

[54] EGG MARKING APPARATUS

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[51] Int. Cl. **B41f 17/30**

[58] Field of Search101/35-37, 41, 376, DIG. 3

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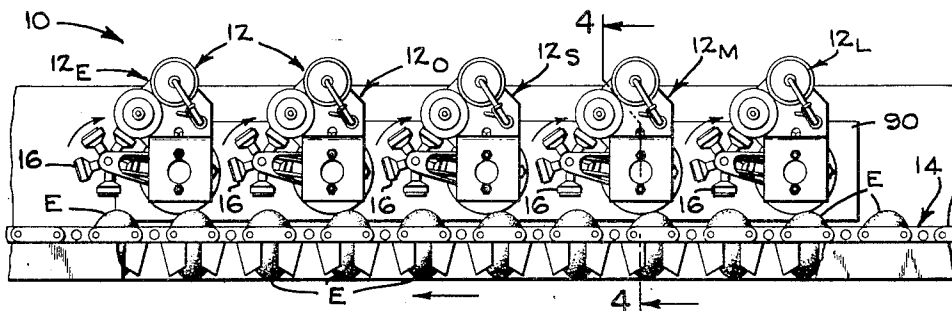
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[57] **ABSTRACT**

An apparatus for selectively marking individual eggs carried by a bucket-type egg conveyor includes a bank of marking wheels each of which carries a plurality of circumferentially spaced marking heads with printing dies embedded in their outer faces. The outer portion of each marking head is universally pivotable about an inner neck portion so that the printing dies can be urged into flush printing engagement with the eggs carried by the conveyor, even one that is cocked in its bucket and thereby not aligned squarely with the marking head. Each marking wheel is arranged to be continuously rotated and is mounted on a pivotable arm that is operatively connected to a rotary solenoid whereby, when the solenoid is energized, the marking wheel will be moved down to place one of its marking heads into engagement with an egg passing therebeneath. The marking wheels are each associated with a particular grade of eggs and are operated through a memory unit which records the grade of the egg carried by each individual bucket of the egg conveyor.

13 Claims, 13 Drawing Figures



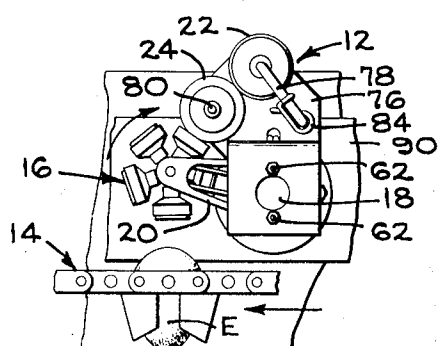
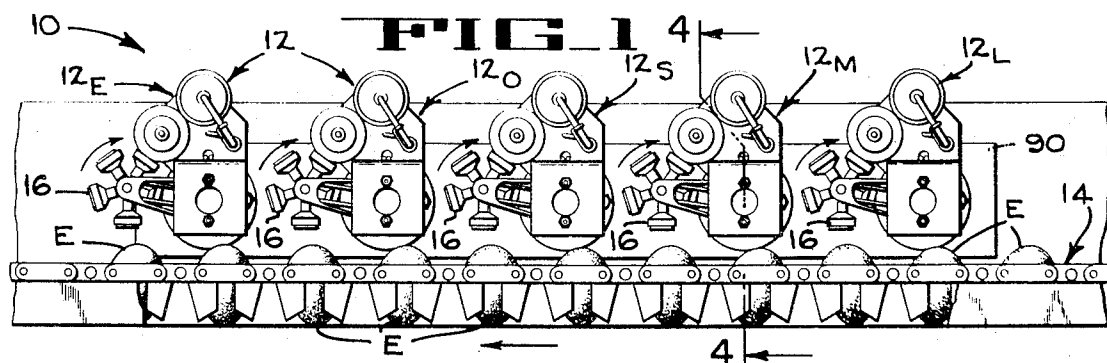


