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[56]

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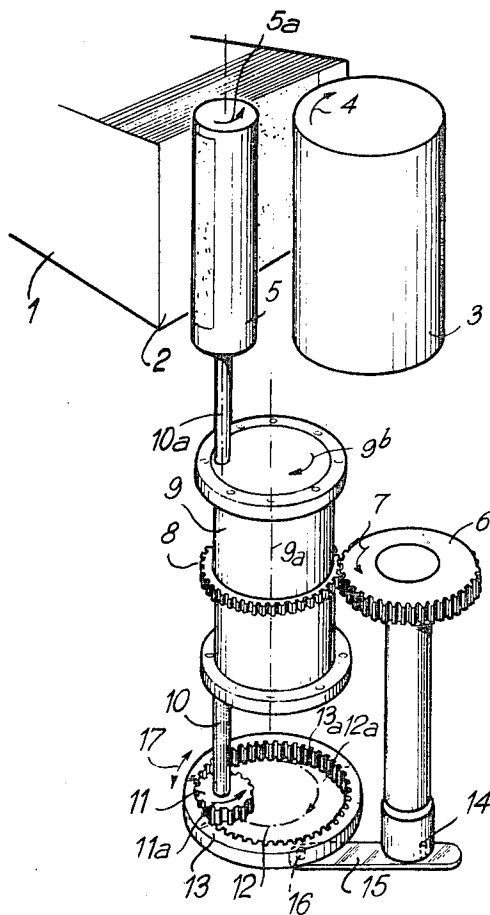
[54] **HIGH-SPEED LABELLING MACHINE**
 6 Claims, 3 Drawing Figs.

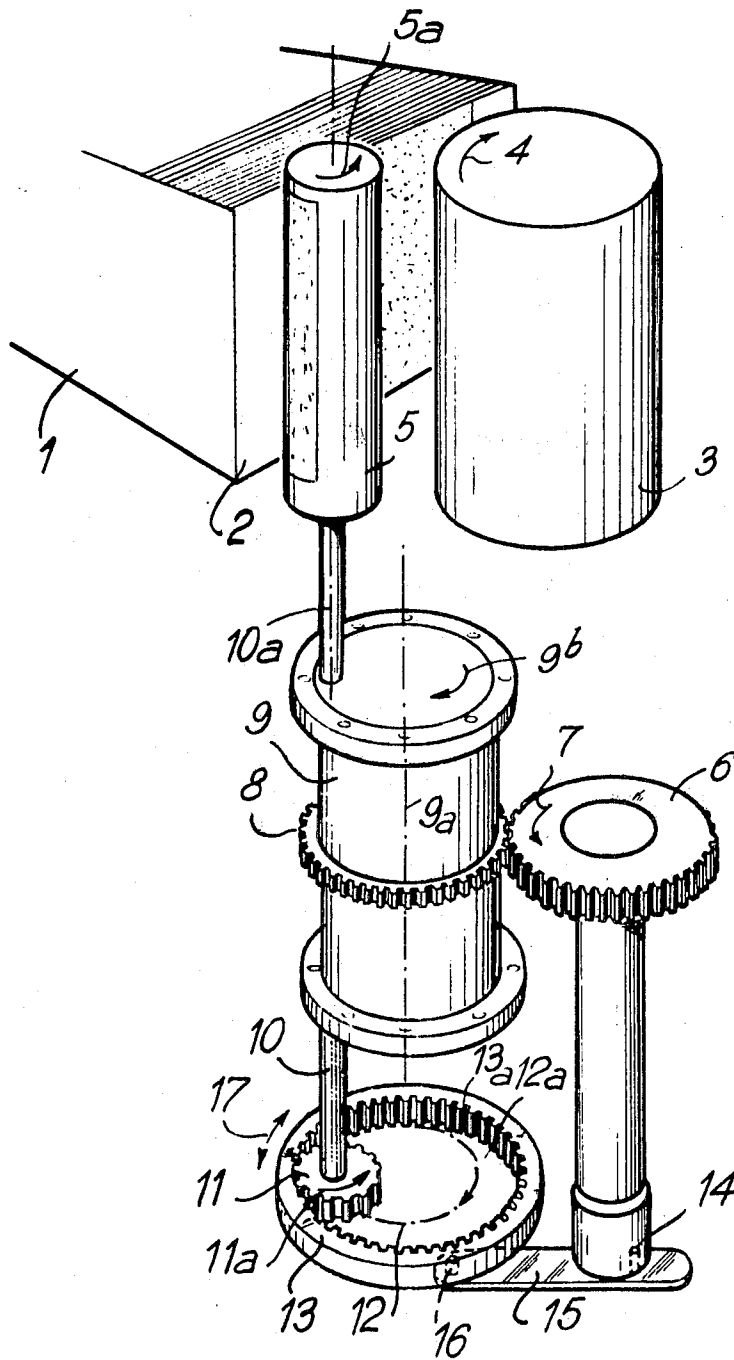
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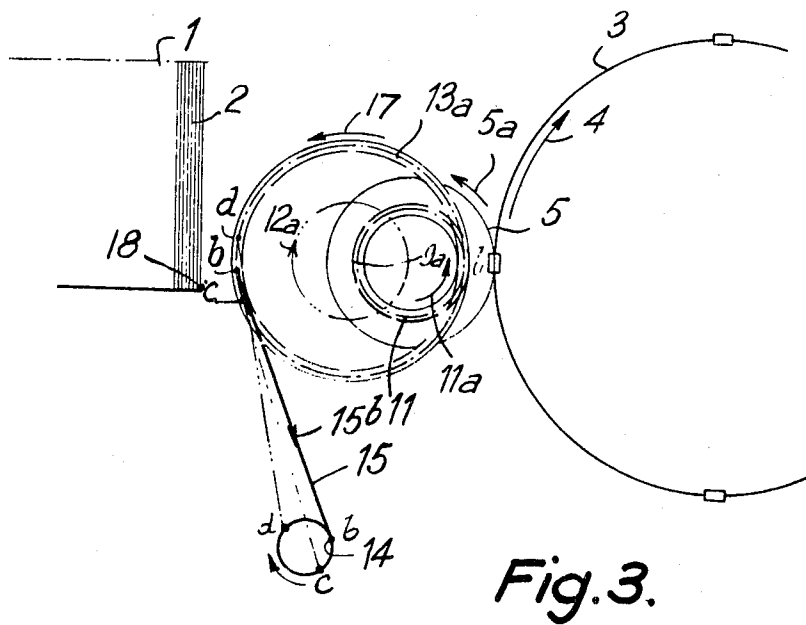
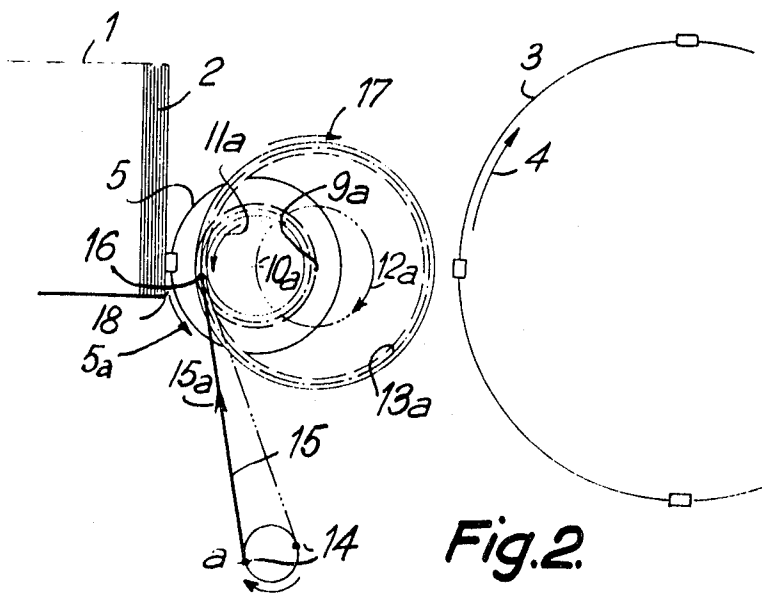
[51] Int. Cl. **B65h 3/10**

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ABSTRACT: The present invention relates in general to high-speed labelling machines and is concerned more particularly with the device incorporated in machines of this type for picking up labels from the label box or magazine and delivering them to a transfer cylinder adapted subsequently to deliver the labels to a gumming or gluing device before distributing them to the periphery of a turret adapted to lay the labels to the containers, bottles or other articles to be labeled.







