

July 29, 1941.

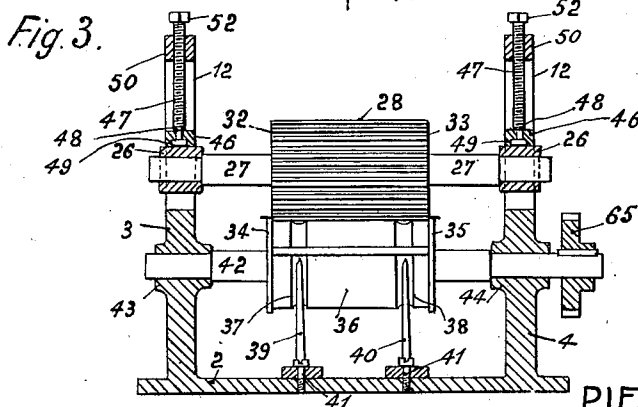
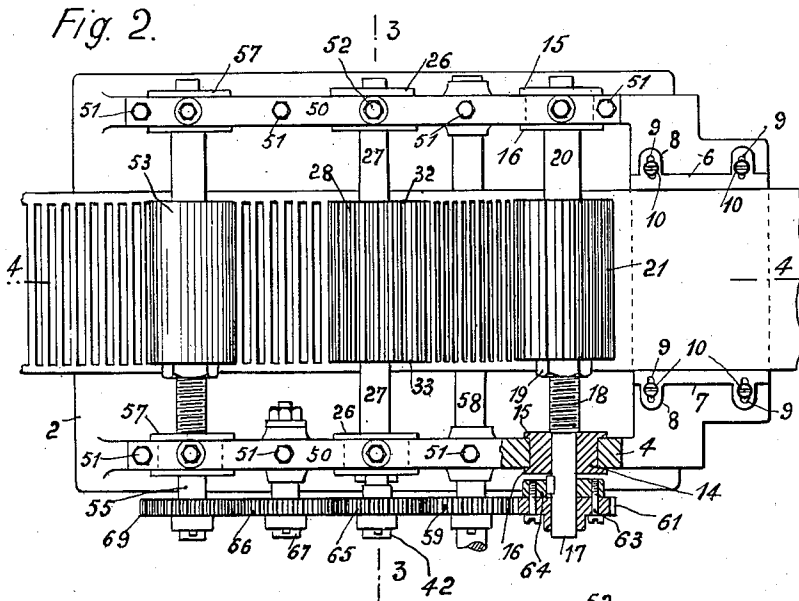
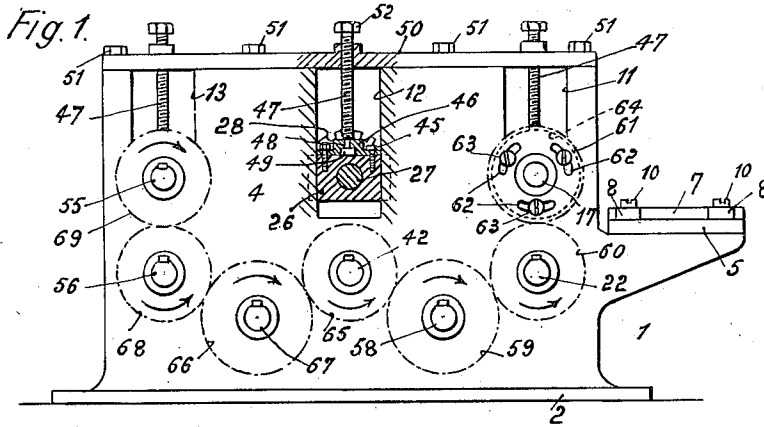
P. MESNEL

2,250,593

METHOD AND MACHINE FOR CUTTING OPENINGS IN METAL RIBBONS OR THE LIKE

Filed July 18, 1939

3 Sheets-Sheet 1



INVENTOR:
PIERRE MESNEL

BY *Haseltine, Lake & Co.*
ATTORNEYS

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Fig. 4.