FIG 1A

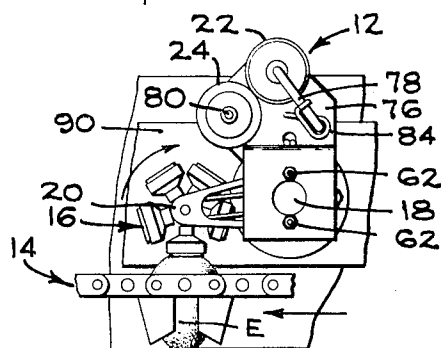


FIG 1B

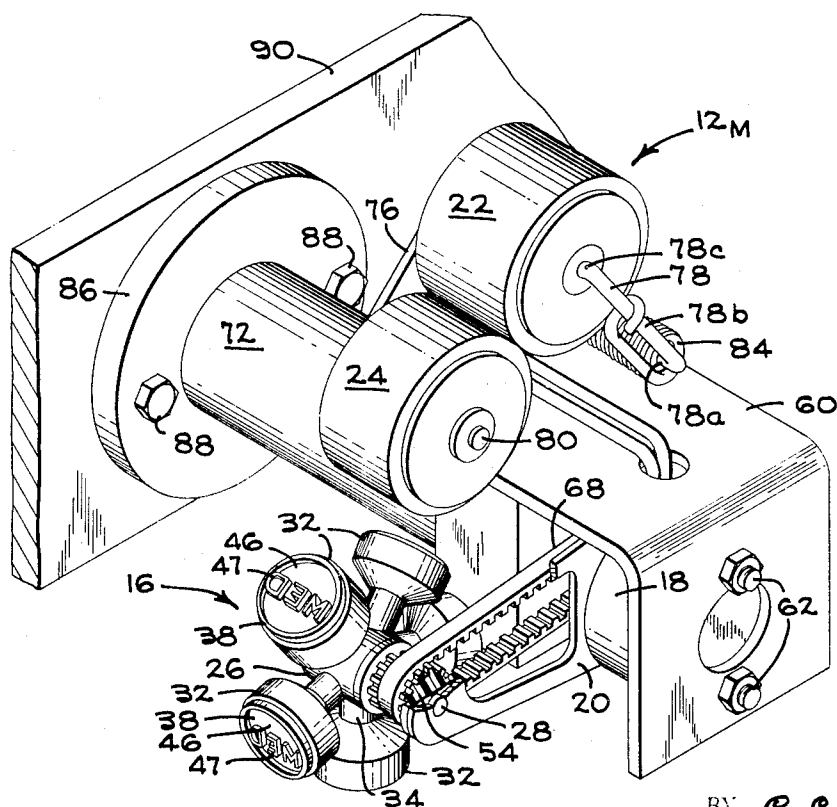


FIG 2

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FIG. 3

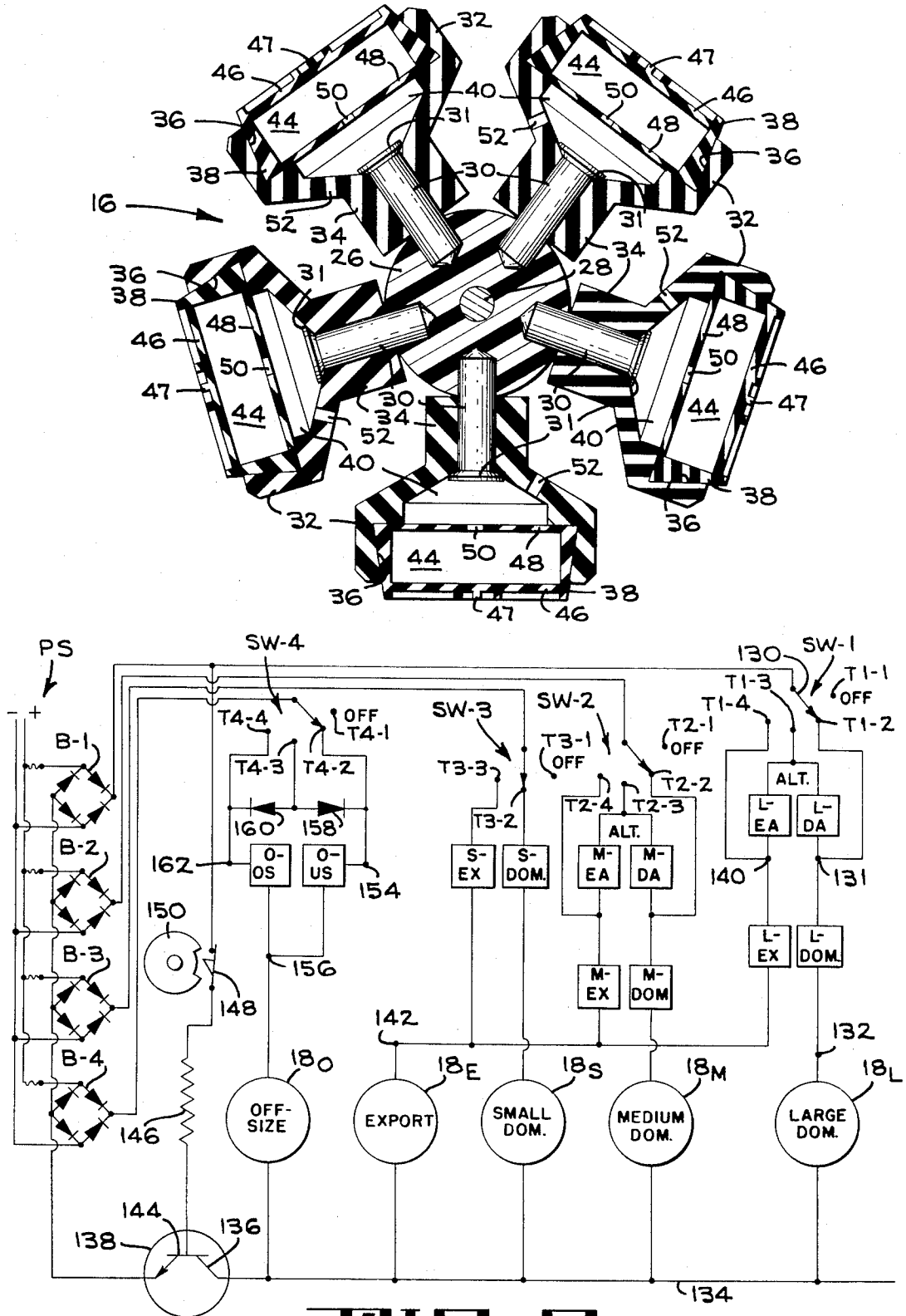


FIG. 3

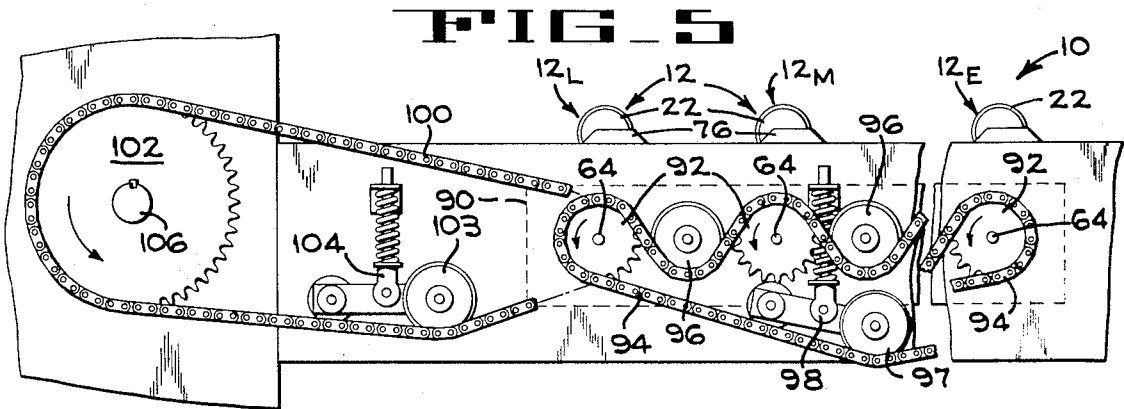
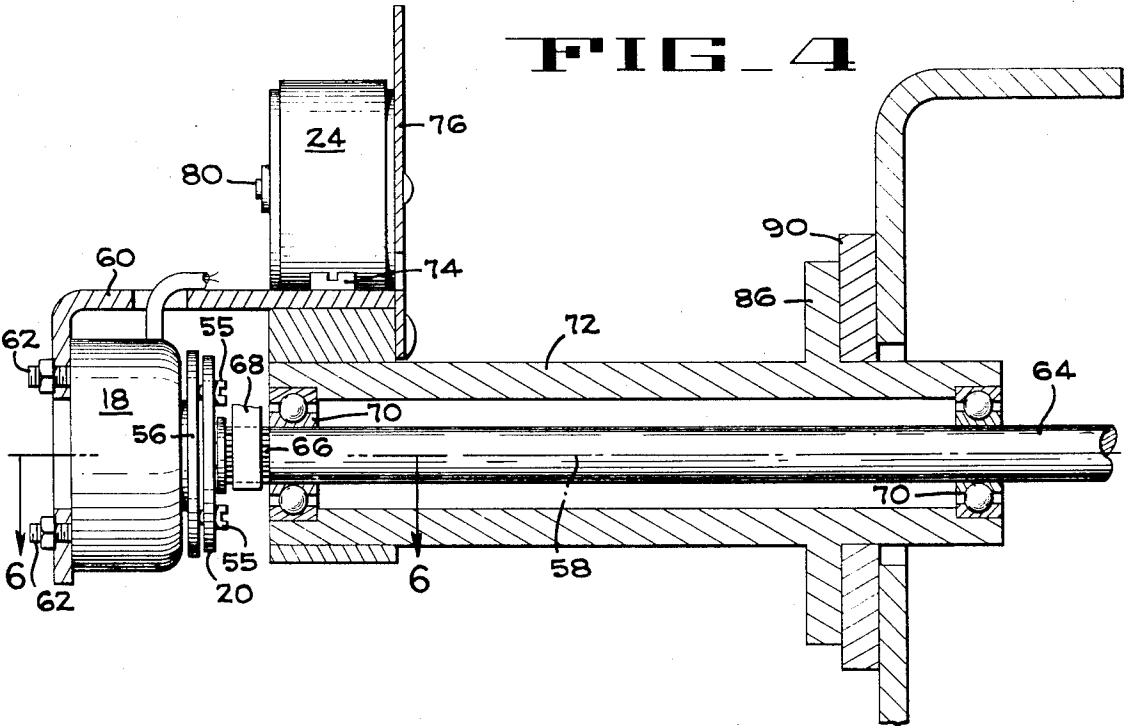


