March 31, 1964 B. E. BOOTH 3,126,780

SHEET METAL CUTTING MACHINES

Filed Nov. 21, 1960 2 Sheets-Sheet 1

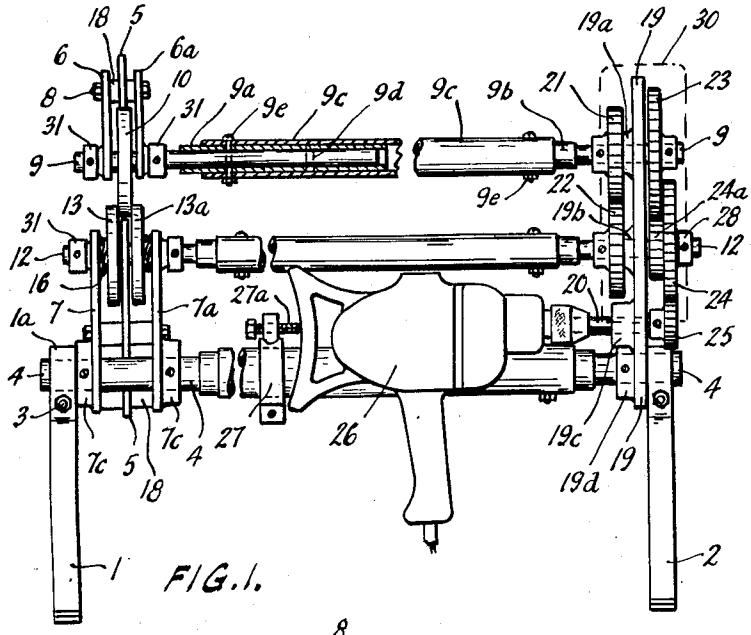


FIG. 1.

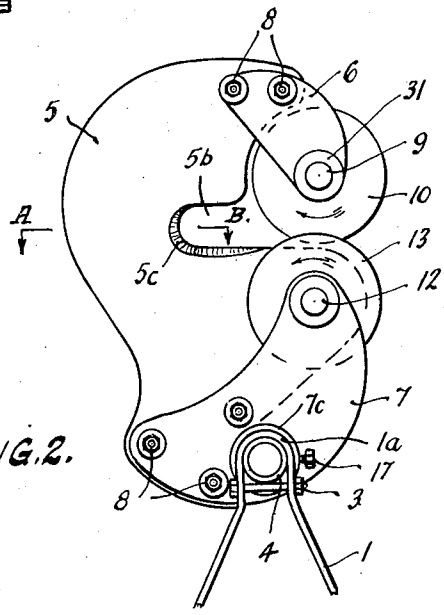


FIG. 2.

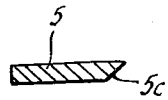


FIG. 3.

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March 31, 1964 B. E. BOOTH 3,126,780

SHEET METAL CUTTING MACHINES

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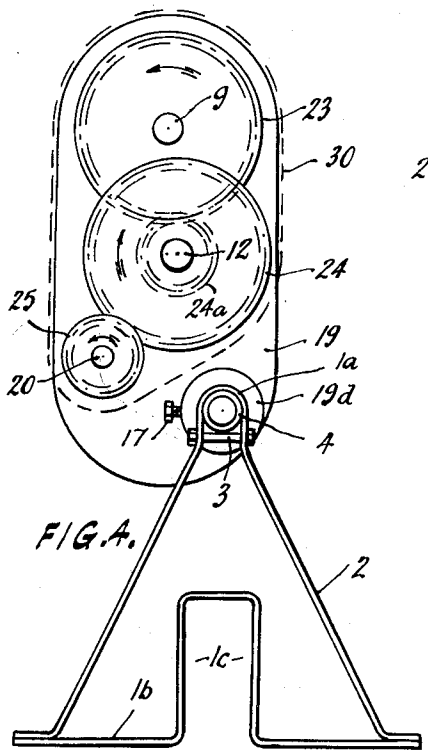


FIG. 4.

