This invention relates to machinery for piercing and slitting strip material in a continuous manner. A piece of metal may be made into such a shape that when it is pressed against a sheet of material then the said sheet is deformed or pierced in accordance with the shape of the piece of metal. It is customary to fit such a piece of metal or die as is called in a machine called a stamping machine which causes the die to descend sharply on the piece of material being pierced. To provide the energy necessary for this operation the machine is usually provided with large rotary counterweights and the entire machine is very massively constructed. The disadvantage of this arrangement is that the motion is essentially a reciprocating or up and down motion and there is a fairly low limit to the speed at which the operation can be conducted due to the considerable accelerating and decelerating forces which arise through the changed direction of motion and due to the reciprocating action. A further disadvantage of the normal manner of piercing material on a continuous basis is that the same part of the die contacts the material being pierced on each piercing operation so that excessive wear soon takes place. It is the object of this invention to provide a machine suitable for piercing sheet material in a continuous high speed manner. It is also an object of this invention to provide a machine for continuous slitting of sheet material with minimal wear of the cutting edges and/or surfaces. The invention also contemplates a high speed continuous process for producing long lengths of slit material.

The invention consists broadly of two axially rotating intermeshing screw profiles arranged in such a manner that an elongated sheet of material may be inserted between the thread profiles which on rotating cause the sheet material to be drawn between the thread profiles and pierced by the thread profiles so that on emerging from between the thread profiles the sheet material has a series of transverse slits which may or may not extend to one edge of the material. The two axially rotating intermeshing screw profiles are suitably supported to absorb the thrust of the cutting action by the thread profiles and are shaped in such a manner as to permit the sheet material to be inserted between the said screw profiles in such a way that the material is drawn between the thread profiles as the screws are rotated. The material is pierced to form slits by the shearing action between the opposed intermeshing screw profiles. The surfaces forming the "walls" of the threads may be substantially parallel to reduce distortion of that part of the sheet material between adjacent slits.

The sheet material that may be worked by the apparatus include metal strip and the tougher engineering plastics. Although the sheet material will usually be flat stock, it may have an oval or other elongated cross-section. The sheet material will usually be solid; it may also be hollow.

The invention will be more clearly understood on reference to the accompanying drawings and the detailed description.

FIGURE 1 is a plan view of the two screw threads and the strip passing between them. Numerals 1 designates the four bearings which support the axes 2 of the screw thread profiles 13 and 14. The thread profiles 13 and 14 are left handed and right handed screws and intermesh at 15. The profiles may also be either left handed or right handed and they may be either single start or multi start depending on the requirements needed. It is also possible for the diameter of the screws to be either the same or different provided they are arranged to intermesh in a satisfactory manner. The shape of the thread profiles in the parallel section at 13 and 14 is what is known as castle thread but other shapes may be adopted if desired. In the particular case illustrated the thread profiles have been tapered at 12 approximately down to the root in the direction of feed to permit insertion of the strip of material 9 between the thread profiles. A spoon of uncut sheet material 7 is supported on the axle 5 and is passed between the rolls 3 to twist the sheet through ninety degrees from which point it is fed between the thread profiles 13 and 14 where it first begins to deform at 15. Rotation of the axes 2 in opposite directions in the case of thread profiles of opposite hands of rotation causes the sheet material 9 to advance between the thread profiles 13 and 14 and emerge with the material deformed and cut into shapes 10 and 11 similar to the thread profiles 14 and 13 respectively. The bowing in the material shown at 10 and 11 may be pressed back into the plane of the sheet 9 by the rolls 4 and the flattened sheet may be coiled on an axle 6 to form a coil with 8 slips 18 in the material substantially at right angles to the sides of the material. The angle of the slits to the direction of movement of the material. Alternative means may be provided to support the thread profiles 13 and 14 and the coils 7 and 8 may be positioned in other ways. The rolls 3 and 4 are not necessary and may be replaced with other means for guiding the material to the screw threads. The rotation of the thread profiles 13 and 14 is synchronized by a simple gear or other system, the main virtue of which should be high speeds of rotation.

The applications of this piercing machine cover a very wide field. The machine may be used to produce sheet or strip which has substantially transverse slots pierced in it where the slots do not extend to the edges of the material. Such material may be subsequently used for ornamental purposes and for producing extended surface heat exchanger tubing. The sheet material may be cut in such a manner that the slots extend to one edge so that the resultant strip may be used for other types of ornamental purposes and also for extended surfaces on heat exchangers. Further the strip can be rolled along its two edges to extend the length of the strip and form a gap between the slots to result in a further ornamental application or be suitable for screening applications.

As many embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention includes all such modifications and variations as come within the scope of the appended claims.

What I claim is:

1. Apparatus for forming a plurality of slits in an elongated sheet of material, comprising a pair of screws having their axes substantially parallel, means for guiding an elongated sheet of material in the direction of movement axially between the screws with the sheet of material substantially parallel to said axis and substantially perpendicular to the plane that includes both said axes, each screw having at least one screw thread extending about the axis of the screw in a plurality of turns, each screw thread being defined between two substantially parallel helical surfaces each of which is the locus of a helically moving radius of the axis of the screw, said surfaces intersecting the plane of the sheet of material in a plurality of parallel lines, at least a portion of each said surface terminating outward in an edge that is a helix of a diameter that expands in said axial direction of movement, the screw threads intermeshing closely to a depth that increases...
progressively in said direction of movement whereby a shearing action is imparted to said sheet of material by the action of the screw thread sides, one against the other.

2. The apparatus of claim 1 wherein the screw threads are equi-spaced so that their intersection with the plane of the sheet of material results in a plurality of parallel lines spaced equal distances apart.

3. Apparatus for forming a plurality of slits in an elongated sheet of material, comprising a pair of screws having their axes substantially parallel, means for rotating the screws in opposite angular directions, means for guiding an elongated sheet of material in substantially the direction of movement axially between the screws with the sheet of material parallel to said axes and substantially perpendicular to the plane that includes both said axes, each screw having a screw thread extending about the axis of the screw in a plurality of turns, said screw threads having opposed hands of rotation, each screw thread being defined between two substantially parallel helical surfaces each of which is the locus of a helically moving radius of the axis of the screw, said surfaces intersecting the plane of the sheet of material in a plurality of parallel lines, at least a portion of each said surface terminating outward in an edge that is a helix of a diameter that expands in said axial direction of movement, the screw threads intermeshing closely to a depth that increases progressively in said direction of movement whereby a shearing action is imparted to said sheet of material by the action of the screw thread sides, one against the other.

4. The apparatus of claim 3 wherein the screws threads are equi-spaced so that their intersection with the plane of the sheet of material results in a plurality of parallel lines spaced equal distances apart.

5. The apparatus of claim 3 wherein the screw threads closest to the sheet material feed guide are tapered to permit easy engagement of the sheet material.

6. The apparatus of claim 3 in which lines formed by the intersection of planes through the length of the screw axis and the circumferential surface of the screw threads defined between the two parallel helical surfaces, are inclined toward the axis of the screw thread and closer to the axis in the direction of feed.

7. A process for forming a plurality of slits in an elongated sheet of material comprising passing said material between a pair of mating intermeshing screws axially rotating so that the intermeshing mating screw thread sides are in sliding surface contact whereby said material is pierced with a number of parallel spaced slits, the direction of movement of said sheet material being substantially parallel to the axis of said screws.

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