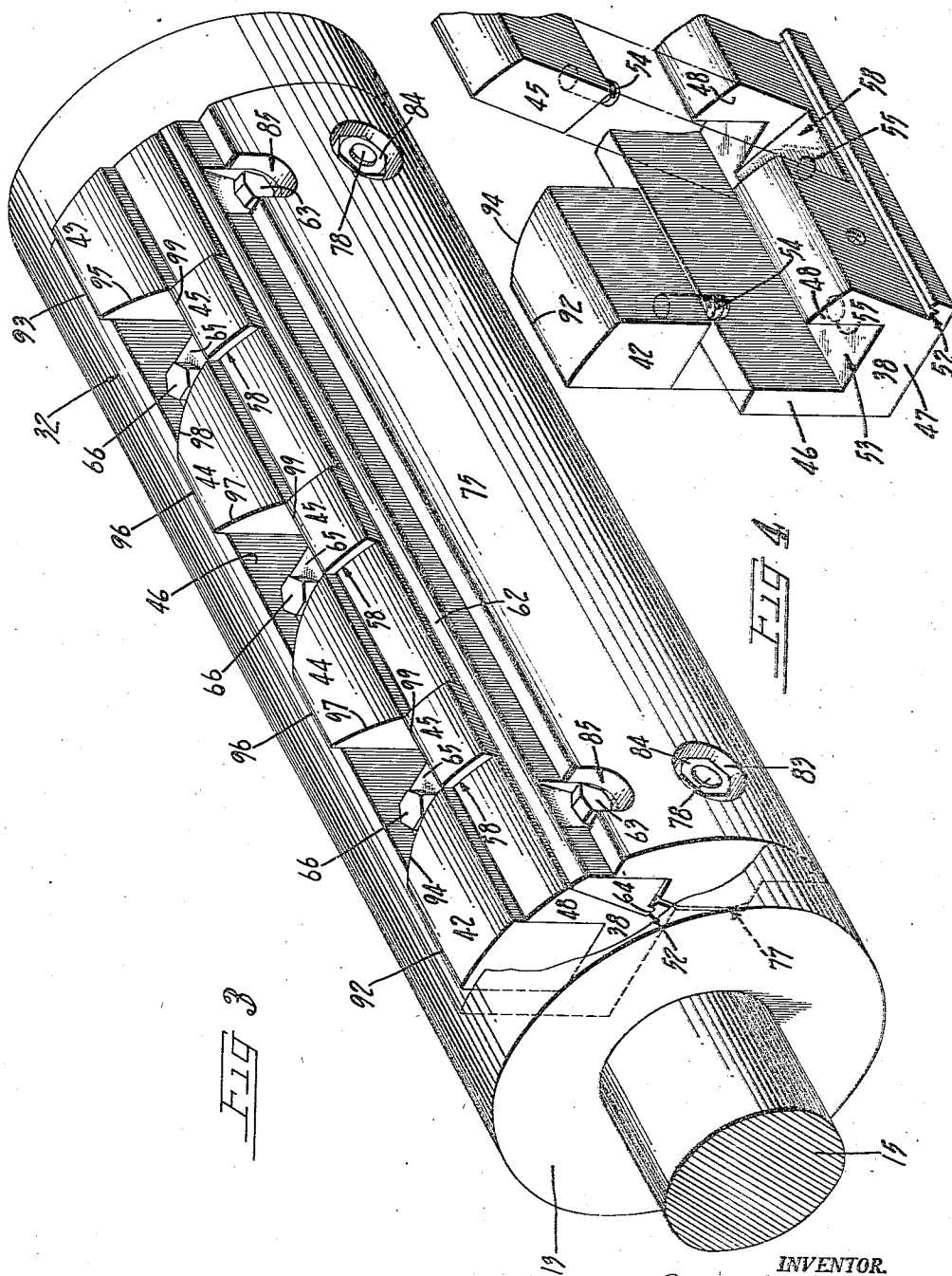
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3 Sheets-Sheet 2