FIG 3A

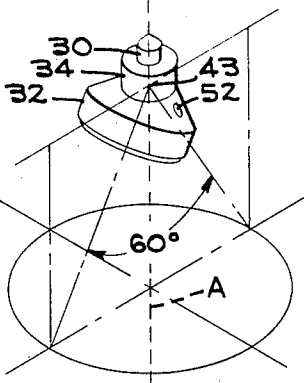
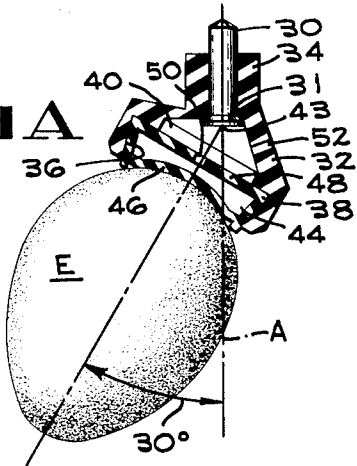


FIG 3B

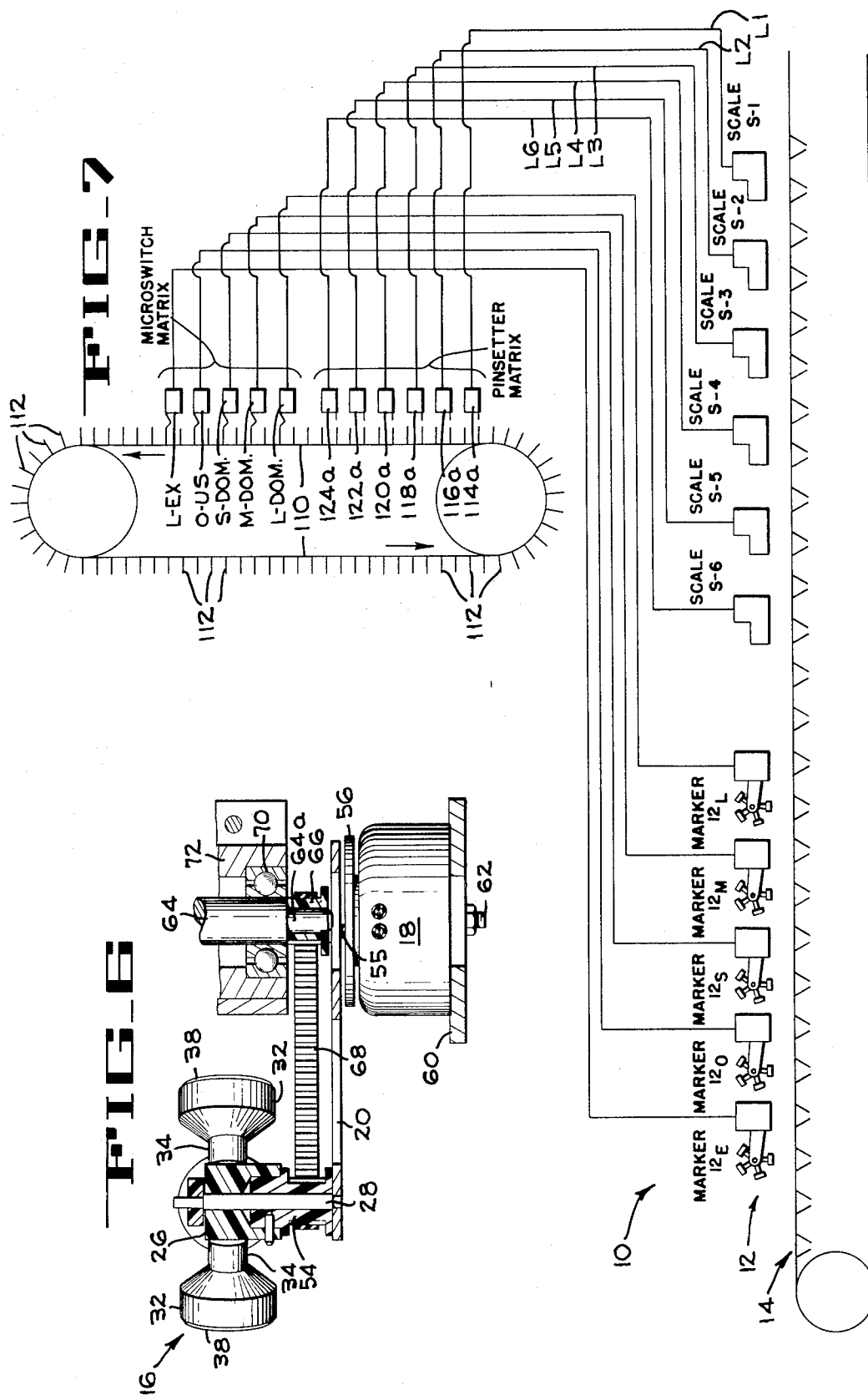


FIG. 8

	COLUMN ONE	COLUMN TWO	COLUMN THREE	COLUMN FOUR	COLUMN FIVE	COLUMN SIX	COLUMN SEVEN
	UNDERSIZED	LARGE	MEDIUM	SMALL	OVERSIZED	LARGE ALTERNATE	MEDIUM ALTERNATE
EXPORT MARKER 12E	○	○ L- EX	○ M- EX	○ S- EX	○	○ L- EA	○ M- EA
OFF-SIZED MARKER 12O	○ O- US	○	○	○	○ O- OS	○	○
SMALL DOMESTIC MARKER 12S	○	○	○	○ S- DOM	○	○	○
MEDIUM DOMESTIC MARKER 12M	○	○	○ M- DOM	○	○	○	○ M- DA
LARGE DOMESTIC MARKER 12L	○	○ L- DOM	○	○	○	○ L- DA	○
	○	○	○	○	○	○	○
	○	○	○	○	○	○	○
SCALE S-6	124 a	124 b	124 c	124 d	124 e	○	○
	○	○	○	○	○	○	○
SCALE S-5	122 a	122 b	122 c	122 d	122 e	○	○
	○	○	○	○	○	○	○
SCALE S-4	120 a	120 b	120 c	120 d	120 e	OPERATIVE	○
	○	○	○	○	○	INOPERATIVE	○
SCALE S-3	118 a	118 b	118 c	118 d	118 e	OPERATIVE	○
	○	○	○	○	○	INOPERATIVE	○
SCALE S-2	116 a	116 b	116 c	116 d	116 e	○	○
	○	○	○	○	○	○	○
SCALE S-1	114 a	114 b	114 c	114 d	114 e	○	○
	○	○	○	○	○	○	○

EGG MARKING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally concerns the processing of eggs, and more particularly, the marking of eggs.

2. Description of the Prior Art

It has become desirable, and sometimes necessary, for egg packing houses to mark their eggs for various purposes. In some instances, particularly in foreign countries, it is necessary to mark eggs with their weight and grade, and in most all countries it is necessary to mark exported eggs with the name of the country of origin.

Most egg packing houses prefer to have the mark put on the large end of the egg where it is immediately visible upon opening an egg carton or viewing an egg flat since eggs are generally packed with their large ends up. Applicants are aware of one type of prior art marking device that marks a plurality of eggs after they are in a carton or a filler flat so that the marks will automatically be made on the large ends of the eggs where they are visible. This type of device, however, is not adapted to selectively mark individual eggs, and is only useful in marking eggs that have previously been physically segregated. Such devices are shown, for example, in U.S. Pat. Nos. 3,094,920 to Charles Priesmeyer, 1,906,094 to Charles K. Powell, and 3,389,654 to Edwin R. Hirt.

An egg marking device is disclosed in U.S. Pat. No. 1,611,679 issued to W. H. Rees on Dec. 21, 1926, which device utilizes a marking wheel to mark successive eggs carried in an underlying bucket-type conveyor, but this device also is not adapted to selectively mark eggs with various preselected designations. Each successive egg or sequence of eggs must be marked with the same designation inasmuch as the wheel is mounted to contact and mark every egg.

