United States Patent

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[54] HOT STAMPING MACHINES FOR ROLL MARKING CYLINDRICAL ITEMS

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[52] **U.S. Cl.** **101/8**, 101/38

[51] **Int. Cl.** **B41f 17/08**

[58] **Field of Search** 101/4, 5, 6, 7, 8, 25, 27, 101/38, 39, 40

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[57] **ABSTRACT**

In the machine shown, a series of upright, parallel, equispaced rotatable spindles, which for tubular workpieces serve as the mandrels therefor, extend from individual bearings carried by a constantly moving, substantially horizontally mounted link chain belt, a portion of whose path is straight, wherealong workpieces associated with the spindles, in succession, pass a marking station presenting a heated flat die whose face is upright and has thereacross a colored foil. In their passage along the die, the workpieces are roll marked thereby, but they are rotated by a positive drive, independent of contact with the die. Said die is allowed some wobble, but each bearing is held so the axis of its spindle is maintained in a fixed direction during passage along the marking station, and there is a means associated with each spindle, to adjust the peripheral speed of the workpiece in relation to the speed of said chain. An adjustably pressurized air cushion imparts the necessary pressure the die imposes on the work rolling thereon.

11 Claims, 9 Drawing Figures

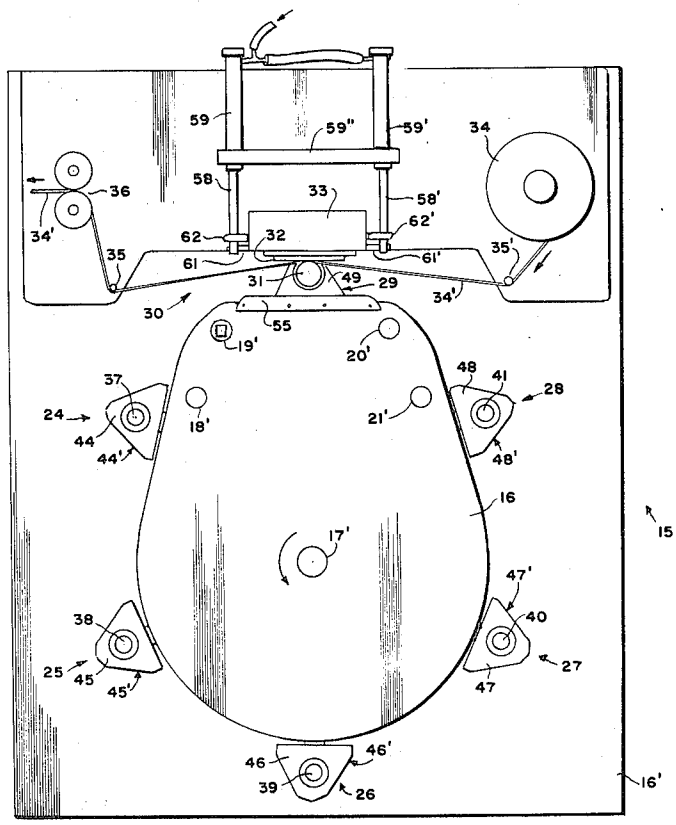
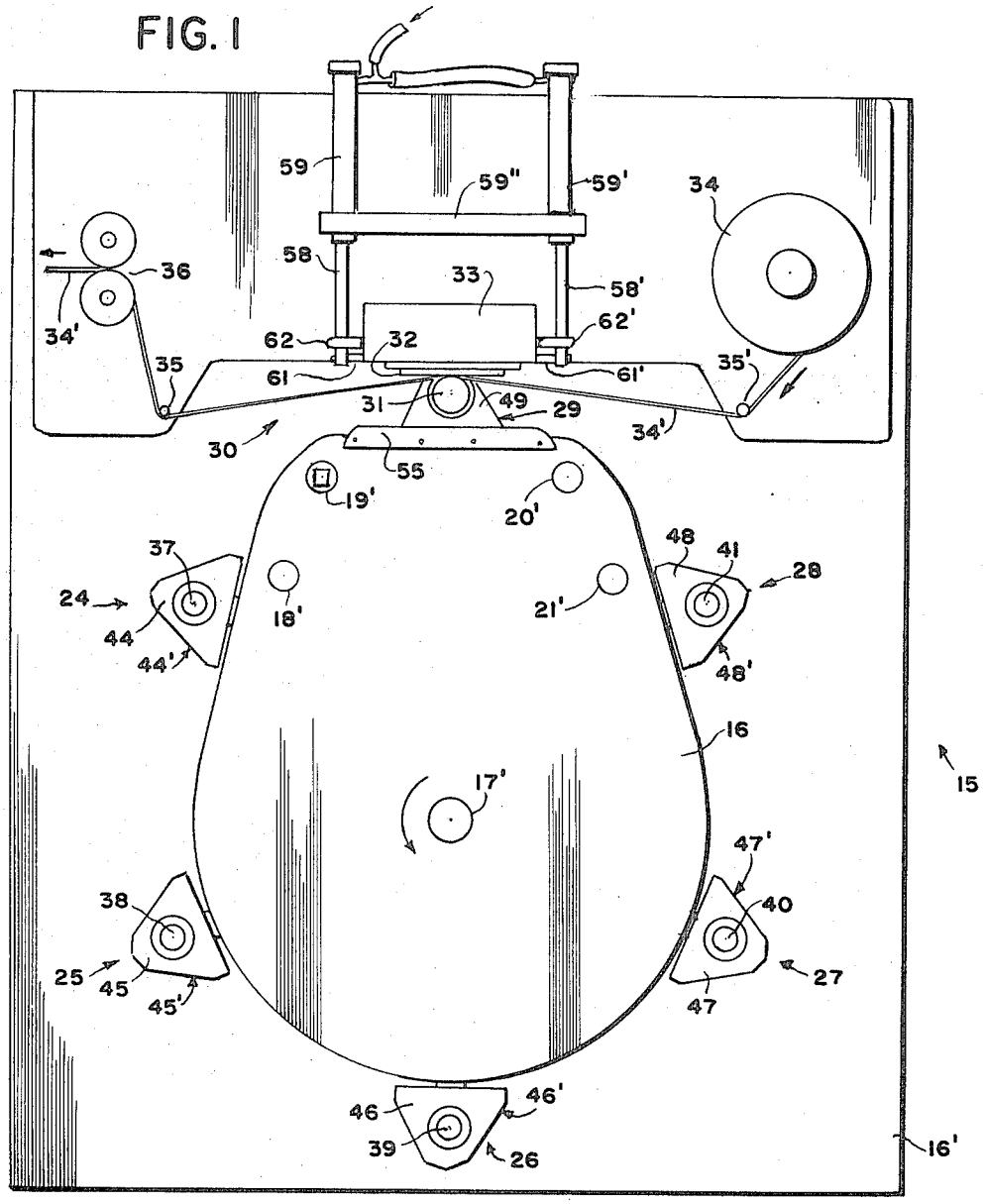