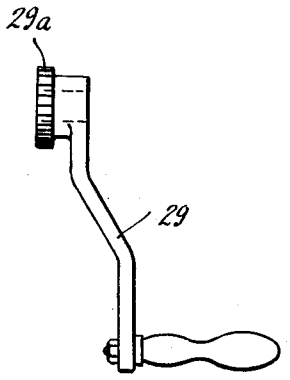


FIG. 5.

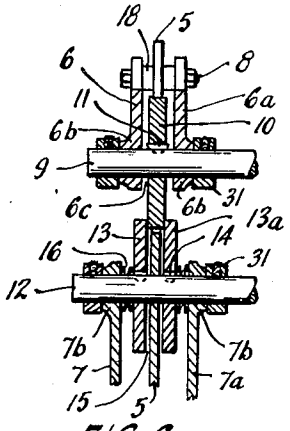


FIG. 6.

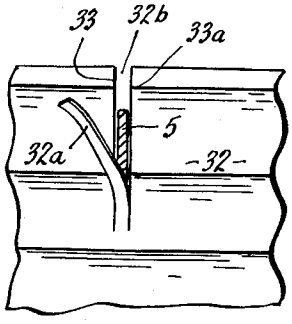


FIG. 7.

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SHEET METAL CUTTING MACHINES

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7 Claims. (Cl. 83—500)

This invention relates to machines for cutting sheet metal and while suited for the cutting of thin flat sheet metal, is particularly intended for the cutting of corrugated iron and the like sheet materials. The objects of the present invention being the provision of an improved machine for the cutting of sheet materials and particularly corrugated iron and the like which not only easily and very quickly effects the cutting, but will also effect such cutting without flattening or otherwise injuring the corrugations and in an unrestricted manner as to the length of cut which may be made.

At present, the cutting of thin sheet metals, corrugated iron and the like is effected by the use of tin snips and by guillotines and while these are quite suited for the cutting of flat sheet metals, they are not so suited when the sheet metals are corrugated, cutting by hand by use of the snips being slow and a guillotine substantially flattens a corrugated sheet along the line of the cut made so that after the cut has been effected, time is lost in an endeavor to bring the cut back to the proper corrugated form.

Furthermore, the guillotine is limited by its length as to the maximum length of cut it can effect, is heavy and is not of a readily portable nature.

My invention has been devised to produce a machine specially intended for the cutting of corrugated sheet materials which will effect the cutting quickly and easily and in such a manner as will substantially avoid injury to the sheet at the cut edge, the apparatus also being such as to be unrestricted as to the length of cut it can effect and also capable of being readily portable so as to enable it to be used at a building site or the like where the corrugated sheets are to be applied, as on roofing and the like.

Broadly the invention comprises improvements in sheet metal cutting machines wherein there are disc type cutters rotatably carried by base plate means, the cutters making two spaced apart parallel cuts simultaneously in the sheet material fed between same whereby a ribbon or strip is severed in the sheet to be removed and present a space or path extending progressively into the sheet while the cutting proceeds, the sheet continuing to be movable past the base plate of which a portion extends through the space or path as formed in the cutting of the sheet.

In describing the invention, reference will be made to the accompanying drawings in which:

FIGURE 1 shows a front elevation of the cutting machine.

FIGURE 2 is a side elevation of the cutter head end of the machine,

FIGURE 3 shows a cross section of the main plate on line A—B of FIG. 2,

FIGURE 4 is a side elevation of the drive end of the machine with gears arranged for power drive thereof,

FIGURE 5 shows the crank handle which is applied to the drive end of the machine when same is to be manually rotated,

FIGURE 6 shows an enlarged cross-sectional view through the cutters and their shafts in the cutter head and

FIGURE 7 shows a sheet of material with a partial cut made therein.

In the invention, there is a base or stand which is composed of two spaced apart vertical supports or pedestals 1 and 2 which at their inverted U-shaped top portions 1*a* are rigidly clamped as by bolts 3 over opposite ends of a preferably tubular horizontal base member 4, the lower portions 1*b* of these pedestals 1 and 2 presenting an upwardly extending slot or space 1*c* therein, if so desired.