INVENTOR.
Ronald E. J. Nordquist
BY *Ivan D. Thornburgh*
Charles H. Erne
ATTORNEYS

UNITED STATES PATENT OFFICE

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SHEET CUTTING MACHINE

Ronald E. J. Nordquist, Maplewood, N. J., assignor
to American Can Company, New York, N. Y., a
corporation of New Jersey

Application June 19, 1944, Serial No. 541,072

10 Claims. (Cl. 164-68)

This invention relates to a machine for the economic scroll cutting of sheet edges while severing sheets from a web or strip and has particular reference to a pair of die carrier units, one unit being mounted in an upper roll and an associated unit mounted in a lower roll of a rotary scroll shear, each die unit holding a plurality of removable die members, the members coacting together during the scroll cutting of sheets transversely of the web as the latter is fed between the rolls.

An object of the invention is the provision of a transverse rotary shear for scroll cutting the edges of sheets as they are being severed from a moving web or strip which includes novel die carrier units mounted in pockets or grooves of the upper and lower rotary rolls, such units holding a plurality of die members in definite relation to define a scroll cutting line, the members in the upper and lower rolls co-acting together for cutting a scroll edge sheet from the web and along such a cutting line.

Another object is the provision of a removable die carrier unit for shearing rolls wherein a plurality of die members are assembled in accurate pattern form and are held therein by a locking plate so that the separable die members may be ground individually to sharpen their cutting edges and to otherwise prepare them for service, the removable feature adapting the work for treatment on the bench preparatory to the carrier unit with its die parts being mounted into the rotary roll, such sharpening and mounting being performed in the most convenient place which may be separated from the place where used, thereby reducing the length of shut-downs of the machine line of the scroll cutting operation and minimizing time for change over or replacement of the die members.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a perspective view of a machine embodying the present invention from which parts have been broken away to illustrate more fully die carrier units in an upper and a lower roll of a rotary scroll shear;

Fig. 2 is an enlarged transverse sectional view taken through the rotary scroll shear rolls shown in Fig. 1;

Fig. 3 is a perspective view drawn to an enlarged scale of a lower rotary roll and showing a

plurality of die members disposed in a die carrier unit in working position within a pocket of the roll;

Fig. 4 is a perspective view showing a detail of the die carrier unit with parts broken away and with certain die members separated in what might be designated an exploded position; and

Fig. 5 is a view similar to Fig. 3 but showing the die carrier unit and the clamping plate in exploded positions.

As a preferred embodiment of the invention the drawings illustrate a rotary scroll shear A for operating on a web or strip B. The shear includes an upper roll 12 and a lower roll 13. Each roll carries a removable die carrier C which is adapted for holding a plurality of removable die members. The die members in one unit coact with die members in the associate unit to effect the scroll cutting of sheets D from the web or strip B when the same is passed through the rotary shear A.

The rolls 12, 13 have shaft extensions 14, 15 at their ends and these are journaled in suitable bearings in a machine frame 16. One of the shaft extensions 15 of the lower roll projects out beyond the machine frame as at 17 (as viewed at the right Fig. 1) and this serves as the main drive shaft of the machine and may be operated in any suitable manner.

It is necessary that both rolls 12 and 13 operate in exact synchronism so that their die members properly intermesh for severing a sheet D. A gear 18 is mounted on the end of the shaft extension 15 of the roll 13 and meshes with a drive gear 21 mounted on the end of the shaft extension 14 of roll 12.

Rolls 12, 13 do not engage one another but are spaced apart, feed rollers 22 being employed to advance the web or strip B through the machine. Rollers 22 are located above and below a feed table 23 along which the web may be fed and guided. The feed rollers are parallel to and are located adjacent the rolls 12, 13 and have shaft extensions 24 at the ends which are journaled in suitable bearings in the machine main frame 16.

