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MACHINE FOR FABRICATING RADIATOR FINS

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Fig. 1.

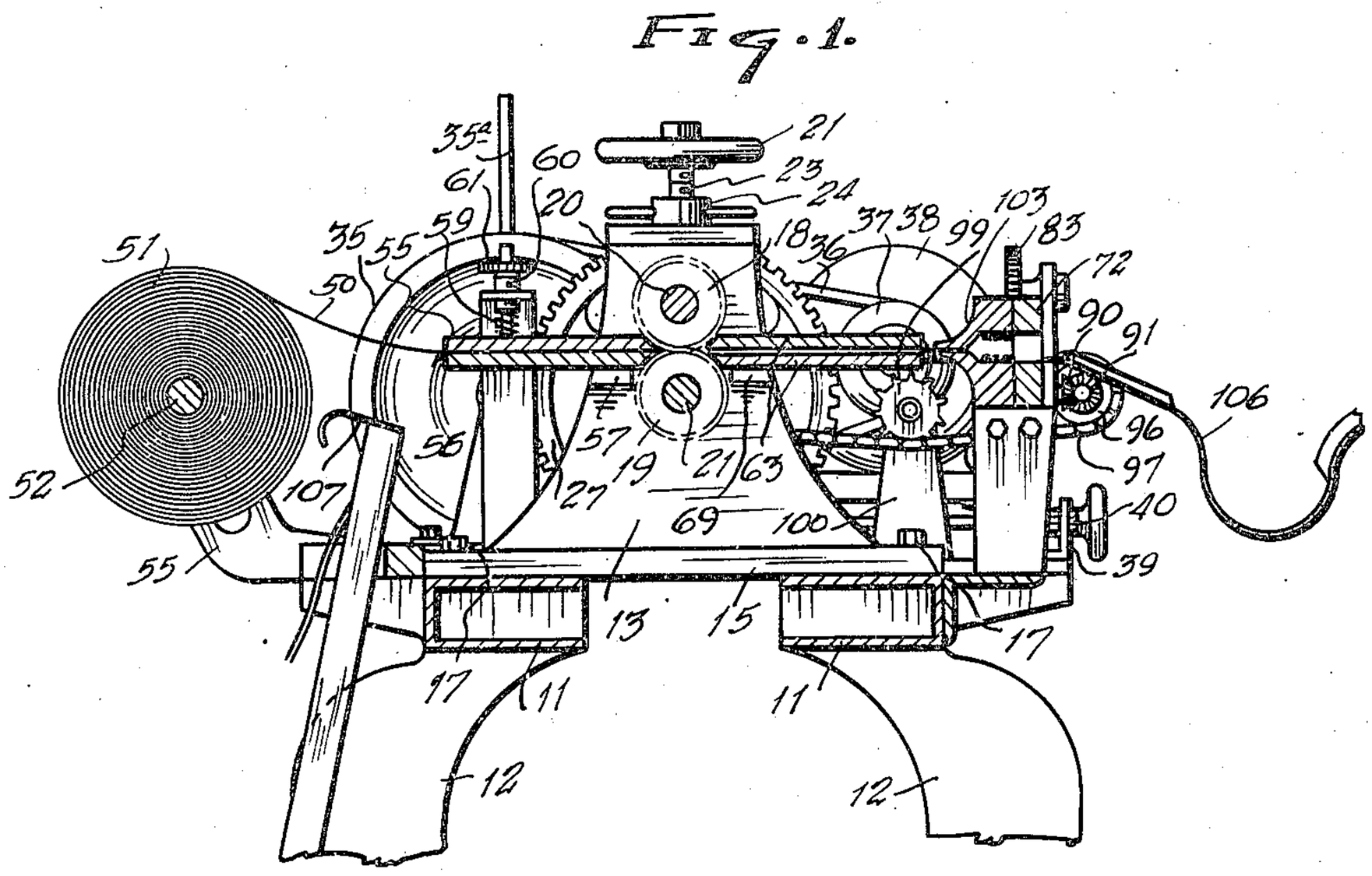

Fig. 2.

