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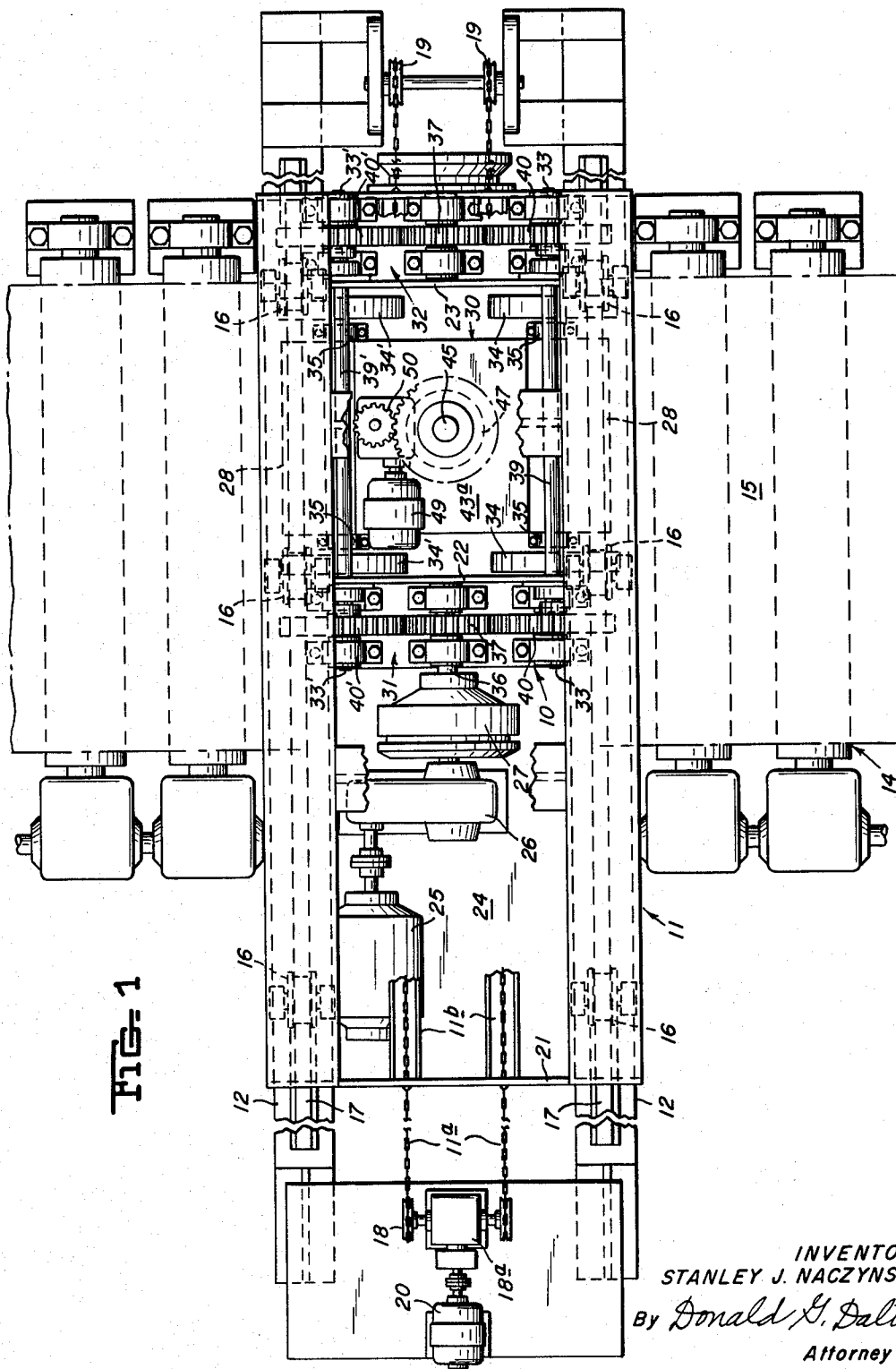
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APPARATUS FOR STENCILING MOVING PLATE

