

[54] **BALLOON PRINTING APPARATUS**

[76] Inventors: **Norman H. Nye**, 1348 Highbridge Rd., Cuyahoga Falls, Ohio 44222;
Arthur T. Medkeff, 260 Fawnwood Dr., Tallmadge, Ohio 44278

[22] Filed: **Apr. 30, 1973**

[21] Appl. No.: **355,464**

[52] U.S. Cl. **101/35**, 198/131, 269/156, 269/157

[51] Int. Cl. **B41f 17/00**

[58] Field of Search 101/35-37; 302/2; 73/45.1, 45.2, 45, 41.4, 41.3, 41.2, 41; 214/1 R; 198/131; 269/156, 157

[56] **References Cited**

UNITED STATES PATENTS

1,988,662 1/1935 Myers 101/36

2,645,870 7/1953 Smith et al. 101/40 X
3,224,364 12/1965 Terzuoli 101/37
3,391,803 7/1968 Povlacs 302/2 R

Primary Examiner—Clifford D. Crowder
Attorney, Agent, or Firm—Oldham & Oldham Co.

[57] **ABSTRACT**

Apparatus for printing on balloons including a conventional printing press including a driven rotary printing cylinder, and an endless driven conveyor positioned to be moved through a course including a portion adjacent and tangent to a portion of the periphery of the cylinder. Balloons are attached to the conveyor and then automatically inflated to be moved past the printed cylinder and be pressed thereagainst to receive a printed impression therefrom.