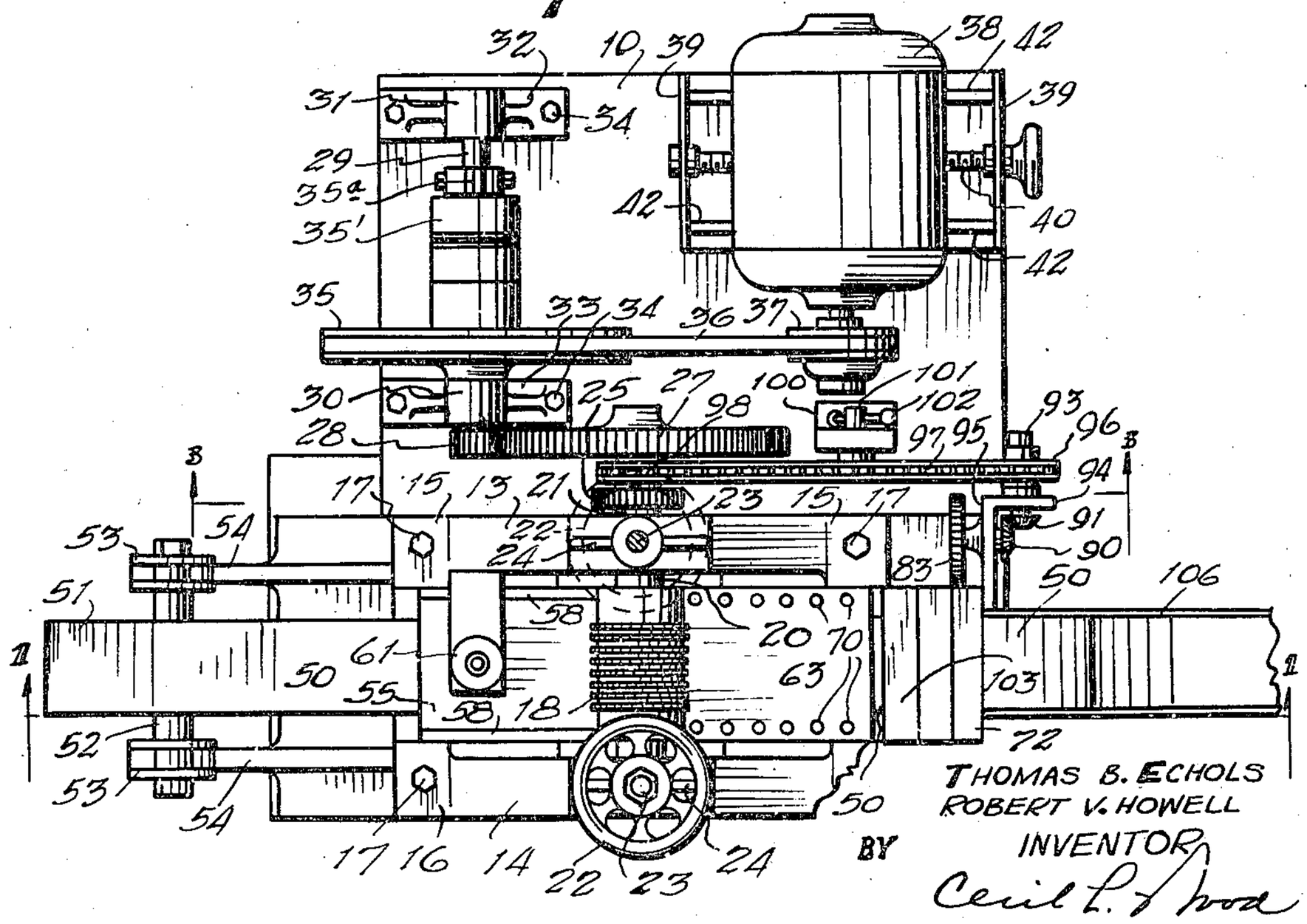

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Fig. 3.

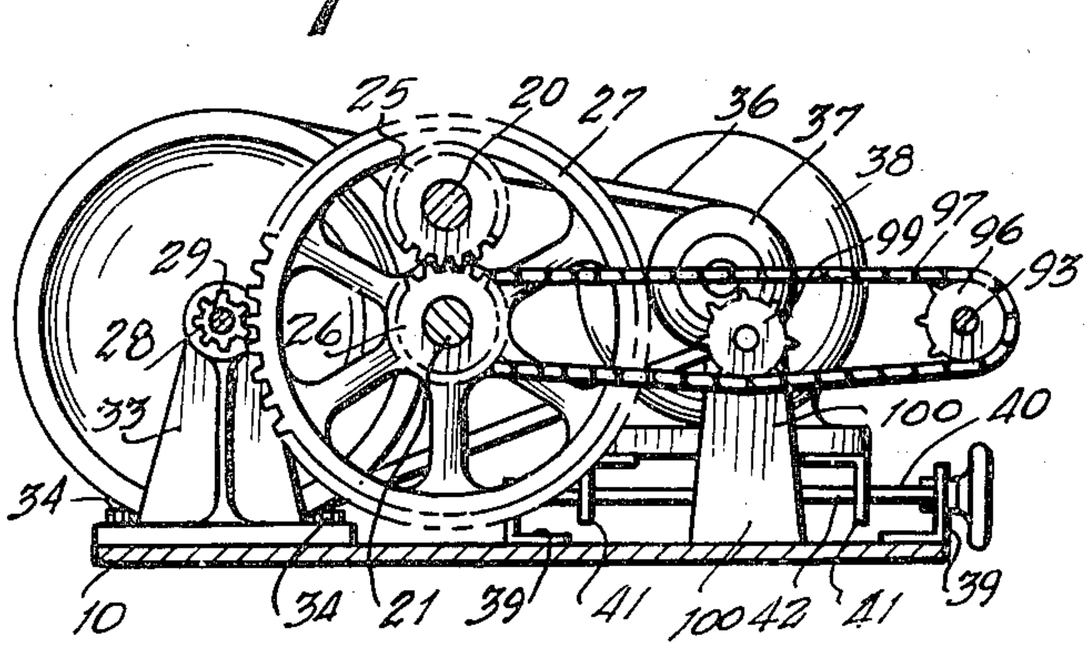

Fig. 4.

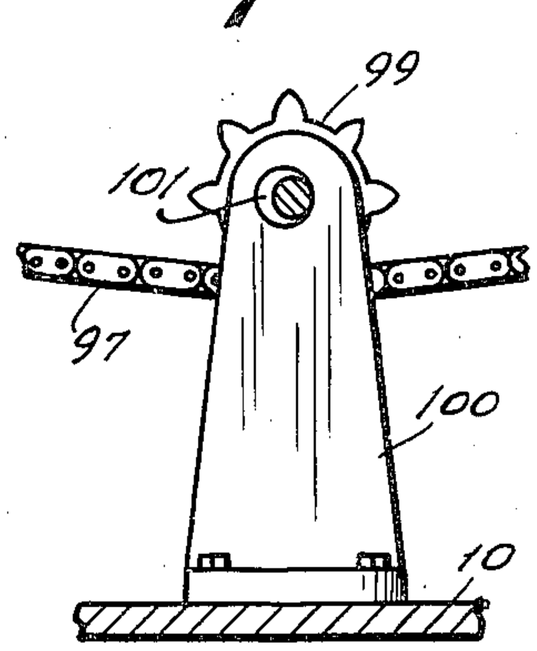

Fig. 5.

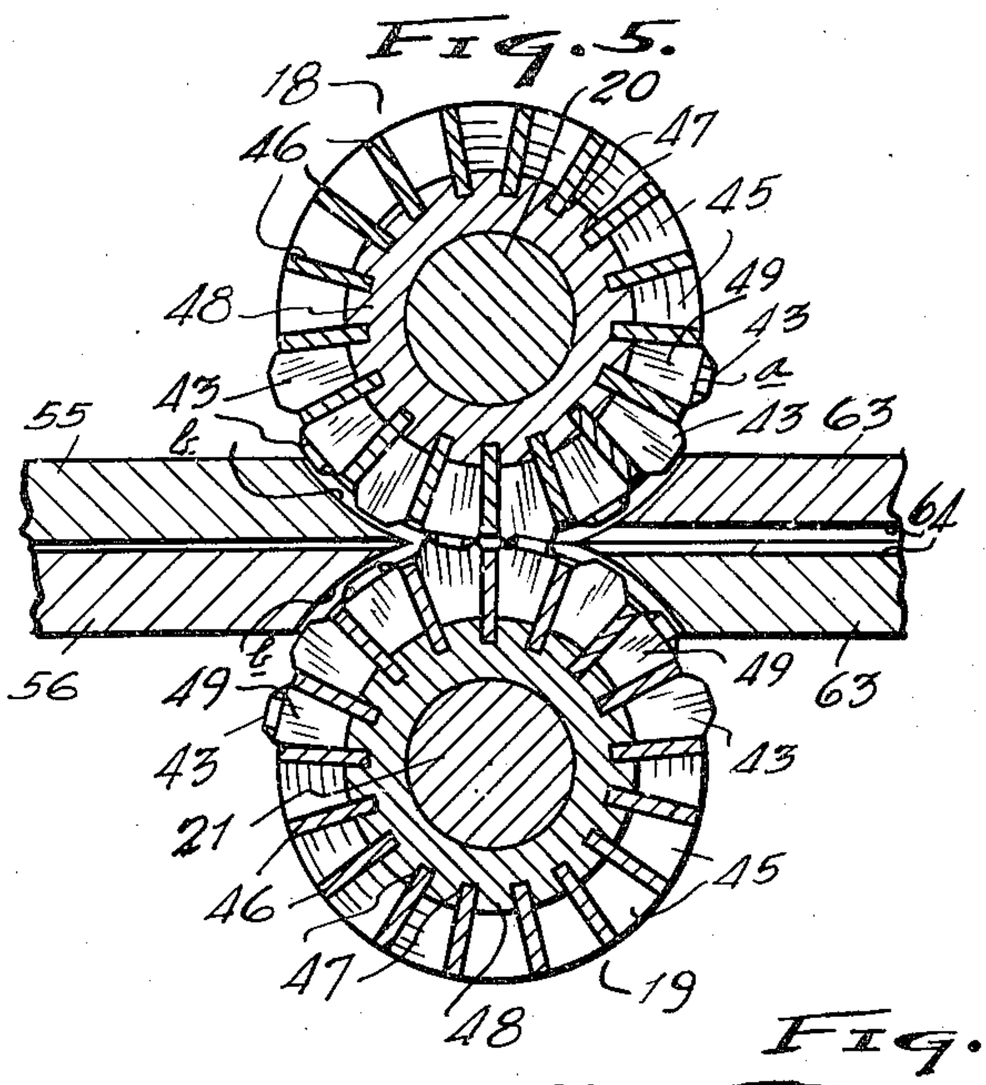

Fig. 6.

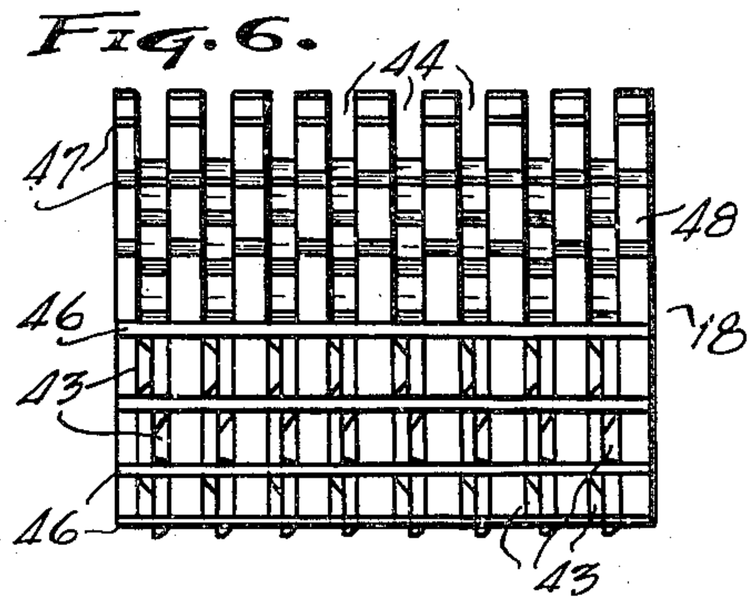

Fig. 7.