FIG. 1



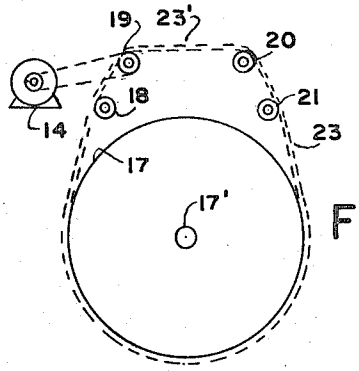


FIG. 2

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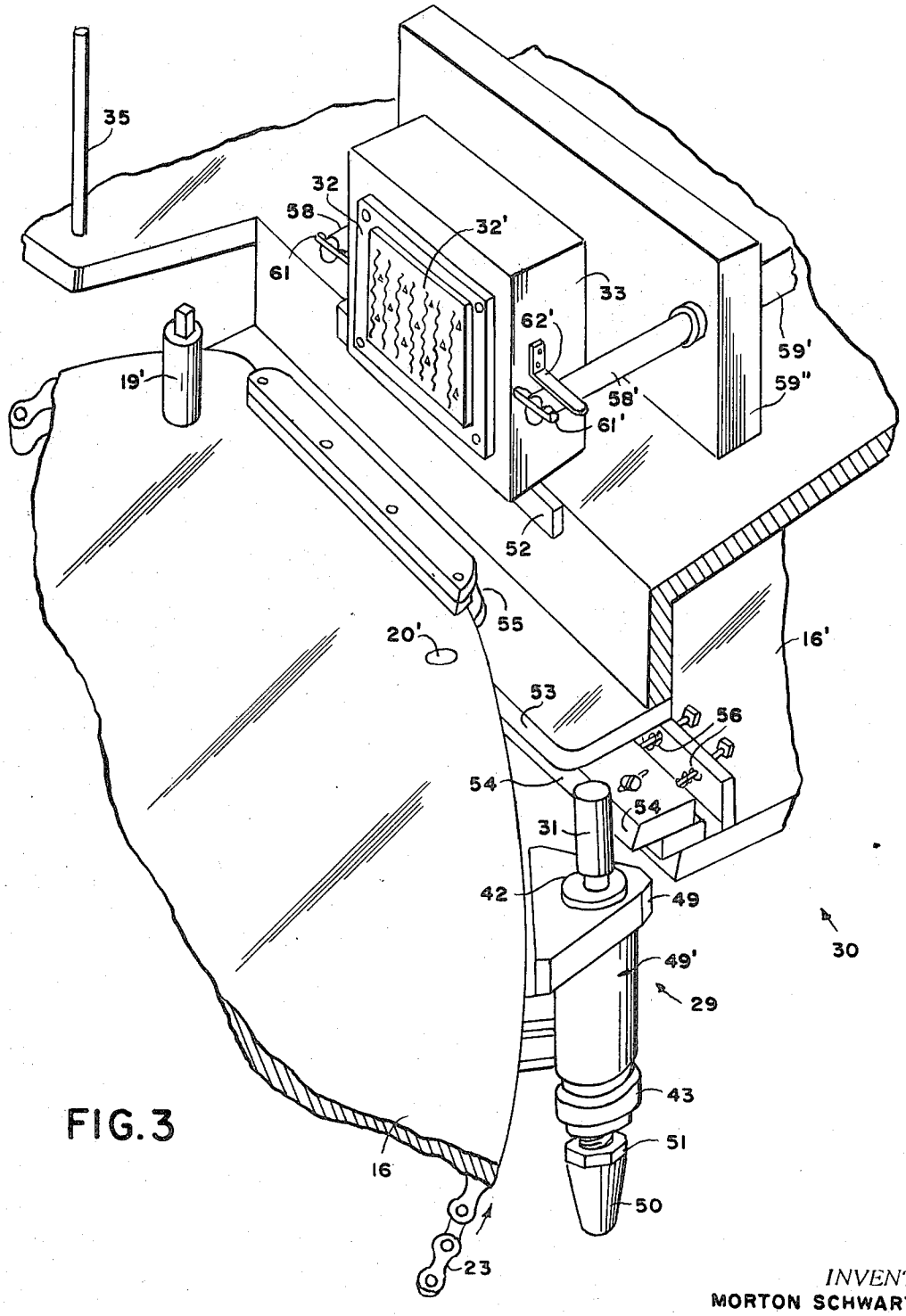

FIG. 3

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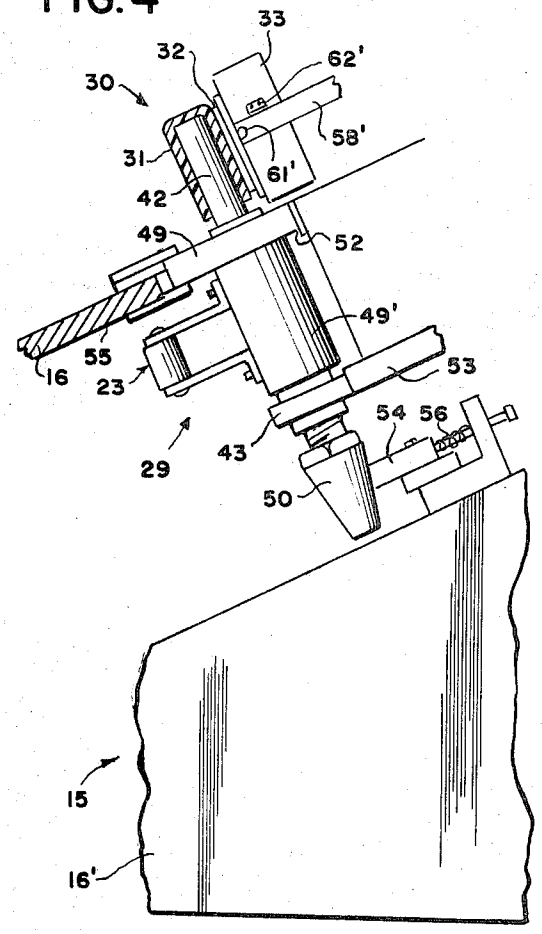
FIG.4



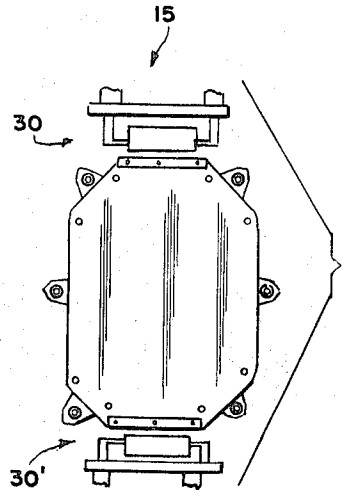


FIG.5

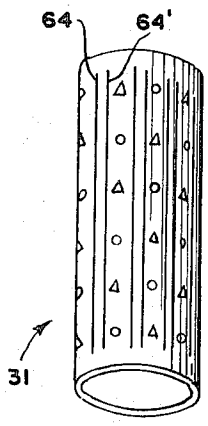


FIG.6

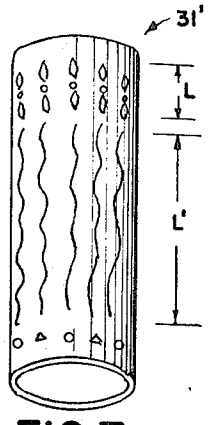


FIG.7

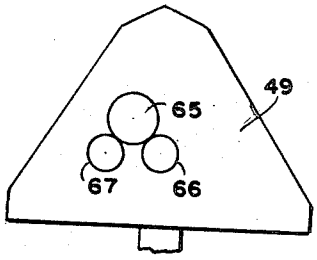


FIG.9

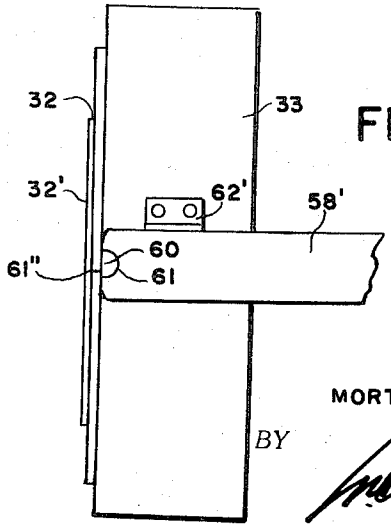


FIG.8

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HOT STAMPING MACHINES FOR ROLL MARKING CYLINDRICAL ITEMS

The present invention relates to hot stamping machines in which the face of a heated marking die, covered by a colored foil, is impressed onto the surface of a work piece to mark the indicia thereon as a foil inlay.

More particularly, this invention is concerned with, and its principal object is to provide a novel and improved hot stamping machine of the type mentioned, for roll marking tubular and solid cylindrical items, as for example, lipstick tube caps, cosmetic tubes and surface-decorated handle elements, using only standard flat dies, thus obviating the need for contoured dies which besides having other objections, are difficult and expensive to make.

A further object thereof is to provide a novel and improved machine of the character described, which automatically compensates for small variances in outside diameter and roundness in tubular and solid pieces, and for small variances in concentricity in tubular workpieces, as commonly occur in commercial tube and bar stock and in molded pieces.

Another object thereof is to provide a novel and improved hot stamping machine of the kind set forth, affording adjustment of the spread of the marking to allow the "expansion and contraction" of the pattern, to effect proper closing or matching.