Rigidly mounted on the base member 4 near one end thereof there is mechanism which will be called the cutter head the main member of which is the base or main plate 5, this having pairs of cheek plates 6, 6*a* and 7, 7*a* secured as by bolts 8 to opposite sides thereof in upper and lower positions thereon, the upper cheek plates 6 and 6*a* presenting a pair of bearings 6*b* concentric with each other within which the upper cutter shaft 9 is rotatable, there being a single disc type cutter 10 mounted on a key 11 (see FIG. 6) in such shaft 9 in the space 6*c* between the upper cheek plates 6 and 6*a*.

The lower cheek plates 7 and 7*a* similarly present a pair of bearings 7*b* which are concentric with a hole which passes through the main plate 5, a lower cutter shaft 12 being rotatable in such bearings 7*b* and there being a pair of disc type cutters 13 and 13*a* mounted on keys 14 in the shaft 12, these cutters 13 and 13*a* having a space or gap 15 between same which is of such a width as will permit the lower portion of the periphery of the upper cutter 10 to extend down thereinto, the cutters 13 and 13*a* also being capable of some axial movements on the shaft 12 but being yieldingly held towards each other by spring washers or the like 16 on the shaft 12 bearing against their outer faces whereby they are pressed against the peripheral edges of the upper cutter 10.

The lower cheek plates 7 and 7*a* also include bosses 7*c* through the bores of which the base member 4 passes, setscrews or the like 17 in such bosses 7*c* effecting the required rigid securement of the main plate 5 (by way of the cheek plates 7 and 7*a*) to the base member 4.

The single cutter 10 is disposed substantially vertically above the spaced apart pair of cutters 13 and 13*a* and these cutters are at the front of the main plate 5 which is also the front of the machine from which the sheet material to be cut will be moved to between such upper and lower cutters and the width or thickness of the upper cutter 10 is slightly greater than the thickness of the main plate 5, there being a gap or slot 5*b* extending into such main plate 5 at a position behind the cutters and in line with the path the sheet material will take while being cut, the edge of the gap or slot 5*b* being chamfered at 5*c*.

Distance pieces, bosses or the like 18 either separate from or attached to the inner faces of the cheek plates 6, 6*a* and 7, 7*a* and held by the various bolts 8 hold the said cheek plates at required distances apart with the main plate 5 centrally between these.

At the other end of the base or stand to that of the cutter head there is the driving mechanism for the cutters and of this the main part is the drive bearing plate 19 which may be of substantially oval form and have bearings 19*a* and 19*b* therein for receiving the cutter shafts 9 and 12 respectively, a bearing 19*c* for the main shaft drive or drive shaft 20 and a boss 19*d* through the bore of which the base member 4 passes, with a setscrew or the like 17 in such boss 19*d* effecting the rigid securement of the bearing plate 19 to the base member 4.

Secured on the cutter shafts 9 and 12 at the inner side of the bearing plate 19 there are gear wheels 21 and 22 meshing with each other and of like size to cause equal speed counterrotation of the shafts 9 and 12 and on the outer end of the shaft 9 to the other side of the bearing plate 19 there is secured a gear wheel 23.

Freely rotatable on the outer end of the cutter shaft 12 there is a gear wheel 24 and a concentric attached pinion

24*a*, this latter being in mesh with the gear wheel 23 while the wheel 24 is in mesh with the pinion 25 which is secured to the main drive shaft which projects through to the outer side of the bearing plate 19, the inner end of this main drive shaft 20 being available for receiving any suitable power drive.

This suitable power drive may take the form such as a conventional electric power drill 26, secured as by a clamping band 27 mounted on the base member 4 with its chuck coupled to the main drive shaft 20 and handle end engaged by a setscrew 27*a* in the band 27.

The gear wheel 24 with its attached pinion 24*a* freely rotatable on the cutter shaft 12 is held from lateral travel by a collar 28 secured to the shaft 12, but the shafts 9 and 12 can be manually rotated by removing the collar 28 and such gear wheel and pinion 24 and 24*a* and applying a crankhandle 29 as shown in FIG. 5 to the end of the cutter shaft 12, on which it is freely rotatable, the crankhandle 29 including a pinion 29*a* which will mesh with the gear wheel 23.