SUMMARY OF THE INVENTION

The egg marking apparatus of the present invention is comprised of a bank of marking devices each of which carries marking dies with different indicia from those of the other marking devices. The marking devices are each capable of selectively marking an egg carried by an underlying egg conveyor according to predetermined recorded information peculiar to that particular egg. With the present apparatus it is not necessary that eggs be physically segregated prior to marking as with other prior art egg markers. Rather, they can be randomly positioned in a compartmentalized conveyor after having been individually categorized as, for example, by weight. The location on the conveyor of each categorized egg is recorded in a memory unit which is operatively connected to the separate marking devices. Each marking device can then be commanded by the memory unit to move into marking engagement with a predetermined egg to imprint its associated indicia on the egg.

The structure of each marking device is identical except, of course, for the indicia carried on the face of the marking dies. The marking devices include a marking wheel with circumferentially spaced, die-carrying marking heads, means operatively connected to the marking wheel to move it into and out of engagement with eggs carried by an underlying conveyor, and a

drive means for rotating the marking wheel synchronously with the movement of the egg conveyor.

A special feature of the present invention is the construction of the marking apparatus whereby the marking wheel is provided with a plurality of radiating pins each one of which carries on its outer end a marking head. Each marking head has a narrowed neck portion that is secured to one of the pins and allows the remainder of the head to swivel so that the die can be urged into flush printing engagement with an egg on the egg conveyor, even one that is cocked or tilted to one side. The wheel is rotatably mounted on the outer end of a pivotable arm that is swingable through an arcuate path to move the wheel alternatively between its inoperative and its operative positions.

Inasmuch as the marker wheels are rotatably driven in synchronism with the movement of the egg conveyor and since the marking heads are swivelly mounted, uniform marks can be imprinted on the surface of the moving eggs without resulting in smearing of the marks.

Accordingly, it is an object of the present invention to provide an egg marking apparatus that is capable of selectively marking aligned, continuously moving eggs.

It is another object to provide an egg marking device having a marking head that is swivelly mounted so as to adapt itself to the curved surface of an egg even when the egg is not aligned with the marking head when it is presented to the marking device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the marking apparatus of the present invention with parts of an underlying egg conveyor being removed for clarity.

FIG. 1A is an enlarged side elevation of one of the marking devices shown in FIG. 1 with its marking wheel raised in an inoperative position.

FIG. 1B is an enlarged side elevation of a marking device, similar to FIG. 1A, but with its marking wheel lowered in an operative, or egg-marking, position.

FIG. 2 is an enlarged isometric view of one of the marking devices of the apparatus of FIG. 1.

FIG. 3 is an enlarged vertical section of the marking wheel of the device of FIG. 2.

FIG. 3A is a fragmentary operational view of a marking head engaging an egg.

FIG. 3B is a diagrammatic view of a marking head in the egg-engaging position of FIG. 3A which view illustrates the marking zone of the head.

FIG. 4 is an enlarged section taken along line 4—4 of FIG. 1 with parts of the marking wheel being removed for clarity.

FIG. 5 is a side elevation of the drive mechanism for the marking wheels.

FIG. 6 is a section taken along the line 6—6 of FIG. 4.

FIG. 7 is a diagrammatic representation of the memory unit of an egg processing machine and its utilization with the marking apparatus of the present invention.

FIG. 8 is a diagrammatic view of the microswitch and pinsetter matrices showing their relationship to the memory belt of the memory unit.

FIG. 9 is a schematic electrical diagram of the control circuit for the marking apparatus of the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 1, the egg marking apparatus 10 of

the present invention can be seen to comprise a bank of aligned horizontally spaced marking devices 12 elevated a predetermined distance from a bucket-type egg conveyor 14. Each of the marking devices 12, herein successively designated 12_L, 12_M, 12_S, 12_O, and 12_E, is adapted to mark an egg with indicia relating to grade and/or destination of the egg. Therefore, there is a separate marking device 12 associated with each of the various weight classes of eggs and destinations of the eggs as will be explained more fully hereinafter. The egg conveyor 14 may be identical to that disclosed in U.S. Pat. No. 2,895,274 issued to Harold J Mumma on July 21, 1959. However, it is only necessary for the operation of the apparatus of the present invention that the conveyor be of the type which is capable of carrying equally spaced eggs in a straight line beneath the marking apparatus with the ends of the eggs to be marked oriented in the uppermost position.

The marking apparatus 10 is adapted to be used with an egg processing machine such as disclosed in the before mentioned U.S. Pat. No. 2,895,274. In that machine, eggs are separately weighed and deposited into a bucket-type conveyor with their large ends up while a memory unit records the weight of each egg along with identifying data relating to the particular bucket into which the egg is deposited. With this information recorded, the memory unit can be used to command the separate marking devices 12 of the present invention whereby an egg can be marked in accordance with its weight and/or destination.

The marking devices 12 are identical except for the indicia carried by the associated marking dies, so only one marking device will be described in detail. Referring to FIG. 2, a marking device 12 can be seen to include a marking wheel 16, a rotary solenoid 18 operatively connected to the marking wheel by an arm 20, a conventional inking roller 22, and a conventional transfer roller 24.

The marking wheel 16 can be seen more clearly in FIG. 3 to have a central hub 26 rotatably mounted upon a shaft 28. The hub rigidly supports five radiating pins 30 each carrying on its outer end a marking head 32. The pins each have an enlarged end portion 31 to secure the marking head to the pin and to react against centrifugal forces exerted on the marking head when the wheel is rotating.

The marking heads 32 are flexible hard rubber members and have a circumferential spacing about the marking wheel 16 equal to one half the linear center-to-center distance between two adjacent buckets in the egg conveyor 14. The heads are provided with an axial passage that has three distinguishable portions—a narrow base portion 34 that tightly receives one of the pins 30, an enlarged outer portion 36 defining a pocket for a marking die 38, and a hollow central portion 40 whose function will become apparent from the description that follows. The central portion of each head is capable of shifting along its longitudinal axis A (FIG. 3A and 3B) in compressive deformation. The narrowed cylindrical base portion 34 forms a neck about which the outer enlarged body of the head can swivel due to the flexible characteristics of the rubber. The swiveling movement enables the marking head to adapt itself to an egg E that is cocked, i.e., tilted to one side, in the conveyor 14 whereby the enlarged end of the egg is not pointing in a precisely vertical direction (FIG. 3A). Each head is capable of moving freely about its longitudi-

dinal axis A (FIGS. 3A and 3B). It can pivot outwardly in any direction from its longitudinal axis A about the juncture 43 of the axes of the body and neck of the marker head through an angle of 30°. It is clear that the head is, therefore, capable of swiveling universally in a conical zone having a 60° apex angle as illustrated in FIG. 3B and compressively deforming along the axis of its pin 30. The marking head, when it is within this conical zone, is capable of imprinting an unsmeared mark on the shell of an egg E.

The marking dies 38 are frusto-conical rubber elements that fit into the enlarged outer portion 36 of the marker heads. The annular wall of the enlarged outer portion 36 is tapered to matingly receive the tapered side wall of a die 38 in a manner such that the centrifugal force exerted on the die when the marking wheel is rotating will not cause the die to be forced out of the marker head. The resilience of the rubber marking head, however, allows the die to be simply snapped by hand into the mating pocket and snapped out in a similar manner when it is desired to change dies in any one of the marking heads.