The feed rollers 22 are operated in and by driving connection with the rolls 12, 13. An idler gear 25, carried on a stud 26 mounted in the main frame, meshes with and is driven by the gear 21. This idler gear also meshes with and transmits motion to a gear 27 carried on the shaft extension 24 of the upper feed roller. A gear 28 carried on shaft extensions 24 of the lower feed roller meshes with and is driven by gear 27. The upper and lower feed rollers thus

engage and feed the web or strip B continuously into and through the rotary scroll shear A and a sheet D is severed from the web as illustrated in Figs. 1 and 2 for each revolution of the rolls 12 and 13.

Both rolls 12 and 13 and the two carrier units C carried thereby are of the same construction. The die members which are mounted in the units C are similar but are complementary as to their cutting edges. A description therefore of the lower roll 13 and its die parts, which will now be given, will suffice for both rolls. Each roll is a cylindrical member having a longitudinally extended pocket 32 opening out into the outer periphery of the roll (Fig. 5) for containing the carrier unit C. The pocket is defined by a seat 33 and a side wall 34 at right angle thereto. This pocket is bordered along the side opposite the wall 34 by an edge wall 35 which merges into a right-angled ledge 36. The two ends of pocket 32 are closed off by walls 37 all forming an integral part of the roll.

The removable die carrier unit C comprises a die carrier 38 for holding end die members 42, 43, intermediate angular die members 44 and filler die members 45 (Figs. 3, 4 and 5). The die carrier 38 is an elongated element having right angle sides 46, 47 and an angular side 48, the latter terminating in a channeled ledge 52. This die carrier has a longitudinal slot 53 open at its ends which forms a flat seat for supporting the die members 42, 43, 44 in a radial position relative to the roll. The sides 46 and 48 on their outer faces, i. e., opposed to the wall 47, are of curved profile conforming to the curvature of the roll 12 or 13.

The die members 42, 43, 44 are mounted in the slot 53 of the carrier 38 and are held therein by studs 54, there being one stud threaded into each of the die members (Figs. 2 and 4). These studs extend through holes 55 in the die carrier and into counterbored openings 56 in the side 47 of the carrier. Nuts 57 disposed within the openings 56 and threaded tightly on the studs secure the die members in place.

Die members 42, 43, 44 are spaced accurately in the longitudinal slot 53 of die carrier 38 in accordance with the scroll design of the dies, one set of die members coacting with similar mating die members mounted in an associate carrier during the rotation of the shear rolls. The filler die members 45 are interposed between the die members 42, 43, 44, as best shown in Fig. 3, and are located in transverse slots 58 (Figs. 2 and 4) cut across the side 48 and in part in the side 47 of the die carrier. The bottom of the slots 58 forms a tapered seat for holding each die member in a radial position relative to the roll. The filler die members, like the die members previously described, also are secured in position in the carrier 38 by studs 54.

The die members are locked in position to form the complete die carrier unit C by a locking plate 62 (Figs. 3 and 5) which is secured to the die carrier 38 by bolts 63. This locking plate has a tongue 64 along one edge which fits into the channeled ledge 52 of the die carrier. Filler die members 45 are clamped rigidly against the locking plate 62 by wedge blocks 65 secured in the die carrier 38 by bolts 66 (see also Fig. 2).

Each die carrier unit with all of its die parts is accurately aligned and fully assembled as a unit without regard to the shear roller which will carry the unit. This allows for the desired preparation on the bench and may be performed at

a distance from where it is to be used. Figure 5 shows the unit about to be positioned in the pocket 32 of the roll 13. Fig. 3 shows the completed assembly, the die unit having been secured and clamped in place in the roll. The unit is held from two different angles, as best shown in Fig. 5.

Studs 72 threaded at one end in the carrier 38 pass into holes 73 cut in the roll (see also Fig. 2) and when the carrier unit is fully in the roll pocket it is secured by nuts 74. A clamping plate 75 provides for the other right angled anchorage. This clamping plate 75 has a tongue 76 along one face while the opposite face is curved to conform to the cylindrical surface of the roll when assembled therewith. Tongue 76 fits into a channel 77 formed by the locking plate 62, the edge wall 35 and the ledge 36 (Figs. 3 and 5). Studs 78 anchored in the roll 13 pass through holes 82 and into counterbore openings 83. Nuts 84 threadably secured on the studs are disposed in the counterbores 83 and thus secure the clamping plate in position. Slots 85 are provided in the clamping plate 75 to clear the bolts 63. The removal of the die carrier unit or parts thereof may be effected by merely loosening the plate 75.