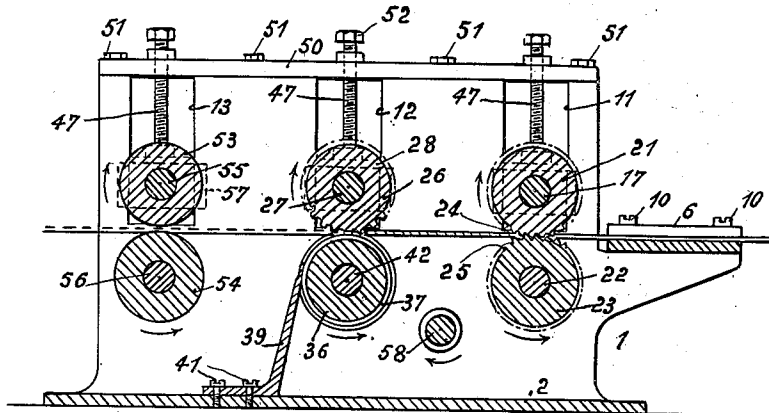


Fig. 5.

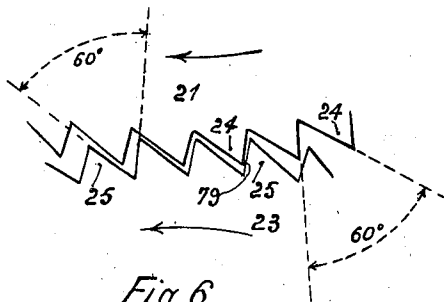
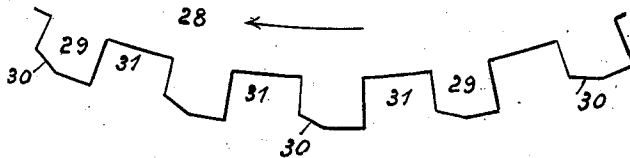


Fig. 6.



INVENTOR:
PIERRE MESNEL
BY *Haseltine, Lake & Co.*
ATTORNEYS

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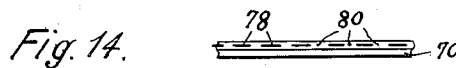
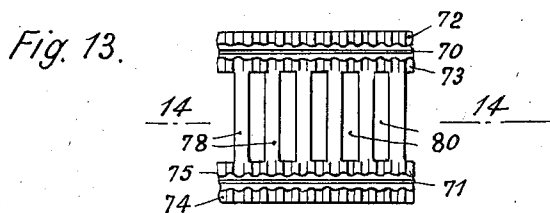
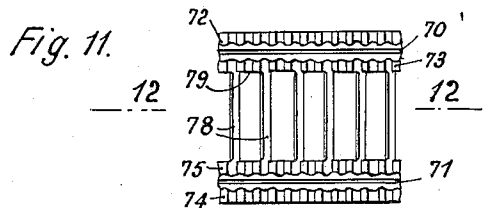
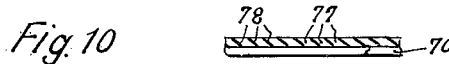
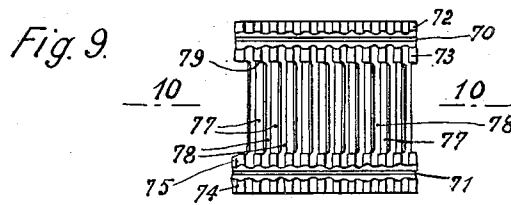
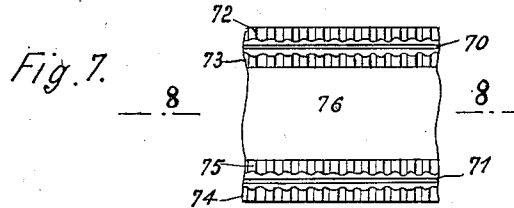
P. MESNEL

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METHOD AND MACHINE FOR CUTTING OPENINGS IN METAL RIBBONS OR THE LIKE

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3 Sheets-Sheet 3



INVENTOR:
PIERRE MESNEL
BY *Haseltine, Lake & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,250,593

METHOD AND MACHINE FOR CUTTING
OPENINGS IN METAL RIBBONS OR THE
LIKE

Pierre Mesnel, Colombes, France

Application July 18, 1939, Serial No. 285,120
In France June 16, 1939

4 Claims. (Cl. 164—99)

The invention relates to the cutting out of ribbons or bands of strip metal, that is to say of thin metal, in order to form therein openings or holes which are evenly arranged along the length of said ribbons or bands. Hitherto, such cutting out was usually effected by punching in a press, that is to say that the ribbon or band, which was held stationary in a press and supported by a die, was punched over a certain length and then shifted to bring it into a suitable position for the next punching operation, etc. This method offers numerous drawbacks: the movement of the ribbon is discontinuous, that is to say that it is formed by a succession of shifts and stoppages; the feeding of the ribbon in the press has to be accurate, otherwise it will be detrimental to the evenness of the openings cut out, and such accuracy cannot always be obtained owing to slipping; the machines for subsequent treatment are only supplied in jerks, etc. On the other hand, a punching or cutting out press is a low efficiency machine.