The dies 38 are hollow and have an internal chamber 44 and a face diaphragm 46 which carries on the outer side thereof the indicia 47 peculiar to that die. The rear wall 48 of the die has a vent passage 50 communicating with the hollow central portion 40 of the marker head. The hollow central portion 40 of the marker head is, in turn, in communication with the ambient atmosphere through a vent passage 52 in the side of the marker head. The face diaphragm 46 is, therefore, able to easily flex inwardly, thereby conforming with the curved surface of an egg E (FIG. 3A), because the chamber 44 within the die is vented through passages 50 and 52 to the atmosphere.

The shaft 28 upon which the marking wheel 16 is rotatably mounted is fixed to the outer end of the arm 20 (FIG. 6). The shaft 28 also has rotatably mounted thereon a timing pulley 54 which is secured to the hub 26 of the marking wheel for joint rotation. The arm 20 is secured at its inner end by screws 55 to a pivotally mounted plate 56 (FIG. 4) operatively connected to the rotary solenoid 18 for oscillatory movement about an axis 58 through the solenoid whereby the arm 20 is swingable from a raised non-marking position (FIG. 1A) to a lowered marking position (FIG. 1B). The solenoid is fixedly mounted on an angular frame member 60 by threaded studs 62 (FIG. 4).

A drive shaft 64 is mounted for rotation along the axis 58 and has fixedly secured on one reduced end 64a thereof a timing pulley 66 which is identical to the timing pulley 54 that is rotatably mounted on the marking wheel drive shaft 28. A timing belt 68 is trained around the timing pulleys 54 and 66 to impart rotary movement to the marking wheel upon rotation of the drive shaft 64. The drive shaft 64 is journaled in two bearings 70 mounted internally in a cylindrical housing 72, and the housing 72 is fixed to the frame member 60 by a bolt 74.

The frame member 60 mounts an upstanding plate 76 adjacent the upper portion of the marking device to which plate is mounted a pair of shafts 78 and 80 that rotatably carry the inking roller 22 and transfer roller 24, respectively. The shaft 78 is U-shaped and includes an outwardly extending portion 78a that is rotatably secured to the plate 76. A torsion spring 84, encircling the portion 78a of the shaft 78 is anchored at one end

in the plate 76 and hooked at its other end onto an upturned portion 78b of the shaft 78 to urge the inking roller, which is rotatably received upon the inwardly turned end 78c of the shaft 78, into pressing engagement with the transfer roller whereby an adequate supply of ink will be continually fed to the transfer roller in a conventional manner. It can be seen from FIG. 1A that when the marking wheel is in its raised inoperative position, the rotating marking dies successively contact the face of the transfer roller 24. This contact between the rotating dies and the transfer roller maintains a supply of ink on the marking face of the dies and also serves to frictionally rotate the transfer roller and, consequently, the inking roller 22.

The housing 72 is provided with a radially outwardly extending flange 86 so that the associated marking device 12 can be secured by bolts 88 (FIG. 2) to a mounting bar 90 secured to the egg processing machine slightly above the egg conveyor 14 (FIG. 1) and extending adjacent to each of the marking devices. The drive shaft 64 for each of the marking devices extends through the mounting bar 90 and has fixed on its protruding end a drive sprocket 92 (FIG. 5). An endless drive chain 94 (FIG. 5) is trained around the several drive sprockets 92 associated with each of the marking devices 12. The drive chain is also trained about idler guide pulleys 96 which are spaced between the drive sprockets, and about an adjustably mounted pulley 97 of a chain tensioning device 98. The drive shaft 64 of one of the marking devices (e.g., marking devices 12_L in FIG. 5) has secured thereto a second drive sprocket (not shown) which has trained therearound a second endless drive chain 100. The endless drive chain 100 is also trained around a relatively large drive sprocket 102 and the adjustably mounted pulley 103 of a second chain tensioning device 104. The drive sprocket 102 is keyed to a drive shaft 106 which is driven through a drive train (not shown) that is operatively connected to the egg conveyor 14 so that the linear movement of the eggs on the egg conveyor can be coordinated with the rotary movement of all of the marking dies. The relative sizes of the various drive sprockets are such that the tangential speed of the marking wheel will be identical to the linear speed of the egg conveyor. The marking wheel and the egg conveyor are also spatially synchronized so that the phase angle between the two speeds is zero. This spacial synchronization insures that each marker head will strike each egg squarely. With the relative speeds of the marking wheels and the egg conveyor so regulated and with the circumferential spacing between the marker heads being one half the linear center-to-center distance between the buckets in the egg conveyor, as before mentioned, it is apparent that every other marker head will be in position to mark eggs carried in successive buckets of the egg conveyor. Inasmuch as five marker heads are mounted upon each marker wheel, and the marker heads alternate in contacting successive eggs (assuming successive eggs are marked by the same marking device 12), it can be seen that the wear on the marking heads will be uniform. Because the tangential speed of the marker wheel and the linear speed of the egg conveyor are identical, it will be appreciated that a non-smeared mark will be imprinted on the surface of the egg. As pointed out before, the mark is fully imprinted on the curved surface of the egg because of the flexible nature of the indicia-carrying diaphragm of the marking die and the swivel

feature of the marking head, i.e., the ability of the enlarged outer portion 36 of the marking head to swivel about the fixed base portion 34.

A control circuit for commanding the egg marking apparatus of the present invention is shown in FIG. 9. It will be noted that in FIG. 9 the solenoids 18 associated with the several marking devices 12 have been designated 18_L, 18_M, 18_S, 18_O, and 18_E to correspond with the grade and/or destination of each egg to be marked with the associated marking wheels 12_L, 12_M, 12_S, 12_O and 12_E, respectively. The first three mentioned solenoids 18_L, 18_M, and 18_S are used when marking large, medium, and small eggs, respectively, that are destined for domestic consumption. The fourth solenoid 18_O is used when marking eggs that are undersized or oversized, hereinafter referred to as off-sized eggs, and the fifth solenoid 18_E is used to mark eggs that are to be exported.

In order to better understand the structure and function of the control circuit, a brief description of the memory unit used in cooperation with the several marking devices will be made. The memory unit may be the same memory unit as disclosed in the before mentioned U.S. Pat. No. 2,895,274 to Harold J. Mumma, and the description of the memory unit in that patent is hereby incorporated herein by reference.

The memory unit includes an endless memory belt 110 (FIGS. 7 and 8) driven in a counterclockwise direction (as viewed in FIG. 7) in timed relationship with the egg conveyor 14. On the face of the belt are a multitude of pins 112 aligned in horizontal rows and vertical columns (FIG. 8) and projecting outwardly from the face of the belt. Each horizontal row of pins corresponds to a particular bucket in the egg conveyor 14 and each vertical column of pins represents a different grade of egg. The pins 112 are bi-stable members being shiftable from a neutral, or inoperative, position to an operative position wherein they are in position to selectively operate a plurality of microswitches L-EX, M-EX, S-EX, L-EA, M-EA, O-US, O-OS, L-DOM, M-DOM, M-DA, S-DOM and L-DA (FIGS. 7 and 8) disposed in a matrix (the microswitch matrix) immediately adjacent one face of the endless belt. The vertical columns of the microswitch matrix represent a particular grade of egg while the horizontal rows correspond to the respective marking devices 12, as can be seen in FIG. 8.