With the die carrier unit 11 assembled in the roll 13 as best illustrated in Fig. 3, a transverse scroll cut edge pattern is outlined by the die members which have front and rear cut edges with angular cut edges therebetween. The die members 42, 43 have rear cut edges 92, 93 and angular cut edges 94, 95. Intermediate die members 44 have rear cut edges 96 and angular cut edges 97, 98. Filler die members 45 each have a forward cut edge 99.

In like manner similar die members are mounted in the upper roll 12 and they too have a scroll outline which is complementary to and coactive with the one just described. These scroll edge outlines on the coating sets of die members are raised above and beyond the circumferential periphery of the rolls 12, 13 (Fig. 2) for intermeshing of their cutting edges. Thus the rotary action of such a scroll shear upon a continuously moving sheet or web effects the severing of front and rear scroll cut edges on the sheets D (Fig. 1).

Since the cut edges of the die members are always set at right angles with respect to the line of cut, each die member may be moved outwardly for grinding without disturbing the scroll contour of their cut edges. Thus for each re-dressing of the dies, shims 102 are inserted between the die members and the die carrier, such shims being confined in the slots 53 and 58 (Figs. 2 and 5).

Since the resetting and resharpening of die members involve considerable time and particularly with dies used for scroll cutting, the die carrier units C of this invention are most useful under these conditions inasmuch as there results only a minimum loss of time on the factory floor where the dies are being used. In other words an operating line of machines need be stopped only long enough for replacement of the units into the upper and lower rolls. Auxiliary sets of such units fully adjusted are kept on hand for instant use. The sharpening, adjusting and setting of die parts are thus a machine bench operation separate from the actual factory operation of the scroll shears in which the units are used.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent

that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, a removable die carrier for said roll having a longitudinal slot, individual die members removably confined within said carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge during severing of a sheet from said web, said die members when so confined within the die carrier having their cutting edges extending beyond the periphery of said roll, and means for holding said die carrier in rigid position within said roll pocket.

2. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, a removable die carrier for said roll having a longitudinal slot, individual die members arranged side by side within said carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge during severing of a sheet from said web, locking devices for holding said die members confined within the die carrier, and means for holding said die carrier in rigid position within said roll pocket so that the cutting edges of said die members extend beyond the periphery of said roll.

3. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, the ends of said pocket being spaced inwardly from the ends of said roll, a removable die carrier for said roll having a longitudinal slot, individual die members having straight cut edges and angular cut edges arranged side by side, each member being threadedly secured within said carrier slot, locking devices for holding said die members in alignment for cutting the scroll edge during severing of a sheet from said web, said die members when so confined within the die carrier having their cutting edges extending beyond the periphery of said roll, and means for holding said die carrier in rigid position within said roll pocket.

4. In a machine for economically cutting a continuous web of material into sheets having a scroll edge contour, the combination of a pair of rotatable shearing roll units, the roll of each unit having a pocket extending longitudinally and opening out into the periphery of the roll, a removable die carrier for each of said rolls, each

carrier having a longitudinal slot, individual die members removably confined within each carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge, devices for holding each die member in said carrier slot, and means for holding each die carrier with its set of die members in rigid position within its associated roll pocket, the die members of one roll coacting with the die members of the other roll during their rotation for cutting the scroll edge during severing of a sheet from said web.

5. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, a removable die carrier for said roll having a longitudinal slot, individual die members removably confined within said carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge during severing of a sheet from said web, said die members when so confined within the die carrier having their cutting edges extending beyond the periphery of said roll, means disposed between said die members and said die carrier for holding said die members in an outwardly adjusted position beyond said roll so that the outer faces of the die members may be ground off for sharpening their cutting edges without altering the cutting angle, and means for holding said die carrier in rigid position within said roll pocket.

6. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, a removable die carrier for said roll having a longitudinal slot, individual die members removably confined within said carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge during severing of a sheet from said web, said die members when so confined within the die carrier having their cutting edges extending beyond the periphery of said roll, adjustable shim means disposed between said die members and said die carrier for holding said die members in an outwardly adjusted position beyond said roll so that the outer faces of the die members may be held in cutting position to compensate for grinding of the outer faces in sharpening their cutting edges, and a clamping plate mounted on said roll for holding said die carrier in rigid position within said roll pocket.

7. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out

into the periphery of the roll, a removable die carrier for said roll having a longitudinal slot, individual die members removably confined within said carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge during severing of a sheet from said web, said die members when so confined within the die carrier having their cutting edges extending beyond the periphery of said roll, said die members being movable outwardly of said die carrier and having inner radially disposed side walls and cooperating straight and parallel side walls to facilitate such outward movement so that the outer faces of the die members may be ground off to sharpen their cutting edges while maintaining the scroll contour of the members, and means for holding said die carrier in rigid position within said roll pocket.

8. A shearing roll unit for the economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into the periphery of the roll, the ends of said pocket being spaced inwardly from the ends of said roll, a removable die carrier for said roll having a longitudinal slot, and a plurality of spaced and parallel transverse slots, individual die members arranged in spaced order in said longitudinal slot and having straight cutting edges and angular cutting edges forming a portion of a scroll shear layout, separate individual die members arranged in spaced order between said first mentioned die members and disposed in said transverse slots and having straight cutting edges cooperating with the cutting edges of said first mentioned die members for completing the scroll shear layout, bolt connections securing said die members in place in their slots, a clamp plate secured to said die carrier and bridging said transverse slots for backing up said separate die members, wedge means disposed between said die carrier and said separate die members for accurately locating them in place against said clamp plate, and means for holding said die carrier in rigid position within said roll pocket.

9. A shearing roll unit for economical cutting of a continuous web to provide sheets having a scroll edge, comprising a roll formed with a pocket extending longitudinally and opening out into

the periphery of the roll, the ends of said pocket being spaced inwardly from the ends of said roll, a removable die carrier for said roll having a longitudinal slot, and a plurality of spaced and parallel transverse slots, individual die members arranged in spaced order in said longitudinal slot and having straight cutting edges and angular cutting edges forming a portion of a scroll shear layout, separate individual die members arranged in spaced order between said first mentioned die members and disposed in said transverse slots and having straight cutting edges cooperating with the cutting edges of said first mentioned die members for completing the scroll shear layout, a flat seat in said die carrier at the bottom of said longitudinal slot for locating said first mentioned die members in a radial position relative to said roll, tapered seats in said die carrier at the bottom of said transverse slots for locating the separate die members in a radial position relative to said roll, bolt connections securing said die members in place in their slots, a clamp plate secured to said die carrier and bridging said transverse slots for backing up said separate die members, wedge means disposed between said die carrier and said separate die members for accurately locating them in place against said clamp plate, and means for holding said die carrier in rigid position within said roll pocket.

10. In a machine for economically cutting a continuous web of material into sheets having a scroll edge contour, the combination of an upper roll having a pocket extending longitudinally thereof, a lower roll located beneath said upper roll and also having a longitudinal pocket, means for feeding said web of material between said rolls for transversely cutting said scroll edge while severing a sheet from the web; a removable die carrier for each of said rolls having a longitudinal slot, individual die members removably confined within each carrier slot in spaced relation to one another, filler die members removably confined within said slot between said individual die members and circumferentially offset with respect thereto, said individual die members having rear and side cutting edges and said filler die members having forward cutting edges, the cutting edges of said die members cooperating to cut the scroll edge, and means for holding each die carrier in rigid position within its roll pocket, the scroll cutting edges of one roll corresponding to the scroll cutting edges of the other roll and coacting during advancement of the web between said rotating rolls to sever a sheet therefrom.

RONALD E. J. NORDQUIST.