It is an object of the invention to provide a method for cutting out metal bands or ribbons, in order to produce therein openings or holes which are evenly spaced along the length thereof, which overcomes these drawbacks. Said method is characterized by the fact that the ribbon is cut out by passing between two cutting wheels which are in contact with each other at one spot on their periphery.

Said method is furthermore characterized by the following points, considered separately or in groups:

1. During a first phase, slots directed transversely of the length of the ribbon are made by passing same between a first pair of wheels.

2. During a second phase, longitudinal cuts are made which, together with the transverse slots, limit the desired perforations or holes.

3. During an optional third phase, the parts of the ribbon which have been deviated, by the cutting out, from the plane of the ribbon, are returned to said plane;

4. The second or third phases are likewise effected with the co-operation of wheels or rollers.

5. The second phase is effected by the co-operation of a cutting wheel and of a roller, and the wheel is driven by the passage of the ribbon slotted during the first phase.

A further object of the invention is to provide a machine for carrying out said method and which is characterized by the following points, considered together or separately:

6. The cutting wheels for effecting the first

phase are in contact, at a given instant, only at the spot thereof that is effecting the cutting out at said instant.

7. Said wheels are provided with triangular teeth and are similar to each other, save that their diameters are slightly different.

8. The use of adjusting means for angularly shifting the teeth of one cutting wheel relatively to those of the other.

9. The second phase of manufacture is effected by the co-operation of a wheel, the frontal faces of which are the operative faces, with a roller provided with cheeks which co-operate with said frontal faces.

10. Said roller is provided with grooves for housing deflecting fingers which facilitate the elimination of the pieces of metal cut out.

In the ensuing description which is given by way of example, reference is had to the accompanying drawings in which:

Fig. 1 is a diagrammatical side view of an embodiment of a machine according to the invention, in partial section.

Fig. 2 is a corresponding plan view, in partial section.

Fig. 3 is a section along the line 3—3 of Fig. 2.

Fig. 4 is a section along the line 4—4 of Fig. 2.

Fig. 5 is a view, on a large scale, of two cutting wheels adjacent their contacting point.

Fig. 6 is a view, on a large scale, of a part of the wheel for carrying out the second phase of the method.

Fig. 7 is a plan view of an embodiment of a metal ribbon, before the method has been carried out.

Fig. 8 is a section along the line 8—8 of Fig. 7.

Fig. 9 is a similar view to Fig. 7, but after the first phase has been effected.

Fig. 10 is a section along the line 10—10 of Fig. 9.

Fig. 11 is a similar view to Figs. 7 and 9, but after the second phase has been effected.

Fig. 12 is a section along the line 12—12 of Fig. 11.

Fig. 13 is a similar view to Figs. 7, 9 and 11, but after the third phase of manufacture has been effected.

Fig. 14 is a section along the line 14—14 of Fig. 13.

The machine comprises a frame 1 which rests on a base 2 and is composed of two uprights 3 and 4. Said frame forms, at one of its ends, a table 5 for the feed of the ribbon or band to be treated. On the table 5 are adjustably arranged guides 6 and 7 for the ribbon which are provided

with ears 8 in which are formed slides 9 which, in co-operation with screws 10, enable the adjustment to be effected.

In the uprights 3 and 4 are provided oppositely located recesses forming three pairs 11, 12 and 13. In each of the recesses 11 is lodged a block 14 forming a bearing which is held by cheeks 15 and 16 that co-operate with the uprights 3 and 4, and which serves to support a shaft 17 provided with a threaded portion 18. Said threaded portion co-operates with a nut 19 which, in co-operation with a bearing surface 20 of the shaft 17, holds an upper cutting wheel 21 fast on the shaft 17.