Immediately below, or upstream, from the matrix of microswitches is a matrix of pinsetter solenoids 114a-114e, 116a-116e, 118a-118e, 120a-120e, 122a-122e, and 124a-124e (FIG. 8). Each horizontal row of pinsetters corresponds to a weighing scale S-1, S-2, S-3, S-4, S-5 and S-6 (FIG. 7) used in the egg processing machine of the before mentioned Mumma patent, and each vertical column represents a particular grade of egg. More specifically, the first vertical column of pinsetters represents eggs that are undersized, the second column represents large eggs, the third column represents medium sized eggs, the fourth column represents small eggs, and the fifth column represents oversized eggs. The first and fifth columns, representing undersized and oversized eggs respectively, in combination represent eggs that are off-sized.

Each scale S-1 to S-6 is connected (FIG. 7) to the horizontal row of solenoid pinsetters associated with that scale by electrical lines designated L-1 to L-6 respectively in FIG. 7. It is to be understood that each

line L-1 to L-6 shown in FIG. 7 represents five separate wires one going to each of the five pinsetters in the horizontal row of pinsetters associated with that particular line and scale. The scales S-1 to S-6 are identical and receive eggs fed thereto by the before mentioned Mumma egg processing machine. A scale, e.g., S-1, weighs an individual egg placed thereon and, in accordance with the weight and therefore the grade of the egg, sends an electrical signal through one of the wires in the associated line L-1 to the pinsetter corresponding to the weight of the egg on the scale. For example, if the egg weighed by scale S-1 was a large egg, the pinsetter designated 114b would be energized and would knock the pin 112 on the memory belt adjacent to the pinsetter 114b at that time to the right (as viewed in FIG. 8) into its operative position. The horizontal row that the pin is in, of course, represents the bucket into which that particular egg was dropped so that the memory unit then has recorded the grade of the egg deposited in that particular bucket. A more detailed explanation of the manner in which the pinsetters are operated by the scales can be had by referring to the before mentioned Mumma U.S. Pat. No. 2,895,274 which is hereby incorporated by reference.

After the pins have been set they move up toward the matrix of microswitches (FIGS. 7 and 8) which are to be operated by the pins. The microswitches, with the exception of two switches L-EA and M-EA, are normally open limit switches. Each microswitch is associated with one of the rotary solenoids 18 in the marking devices 12, there being more than one microswitch associated with most of the rotary solenoids. Referring to FIG. 8, the first vertical column in the microswitch matrix, which is associated with undersized eggs, has only one microswitch designated O-US. The microswitch O-US is in the horizontal row corresponding to the marking device 12_o, and consequently the rotary solenoid 18_o, for off-sized eggs. The second column in the microswitch matrix has two microswitches L-EX and L-DOM, microswitch L-EX being in the row corresponding to marker 12_E and solenoid 18_E for eggs being marked for export and microswitch L-DOM being in the row corresponding to marker 12_L and solenoid 18_L for marking large eggs destined for domestic consumption. The third column has two microswitches M-EX and M-DOM, microswitch M-EX being in the row corresponding to marker 12_E and solenoid 18_E for eggs being marked for export and microswitch M-DOM being in the row corresponding to marker 12_M and solenoid 18_M for marking medium sized eggs destined for domestic consumption. The fourth column has two microswitches S-EX and S-DOM, microswitch S-EX being in the row corresponding to marker 12_E and solenoid 18_E for eggs being marked for export and microswitch S-DOM being in the row corresponding to marker 12_S and solenoid 18_S for marking small eggs destined for domestic consumption. The fifth column has one microswitch O-OS which is in the horizontal row corresponding to marker 12_o and solenoid 18_o. The sixth column has two microswitches L-EA and L-DA, microswitch L-EA being in the row corresponding to marker 12_E and solenoid 18_E and microswitch L-DA being in the row corresponding to marker 12_L and solenoid 18_L. The seventh column has two microswitches M-EA and M-DA, microswitch M-EA being in the row corresponding to marker 12_E and solenoid 18_E

and microswitch M-DA being in the row corresponding to marker 12_M and solenoid 18_M.

It will be observed that the columns in the pinsetter matrix are only aligned with the first five columns in the microswitch matrix. The sixth and seventh columns in the microswitch matrix are used to alternate the marking of large or medium sized eggs between domestic consumption and export. The columns of pins 112 on the memory belt that are aligned with the sixth and seventh columns of microswitches are manually set prior to the operation of the machine so that alternate pins in each column are set to the right in their operative position (FIG. 8). It is important to note that, contrary to the other microswitches in the microswitch matrix, microswitches L-EA and M-EA are normally closed limit switches. It will, therefore, be appreciated that microswitches L-EA and L-DA in column six will never both be closed or both open when a row of pins 112 associated with a particular bucket in the egg conveyor sequentially passes the respective microswitches. For this reason only one of the microswitches L-EA or L-DA will be operative with regard to any particular bucket in the conveyor. The same situation is present with respect to microswitches M-EA and M-DA in the seventh column.

Referring now to FIG. 9 where the control circuit for commanding the marking apparatus is shown schematically, it can be seen that an AC power source PS is used to energize the respective rotary solenoids 18_L, 18_M, 18_S, 18_o, and 18_E. The power source PS is connected through four rectifier bridges B-1, B-2, B-3, and B-4 to four rotary switches SW-1, SW-2, SW-3, and SW-4 respectively, to place a positive potential on the switch arms of the respective switches. The rotary switches are each manually operable and are used to set the associated marking devices 12 for preselected marking patterns as will become apparent with the description that follows.

Looking first at switch SW-1 associated with the marking of large eggs, there is an "off" terminal T1-1 to which the switch arm 130 can be set when it is desired not to mark large eggs. The adjacent terminal T1-2 is connected to one terminal 131 of the normally open microswitch L-DOM whose other terminal is connected to one terminal 132 of the solenoid 18_L. The other terminal of the solenoid 18_L is connected in a common line 134 with one terminal of each of the other rotary solenoids 18_M, 18_S, 18_E, and 18_o, and to the collector 136 of a transistor 138 whose function will be described later. The next adjacent terminal T1-3 of the rotary switch SW-1 is connected to one terminal of the normally open microswitch L-DA and to one terminal of the normally closed microswitch L-EA. The opposite terminal of microswitch L-DA is connected to terminal 131 of microswitch L-DOM and the opposite terminal of the microswitch L-EA is connected to one terminal 140 of the microswitch L-EX. The opposite terminal of the microswitch L-EX is connected to the free terminal 142 of the rotary solenoid 18_E. The last terminal T1-4 of the rotary switch is connected directly to the terminal 140 of the microswitch L-EX.

It can be seen that, regardless of the condition of the microswitches, the solenoid 18_L, or any of the other solenoids 18_M, 18_S, 18_o and 18_E, cannot be energized unless the transistor 138 conducts a current to complete a circuit through the solenoid. The transistor will not conduct unless a positive potential is placed on the base

144 of the transistor. The base of the transistor is connected through a current limiting resistor 146 to one terminal of a normally closed switch 148. The other terminal of the switch 148 is connected to the positive potential line leading to the rotary switch SW-1. A dwell cam 150 is driven adjacent the switch 148 in synchronism with the memory belt and is disposed to hold the switch open during a major portion of its cycle. The dwell cam is timed to make one revolution, or cycle, in the same time period that it takes the conveyor to move a distance equal to the spacing between a pair of successive buckets. During that portion of the cycle of the dwell cam that the switch 148 is not held open, a potential is placed on the base of the transistor allowing the transistor to conduct a current and thereby complete a circuit through any one of or combination of the solenoids 18. It is during this same portion of the cycle of the dwell cam that the pins on the memory belt are aligned with the microswitches in positions where they will operate the microswitches if the pins have been moved to their operative positions.