Still a further object thereof is to provide a novel and improved roll marking hot stamping machine of the sort set forth, having the mentioned attributes, and which is simple in construction, reasonable in cost to manufacture, easy to operate and efficient in carrying out the purposes for which it is designed for a large range of sizes, allowing easy changeover in dies and mandrels, in minutes.

Other objects and advantages will become apparent as this disclosure proceeds.

For one practice of this invention, the upper end of each of a plurality of equispaced upright spindles, are adapted to frictionally receive or otherwise become frictionally associated to drive an upright cylindrical workpiece. Each spindle is journaled in and extends through a bearing structure of its own, which is carried by a constantly moving endless chain, trained on a system of sprockets on the machine frame, in a plane normal to the axes of said spindles. Each workpiece, in turn, passes a marking station along a straight run in the chain path, where it contacts and rolls along the colored foil ribbon-covered face of a flat die which is allowed movement of a wobbly nature. Each bearing body has a flange at its upper end, on which the workpiece stands or is supported. Each spindle at its lower end carries a frustoconical element, and a little distance above it, there is a journaled collar. Before a workpiece actually reaches the marking station, the axis of its associated spindle becomes fixed in its direction of extension, because the flange on its bearing is made to ride through a channel on the frame which it fits for sliding movement therethrough, and the journaled collar rides in frictional traction on a track rod on the frame, while the frustoconical toe rides in frictional traction on a bevelled track rod on the frame. The position of said toe along the spindle, is adjustable. The die, of course is heated, and there is substantial pressure of the die on the workpiece as the latter rolls thereon. Usual means is employed to provide a fresh length of colored film across the die face, after each marking operation.

In the accompanying drawings forming part of this specification, similar characters of reference indicate corresponding parts in all the views.

FIG. 1 is a top plan view of one embodiment of the teachings of this invention.

FIG. 2 is a diagrammatic top plan view of the sprocket and chain system included in the machine of FIG. 1, drawn to a reduced scale.

FIG. 3 is an enlarged fragmentary perspective view, showing the marking station being approached by a workpiece. Various parts are omitted, in order to attain clarity of illustration.

FIG. 4 is a fragmentary side view of FIG. 1, showing a workpiece being marked. Some parts are shown in section.

FIG. 5 is a diagrammatic top plan view of a machine in accordance with this invention, which is a modified embodiment arranged with two marking stations, so work can be done in two colors. This view is drawn to a reduced scale.

FIG. 6 is a perspective view of a workpiece which was hot stamped on the machine of FIG. 1.

FIG. 7 is a perspective view of a workpiece which was hot stamped on the machine of FIG. 5.

FIG. 8 is a fragmentary side view showing the manner of mounting the heated die.

FIG. 9 is a top plan view showing diagrammatically, one manner of presenting a solid workpiece to the heated marking die.

In the drawings, the particular hot stamping machine illustrated, is generally designated by the numeral **15**. On its frame **16'**, which includes the upper plate **16**, is mounted a series of parallel upright posts numbered **17'–21'** respectively, on which are the sprockets **17–21** respectively. An endless link chain belt **23**, is trained on said sprocket system as a loop, which at its outer perimeter, carries a series of equispaced identical work holders which are denoted generally by the numerals **24–29** respectively. The portion **23'** of the belt, between the sprockets **19** and **20**, is a straight run which is along the marking station indicated generally as **30**, where workpieces as **31**, in succession, are brought into rolling contact accompanied with pressure against the upright foil-crossed face **32'** of the marking die **32**, which is mounted on an electric heater backing **33**. Usual mechanism is included at the marking station to provide a fresh section of a colored foil ribbon **34'** across the face of the die, before each marking. Of this, only the foil supply roll **34**, its guide pins **35,35'** and the nipping feed rollers **36** thereof are shown. Such foil-supply mechanisms including drive means therefore, timed for proper operation, being well known to those versed in this art, it is believed that no further illustration or explanation thereof, is necessary.

The belt **23** is taut, and the number of work holders may be one or more, but their spacing along the belt shall permit only one of them to pass the die **32**, at a time.

The work holders **24–29** being identical, a description of the holder **29** will suffice for all; said holder being shown approaching the work station **30**, in FIG. 3. An upright spindle **42**, is journaled for rotation in a bearing member **49'**, out of which, both its ends extend; said bearing member being fixed to a link of the chain belt **23**. The upper part of the bearing member has an integral flange **49**, above which the upper part of the spindle extends and has a roughened peripheral surface to frictionally receive a tubular workpiece **31** thereon. Immediately below the bearing member, the lower part of said spindle **42** carries a collar **43**, capable only of rotation thereon. The lower end of the spindle, which is threaded, carries a downwardly tapered, frustoconical tip element **50**, whose position therealong is adjustable, and releasably securable in any set position, by a locknut **51**. The spindles of the work holders, are denoted by the numerals **37–42** respectively. The flanges on said work holders, are denoted as **44–49** respectively. The post **19'** is preferably a rotatable shaft having its sprocket **19** fixed thereto; the upper part of said shaft extending above the plate **16**, and flattened to square cross section to receive a handcrank to "edge" the machine; said shaft being driven by an electric motor **14**, provided with a speed adjustment means not shown.

Commencing in advance of the marking station **30**, as shown in FIG. 3 where the chain belt **23** is moving counterclockwise, and extending beyond said station, the frame **16'** presents several bars, namely, a bar **52** for the apex edge of the flange **49** to contact and slide therealong, another bar **53** for the collar **43** to frictionally contact and roll on, and still another bar **54** for the conical tip **50** to frictionally contact and roll along to rotate the spindle **42**. Opposite the bar **52**, the plate **16** offers a channel **55** for the flange **49** to enter and slide in good fit therethrough, so with the bar **52**, the work holder **29** will be held against wobble. The bar **54** is mounted for lateral shift and is biased by a series of coil springs **56** to

have its bevelled surface 54', as the one for contacting the periphery of the tip 50.

The heating head 33, midway up its side edges, is swingably mounted by its aligned horizontal trunnions 61,61', which are rotatably fitted through the piston rods 58,58' of the pneumatic cylinders 59,59' fixed to a frame piece 59''. The axis of swing 60, is made as close as possible to the die face 32', and the trunnions are flattened as at 61'', so their bearing holes are in the forward ends of said piston rods as slots thereacross, each such slot having a cross section of slightly more than a semicircle as shown in FIG. 8. This allows clearance for movement of the workpiece to the die 32. The numerals 62,62' denote resilient fingers extending from the heating head, behind said trunnions, and bear against the piston rods 58,58' respectively to hold said heating head to an upright position.

In FIG. 3, the work holder 29 carrying the piece 31 to be marked, is shown approaching the marking station 30, while in FIGS. 1 and 4, said work holder is shown within and moving through said station, and the workpiece 31 is being marked by the die 32. It is to be especially noted, that the fit of the parts is so proper, that when a work holder is engaged at and during its passage through the marking station, the direction of the axis of its spindle as 42, is fixed, and because of the traction of the tip element 50 on the rod member 54, said spindle will rotate. Hence, the work is positively driven.

The machine 15 is set into operative condition by applying current to the heater 33 so the die 32 is hot, the motor driving the chain 23 is actuated, whereupon the chain travels continuously at a uniform speed, and a regulated supply of compressed air is continuously applied into the pneumatic cylinders 59,59', so the piston rods 58,58' are shifted outwardly a limit distance so that the workpiece 31 in coming into contact with the die 32, will have to push it back a bit, and thus a pressure is imposed by the foil-crossed die face 32' upon the workpiece during the latter's passage through the marking station 30. The workpieces as 31, are cylindrical shells, which are set by hand onto the spindles which they frictionally fit, so each workpiece shall turn with its spindle. When a piece is marked and has left the station 30, it is removed, preferably by automatic stripping means not shown, but well known in the machine art, and so it is believed that illustration or further explanation thereof is not needed.

In setting up the machine for properly sized workpieces, the tip elements 50 are adjusted to a position along the spindles so that in the rotation of the work by the positive drive effected by the movement of said elements against the bar 54' during passage along the marking station, the peripheral speed of the workpiece which is turned by its spindle, shall be equal to the linear speed of the belt 23.

Ideally, the length of the operative surface of the die equals the length of the circumference of the workpiece to be stamped. As a workpiece passes the entire die, the stamped on design will "close" on itself, i.e., its beginning will meet its end, and there will be no noticeable break in the imprinted design. Actually, however, variations in the diameters or circumferences of the workpieces occur, in different workpiece lots, for example, or the die surface may be inaccurate in length. Assume the workpiece were merely to frictionally engage the die and roll thereover at the same rate as the workpiece passes the die. If the length of the imprinting surface of the die is greater than the circumference of the workpiece, the design will not only "close" upon itself, it will include an undesirable overlap where part of the workpiece will be doubly imprinted. Similarly, if the length of the operative surface of the die is shorter than the circumference of the workpiece, there will be a gap between the beginning and the end of the imprinting on the workpiece and the design will never "close" upon itself.

To ensure that the design closes, the speed of rotation of the workpiece with respect to the operative surface of the die must be adjusted so that the design will always close, without overlapping. In certain applications, the workpiece rate of rotation must be greater than the speed at which it passes the die and in other cases it must be less than this speed. Appropriate adjustments, described below, adjust the relative rate of rotation of each workpiece with respect to the die surface.

Speed adjustments of the type described will cause some relative slippage between the die and the surface of the workpiece. However, in most applications, there are very minor relative rate adjustments and the slight amount of smearing, which may result, would not be noticeable to or objectionable to the typical recipient of an imprinted workpiece.

When a run of workpieces is a bit oversized in diameter, so the spread of the die face 32' is too small in relation to the periphery of a workpiece to make the design close, then after a test operation before the run is made, an adjustment is made by raising the tip elements 50 on all the spindles, true position is found for said elements where the speed of the workpiece is made a bit faster than chain speed, sufficient to cause the design to close on the marked pieces. When a run of workpieces is found to be undersized, then the tip elements are lowered so that the peripheral speed of the workpiece is made a bit slower than chain speed, to effect proper matching of the design ends, meaning that the end lines 64,64' are properly spaced on the work.

It is evident that the manner in which the die holder 33 is mounted allows for its wobbly movement. This will automatically align the die face against the workpiece to make a proper impression, though there is a small variance in the piece being worked on, as to its outside diameter, roundness and concentricity.

When it is desired to mark different peripheral lanes of the workpiece in different colors respectively, then the machine is provided with as many marking stations as there are to be colors. In FIG. 5, the machine 15' has two marking stations 30 and 30', with suitable dies 22 and 22' to mark the lanes L and L' on the workpiece 31', for example in red and black respectively, as as evident, the foil 63 will need be red, and the foil 63' will be black.

It is believed readily understandable without the need of further illustration, that the upper part of each spindle may be threadedly secured pieces which are easily removable for replacement with other sets of different sizes to suit different runs of workpieces, and that the die which is mounted on the heater body by screws, is easily replaceable with others as need be. Such changeover can be accomplished in a matter of minutes.

For the particular machine illustrated, it has been mentioned that the spindles are upright, and it is to be noted that it is convenient to slope the machine as shown in FIG. 4. It is also believed understandable without the need of further illustration, that the frame may be provided with adjustable legs to change such slope. It is evident also, that this machine may be designed or positioned so its spindles be in any desired direction, as vertical, inclined or horizontal. Also to be noted is that it is preferred that the flange shape shall be substantially triangular as 48 so a base thereof shall fit the channel 55 while the opposite apex rides along the bar 52.

Though the machine specifically illustrated herein to explain this invention is for the accommodation of tubular workpieces as 31, it can be arranged to work on solid cylindrical workpieces as 65, by having on the upper part of each spindle which is above the flange, a chuck device, not shown, or by having on each flange as 49, an arrangement which for example is shown in FIG. 9, where the spindle 66 cooperates with a revolvable post 67, to rollingly support the workpiece set to stand along against them, resting on the flange; the machine being tilted as in FIG. 4.

This invention is capable of various applications and numerous forms without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiments shown herein shall be deemed merely illustrative and not restrictive; reference being had to the following claims rather than to the specific description and showings herein, to indicate the scope of this invention.

I claim:

1. In a stamping machine for roll marking items, said machine comprising:

a frame;

a belt mounted upon mounting means upon said frame; means for causing said belt to move lengthwise;

guide means, which are relatively stationary with respect to said belt and are secured to said frame, for engaging said belt along a portion of its length for directing said belt portion along a predetermined pathway;

a die holder mounted on said frame; a die carried by said die holder on one side thereof and spaced from that said belt portion, which is then being engaged by said guide means;

resilient means biasing said die and said die holder toward said belt; said die being shaped to be parallel to said predetermined belt portion pathway, thereby to create a substantially uniformly wide space between said die and said belt portion;

means carried on said frame for interposing a transfer medium in front of said die to permit said die to stamp items with the material of the transfer medium;

at least one spindle attached to said belt for a generally cylindrical workpiece and for permitting rotation of said workpiece when said spindle is on that portion of said belt which is being engaged by said guide means; said spindle being so positioned with respect to said belt that a workpiece which it engages, when traveling on that said belt portion, is in rolling contact with said die;

a die holder support means mounted upon said frame;

the improvement comprising, said die holder being mounted by trunnion means on its said support means;

said die holder including at least one slot for receiving said trunnion means; each said slot being positioned such that its respective said trunnion means is at the side of said die holder upon which said die is mounted, whereby said die can swing about an axis passing substantially through the face of said die; each said slot being shaped to entrap said trunnion means, thereby to hold said die holder on said frame

thereby permitting swinging movement of said die holder about an axis parallel to the principal direction of extension of that said belt portion passing said guide means.

2. In the stamping machine of claim 1, the improvement further comprising,

each said slot for a trunnion means being in the shape of part of a circle, with an axis extending parallel to the axis about which said die holder may swing; each said slot being shaped so as to surround a space greater than a semicircle, and each terminating at the die-holding side of said die holder in a chord of said partially circular slot;

each said trunnion means being correspondingly partially circularly shaped to its respective said slot and having a flat surface, which aligns with said chord terminus of said slot.

3. In the stamping machine of claim 1, wherein the machine further includes an element of round cross section, which is secured to said spindle such that rotation of said round element rotates the workpiece associated with said spindle;

a bar attached to said machine frame and extending along a pathway parallel to the pathway of that said belt portion passing said guide means; said bar being positioned to maintain engagement with each said round element as its respective said spindle passes along that said belt portion;

the improvement further comprising, independent means for adjusting the position of each said round element with respect to said bar and its respective said spindle; said round element being of varying circumference along its length such that said adjustment in the position thereof causes a desired portion of said round element having a desired circumference to engage said bar, thereby controlling the rate of rotation of each said spindle.

4. In the stamping machine of claim 3, the improvement further comprising, each said spindle including a spindle wobble control device that is displaced from said round element;

said belt guide means including a guide surface, which is positioned to engage each said wobble control device along the entire pathway past said guide means when the respective said round element attached to said spindle is being contacted by said bar, thereby to hold the workpiece in secure contact with said die and to maintain the axis of said spindle in a fixed direction while it passes said die.

5. In the stamping machine of claim 4, the improvement further comprising, said spindle wobble control device comprising a collar journaled on said spindle.

6. In the stamping machine of claim 1, the improvement further comprising, each said spindle including a spindle wobble control device secured thereto;

said belt guide means including a guide surface, which is positioned to engage each said wobble control device along the entire pathway of said spindle past said guide means, thereby to hold the workpiece in secure contact with said die and to maintain the axis of said spindle in a fixed direction while it passes said die.

7. The stamping machine of claim 1, further including heating means connected with said die to heat same, thereby to cause said stamping machine to be a hot die stamping machine.

8. In the stamping machine of claim 3, the improvement further comprising, said rounded element is conical, and its position is adjustable along the spindle; and means to fix said rounded element releasably at any set position.

9. In the stamping machine of claim 8, the improvement further comprising, the surface of said bar contacted and rolled on by said conical element is a bevelled surface.

10. In the stamping machine of claim 9, the improvement further comprising, said bar that is contacted and rolled on by said conical element, is movably mounted on the frame, and includes means forcibly biasing such bar toward the path of the spindle along that said portion of the said belt.

11. In the stamping machine of claim 1, the improvement further comprising, the spindle has a roughened periphery and is adapted for use as a mandrel to frictionally engagingly receive a tubular workpiece thereon.

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