HIGH-SPEED LABELLING MACHINE

The present invention relates in general to high-speed labelling machines and is concerned more particularly with the device incorporated in machines of this type for picking up labels from the label box or magazine and delivering them to a transfer cylinder adapted subsequently to deliver the labels to a gumming or gluing device before distributing them to the periphery of a turret adapted to lay the labels to the containers, bottles or other articles to be labelled.

Many types of pickup devices disposed between a label magazine and a transfer cylinder have already been proposed; these devices operate in general by adhesive effect (gluing) or suction effect (vacuum) and consist essentially of cylindrical pickup rollers or rollers having a label pickup surface of relatively intricate configuration. The movements imparted to these rollers or like members are usually complicated and of alternating or oscillating nature and/or rotational about their axes or about fixed or movable other axes, with idle periods, since their kinematic operation must meet two critical conditions which may be summarized as follows: on the one hand, picking up a label by traction from the magazine, or rolling on the label without any relative slip to avoid any rumpling or damaging thereof, and on the other hand depositing this label onto the transfer cylinder at a predetermined and considerably higher peripheral velocity, also without any relative slip, to avoid any rumpling and damaging of said label, and the higher this transfer cylinder speed, the higher said peripheral velocity and the higher and efficiency of the machine.

Certain known devices operate according to the continuous-cycle principle by utilizing a planet-and-sun gear mechanism or epicyclic gearing for driving the pickup device proper, but the label pickup surfaces of these devices are discontinuous or constitute separate hinged units, thus adding undesired and tedious complications to the machining, assembling and adjustment of the assembly, and furthermore and component elements of these units have a certain mechanical fragility preventing the use of very high label-dispensing rates. To avoid these inconveniences and reduce the operating speeds of the units, a plurality of these pickup assemblies must be used in combination, thus increasing considerably the cost and overall dimensions of the installation.

Finally, picking up a label from a stationary box or magazine at high speed is an obvious cause of shocks and jolts; therefore, in prior devices it was attempted to cope with this inconvenience by causing the label magazine to partake in the label-picking operation of the pickup device, that is, by impressing to said magazine a slight movement towards the device when the latter approaches the magazine and then rolls on the first label to be picked up.

These improvements did not remove, however, the inconvenience resulting from the considerable inertia inherent in relatively heavy moving parts, and also from the production rate delays resulting therefrom. Besides, it is always difficult to reload a movable label magazine during a label sticking operation, and it is nowadays unthinkable to have to stop the machine for accomplishing this reloading operation.

The pickup device according to this invention eliminates the various inconveniences set forth in the foregoing. In fact, as will clearly appear from the structure to be described presently, the label-containing box or magazine is strictly stationary; no idle time is lost during the operation of the pickup roller which operates continuously and is adapted to pickup labels as closely spaced as desired to each other; furthermore, the change of speed of the pickup roller from a value V_0 when picking up the stationary label from the magazine to a value V_1 when depositing the same label onto the transfer cylinder is obtained by resorting to an extremely simple yet efficient compensation mechanism.

Now the device of this invention not only eliminates these hitherto unavoidable inconveniences but provides in addition very advantageous features not encountered in any of the hitherto known devices serving the same purpose.

More particularly, labels of different lengths can be picked up and transferred by simply cutting off the pneumatic suction

produced in the pickup roller every other revolution, or twice every third revolution, or three times every fourth revolution, or according to any other predetermined cyclical law; the label pickup rate of the device can be increased considerably for its shape, its operating mechanisms and their kinematic mode of operation have been simplified to the greatest extent; thus, it is possible to dispense labels at variable time intervals and modify the linear transfer speeds by easily substituting pickup rollers of different diameters without interfering with the mechanism as a whole, the only required adjustment consisting in modifying the stroke of the compensation mechanism.

The label pickup device according to the present invention, which utilizes an epicyclic gearing for operating the pickup member proper, is characterized essentially in that it comprises a pick up roller of circular cylindrical configuration, adapted to pickup the labels from a stationary magazine by pneumatic suction; a planet pinion coaxial to said pickup roller and angularly rigid therewith; a cylindrical sleeve rotatably driven at a constant speed, on which the common shaft of said pickup roller and said planet pinion is mounted in an eccentric position, said common shaft being thus caused to revolve continuously and at a constant speed in the space; an internally toothed annulus having a fixed axis and disposed coaxially to said sleeve, said planet pinion being in constant meshing engagement with said internally toothed annulus; a driving or power pinion rotatably driven at constant speed and in constant meshing engagement with a driven pinion rigid with said sleeve; an eccentric-and-rod mechanism driven at constant speed from said power pinion, said rod being attached to said internally toothed annulus so as to impart a circular reciprocating oscillatory motion of relatively low amplitude thereto; whereby said pickup roller is driven not only for constant continuous rotation in the space left between the label magazine and the transfer cylinder but also for rotation about itself at a uniformly variable speed, this last-mentioned speed being on the one hand retarded as the roller picks up a label from the magazine, due to the rotation of said toothed annulus in a direction opposite to that of said pickup roller, and on the other hand increased when the label is being applied to the transfer cylinder, due to the rotation of said internally toothed annulus in the same direction as said pickup roller.

It is worth pointing out that the maximum retarding effect produced by the toothed annulus on the label-pickup speed of the pickup roller, as well as the maximum acceleration effect produced by said internally toothed annulus on the speed during the laying of the label on the transfer cylinder take place not at the dead centers of the oscillating movements of said annulus but on the contrary at the points of maximum speed of oscillating movements of said annulus, which is quite logical. Another feature worth stressing is that this conjunction of the aforesaid retarding and accelerating actions attains its maximum efficiency only because the vertical line along which the label is picked up from the magazine, the vertical line along which the label is deposited onto the transfer cylinder, and the common vertical axis of said sleeve and said toothed annulus lie in the same vertical plane. In other words, it is another characteristic feature of this invention to arrange the lines of picking up the label from the magazine and laying the label onto the transfer cylinder in diametrically opposite relationship with respect to the annulus, this annulus having its axis equally spaced from the line along which the label is picked up from the magazine and from the line along which this label is applied onto the transfer cylinder.

Finally, in contrast to other devices known in the art, wherein the pickup roller takes the labels from the supply box or magazine by utilizing the inherent adherence resulting from a preliminary gluing or gumming step, the pickup roller according to this invention operates by suction or vacuum effect, so that it can rotate at relatively high speeds without any risk of projecting glue by centrifugal action.

Other features and advantages characterizing this invention will appear as the following description proceeds with reference to the accompanying drawing illustrating diagrammatically by way of example a typical form of embodiment of this invention. In the drawing:

FIG. 1 is a diagrammatic perspective view showing the relative arrangement of the various component elements of the device of this invention for transferring a label from a magazine to a transfer cylinder;

FIG. 2 is a diagrammatic plane view showing the same elements during the picking up of a label from the magazine, and

FIG. 3 is a view similar to FIG. 2 but showing these elements during the laying of the previously picked up label onto the surface of the transfer cylinder.

The total kinematic chain illustrating the sequence of operations performed downstream of this device by an installation of the type referred to in the above preamble, i.e. transferring the labels from the transfer cylinder to the distributing turret then applying the labels to the containers or other articles to be labeled, is not shown in the drawing as it is well known to those conversant with the art.

In the form of embodiment illustrated in FIG. 1 the reference numeral 1 designates a stationery of or box filled with labels; and the first label to be removed therefrom is denoted 2. The reference numeral 3 designates the transfer cylinder revolving continuously at a constant speed in the direction of the arrow 4. The velocity of rotation of this cylinder 3 may be calculated for examples as a function of that of the pickup roller 5 so that the useful or operative sector of the cylinder has an amplitude of 120° for each revolution of the pickup roller; in other words, three labels will be transferred during each revolution of the transfer cylinder. The latter may be driven through any suitable intermediate transmission (not shown), for example from the main power pinion 6 revolving at a constant speed in the direction of the arrow 7. This power pinion 6 drives another pinion 8 angularly rigid with a cylindrical sleeve 9 having a vertical axis 9a. This sleeve 9 revolving in the direction of the arrow 9b drives eccentrically the shaft 10 of the pickup roller 5 which shaft projects from the lower portion of said sleeve and carries a planet pinion 11. The shaft portion 10a rotating freely in the sleeve 9 and emerging from the top of this sleeve is thus driven at a constant and continuous speed so as to describe a circular path 12 in the direction of the arrow 12a.

Simultaneously, the planet pinion 11 meshes with the inner teeth 13a of an internally toothed annulus 13 having its fixed vertical axis coincident with the axis 9a of sleeve 9. Under these conditions the planet pinion 11 revolves at the same time about itself in the direction of the arrow 11a. As the pickup roller 5 is angularly rigid with the planet pinion 11, the former revolves in the same direction as shown by the arrow 5a. It is clear that while revolving about itself according to a law to be defined hereinafter, the pickup roller will alternatively move towards the magazine 1 and towards the transfer cylinder 3.

The shaft of pinion 6 drives at its lower end and an eccentric crankpin 14 controlling in turn a rod 15 having its other end pivotally connected at 16 to the internally toothed annulus 13. As a consequence of the eccentric position of crankpin 14, the rod 15 to which a regular motion is imparted by said crankpin causes the toothed annulus 13 to oscillate alternatively along a circular path with a reduced angular amplitude as shown by the double arrow 17.

It is clear that during one phase of its alternating motion the toothed annulus 13 will rotate in a direction opposite to that of planet pinion 11, while during the opposite phase said annulus will rotate in the same direction as said planet pinion 11. During the first phase defined hereinabove it will thus slow down the velocity of rotation of the planet pinion about its axis, and during the other phase also defined hereinabove it will accelerate the velocity of rotation of the planet pinion about itself. It will be seen, with reference to FIGS. 2 and 3, that the first phase will be utilized during the operation consisting in

picking up a label from the magazine 1 (FIG. 2) and that the second phase will be utilized during the operation consisting in laying a label onto the outer surface of the transfer cylinder 3 (FIG. 3). The direction of rotation of crankpin 14 is immaterial, the main point being that the above-defined oscillating motion be imparted to the internally toothed annulus 13.

Referring more particularly to FIG. 2, it will be seen that the pickup roller 5 contacts the label to be picked up through a line of suction holes. This contact must be of the rolling type, not a slipping one, for in this last case the label might become rumpled or otherwise damaged and could not escape from the retaining claws 18. At this point the tangential velocity of the pickup roller must be zero. In order to reduce to zero its inherent rotary speed, the rod 15 is caused to recede by the action of crankpin 14 in the direction of the arrow 15a, thus actually reducing to zero the velocity of the pickup roller, the counter-velocity of the toothed-annulus 13 revolving in the direction opposite of that of said planet pinion compensating the planet pinion speed. The label is picked up by suction when the crankpin 14 is in position "a." After this threshold, the pickup roller carries the label 2 to the transfer cylinder 3.

When the label registers with the transfer cylinder 3 (FIG. 3) a reverse effect is produced for, to avoid any slippage between the velocities of the pickup roller and transfer cylinder the former must have its inherent rotational speed increased considerably. To this end, the rod 15 is pulled by the crankpin 14 in the direction of the arrow 15b so as to momentarily accelerate the speed of the pickup roller, the speed of the planet pinion 11 being accelerated to a predetermined extent by the overdrive effect produced in the velocity of the toothed annulus 13 revolving in the same direction as said planet pinion. The label is placed onto the transfer cylinder by momentarily discontinuing the pneumatic suction through the orifices of the pickup roller while resuming the suction through the holes of the transfer cylinder as the crankpin 14 reaches position "b." After this threshold, the pickup roller is moved back to the label magazine and resumes the same cycle as described hereinabove. When the crankpin 14 has accomplished a complete revolution the planet pinion 11 has completed its circular path within the internally toothed annulus 13.