The dwell cam 150 reduces the period of actuation of the solenoids 18_D, 18_E, 18_S, 18_M and 18_L and permits the microswitches in the microswitch matrix to be opened and closed when they are not conducting current to thereby preserve their operating life. The cam switch 148, which sets the limits of the period of actuation of the solenoids, only has to carry the relatively small base current for the transistor 138 rather than the large solenoid currents. The timing of the cam 150 is such that the marking devices 12 will be brought down just prior to the "dead center" position, i.e., where the appropriate marking head 32 is directly in vertical alignment with the appropriate egg on the conveyor which is to be marked. The marking head will be held in this lowered position for just a brief interval, as determined by the dwell in cam 150, in order to allow the mark to be transferred from the marking head to the eggs which are moving at the same linear speed as described hereinbefore.

For a better understanding of the cooperation between the memory unit, the microswitches and the rotary solenoids 18 in the marking devices 12, assume that an egg is weighed by scale S-1 and is graded as "large" because of its weight. Scale S-1, upon depositing the egg into the bucket (hereinafter referred to as bucket B-1) in the egg conveyor, will send an electrical signal through line L-1 to the pinsetter designated 114b. The pinsetter 114b will knock the pin on the memory belt, that is adjacent thereto at the time the pinsetter receives the signal, to the right (as viewed in FIG. 8) into its operable position. This pin is in a horizontal row of pins on the memory belt that corresponds to bucket B-1. When the pin, which is now in its operable position, reaches the microswitch matrix it will first operate microswitch L-DOM to close the switch. If switch arm 130 of rotary switch SW-1 is set on terminal T1-2, as illustrated in FIG. 9, a circuit will be completed to energize solenoid 18_L to cause the marker device 12_L to imprint its indicia on the egg immediately therebeneath at that time. This egg will be the egg carried by bucket B-1 because the microswitch L-DOM is in the horizontal row corresponding to the marker device 12_L. In other words, due to the synchronized timing between the egg conveyor and the memory belt, the pin which was set by pinsetter 114b will pass through the vertical distance from pinsetter 114b to micro-

switch L-DOM in the same time it takes bucket B-1 to pass the distance from scale S-1 to the marking device 12_L. In a similar manner, an egg which is graded "large" by any of the other scales will energize one of the pinsetters 116b-124b to similarly activate microswitch L-DOM. It will also be seen from FIG. 9 that an egg graded "large" by one of the scales would be marked for export if the rotary switch SW-1 were set on terminal T1-4.

If rotary switch SW-1 were set on terminal T1-3 an egg graded "large" by scale S-2 and dropped in a particular bucket (hereinafter designated bucket B-2) could be marked for domestic consumption by the marking device 12_L or for export by the marking device 12_E. Which of the markers 12_L or 12_E imprints its indicia on the egg is determined by the position of the pin in column six (FIG. 8) of the memory belt. As stated before, and as can be seen in FIG. 8, the pins in columns six and seven are preset in alternated operative and inoperative positions. If the pin in column six corresponding to bucket B-2 were one which had been preset in an inoperative position it would not operate either of the microswitches L-DA or L-EA associated with column six. Therefore, microswitch L-DA, which is normally open, would remain open when the pin in column six associated with bucket B-2 passed thereby, and microswitch L-EA which is normally closed would remain closed when the pin passed it by. Inasmuch as pinsetter 116b would have been energized by scale S-2 to set the pin in column two corresponding to bucket B-2 because the egg was graded "large," microswitches L-DOM and L-EX will be successively closed by the pin as the bucket B-2 passes beneath markers 12_L and 12_E, respectively. It can thus be seen, by referring to FIG. 9, that under these circumstances a circuit will be completed through microswitches L-EA and L-EX and through solenoid 18_E when bucket B-2 passes beneath marker 12_E so that the egg will be marked for export. If the next successive bucket (hereinafter designated as bucket B-3) were to have received a "large" egg it would have been marked by marker 12_L for domestic consumption because the pin in column six corresponding to bucket B-3 would be preset in an operative position, i.e., the opposite condition of the pin in column six for bucket B-2. The operative pin in column six corresponding to bucket B-3 will successively close the normally open microswitch L-DA and open the normally closed microswitch L-EA. It can be seen that under these circumstances a circuit will be completed through closed microswitches L-DA and L-DOM and through solenoid 18_L when bucket B-3 passes beneath marker 12_L to mark the egg carried by bucket B-3 for domestic consumption. It will be apparent that if all of the eggs processed were large eggs and the switch SW-1 were set on terminal T1-3, half of the eggs would be marked by marker 12_E for export and half would be marked by marker 12_L for domestic consumption. In reality it would be very unlikely that all of the eggs processed would be large eggs, or all of any other specific grade, but it has been found that due to the law of probability approximately half of the large eggs processed will be marked large for domestic consumption and the other half marked for export if the rotary switch SW-1 is set on terminal T1-3.

The rotary switch SW-2 is associated with the marking of medium sized eggs and is also provided with four terminals T2-1, T2-2, T2-3, and T2-4 that are con-

nected to the four microswitches M-DOM, M-EX, M-DA, and M-EA in a manner similar to the connections of the terminals and microswitches associated with rotary switch SW-1. It can be seen that medium sized eggs destined for domestic consumption will be marked by marker 12_M, associated with solenoid 18_M, and medium sized eggs that are to be exported will be marked by marker 12_E, associated with solenoid 18_E, in a manner similar to that described above with reference to large eggs. It can also be seen that medium sized eggs can be automatically alternately marked for domestic consumption or for export by setting the rotary switch SW-2 on terminal T2-3, similarly to the method of alternately marking large eggs. It will be apparent that both large and medium sized eggs (as well as small eggs as will be explained hereinafter) that are to be exported are marked by the same marker 12_E.

The rotary switch SW-3 is associated with the marking of small eggs. It has only three terminals T3-1, T3-2, and T3-3. Terminal T3-1 is an "off" terminal where the switch can be set if it is desired not to mark small eggs. Terminals T3-2 and T3-3 are similar to terminals T1-2 and T1-4, respectively, of switch SW-1 in that they are used to only mark eggs for domestic consumption or only to mark eggs for export, respectively. It is apparent that when the switch SW-3 is set on terminal T3-2, the marker 12_S will mark all small eggs, due to its association with the activated solenoid 18_S, and when the switch is set on terminal T3-3, the marker 12_E will mark all small eggs due to the association of this member with the activated solenoid 18_E. It can be seen that no provision is made whereby small eggs can be automatically marked approximately half for export and half for domestic consumption as with either the large or medium sized eggs.

The rotary switch SW-4 is associated with the marking of off-sized eggs, i.e., eggs that are undersized or oversized. The switch has four terminals T4-1, T4-2, T4-3 and T4-4. Terminal T4-1 is an "off" terminal where the switch can be set if it is desired not to mark off-sized eggs. Terminal T4-2 is connected to one terminal 154 of the microswitch O-US whose other terminal is connected to the free terminal 156 of the solenoid 18_O. With the switch SW-4 set on terminal T4-2, it is apparent that only undersized eggs will be marked by the marker 12_O associated with the solenoid 18_O. In this switch setting any oversized eggs would pass through the marking apparatus without being marked. Terminal T4-3 is connected to the anodes of two diode rectifiers 158 and 160. The cathode of the diode 158 is connected to terminal 154 of the microswitch O-US and the cathode of the diode 160 is connected to one terminal 162 of the microswitch O-OS. The other terminal of the microswitch O-OS is connected to the free terminal 156 of the solenoid 18_O. It can be seen that with the switch SW-4 set on terminal T4-3, both undersized and oversized eggs will be marked by the marker 12_O associated with the solenoid 18_O. Terminal T4-4 is connected to terminal 162 of microswitch O-OS so that if switch SW-4 is set on terminal T4-4, only oversized eggs will be marked by marker 12_O and all undersized eggs will pass through the marking apparatus unmarked.