In the uprights 3 and 4 rests a shaft 22 on which is fixed, opposite the upper wheel 21, a lower cutting wheel 23. The upper and lower cutting wheels are similar to each other; their periphery is formed by triangular teeth respectively 24 and 25, the angle of cut of which is of constant cross-section and is preferably chosen approximately 60°. The upper wheel 21 and the lower wheel 23 have the same number of teeth. The outside diameters of the wheels are slightly different from each other. In the example described, a diameter of 57.2 mm. has been chosen for the upper wheel and a diameter of 56.6 mm. for the lower wheel. It is of course understood that these figures are in no way limitative and that they may be altered for the various purposes desired, without exceeding the scope of the invention. In the example described, the height of the teeth of both the wheels is the same.

The difference between the cutting wheels provided for ensuring a satisfactory disengagement of the teeth from each other, need not be obtained by means of a difference of diameter of the wheels, but by means of a difference of the cross-sections of their teeth, in which case the outside diameters of the wheels may be the same. This construction leads, however, to a more complicated machining.

The sharpening of the upper and lower cutting wheels is effected simply by means of a circular grinding wheel, which rounds off the top of the triangular teeth.

In the recesses 12 are lodged blocks 26 which form a bearing and which support the upper shaft 27 of the second train of wheels. The upper wheel 28 of this second train is formed by a row of teeth 29 which are of generally rectangular shape but which are provided with a cant 30 for relieving them. The teeth 29 are separated from each other by spaces 31 of the same width as the teeth 29. The operative parts of the wheel 28 are formed by the frontal faces 32 and 33 which co-operate with cheeks 34 and 35 formed at the end of a roller or cylinder 36 which forms the lower element of the second train. The roller 36 is provided with circular grooves 37 and 38 in which are engaged the ends of deflecting fingers 39 and 40 fixed by screws 41 on the base 2 of the machine. The roller 36 is fixed on a shaft 42 which rests rotatably in the uprights 3 and 4 by means of bearings 43 and 44 formed in said uprights.

The block 26 is rigidly secured, by means of screws 45, to a part 46 in which is engaged, in such a manner that it can rotate but cannot move longitudinally, a threaded rod 47; for this purpose, said rod is provided with shoulders 48 and 49. The threaded rod 47 co-operates with a tapped hole formed in a covering bar 50 which is fixed by screws 51 on the upper face of the

upright 3 or of the upright 4, according to the case.

The threaded rod 47 terminates in a polygonal head 52 for actuating same.

The third train of the machine is formed by two smooth rollers or cylinders, an upper one 53 and a lower one 54, which are respectively fixed on shafts 55 and 56. The upper shaft 55 rests in bearing blocks 57 which are mounted in the recesses 13 and which are fitted with a threaded rod 47 as just described.

The drive of the machine is effected by means of a shaft 58 which receives power from a motor, not shown, and which rests in the uprights 3 and 4. On the shaft 58 is fixed a gear 59 meshing with a gear 60 which is fixed on the shaft 22. The gear 60 meshes with an identical gear 61 which is loosely mounted on the shaft 17. On said gear 61 are provided circular slideways 62 through which pass screws 63 which are on the other hand permanently fixed in a disc 64 fast on the shaft 17. The gear 59 meshes on the other hand with a pinion 65 fast on shaft 42. Said pinion transmits its movement to an intermediate pinion 66 which is mounted on a shaft 67 journaled in the upright 4 and which transmits its movement to a pinion 68 fast on the shaft 55. The pinion 68 meshes with an identical pinion 69 fixed on the shaft 55.

The band or ribbon of strip metal to be treated rests on the table 5 and is held by the guides 6 and 7. In the example chosen, said ribbon is provided with longitudinal ribs 70 and 71 which are bordered on either side by corrugations 72, 73, 74 and 75. The central part 76 of the ribbon, which is limited by the corrugations 73 and 75, is plane. When the shaft 58 is driven with a continuous movement, the cutting wheels 21 and 23 also rotate continuously. They seize the ribbon between them and their teeth 25 form in the plane portion 76 slots 77 which limit blades 78 which are deviated from the plane of the ribbon and follow the contour of the teeth 25. Owing to the construction of the wheels, at a given instant they are only in contact along a line 79 where the cutting of the metal is being effected at this instant. There are then no other points of contact between the wheels, so that the entire pressure is exerted at the spot where cutting is taking place, along the line 79, without untimely friction and without danger of jamming the band or ribbon between the wheels.