Filed Oct. 30, 1962

4 Sheets-Sheet 1



Aug. 11, 1964

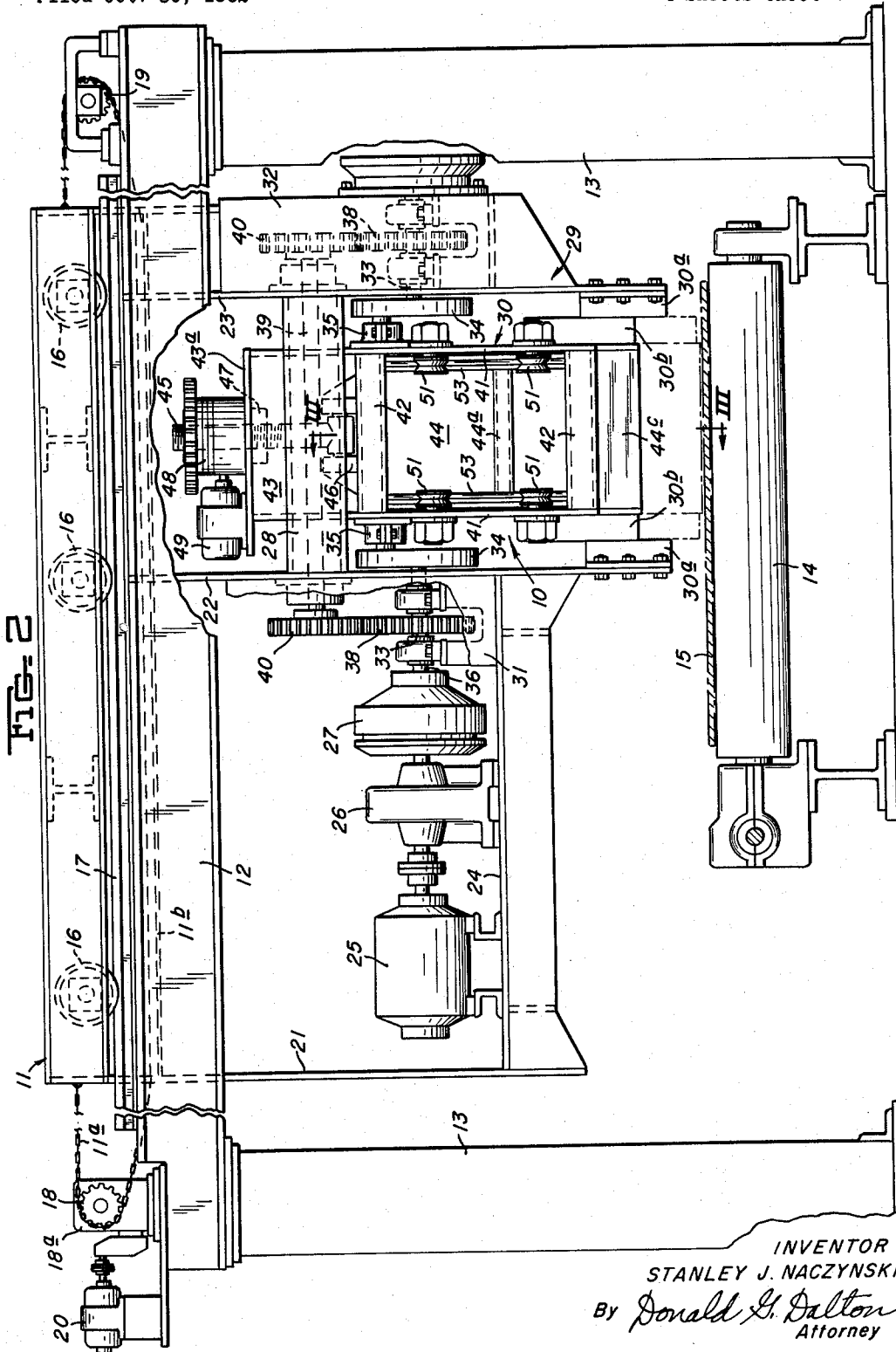
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APPARATUS FOR STENCILING MOVING PLATE

Filed Oct. 30, 1962

4 Sheets-Sheet 2



Aug. 11, 1964

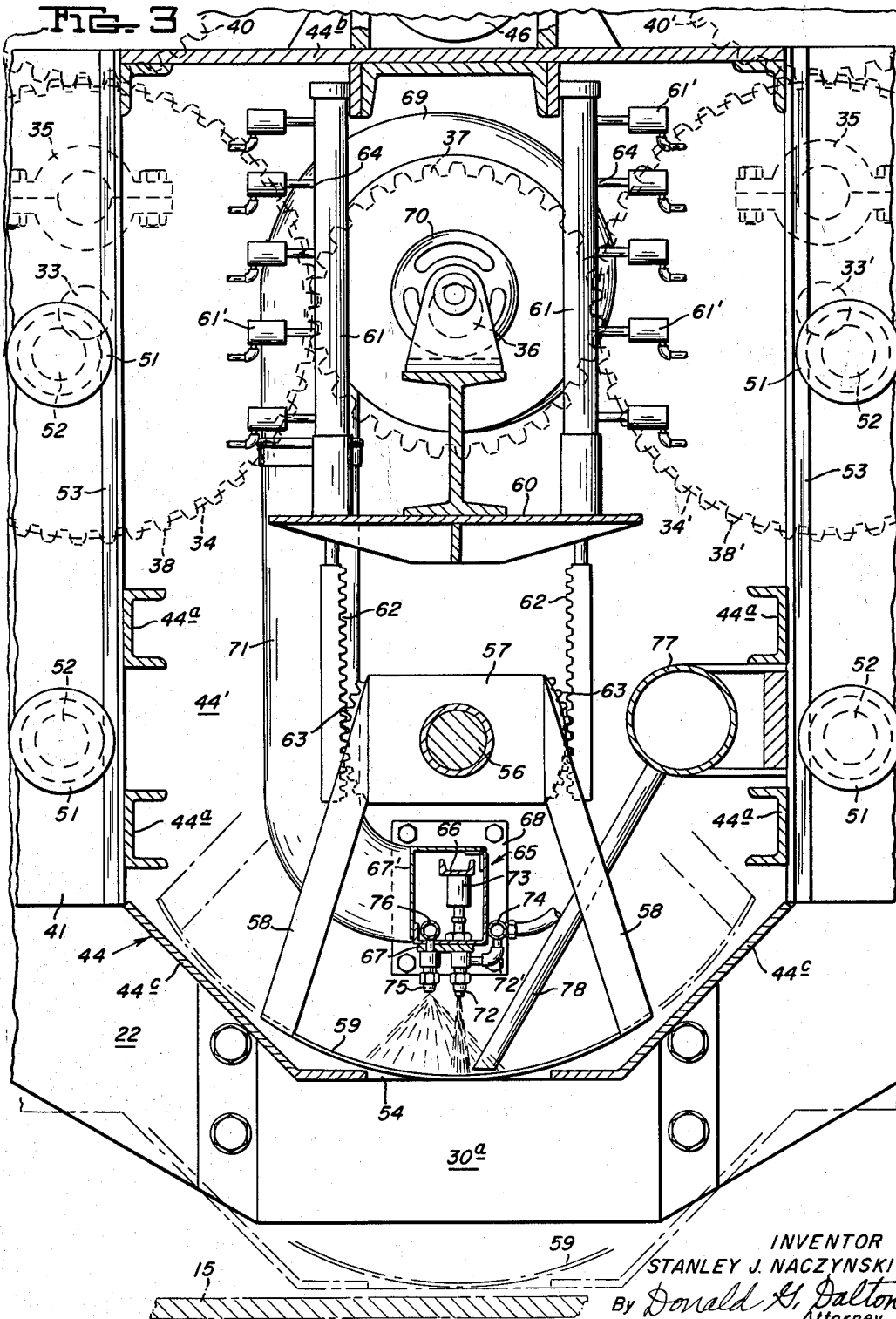
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APPARATUS FOR STENCILING MOVING PLATE

Filed Oct. 30, 1962

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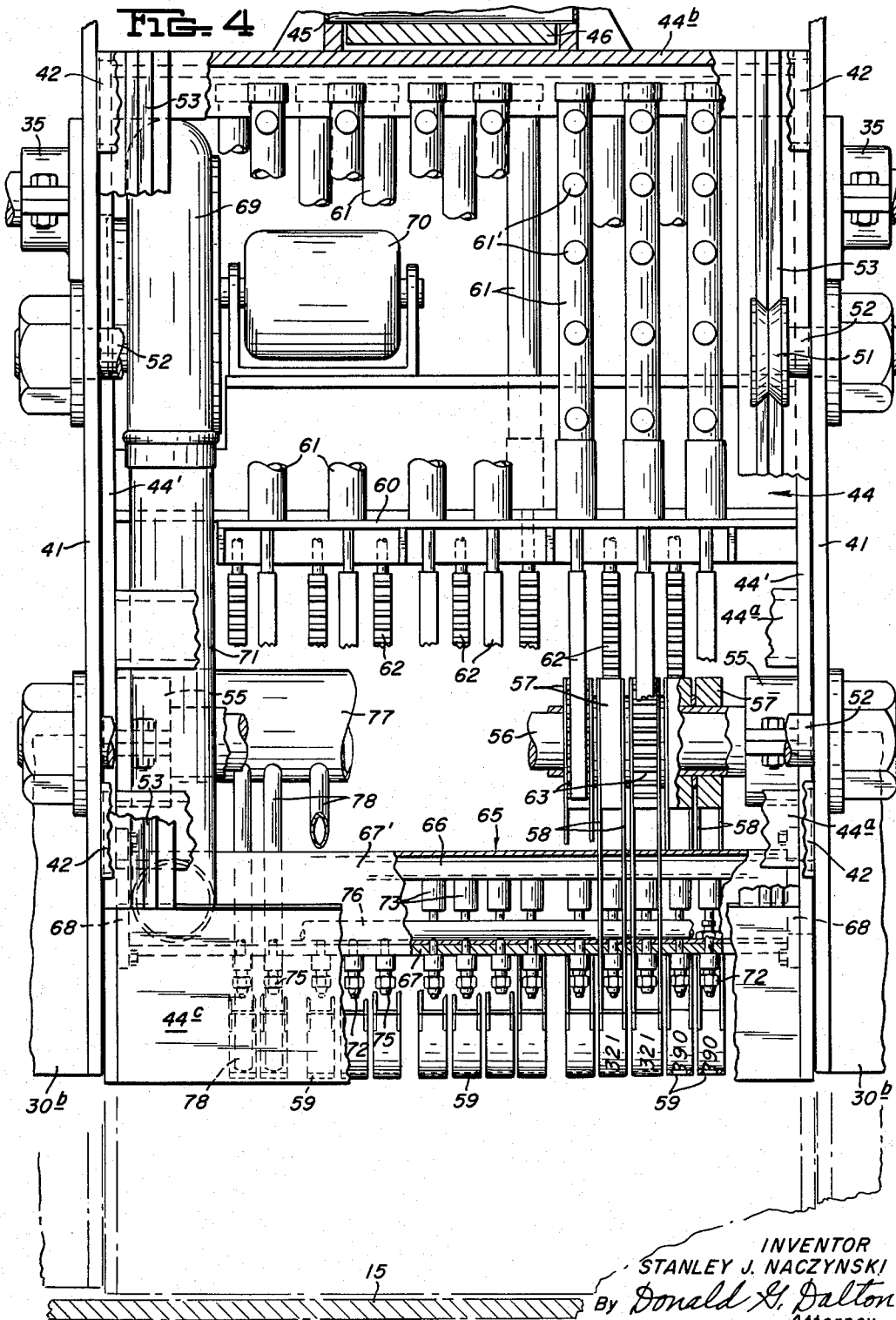
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APPARATUS FOR STENCILING MOVING PLATE

Filed Oct. 30, 1962

4 Sheets-Sheet 4



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APPARATUS FOR STENCILING MOVING PLATE
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Filed Oct. 30, 1962, Ser. No. 234,152

9 Claims. (Cl. 101-121)

This invention relates to apparatus for stenciling identifying indicia on plate or like material traveling in a production line, e.g., over a runout roller table.

It has been customary to mark steel plate by hand with a paint brush or crayon when cold or partly cooled after rolling. The disadvantages of this practice are the amount of manual labor involved, the discomfort to the workmen and the possibility of error and confusion among the substantial number of plates in the process of cooling from rolling temperature to the point at which marking is feasible, say 500° F. It is accordingly the object of my invention to provide apparatus for stenciling indicia repeatedly on traveling plate without the necessity of hand work and regardless of the plate temperature.

A further object is to provide a marking apparatus having a plurality of stencils movable to selected positions by remote control.

In a preferred embodiment, my invention comprises a car supported for travel transversely above the path of the plates to be marked. A cage is mounted on eccentrics journaled in a frame depending from the car. A housing movable vertically in the cage has stencil strips in the form of circular segments journaled in the housing and is provided with means for changing their settings as desired. Nozzles discharge marking ink through the stencil strips under high pressure. The supply of ink to the nozzles is controlled by high-speed solenoid-operated valves. By virtue of the mounting of the cage, the stencil strips approach the moving plate closely without making contact therewith and, in a portion of their travel, move at the same speed as the plate. I also provide means for cooling the valve-operating solenoids and vacuum means for removing excess marking ink from the stencils thus assuring sharp characters at all times.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings:

FIGURE 1 is a plan view;

FIGURE 2 is an elevation showing the roller table and plate thereon in transverse section;

FIGURE 3 is a section taken along the plane of line III-III of FIGURE 2; and

FIGURE 4 is an elevation of the apparatus shown in FIGURE 3, looking thereon from the left, with parts in section along a central plane and parts broken away.

Referring now in detail to the drawings and, for the present, particularly to FIGURES 1 and 2, the apparatus of my invention, indicated generally at 10 is suspended from a car 11 traveling on beams 12. The beams are supported by posts 13 and extend across a roller table 14 on which a plate 15 is conveyed. Car 11 has wheels 16 traveling on rails 17 secured to the beams and is actuated therealong by drive chains 11a attached thereto and trained through channels 11b and over sprockets 18 and 19 at opposite ends of the beams. A reversible motor 20 drives sprocket 18 through a gear reducer 18a to position the car as desired.

Plates 21, 22 and 23 depend vertically from the frame of car 11 in spaced relation along the length thereof. A base 24 extending between plates 21 and 22 supports

a motor 25, a gear reducer 26 and a pneumatic clutch 27. Plates 22 and 23, together with connecting top transom 28 constitute a frame 29 enclosing a cage 30 mounted therein for planetary movement as will now be explained.

Gear boxes 31 and 32 extending laterally from plates 22 and 23, respectively, have pairs of coaxial shafts 33 and 33' journaled therein, one pair on each side of the common axis of reducer 26 and clutch 27 (see FIGURE 1). Each shaft 33 has a disc 34 thereon. Crank pins on the discs extend into bearings 35 on opposite sides of cage 30. The two pairs of crank pins support the cage erect in space and, on rotation of the eccentrics, impart to the cage continuous planetary motion in a circular path or orbit. The cage remains vertical at all times.

A shaft 36 on which clutch 27 is mounted is journaled in gear box 31 and has a pinion 37 thereon meshing with gears 38 and 38' on shafts 33 and 33' on the drive side of frame 29. Cross shafts 39 and 39' journaled in frame 29 have gears 40 and 40' thereon meshing with gears 38 and 38'. Through identical gearing on the far side of frame 29, shafts 39 and 39' drive the shafts 33 and 33' on that side. Thus all four discs 34 are driven in the same direction at the same speed.

Cage 30 comprises spaced side plates 41 connected by cross bars 42 and 43 and a top plate 43a. The cage is open at the bottom. It is confined laterally by spacers 30a on plates 22 and 23 which are slidably engaged by bearing blocks 30b on side plates 41. A housing 44 having side plates 44' connected by cross bars 44a and top and bottom plates 44b and 44c, respectively, is suspended within cage 30 by means of a T-head screw 45 pivoted to bearings 46 on top of the housing. The screw has threaded thereon a sleeve 47 rotatably supported in a thrust bearing 48 on top plate 43a. A motor 49 mounted on the top plate drives the sleeve through a reduction gear 50. Housing 44 is free for movement vertically in cage 30. Such movement is guided by wheels 51 journaled on stub shafts 42 secured to plates 41. Wheels 51 travel on V-rails 53 on the housing. The lowermost position of the housing 44 in cage 30 is determined by the adjustment of screw 45. When the sleeve 47 is driven to run the screw entirely out of it, housing 44 may be dropped from the cage through the open bottom thereof.

FIGURES 3 and 4 show the uppermost position of the cage in solid lines and the lowermost position in chain lines. The position of housing 44 in cage 30 is controlled by adjusting screw 45 so that, as the cage passes through its lowermost position, the bottom plate 44c of the housing closely approaches the top of plate 15 as shown in chain lines in FIGURES 2, 3 and 4.

FIGURES 3 and 4 show the housing 44 in greater detail. Bearings 55 on the inner faces of side plates 44' support a transverse shaft 56. Hubs 57 journaled on the shaft have downwardly extending arms 58. The two arms on each hub support between their ends a circular-segmental stencil strip 59 having character-forming perforations spaced therealong. Strips 59 are coated with Teflon resin to a thickness of about 0.002". Bottom plate 44c has an opening 54 therein which permits characters formed in strips 59 to be stenciled on plate 15 by means to be described shortly.

A shelf plate 60 extends between plates 44' and supports a plurality of multiple-position fluid-pressure cylinders and pistons 61 (Westinghouse Airbrake Co.) for actuating the stencil segments to the desired position. The piston rod of each cylinder has a rack 62 meshing with teeth 63 on the peripheral surface of one of the hubs 57. Each cylinder has a plurality of ports 64 and on admitting air to various combinations thereof, by operating suitable remotely controlled valves 61', the pistons

may be caused to move to selected positions in the cylinders. Thus segments 59 may be adjusted to bring the desired character thereon into printing position, i.e., centrally of opening 54. The cylinders for operating adjacent hubs are located on opposite sides of shelf 60.