According to the foregoing description, it will be apparent that when eggs are processed by the machine described in the before mentioned Mumma patent and deposited by the scales S-1 to S-6 into the buckets in

the egg conveyor 14, a signal corresponding to the grade of the egg will be transmitted to the memory unit which memory unit will function to record the grade of the egg as well as the bucket into which the egg was dumped. The memory unit then uses this recorded information to operate microswitches that are associated with the various marking devices 12. The various marking devices are selectively commanded to mark the eggs as they pass therebeneath according to their grade and/or destination. Selective marking patterns are available through the use of rotary switches S-1 to S-4 controlling the operation of the marking devices so that the eggs can be marked in any one of a combination of ways.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

What is claimed is:

1. An egg marking apparatus for use with an egg processing machine that has means for grading eggs prior to depositing the eggs into a conveyor having a plurality of uniformly spaced pockets for carrying the eggs and memory means for recording and processing information relating the grade of an egg to the particular pocket on the conveyor into which the egg is deposited, said apparatus comprising in combination a commandable egg marking device aligned with and mounted adjacent to the egg conveyor for individually marking the passing eggs in the egg conveyor in response to the information within the memory means, said marking device including marking means mounted so as to be movable between an operative marking position and an inoperative marking position spaced away from the eggs on the conveyor, and means operably connecting the marking device to the memory means whereby said marking means can be commanded into and out of operable marking engagement with individual passing eggs on said conveyor, the commandable movement of the marking means being determined by the information within the memory means relating the grade of the egg to the particular pocket on the conveyor passing thereby.

2. An egg marking apparatus for use with an egg processing machine that has means for grading eggs prior to depositing the eggs into a conveyor having a plurality of uniformly spaced pockets for carrying the eggs and memory means for recording and processing information relating the grade of an egg to the particular pocket on the conveyor into which the egg is deposited, said apparatus comprising in combination a plurality of commandable egg marking devices aligned with and mounted adjacent to the egg conveyor at longitudinally spaced positions along the conveyor for marking each passing egg in the egg conveyor in response to the information within the memory means, said marking devices each including marking means mounted so as to be movable between an operative marking position and an inoperative marking position spaced away from the eggs on the conveyor, and means operably connecting the marking devices to the memory means whereby each marking means of each marking device can be commanded into and out of operable marking engagement with individual passing eggs on said conveyor, the commandable movement of each marking means being determined by the information within the memory

13

means relating the grade of the egg to the particular pocket on the conveyor passing thereby.

3. The apparatus of claim 2 wherein said egg conveyor is continuously driven at a constant speed and each of said marking means includes a rotatable wheel having at least one printing die mounted at the periphery thereof and means for driving said wheel in timed rotation so that the tangential speed of said die is equivalent to the speed of the conveyor, and the die is spatially synchronized with the moving pockets of the conveyor whereby on command said die individually engages the eggs in the pockets of the conveyor.

4. The apparatus of claim 3 wherein each of said rotatable wheels are mounted on a pivotable arm movable between a raised inoperative position and a lowered operative position corresponding to said operative marking position of the associated marking means and each of said rotatable wheels are operatively connected to said drive means by a timing chain whereby the printing dies can selectively engage individual eggs carried by the conveyor.

5. The apparatus of claim 4 wherein said pivotable arms are operably connected to rotary solenoids whereby, upon energization of a rotary solenoid, the associated arm will be caused to pivot quickly into its operative position for engaging the individual egg carried by the conveyor therebelow and upon subsequent deenergization of the rotary solenoid the associated arm will be caused to pivot quickly out of its operative position.

6. The apparatus of claim 5 wherein said memory means includes a plurality of mechanical switches and said rotary solenoids are electrically connected to the switches thereby providing quick responses to the information within the memory means.

7. A marking head of elastomeric material for use with a marking device having a projecting pin for retaining the marking head thereon, said marking head comprising in combination an elastomeric body portion having a recess, an elastomeric printing die snugly received in said recess and projecting outward beyond said body portion, and a reduced neck of elastomeric material about which the body portion is free to swivel, said neck having an axial bore in which said projecting pin is snugly engaged to attach said marking head to said marking device.

8. The marking head of claim 7 wherein said printing die comprises a hollow member defined by a rear wall, at least one side wall, and an elastomeric face diaphragm having printing indicia thereon whereby said face diaphragm can conformally flex about the curvature of the object while printing thereon.

9. The marking head of claim 8 wherein said rear wall and side wall are thin elastomeric walls capable of collapsing and stretching to conform to objects being marked.

10. The marking head of claim 7 wherein the walls of said printing die have an aperture therein in communication with the atmosphere so as to permit said printing die to freely collapse when in printing engagement with

14

an object except for the restraint imposed on the die by the engagement of the walls of the recess of the body portion of the marking head.

11. An egg marking device for applying printing marks to eggs using a conveyor having a plurality of uniformly spaced pockets for carrying eggs, said marking device comprising a marking wheel, a plurality of marking heads uneven in number and uniformly spaced around the periphery of the marking wheel, each of said marking heads being arcuately spaced apart a distance which is substantially one-half of the linear spacing between successive pockets on the said conveyor, means for rotating said marking wheel at the same speed as the eggs are carried thereby, means for moving the marking wheel cyclically between operative printing engagement and inoperative printing engagement positions between successive applications of the printing marks, and an inking means for applying ink to said marking heads in the inoperative printing engagement position, whereby said arcuate spacing of the marking heads and the speed of the rotating means permit the marking heads to alternate in their sequence of entering into printing engagement with the eggs in the conveyor and whereby said unevenness in the number of marking heads allows the marking heads to alternate in their sequence of inking.

12. An egg marking device for placing a unitary mark on a moving egg, comprising:

a marking wheel having a plurality of circumferentially spaced pins extending radially from a central hub, each of the pins being rigidly mounted at one end to the hub;

a plurality of marking heads each having a base portion and a flexible portion, the base portion being firmly attached to the terminal free end of one of said pins remote from the hub and the flexible portion extending radially outward from the base portion, said flexible portion being free to flex and to swivel about the radial axis of the pin and having a flexible printing surface disposed thereon, whereby each marking head is capable of conforming to the curvature of the shell of an egg that is presented to a marking head with a cocked orientation;

a pivotal arm rotatably supporting the marking wheel;

drive means for rotating the marking wheel in synchronization with the moving egg; and

means for pivoting said arm alternately between operative and inoperative positions thereby moving said printing surface into and out of unitary marking engagement with the moving egg.

13. The marking device of claim 12 wherein said flexible portion of each marking head further includes a flexibly swivelable, frusto-conical neck portion connecting the flexible portion to the base portion, whereby the flexible portion of the marking head is free to swivel and to flex about the radial axis of the pin.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,779,159

DATED : December 18, 1973

INVENTOR(S) : BOYD W. ROSE, JOHN H. BERCOVITZ, JR.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 13, "and" (first occurrence) should be --or--

Column 10, line 3, "en" should be --an--.

Column 11, line 10, "beseen" should be --be seen--.

Signed and Sealed this

thirtieth Day of December 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks