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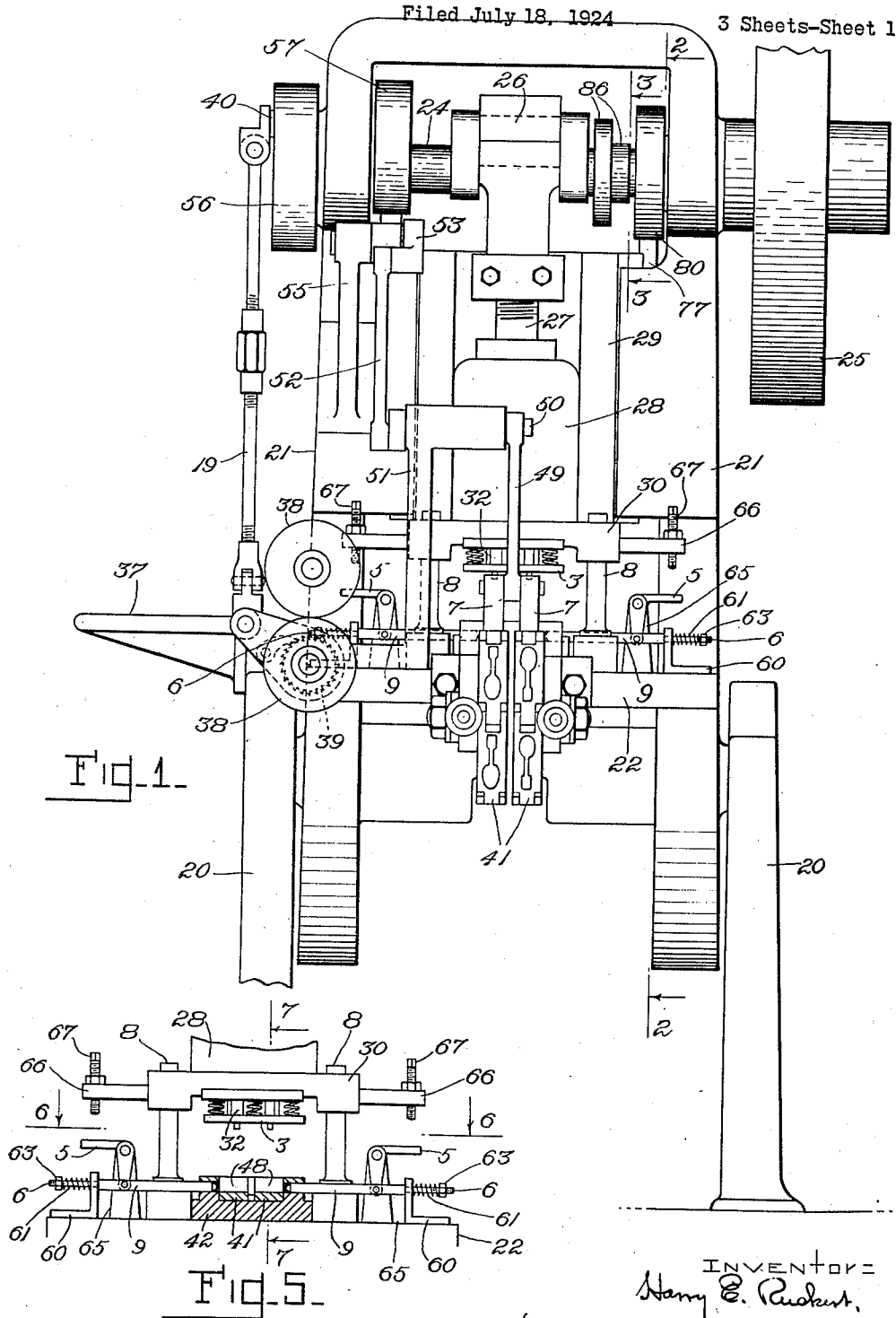
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MACHINE FOR FORMING ARTICLES FROM SHEET MATERIAL

Filed July 18, 1924

3 Sheets-Sheet 1



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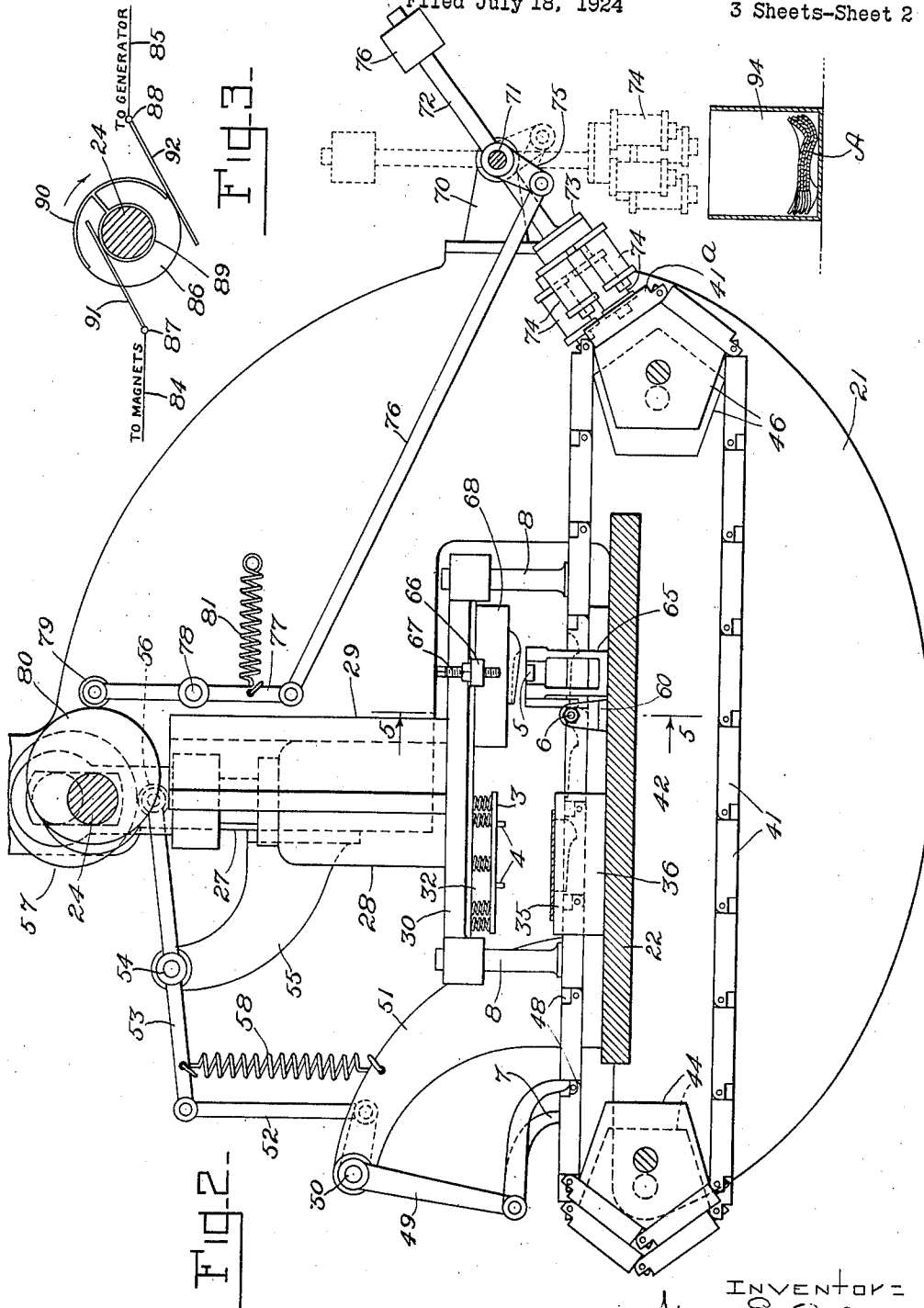


FIG 2-

FIG 3-

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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING ARTICLES FROM SHEET MATERIAL.

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This invention relates to machines for forming small articles such as spoons, forks, and the like, from sheet material and especially, although not exclusively, from sheet metal, such as tin plate. The invention has for its object to provide a substantially automatic machine of simple construction and large capacity, which is accurate in its operation, and in which the parts which are subject to wear can be readily replaced, said machine including means for delivering the articles formed in an orderly manner and preferably in nested relationship.

The foregoing and other objects of the invention, together with means whereby said invention may be carried into effect, will best be understood from the following description of one form or embodiment thereof illustrated in the accompanying drawings. It will be understood, however, that the particular construction described and shown has been chosen for illustrative purposes merely, and that the invention, as defined by the claims hereunto appended, may be otherwise embodied without departing from its spirit and scope.

In said drawings:

Fig. 1 is a front elevation of substantially the complete machine.

Fig. 2 is a longitudinal section taken substantially on the line 2—2, Fig. 1.

Fig. 3 is a detail section, taken substantially on the line 3—3, Fig. 1, of the controller for the electromagnetic delivering mechanism.

Fig. 4 is an enlarged elevation, partly in section, of the parts in the rear of the machine, including the electromagnets for removing the completed articles from the dies, the circuit to the latter being shown diagrammatically.

Fig. 5 is a section taken substantially on the line 5—5, Fig. 2.

Fig. 6 is a horizontal section taken substantially on the line 6—6, Fig. 5.

Fig. 7 is an enlarged detail longitudinal section taken substantially on the line 7—7, Fig. 5.

The invention is herein shown as embodied in a die press which, as to its general organization, may be of any suitable design, being shown as substantially of the type illustrated in Letters Patent No. 1,378,707,

May 17, 1921. Said press is supported on a suitable base 20 (Fig. 1) and comprises uprights 21 carrying between them a bolster 22 and in the upper part of which is journaled a main or driving shaft 24 to which power from any suitable source may be supplied through a belt pulley 25. The shaft 24 is formed with a crank 26 connected by a preferably adjustable pitman 27 with a ram 28 having secured thereto a semi-cylindrical web plate 29 by which said ram is guided for vertical movement in suitable guides on the uprights 21. Secured to the lower end of the ram is a die carrier 30 guided by posts 8 rising from the bolster 22. Secured to the die carrier 30 is a punch 32 provided with the usual spring-pressed stripper plate 3 and yieldingly mounted knock-out pins 4, said punch cooperating with an open punch die 35 (see particularly Fig. 7) forming part of an open-ended, box-like member 36 carried by the bolster 22 above which said punch die is supported in elevated position. The punch 32 and punch die 35 constitute blanking out dies which are preferably double, so as to blank out two articles at each stroke of the ram, and are slightly staggered with respect to one another, as explained in Letters Patent No. 1,378,707, above referred to. Said dies are, however, constructed to punch blanks from the stock only and not to mold said blanks as in said prior patent. The stock, which, in the present instance, may be in the form of sheet metal plates, is supplied to a table or bracket 37 secured to the base 20, said stock being intermittently fed between the blanking out dies by means of feed rollers 38 operated by a ratchet mechanism 39 connected by a pitman 19 with a crank 40 on the shaft 24.

The blanks B (see particularly Fig. 7) which are severed from the stock by the punch 32 are forced by said punch through the open punch die 35, successive blanks being received in the cavities of a series of die sections 41. The die sections 41 comprise links which are pivotally connected to form a continuous endless chain, two such chains being preferably provided, and the die sections of one chain being slightly staggered with respect to the sections of the other to correspond with the staggered relationship of the openings in the punch die 35.

The upper reaches of the chains are guided over the bolster 22 in grooves in a guide plate 42 carried by said bolster and pass through the box-like member 36. Said chains pass about drums 44 and 46 journaled in suitable bearings in the side plates 21 at the front and rear of the bolster respectively, said drums being of polygonal form and having flat faces which substantially fit the several links or die sections. The chains are fed intermittently to bring the several die sections 41 successively into position beneath the punch die 35 to receive the blanks B therefrom, by means of a pair of pawls 7, adapted to engage the several die sections successively, said sections being formed with notches 48 at their forward ends to permit engagement of said pawls with the contiguous sections. The pawls 7 are oscillated by and are pivotally connected with one arm of a bell crank 49 pivoted at 50 to a bracket 51 supported on the bolster 22, the other arm of said bell crank being connected by a link 52 with the outer end of a lever 53 pivoted intermediate its ends at 54 to a bracket 55 carried by one of the uprights 21. At its inner end the lever 53 carries a cam roller 56 which cooperates with a cam 57 on shaft 24, said roller being held in engagement with the edge of said cam by means of a spring 58 connecting the forward end of the lever 53 with the bracket 51. The arrangement is such that at each complete rotation of the shaft 24 the pawls 7 advance the chains a distance equal to the length of one of the die sections 41 and are then retracted and caused to engage the next die sections of said chains.

The mechanism last described operates to move the chains between successive downward or operative strokes of the ram 28, and during said operative strokes, which cause the punch 32 to sever the blanks from the stock and deposit them in the cavities of the die sections 41, said chains are locked against movement, and the dies accurately positioned beneath the openings in the punch die 35, by means of wedge slides 9 (see particularly Fig. 5 and 6) which engage the notches 48 of the several die sections successively. The slides 9 are guided in the plate 42 and are formed with stems 6 guided in brackets 60 on the bolster 22, said slides being normally withdrawn from the notches 48 and held in inoperative position by means of springs 61 which surround the stems 6, said springs being interposed between the brackets 60 and collars 63 on the outer ends of said stems. The slides 9 are moved inwardly to engage the notches 48, between successive movement of the chains by the pawls 7, by means of bell cranks 5 pivoted to brackets 65 on the bolster 22. One arm of each of the bell cranks 5 is pivotally connected to the corresponding slide 9, the other arm being dis-

posed in the path of movement of an adjustable abutment screw 67 carried by a bracket 66 projecting laterally from the die carrier 30. The arrangement is such that, when the ram 28 descends, and the punching operation takes place, the chains will be locked against movement, and the appropriate die sections 41 accurately positioned beneath the opening in the punch die, by the slides 9.

At the rear of the punch 32, the die carrier 30 is provided with a die section 68 adapted to cooperate with the several die sections 41 of each chain successively and of a shape complementary thereto, said die section 68 being preferably double to correspond to the double arrangement of the blanking out dies and travelling die sections. The arrangement is such that, as the chains are moved intermittently, each die section 41 is brought beneath the punch die 35 to receive a blank B at one stroke of the ram, as above explained, and is thereafter moved rearwardly toward the die section 68, so that at a subsequent stroke of the ram said blank will be shaped between the die sections 41 and 68 into an article A. The die section 68 is provided with one or more spring-pressed ejectors 69, whereby, when the ram rises, the completed articles A are caused to remain in the cavities of the die sections 41.

From the die section 68 the several sections 41 pass successively rearwardly about the drum 46. Between successive movements of the chains each die section 41 is caused to dwell momentarily upon one of the flat faces of said drum, as shown at 41^a in Fig. 4, this position being the discharging position of the die section in which the completed article A is removed therefrom and discharged from the machine by automatic delivering mechanism which, in the embodiment of the invention herein shown, is constructed and arranged substantially as follows:

Journalled in brackets 70 secured to the uprights 21 at the rear of the machine is a rock shaft 71 having fast thereon an electromagnet carrier 72. Said carrier comprises a lever mounted intermediate its ends on the shaft 71 and having at its forward end a head 73 carrying a set of electromagnets 74. As shown in Fig. 2, said electromagnets are arranged in two pairs of two each so arranged that, when the carrier 72 is in the inclined position shown in Fig. 4 and in full lines in Fig. 2, one pair of said electromagnets will be directly over each of the die sections 41^a in discharging position on the drums 46. The opposite arm of the lever 72 is preferably provided with a counterweight 76 to balance the weight of the electromagnets 74. The shaft 71 has fast thereon an arm 75 connected by a link 76 with one arm of a lever 77 pivoted in-

intermediate its ends at 78 to one of the frame uprights 21. At its opposite end the lever 77 carries a cam roller 79 which is held in engagement with a cam 80 on the shaft 24 by means of a spring 81 connecting said first named arm of the lever 77 with said upright 21. The mechanism last described is so synchronized with the mechanism for operating the ram and that for feeding the chains that during the descent of the ram the electromagnets 74 are brought into the inclined position shown in Fig. 4 and in full lines in Fig. 2, but when the ram rises, and the chains are advanced by the pawls 7, the shaft 71 is rocked to swing the carrier 72 and electromagnets 74 into the vertical delivering position shown in dotted lines in Fig. 2.

Current is supplied to all of the electromagnets 74 simultaneously through a circuit comprising a generator or other source of current 82 (Fig. 4) conductors 83, 84 and 85 and a circuit controller 86. The conductor 83 leads directly from one pole of the generator 82 to the electromagnets 74. The conductor 84 leads from the electromagnets to a terminal 87 of the circuit controller 86. The other terminal 88 of the circuit controller is connected by the conductor 85 with the opposite pole of the generator 82. The circuit controller 86 comprises a commutator on the shaft 24, said commutator being composed of insulating material and having an annular conducting portion 89 electrically connected with a coaxial segmental conducting portion 90. A brush 91 connected with the terminal 87 is in continuous engagement with the conducting portion 89, while a brush 92 connected with the terminal 88 is alternately engaged by the conducting portion 90 and the non-conducting periphery of the commutator. The terminals 87 and 88 are also connected to the opposite poles of a condenser 93.

It will be observed that in the construction shown the crank 40 for operating the mechanism which feeds the stock into the machine, the crank 26 for operating the ram, the cam 57 for moving the travelling series of die sections 41, the cam 80 for operating the electromagnet carrier 72, and the commutator for controlling the current to the electromagnets are all carried by the same main shaft, this being the preferred arrangement in order that the several mechanisms may be accurately synchronized with respect to one another. The angular position of the commutator 86 with respect to the cam 80 is such that during the movement of the electromagnets from the position shown in dotted lines in Fig. 2 into the position shown in full lines therein the brush 92 engages the non-conducting periphery of the commutator, and no current passes to said electromagnets. When the

electromagnets reach the full line position, the commutator assumes the position shown in Fig. 3, and immediately thereafter the circuit is closed by contact of the conducting portion 90 with the brush 92, as shown in Fig. 4. The electromagnets are thereupon energized to remove the articles A from the die sections 41^a, the magnetic force acting to attract said articles and remove them from the dies being momentarily augmented by the action of the condenser 93, which also acts to dissipate the residual magnetism when the circuit is subsequently broken, thereby permitting the release of the articles. After the circuit is closed, the electromagnets are swung from their position adjacent the dies into the vertical delivering position shown in dotted lines in Fig. 2, and when this position is reached, the portion 90 of the commutator passes out of contact with the brush 92, breaking the circuit and causing the electromagnets to drop the articles, which may be received in a suitably disposed receptacle 94. The circuit to the electromagnets is not closed until said electromagnets reach a position immediately over the dies and is not broken until they reach a position immediately over the receptacle 94, the circuit being closed and broken always at the same respective points in the cycle of movements of the magnets. It therefore follows that successive articles will all be deposited at the same point of delivery and in the same relative position, so that said articles will be received by the receptacle 94 in nested relation and in convenient form for packing and shipment.

For convenience the invention has been herein shown and described as embodied in a machine for making articles from sheet metal, and electromagnetic devices have therefore been chosen as the means for removing the completed articles from the dies and depositing them at the point of delivery. It will be obvious, however, that the invention in its broader aspect, is equally applicable to machines for operating on other sheet materials such, for example, as sheet fibre stock. The type of delivering mechanism employed will therefore be chosen in accordance with the material operated upon. Thus, for example, if the articles be of paper or fibre stock instead of sheet metal, there may be employed pneumatic delivering mechanism wherein the electromagnets above described are replaced by suction nozzles, the conductors by air conduits, the generator by a suction pump, and the commutator by a suitable valve. This will, however, be obvious to those skilled in the art without further discussion in detail.

Having thus described my invention, I claim:

1. In a machine for forming articles from sheet material, in combination, a series of

die sections linked together into a continuous chain, means for moving said chain intermittently, devices with which said sections are brought successively into cooperative relationship for punching blanks from stock and shaping them into articles, a wedge slide for positioning and locking said chain, and means for projecting said slide between contiguous die sections of said chain between successive movements of the latter.

2. In a machine for forming articles from sheet material, in combination, a series of die sections linked together into a continuous chain, means for moving said chain intermittently, devices with which said sections are brought successively into cooperative relationship for punching blanks from stock and shaping them into articles, a ram by which said devices are carried, a wedge slide for positioning and locking said chain, and means operated by said ram for projecting said slide between contiguous die sections of said chain between successive movements of the latter.

3. In a machine for forming articles from sheet material, in combination, a series of die sections linked together into a continuous chain, means for moving said chain intermittently, devices with which said sections are brought successively into cooperative relationship for punching blanks from stock

and shaping them into articles, a ram by which said devices are carried, a wedge slide for positioning and locking said chain, a bell crank for projecting said slide between contiguous die sections of said chain, an abutment on said ram for engaging and operating said bell crank, and a spring for withdrawing said slide.

4. In a machine for forming sheet metal articles, in combination, a series of die sections linked together into a continuous chain, means for feeding said chain intermittently, means cooperating with said die sections successively to form articles from sheet metal stock, a polygonal drum about which said chain passes, said drum having flat faces to receive the several die sections, an electromagnet, means synchronized with said feeding means for moving said electromagnet into a position adjacent a die section on a flat face of said drum when said chain is stationary and for thereafter moving said electromagnet into a delivering position, and means also synchronized with said feeding means for closing the circuit to said electromagnet when said electromagnet reaches said first named position and for breaking said circuit when said electromagnet reaches its delivering position.

In testimony whereof I affix my signature.
HARRY E. RUCKERT.