FIG. 3 shows at "c" and "d" the positions of crankpin 14 whereat the oscillating movement of annulus 13 clears "dead centres".

According to the disclosure given in the preamble of this specification, it will be noted that the lines along which the labels are picked up and deposited onto the transfer cylinder lie in a common vertical plane also containing the axis 9a.

From the foregoing it will be seen that the speed of the pickup roller has been increased considerably during the actual transfer of a label for delivery to the cylinder 3 without producing a proportional increment in the velocity of the planet pinion. This considerable advantage is due inter alia to the fact that the diameter selected for the pickup roller is greater than the pitch diameter of the planet pinion, and also to the compensation of the mechanism comprising the crankpin 14, rod 15 and internally toothed annulus 13. Thus, an improved efficiency is obtained without subjecting the mechanism to abnormal accelerations. Of course, the diameter of the pickup roller may also be equal to the pitch diameter of the planet pinion, but this would be attended by a higher acceleration when transferring the label to roller 3, thus necessitating a greater compensation through the assembly 14, 15, 16 and 13.

By way of example, label pick up rates of the order of 45,000 labels per hours have been obtained under very satisfactory practical conditions by using a device according to this invention which had the following characteristics:

Diameter of planet pinion	40 mm.
Diameter of pickup roller	60 mm.
Diameter of annulus	80 mm.
Diameter of eccentric crankpin	20 mm.
Diameter of transfer cylinder	120 mm. (3cycles)
	160 mm. (4cycles)

Of course, it would not constitute a departure from the spirit and scope of this invention to bring various modifications and variations to the specific form of embodiment illustrated and described herein, as may readily occur to anybody conversant with the art.

What is claimed is:

1. Apparatus for picking up labels from a stationary source and transferring them to a rotating transfer cylinder, comprising a magazine adapted to position a succession of labels at a stationary position, a rotating transfer cylinder positioned spaced from a stationary label and having its cylindrical surface disposed tangent to a plane parallel to said stationary label, a pickup roller for picking up a stationary label and transferring it to the transfer cylinder, shaft means supporting said pickup roller for rotational movement about its concentric longitudinal axis, sleeve support means mounted for rotation about a fixed axis, a power supply shaft means mounted for rotation about a fixed axis, drive means connecting said power supply shaft means and the sleeve means to rotate the sleeve means from the power supply shaft means, means to rotatably mount said pickup roller shaft means on said sleeve means eccentrically with respect to the axis of the sleeve means whereby the pickup roller is carried bodily in an orbital path between a stationary label and the transfer cylinder, and motion transmitting means connecting said power supply shaft means and said pickup roller shaft means to position the surface of the pickup roller stationary with respect to a stationary label at one portion of said orbital path and to rotate the sur-

face of the pickup roller to correspond with rotation of the surface of the transfer cylinder at another portion of said orbital path.

2. Apparatus defined in claim 1 wherein said transmitting means includes an epicyclic gear train comprising a planet pinion secured to said roller shaft means and an annulus gear mounted for oscillatory rotational movement about an axis concentric with the axis of the sleeve means, and means connecting the annulus gear with the power supply shaft means for cyclically oscillating the annulus gear.

3. Apparatus defined in claim 2, wherein said means for oscillating the annulus gear includes rod means having a pivotal connection with the annulus gear and a pivotal connection with a crank eccentrically mounted on the power supply shaft means.

4. Apparatus defined in claim 3, wherein said annulus means is provided with internal teeth meshing with the planet pinion, and said drive means for rotating the sleeve means includes a pair of meshing gears fixed respectively to the sleeve means and power supply shaft means.

5. Apparatus defined in claim 4, wherein the axes of said transfer cylinder and said pickup roller are disposed in parallel relationship to each other.

6. Apparatus defined in claim 5, wherein the axis of said sleeve means is disposed in a plane midway between the plane of a stationary label and a plane tangent to the surface of transfer cylinder.

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