A nozzle bridge and solenoid chamber 65 (FIGURES 3-4) extends between plates 44' adjacent the lower edges thereof and comprises upper and lower beams 66 and 67 and end plates 68. An openable sheet metal housing 67' on beam 67 encloses beam 66 and the parts carried thereby, providing a tunnel for cooling air. The air is supplied by a blower 69 on shelf 60 driven by a motor 70 similarly supported, through a downcomer 71 connected to one end of the tunnel. An opening in the side wall of the latter at the other end affords an air exit. Beam 67 is drilled to accommodate a plurality of valved nozzles 72 the valve stems of which are actuated by solenoids 73 suspended from beam 66. The inlets of the valves of nozzles 72 are connected by fittings 72' to a manifold 74 extending along one side of bridge 65. The solenoids operate to open the nozzle valves for a fraction of a second whereupon marking ink supplied to manifold 74 under high pressure (1440-2000 p.s.i.) through a flexible hose, is discharged in a conical spray aimed precisely at the character in one of the segments 59 which has been aligned with the nozzle axis, thus stenciling the character on plate 15.

Beam 67 is also drilled to accomodate four or five nozzles 75 spaced therealong. These nozzles depend from a manifold 76 connected to a high-pressure source of water through a flexible hose and supply a fine mist to cool the portions of the stencil segments 59 exposed to the heat of plate 15 through opening 54.

A vacuum header 77 extends across housing 44, secured to the plates 44' thereof and is connected at one end by a flexible hose to a suction means. An individual collecting tube 78 extends downwardly from the header to a point just above each stencil segment 59 for the purpose of collecting any excess marking ink accumulating thereon.

The plate-stenciling apparatus described and explained hereinabove has numerous advantages. In the first place, no manual effort is involved since the valve solenoids may be controlled automatically from a distance. Adverse working conditions are thus obviated. Secondly, the apparatus can mark plate which is still at high temperature, thus reducing the possibility of losing track of plates or confusion among a number of them moving along a cooling table or bed. The apparatus is relatively simple, furthermore, and is adapted to facilitate servicing and maintenance. The number of stencil segments is such as to permit application of all desired indicia and for the necessary changes therein. The segments are largely protected from the heat of the plates and are subject to constant cooling. Changes in the setting of the segments may be effected while the apparatus is in operation. Sharpness of the applied indicia is obtained by the equalization of the speed of horizontal travel of the cage with that of the plate as well as the close approach of the stencil segments to the plate during marking. The high speed of the valve solenoids also contributes to this result,

since it limits the duration of the jets of ink from nozzles 72 to a minute interval of time. The vacuum system for removing excess ink also tends to prevent blurring.

Although I have shown herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

1. Apparatus for marking an elongated product as it moves along a predetermined path, comprising a housing, crank means mounting the housing adjacent said path for planetary travel through an orbit a portion of which closely approaches said path, a shaft mounted in said housing normal to the plane of said orbit, a plurality of arcuate stencil strips journaled side-by-side on said shaft for limited angular movement thereabout, power means in said housing adapted to turn each of said strips to selected positions, a nozzle-supporting bridge member extending across said housing between said strips and said shaft and parallel to the latter, and a plurality of nozzles mounted on said member, each adapted to discharge marking liquid through one of said strips onto the product.

2. Apparatus as defined in claim 1, characterized by a cage mounted on said crank means, and means suspending said housing in said cage for vertical movement therein.

3. Apparatus as defined in claim 1, characterized by a hub on said shaft for each strip and a plurality of arms extending radially from each strip to its hub.

4. Apparatus as defined in claim 1, characterized by a solenoid on said bridge member for controlling each nozzle.

5. Apparatus as defined in claim 4, characterized by an enclosure on said bridge member extending around the solenoids.

6. Apparatus as defined in claim 5, characterized by means mounted on said housing blowing air through said enclosure.

7. Apparatus as defined in claim 1, characterized by cooling-spray nozzles on said bridge member spaced across said housing above said strips.

8. Apparatus as defined in claim 1, characterized by a vacuum header extending across said housing and a suction tube extending downwardly therefrom to a point just above each stencil strip.

9. Apparatus as defined in claim 1, characterized by a bottom plate secured to said housing and an opening therein through which portions of said strips are exposed to the plate on the conveyor.

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