A suitable cover shown in dotted lines 30 secured to the bearing plate 19 encloses the gearing of the drive mechanism, various collars 31 being applied to the cutter shafts 9 and 12 to prevent any undesired lateral travel of these.

Now the apparatus has been described for machines in which the cutter shafts 9 and 12 and the base member 4 are continuous and obviously machines can be produced of various widths between the cutter head and the drive mechanism thereof, but if a machine is to be one man operated and manually rotated by the use of the crankhandle 29, the distance between the cutter head and the crankhandle must be limited in order that the crankhandle can be operated by one hand while the sheet of material being cut is held by the other.

While two men may operate the machine manually with one turning the crankhandle and the other holding the sheet to be cut, it is preferred to avoid this as somewhat detracting from the other benefits of the machine, but obviously the power drive enables one man to effect operation when the site of the use of the machine enables the use of power to rotate the cutters.

There are also cases where extra large sheets have to be cut, or long sheets cut across laterally in positions which may render the distance between the cutter head and the drive mechanism to be too close to permit of passage of the sheet because of being obstructed by the drive mechanism and therefore to meet such cases, the machine may be adapted to give extension beyond the normal requirements of the distance between such cutter head and the drive mechanism thereof.

In such cases, instead of the cutter shafts 9 and 12 and the tube 4 being continuous, they are of a known telescopic form such as shown in FIG. 1, the shafts 9 and 12 and the tube 4 instead of being continuous are each divided into two sections with inner tubes slidable over each of these and an outer tube slidable in turn over both of the inner tubes, holes through the shaft sections and the tubes in various positions along same enabling bolts to effect securement of the shafts and tubes to each other in various extended positions between a maximum and a minimum.

Considering by way of example the shaft 9 shown in section in FIG. 1, instead of this being continuous passing right through the machine, such shaft is divided about midway into two end sections of shaft over each of which the inner tubes 9*a* and 9*b* are slidable, an outer tube 9*c* in turn being slidable over these inner tubes 9*a* and 9*b* with holes 9*d* through the shaft 9 and tubes 9*a*, 9*b* and 9*c* adapted for receiving bolts 9*e* therethrough, a similar telescopic construction being applied to the shaft 12 and the base member or tube 4.

Obviously however, there are other known forms of telescopic shaft which may be used in place of the form shown in FIG. 1, such as for instance shafts of square cross-section slidable within tubes with square bores, or splined shafts disposed in splined bores.

FIGURE 7 of the drawings shows a sheet of material 32 in which a partial cut has been made, the cutters having simultaneously effected spaced apart double cuts 33 and 33*a* whereby a ribbon or strip 32*a* is severed from the sheet or cut into same from an edge thereof to thus form a space or path 32*b* in the sheet which is slightly wider than the thickness of the main plate 5.

In use or operation, if an electric drill 26 is applied to the apparatus or some other power drive applied to the main shaft 20, such drive is transmitted through the pinion 25 to the gear wheel 24 and its attached pinion 24*a*, the latter transmitting the drive to the gear wheel 23 which is secured to the cutter shaft 9 so that same is rotated at the required slow speed, the drive imparted to the shaft 9 being transmitted through the gear wheels 21 and 22 to the cutter shaft 12 whereby these shafts 9 and 12 and the cutters 10, 13 and 13*a* are rotated in opposite directions as indicated by the arrows in FIG. 2.

If the machine is to be manually rotated, the collar 28 and gear wheel 24 with attached pinion 24*a* are removed and the crank handle 29 fitted on the end of the shaft 12 in place of these, whereby with the pinion of the crankhandle 29 in mesh with the gear wheel 23, rotation of the crankhandle effects rotation of the shafts 9 and 12.

With the cutters 10, 13 and 13*a* in rotation, a sheet of corrugated iron or the like 32 to be cut is moved to between the cutters and these feed the sheet 32 through the machine with the two peripheral edges of the upper single cutter 10 acting in conjunction with the inner peripheral edges of the lower cutters 13 and 13*a* to effect two spaced apart cuts 33 and 33*a* in the sheet 32, whereby a ribbon or strip 32*a* disposed between the cuts 33 and 33*a* is severed therefrom along the lines of the cuts.