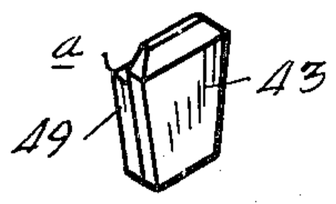

Fig. 8.

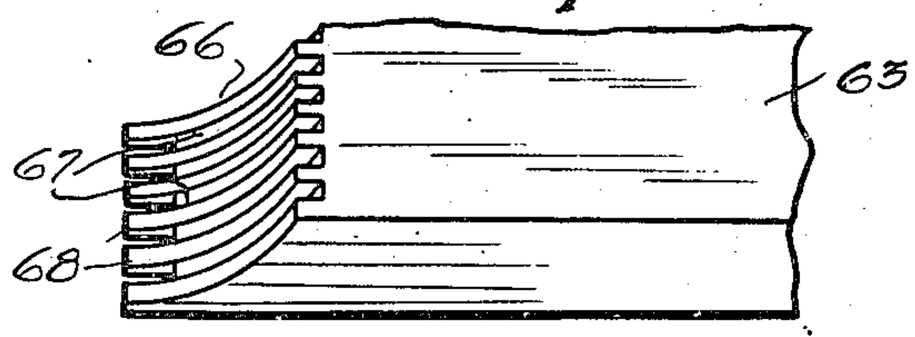

Fig. 9.

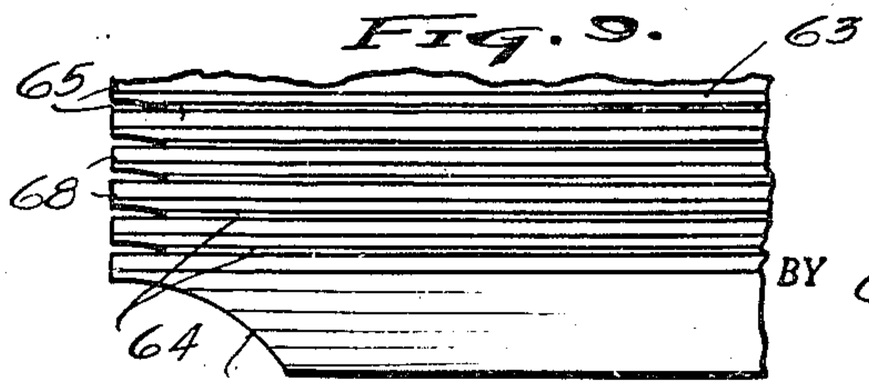

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FIG. 10.