The adjustment of the relative position of the cutting wheels 21 and 23 is effected by loosening the screws 63 and shifting the pinion 61 relatively to the disc 64. It is thus possible to modify the relative angular position between the wheels 21 and 23 and to obtain the best relative position for producing an easy and clean cut. By rotating the corresponding threaded rods 47, it is possible on the other hand to adjust the axial distance between the wheels 21 and 23.

As they pass through the second train, the blades 78 are cut out, one blade out of two, at their point of attachment 79 to the corrugations 73 and 75, by the co-operation of the frontal faces 32 and 33 with the cheeks 34 and 35. The band shown in Figs. 11 and 12 is then obtained.

After the machine has been operating for some time, it becomes necessary to sharpen the wheel 28. This sharpening involves the faces 32 and 33 which are plane, so that it is very easy to effect. Preferably, the wheel 28 may, if desired, be separated into two elements along a transverse plane and shims are interposed between said

elements in order to compensate for the metal worn away in sharpening. The blades which are sheared when passing through the second train are carried along by the roller 36 and ejected by the deflecting fingers 39 and 40, the ends of which are lodged in the grooves 37 and 38.

When they pass through the third train, which is formed by the cylinders 53 and 54, the remaining blades are returned, by rolling, to the initial plane of the part 76.

The machine according to the invention has therefore transformed the continuous plane portion 76 into a plane portion provided with regular and evenly distributed holes 80.

Experience has shown that the machine according to the invention is capable, for example, of producing, on a piece of strip metal two-tenths of a millimetre thick, 3 mm. holes spaced 3 mm. apart, at a speed of travel of the strip metal of 1200 metres per hour, without overheating the cutting wheels 21 and 23. Said cutting wheels may, moreover, be made of usual tool-steel. If the wheels are sprayed to cool same, it is possible to obtain a speed of production of 5000 metres of strip metal per hour.

The holes produced are regular and evenly arranged; the continuous output of the treated strip metal readily permits of the supply of apparatus for subsequent treatment. The treatment effected is very cheap.

Instead of strip metal, it is also possible to treat, according to the invention, strips of so-called plastic material.

The holes or cut out portions may be of other shapes than the rectangular shape illustrated; they may be oblique, elliptical, or be of regular or irregular geometrical shape.

The cutting out of the bands or ribbons by means of the method and the machine according to the invention, need not be effected for the preparation of the bands or ribbons themselves, but for obtaining the cut out or waste metal pieces from said ribbon or band.

I claim:

1. A method for cutting out metal bands or ribbons in order to produce holes or openings therein, which comprises cutting out slots directed transversely of the length of the ribbon by passing the same between a first pair of cutting wheels, then effecting longitudinal cuts

which, with the transverse slots, limit the desired perforations or openings, the cutting operation deviating parts of the ribbon from the plane thereof, and finally returning into the plane of the ribbon the parts which have been deviated therefrom by the cutting operation.

2. A machine for cutting out metal bands or ribbons in order to produce holes or openings therein, which comprises a first pair of wheels provided with corresponding triangular teeth whereof the profile corresponds to the transverse sides of the hole or opening, said pair of wheels serving to cut and deviate parts of the ribbon from the plane thereof, and one of the wheels of said pair being slightly larger than the other, a second pair of wheels whereof the profile corresponds to the longitudinal sides of the hole or opening, and a third pair of wheels which are smooth, for returning to the plane of the ribbon the parts of the same that have been deviated from said plane by the cutting operation.

3. A machine for cutting out metal bands or ribbons in order to produce holes or openings therein, which comprises a first pair of cutting wheels, a second pair consisting of a wheel having operative frontal faces and a corresponding roller provided with cheeks co-operating with said frontal faces which deviate the material cut by the first rollers from the plane of the ribbon operated upon, and a third pair consisting of co-operating smooth rollers for restoring the material cut and deviated respectively by the first and second pairs of rollers to the plane of said ribbon.

4. A machine for cutting out metal bands or ribbons in order to produce holes or openings therein, which comprises a first pair of cutting wheels for cutting the ribbon, a second pair of cutting wheels consisting of a wheel having operative frontal faces and a special roller provided with cheeks co-operating with said frontal faces which deviate the material cut by the first rollers from the plane of the ribbon operated upon, groove portions in said roller, deflecting fingers lodged in said groove portions, and a third pair consisting of co-operating smooth rollers for restoring the material cut and deviated respectively by the first and second pairs of rollers to the plane of said ribbon.

PIERRE MESNEL.