With the severing of the ribbon or strip 32*a* in the sheet 32 in advance of the latter reaching the base plate 5, the strip 32*a* is thrust to one side of such plate by the chamfer 5*c* in the gap or slot 5*b* so that the cut can be continued for any length, there being no restriction as to the length of cut which can be taken because a space or path 32*b* is presented in the sheet 32 behind the cutters, through which the base plate 5 extends to present no obstacle to the travel of the sheet.

When cuts 33 and 33*a* are effected across the corrugations of a sheet (or diagonally thereover) the sheet 32 effects an undulating motion and therefore the manually held side of the sheet is supported in a loose manner to permit of these undulating movements to be freely effected, the result being that along the line of the cuts 33 and 33*a* substantially no distortion from true original form is caused and the sheets on being cut can be immediately put into place on the particular structure they are being used for without any further attention.

The apparatus has as a main desirable feature its portability and therefore with corrugated iron and the like used extensively in the roofing of buildings, the machine may be carried up on to the roof of a building under construction.

Therefore with timber or other material roof rafters and such like present on the roof on which the corrugated iron or the like is to be laid and secured, considerable cutting of the sheets is frequently required.

For the easy support of the machine, the slots or spaces 1*c* are provided in the supports or pedestals 1 and 2, the machine being placed on a rafter or other member entered to the slots or spaces 1*c*.

I claim:

1. An apparatus for cutting sheet metal and sheet metal containing corrugations comprising an expansible base member, a head comprising a main plate having one end connected at one end of said base member, pairs of cheek plates secured to opposite sides of said plate in upper and lower positions thereon and extending towards each other, a first shaft and a second shaft ro-

tatably mounted at the free ends of the cheek plates, said shafts being spaced apart and parallel to each other, a pair of disc cutters operatively mounted on said first shaft, a single disc cutter mounted on said second shaft, said single cutter being disposed between said pair of cutters so that a portion thereof extends therebetween, a bearing plate having one end connected at the other end of said base member, gear means mounted on said bearing plate and operatively connected to said shafts, expansible members connected between said first and second shafts and said gear means to adjustably support said pair of cutters and said single cutter to operate said pair of cutters and said single cutter in counter-rotation, drive means operatively connected to said gear means to drive said gear means, and means disposed in said main plate to divert a strip of metal cut by said cutters to one side as a sheet of metal is being cut thereby.

2. An apparatus as claimed in claim 1 wherein the base member comprises two spaced apart vertical supports with inverted U-shaped top portions, a horizontal expansible member extending between the supports with the ends thereof passing through the top portions of said supports, and means clamping said supports to said horizontal member.

3. An apparatus as claimed in claim 1 wherein bosses are provided in the lower cheek plates for the rigid securement thereof to said base member, a space between the upper cheek plates in which the single cutter is disposed on said second shaft and spaces between the lower cheek plates and the main plate in which said pair of cutters are disposed on said first shaft, and said diverting means in said main plate including a gap extending behind the cutters, the edge of said gap being chamfered.

4. An apparatus as claimed in claim 1 wherein compression springs are disposed on said first shaft between the lower cheek plates and said pair of cutters to yieldingly thrust said pair of cutters against said single cutter.

5. An apparatus as claimed in claim 1 wherein the bearing plate has a boss for the rigid securement thereof to the base member, bearings in said bearing plate for rotatably receiving further shafts extending therethrough, said gear means including gear wheels on each of the further shafts meshed with each other, a further gear wheel on one of the further shafts meshing with a pinion of an attached pinion and gear wheel freely rotatable on the other shaft of said further shafts, said drive means including a further bearing in the bearing plate for a main drive shaft, and a pinion on the latter meshing with the gear wheel of the attached pinion and gear wheel, said expansible members connected between said first and second shafts and said further shafts.

6. An apparatus as claimed in claim 1 wherein said drive means includes either a portable motor or a crank-handle applied to said gear means.

7. An apparatus according to claim 2 in which the expansible members and the horizontal expansible member are each divided into two sections with inner tubes slidable over these and outer tubes slidable over the inner tubes, holes through the sections and tubes enabling bolts to be passed therethrough to effect securement of the sections and tubes in various positions.

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