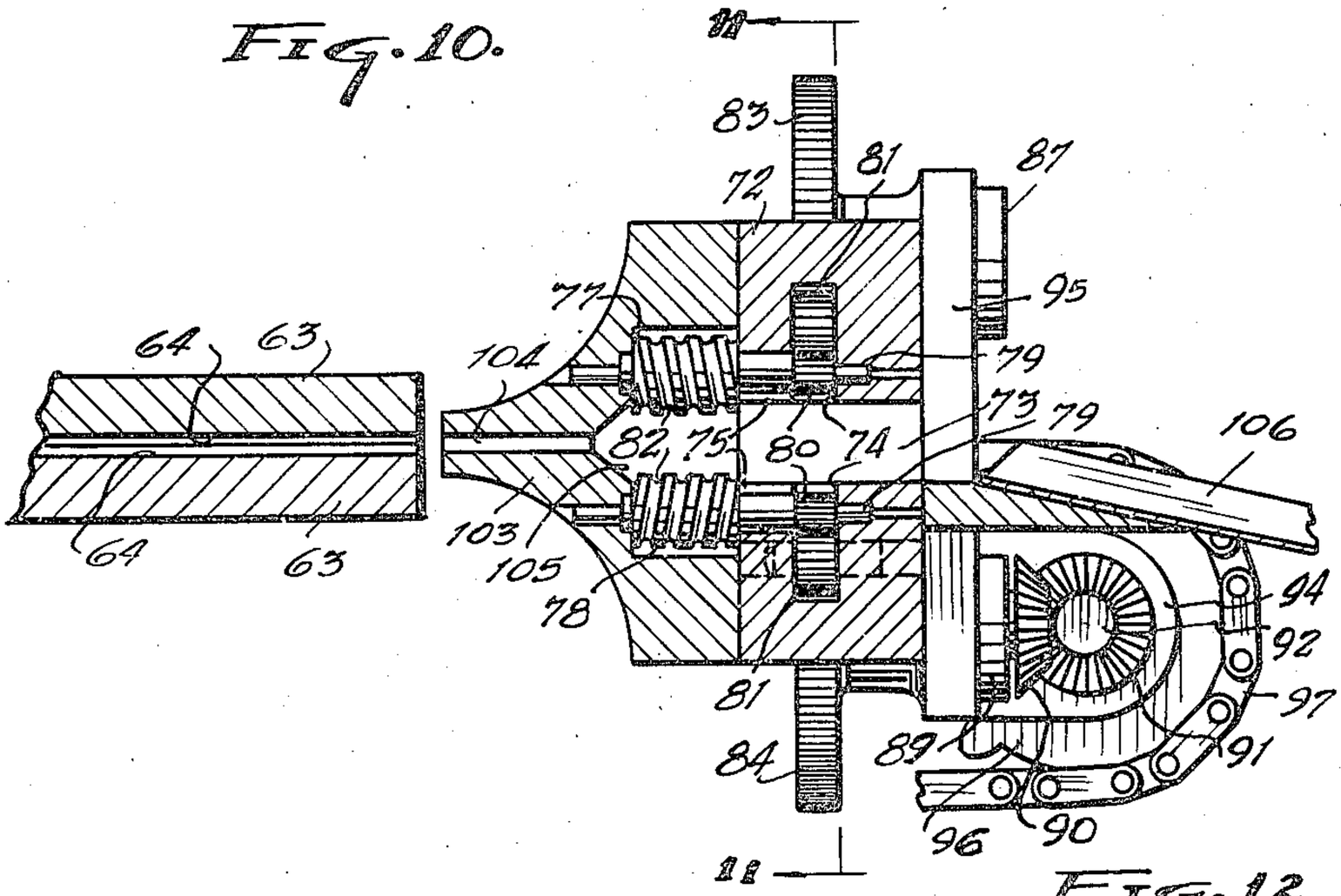

FIG. 11.

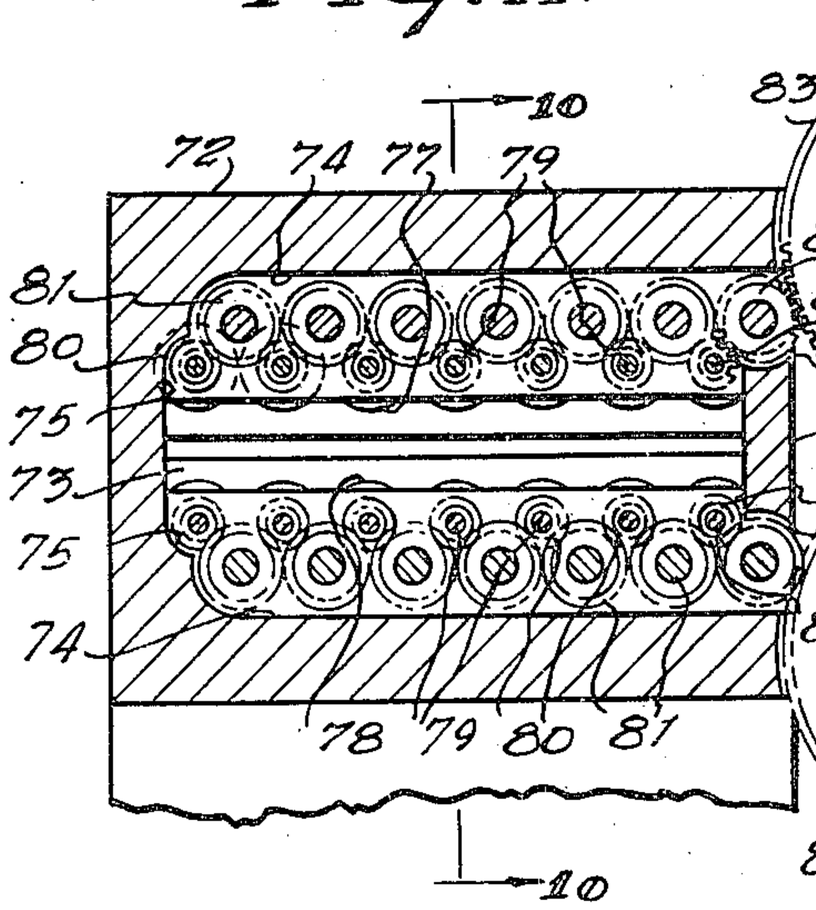

FIG. 12

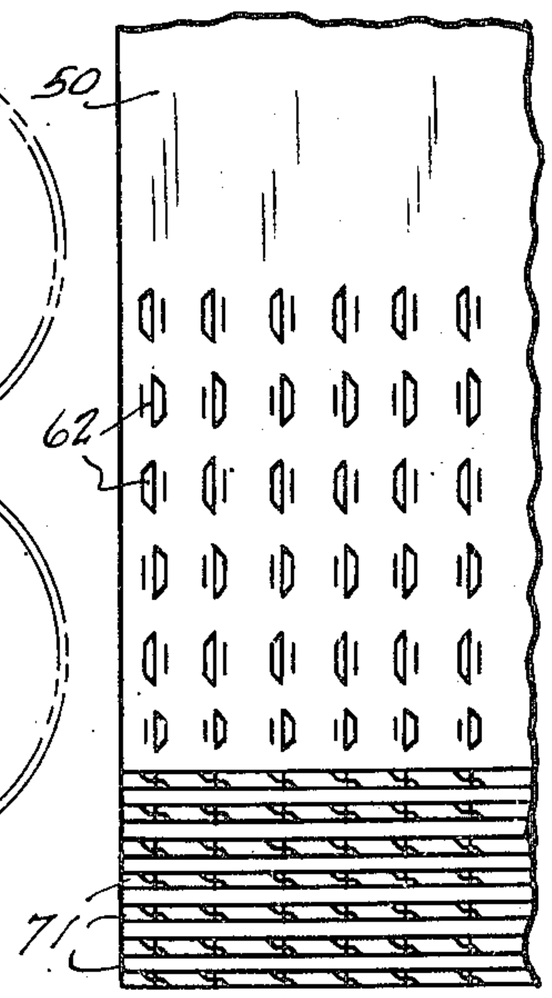

FIG. 13.

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MACHINE FOR FABRICATING RADIATOR FINS

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Application January 31, 1947, Serial No. 725,638

3 Claims. (Cl. 153—2)

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This invention relates to machines for forming cooling fins for radiator cores employed in cooling systems of internal combustion engines, and the like, and it has for its principal object the provision of apparatus for cutting and forming strips of sheet metal, such as copper, or other suitable materials, and forming the same into narrow folds, whereby to space the water tubes and provide a series of fins to radiate heat for dissipation by air contacting the fins which, by their association with the tubes, cools the water circulated through the cooling system.

An object of the invention resides in the provision of a compact and inexpensive machine in which is embodied a simple arrangement of rotary dies for cutting and forming air passages in the fin assemblies, capable of adjustment for impressions, while the material is fed therebetween.

Yet another object of the invention is manifest in the provision of a novel folding or plaiting assembly capable of forming the fins into narrow folds without an impression die and, consequently, without impairing or marring the previously formed air passages in the fins.

Broadly, the invention contemplates the provision of a mechanism which is simple in design yet capable of automatically performing operations ordinarily requiring more complex and expensive mechanisms necessitating the services of an attendant.

While the foregoing objects are paramount, other and lesser objects will become manifest as the description proceeds, taken in connection with the appended drawings wherein:

Figure 1 illustrates the invention in partial longitudinal section, taken on lines 1—1 of Figure 2, showing a roll of strip material, the association of the rotary dies, and folding mechanism.

Figure 2 is a plan view of the invention illustrating the driving arrangement, the upper rotary die, and the path of the material through the mechanism.

Figure 3 is a cross-sectional view of the driving mechanism, taken on lines 3—3 of Figure 2, illustrating some of the adjustment features.

Figure 4 is an elevational view of an adjustable sprocket by which the dies and folding mechanism are synchronized.

Figure 5 is a vertical sectional view taken transversely through the dual arrangement of rotary dies, guide plates and stripper members therefor, showing the construction of said dies.

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Figure 6 is a side elevational view of one of the rotary dies showing some of the forming units removed.

Figure 7 illustrates, in perspective, one of the cutting and forming units which form the rotary dies.

Figure 8 fragmentarily shows a perspective illustration of the top of the stripping element.

Figure 9 is a fragmentary perspective illustration of the bottom of the stripping element.

Figure 10 is a vertical cross-sectional view of the folding mechanism taken on lines 10—10 of Figure 11, showing a pair of the opposingly arranged helical rotors and the driving mechanism therefor.

Figure 11 is a transverse sectional view through the folding mechanism, taken on lines 11—11 of Figure 10, illustrating the dual arrangement of the helical rotors and the driving mechanism therefor.

Figure 12 fragmentarily shows a metal strip on which forming operations have been made by the invention, and

Figure 13 illustrates the material as the same appears from one edge, showing the shaped air passages and the folded or plaited form.

The invention comprises a platform 10 supported on parallel horizontal members 11 which may be attached to or formed with a plurality of legs 12, or other suitable devices, as illustrated particularly in Figure 1. Along one side of the platform 10, and also arranged upon the parallel members 11, are a pair of bearing standards 13 and 14 which are spaced apart, in the manner shown in Figure 2, and have their bases 15 and 16 secured to the horizontal members 11 by bolts 17, or the like.

A pair of rotary dies 18 and 19, having their axes in vertical alignment, are operatively arranged between the standards 13 and 14 and have their shafts 20 and 21 journalled therein. Each of the bearings of the shaft 20 of the upper die 18 are vertically adjustable by hand wheels 22 on threaded shafts 23, shown in Figures 1 and 2, by which the die 18 can be adjusted with relation to the die 19 and thus vary the pressures as desired. Locking members 24 are threaded upon

the shafts 23 to secure the same against rotation when adjustment is made.

The dies 18 and 19, which will be described in detail presently, are opposingly rotated through meshed gears 25 and 26 arranged on the shafts 20 and 21, the latter extending beyond the end of the shaft 20 and having a larger gear 27 rigidly mounted thereon which is meshed with a relatively small pinion 28 on a shaft 29 supported in bearings 30 and 31 in brackets 32 and 33 secured by bolts 34 to the platform 10, as illustrated in Figures 2 and 3. A V-pulley 35 is arranged on the shaft 29 which is driven by a V-belt 36 operating on the V-pulley 37 of a motor 38, also supported on the platform 10 by brackets 39, in the manner shown Figures 1, 2 and 3. The pulley 35 is mounted for free rotation on the shaft 29 and rotates therewith when the clutch 35′ is engaged, the latter being operable by a lever 35*a*.

The driven connection between the motor 38 and the pulley 35 is adjustable through a threaded rod 40 operatively arranged through depending base flanges 41 of the motor 38 and which slidably operate along parallel guide rods 42 arranged transversely of the motor 38 and secured at each end in the brackets 39. By this arrangement the motor 38 can be moved to tighten or loosen the V-belt 36 as desired. The diameters of the pulleys 35 and 37, as well as the gear 27 and pinion 28, determine the rotative speed of the dies 18 and 19.

The dies 18 and 19, illustrated in detail in Figures 5 and 6, comprise a plurality of forming units 43 set in spaced circumferential grooves 44 formed therein and separated in longitudinal rows 45 by bars 46 arranged in grooves 47 formed longitudinally of the cylindrical bodies 48 of the dies 18 and 19.

The bars 46 assume a radial arrangement in transverse section, as shown in Figure 5, and the spaces therebetween are tapered inwardly. The units 43 are accordingly formed, as depicted in Figure 7, and have their operative faces shaped as desired. It is expedient to arrange the units 43 in opposing staggered relationship, as shown in Figures 5 and 6, and a spacing block 49 is inserted beside each in alternate arrangement which also has a cutting edge *a* along one of its upper edges whereby to provide a cut in the material spaced from that made by the unit 43, as will presently become manifest.

The dies 18 and 19 being arranged in their operative relationship illustrated in Figure 5, a strip of material 50, preferably copper, is passed therebetween from a roll 51 pivotally supported on a suitable shaft 52 journalled at each end in bearings 53 in brackets 54 attached to the parallel members 11 of the main supporting structure, as in Figures 1 and 2. The strip of material 50, as it leaves the roll 51, is passed between slide plates 55 and 56 arranged horizontally and having their operative faces in relatively close association.

The lower plate 56 is rigidly supported on integral lugs 57 formed on the standards 13 and 14, as manifest in Figure 1, and is formed to define integral flanges 58 along each side so that the upper plate 55, being narrower, rests between the flanges 58 and is capable of being pressed downwardly against the material 50, sliding along the lower plate 56, under tension as by a spring 59 adjusted by a screw 60 arranged in a bracket and having a suitable hand wheel or knob 61 thereon, as shown in Figures 1 and 2. Thus, any desired tension can be applied to the material as it is passed between the members 55 and 56.

The plates 55 and 56 extend to the dies 18 and 19 and each has its outer face *b* conformably curved transversely so as to project into the substantially triangular space between the dies 18 and 19 adjacent the meeting faces thereof, as in Figure 5. In this manner the material 50 is guided directly between the dies 18 and 19, the latter impelling the strip of material 50 through the invention.

By reference to Figures 12 and 13 it will become apparent that the material 50 is formed by the dies 18 and 19 with uniform arrangements of cuts and impressions 62. In performing these operations it is characteristic of the material 50 to cling to the dies 18 and 19 until detached therefrom by stripper elements 63 arranged in operative association with the dies opposite the plates 55 and 56. The members 63 may be identically formed and their opposing operative faces have longitudinally arranged spaced grooves 64 which accommodate the formed impressions 62 in the material 50 while the ribs 65 between the grooves 64 engage the surfaces of the material 50 and guide the same toward the folding mechanism hereafter described.

It is desirable that the opposing outer faces 66 of the stripper members 63, at their receiving ends adjacent to the dies 18 and 19, have their surfaces curved inwardly conforming to the contour of the dies 18 and 19 and project into the triangular space between these members opposite the guide plates 55 and 56, as in Figure 5. The surfaces 66 have parallel grooves 67 directed longitudinally of the stripper members 63 through which the units 43 operate, the arrangement of spaced fingers 68 at the ends of the members 63 extending between the dies and functioning to separate the material 50 therefrom as the latter is passed therebetween. The stripping elements 63 are illustrated in detail in Figures 8 and 9.

The lowermost member 63 is supported upon integral lugs 69 formed on the standards 13 and 14, similar to the lugs 57 supporting the plates 55 and 56, while the upper member 63 is secured to its mate by cap screws 70, or the like, shown in Figure 2.

The material 50, after passing between the dies 18 and 19, is moved longitudinally along between the stripper elements 63 from which it enters the folding or plaiting assembly whereby the strip of material 50 is formed into a uniform arrangement of narrow folds 71, as apparent in Figures 12 and 13. The folding assembly is illustrated in detail in Figures 10 and 11 and comprises a gear housing 72 which is preferably formed from a solid piece of metal, or other suitable material, and has a horizontally positioned elongated opening 73 therethrough of sufficient depth to permit the passage of the folded material 50 therethrough.

Above and below the openings 73 are grooves 74 arranged longitudinally of the opening 73 and along one side of each groove a recess 75 is formed, as shown in Figures 10 and 11. The opening 73, the grooves 74 and the recesses 75 are closed on one end by a plate 76, as apparent in Figure 11, which will be hereafter described in greater detail.

A dual arrangement of folding elements, comprising a plurality of helically grooved rotors 77 and 78, is operatively supported in the housing 72. The rotors 77 and 78 have their axes in hori-

zontal alignment above and below the opening **73**, in the manner shown particularly in Figure 11, their spindles **79** extending through the recesses **75** and the grooves **74** and journalled in the housing **72**. A small gear or pinion **80** is formed on each of the spindles **79** and each series of the pinions **80** are meshed with a series of gears **81** pivotally arranged in the grooves **74** in the sequences illustrated in Figure 11, above and below the opening **73**.

It will be observed that the helical grooves **82** of the upper series of rotors **77** have right-hand spirals, while the opposite series **78** have left-hand spirals and each series rotates in opposite directions, the rotors **77** rotating clockwise, as viewed in the illustration shown in Figure 11, while the rotors **78** rotate anti-clockwise. This arrangement is accomplished by the opposite rotation of the gears **83** and **84** which are intermeshed, as shown in Figure 11. The gear **83** is meshed with the upper series of gears **81** while the gear **84** is meshed with the lower series, the closure plate **76** being formed to provide suitable openings **85** whereby the gears **81** can be operatively presented to the gears **83** and **84**.

The gear **83** is mounted on a stub shaft **86** journalled in a bearing **87** and is driven by the gear **84** on a stub shaft **88** supported in a bearing **89** and on the end of said shaft a bevelled pinion **90** is arranged which is meshed with another bevelled pinion **91** on a stub shaft **92** whose bearing **93** is arranged in a right-angular portion **94** of a bracket **95** in which the bearings **87** and **89** are supported, as apparent in Figures 2 and 10.

The shaft **92** is driven by a sprocket **96** arranged thereon and a chain **97** which is operatively arranged about a sprocket **98** on the shaft **21** between the gears **26** and **27**, previously described, as illustrated in Figures 2 and 3. The folding assembly is driven, therefore, from the shaft **21** by which the dies **18** and **19** are operated, proper R. P. M. for each unit of the structure having been determined, and the dies can be synchronized with the folding assembly by an eccentrically mounted sprocket **99** supported on a bracket **100** rising from the platform **10**, as shown in Figures 1, 2, 3 and 4.

The sprocket **99** is engaged by the chain **97**, as exemplified in Figure 4, and is adjusted by rotating its eccentric pivot **101** by a lever **102**, shown in Figure 2. By a slight shifting of the pivot **101** to change the relationship of the sprocket **99** with the chain **97** the operative synchrony of the dies with the folding assembly can be varied as desired.

The opposite ends of the spindles **79** are journalled in a closure **103** attached to the housing **72** and which embraces both arrangements of rotors **77** and **78**, as illustrated in Figures 1 and **10**. The member **103** is formed with a narrow horizontally arranged passage **104** opening into the chamber **105** in which the rotors **77** and **78** operate and which in turn, opens into the opening **73** in the housing **72**. The passage **104** is arranged in alignment with the operative grooved faces of the members **63** so that the material **50** is directed into the passage **104** as it leaves the stripper elements **63**.

To accomplish the folding operation and the form illustrated in Figures 12 and 13 it is necessary to manually form the first fold **71** and then insert the same into the spiral grooves **82** of one of the sets of rotors **77** or **78** whereupon the folding operations will continue automatically, the material **50** being urged toward and into the folding assembly by the dies **18** and **19**. The folding or plaiting operation is continued by the continuous movement of the opposing arrangement of the spiral grooves **82**. The material **50** is constantly fed into the roller assemblies **77** and **78** by the dies **18** and **19** which cut into the material and have a positive grip thereon.

The formed material **50**, upon passing through the opening **73**, will move onto a chute **106** along which it travels to a suitable receptacle or to a bench for other operations as desired.

It is contemplated that an automatic switch control **107** be provided by which the current can be shut off and the motor stopped when the roll **51** is exhausted. The last of the material **50** will drop upon the control **107** and close a solenoid circuit (not shown) to actuate the motor circuit. This arrangement will permit the invention to be operated without a constant attendant without hazard.

Manifestly, the structure herein shown and described is capable of considerable changes and modifications without departing from the spirit and intent of the invention or the scope of the appended claims.

What is claimed is:

1. In a machine for forming fins for radiators from a strip of metal, in combination with a base having a pair of coacting rotary dies supported thereon, a pair of guide plates for guiding said strip between said dies, removable means on said dies perforating said strip and forming impressions therein, a pair of stripper plates adjacent said die members opposite said guide plates stripping said strip from said dies, a folding mechanism supported on said base and comprising upper and lower sets of parallel rotary helically grooved elements having their axes aligned with said strip whereby to automatically form said strip into narrow folds as the same is advanced by said dies when the strip is manually projected into one of said sets of elements, means for rotating said dies and folding elements, and means for adjustably synchronizing said dies and said folding elements.

2. In a machine for forming fins for radiator cores, in combination with a supporting base and a pair of rotating die members capable of forming perforations and impressions in a strip of metal, a pair of guide plates spaced to accommodate said strip and direct the same between said die members, a pair of stripper plates arranged adjacent to said die members opposite said guide plates for stripping said material from said die members after the said material has passed therebetween, upper and lower series of helically grooved rotating folding elements having their axes aligned with said strip of material and engageable therewith, and means driving said assembly.

3. In a machine for forming radiator fins, in combination with a supporting base having means thereon for supporting a roll of strip material operatively arranged thereon, a pair of cooperating rotary dies mounted on said base and having elements thereon for perforating said material and forming impressions thereon, means guiding said material between said dies, stripping elements arranged opposite said guide means stripping said material from said dies, and guiding same in its passage therefrom, a plurality of vertically spaced arrangements of rotary folding elements, each having a helical groove formed

therein and operatively engageable with said strip as the same is moved thereinto, the said folding elements having their axes arranged longitudinally of said strip of material, means for adjusting said dies and synchronizing said folding elements therewith, and means driving said dies and said folding elements.

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