2 Claims, 6 Drawing Figures

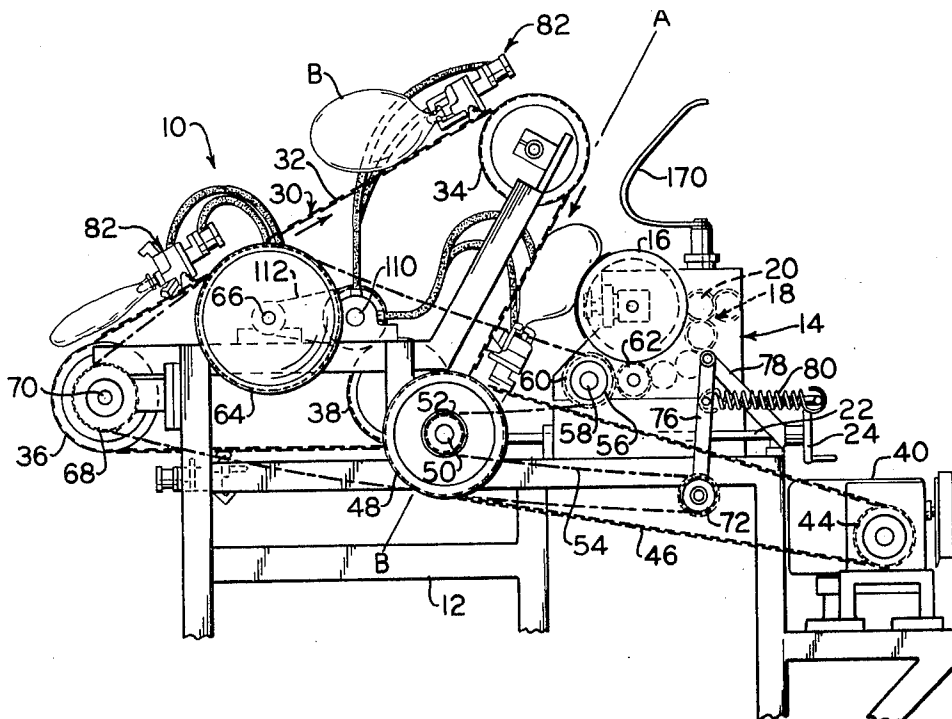


FIG-1

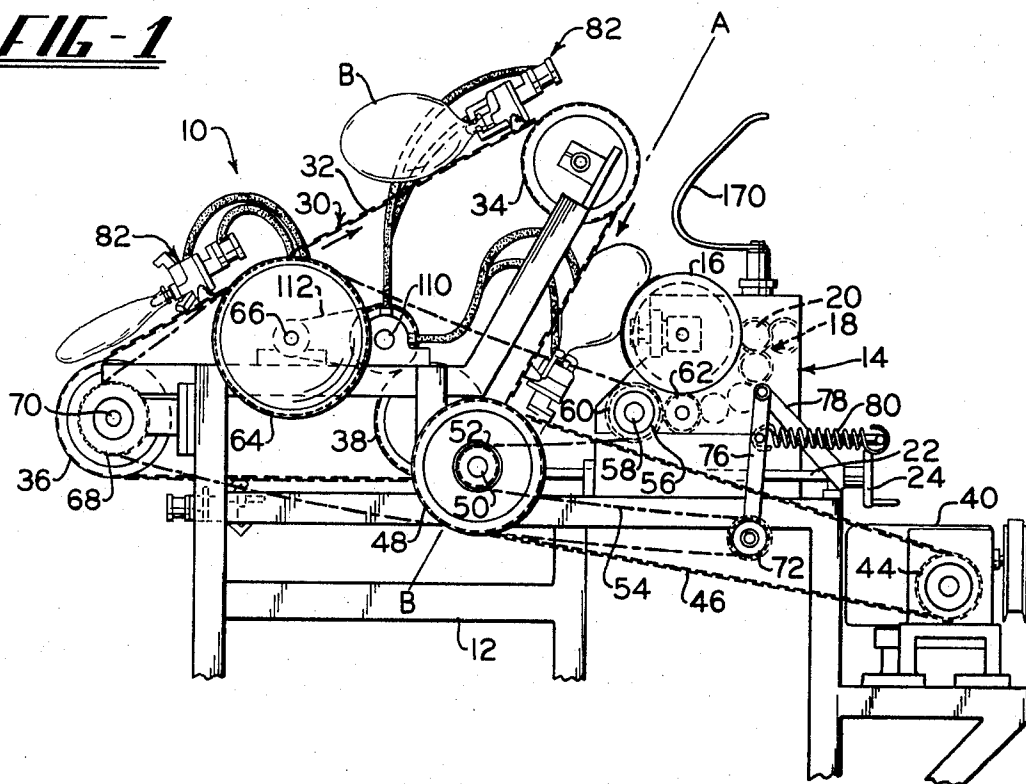
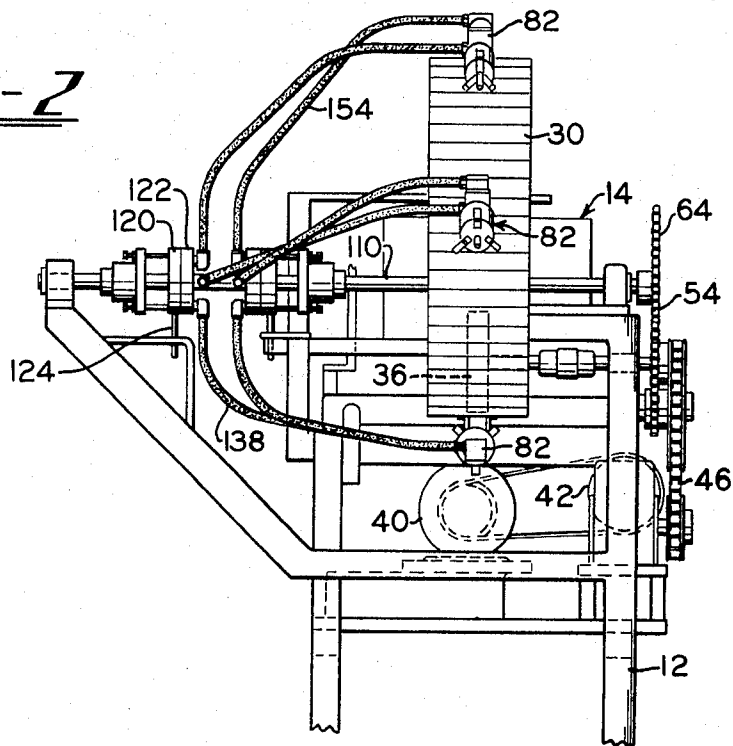


FIG-2



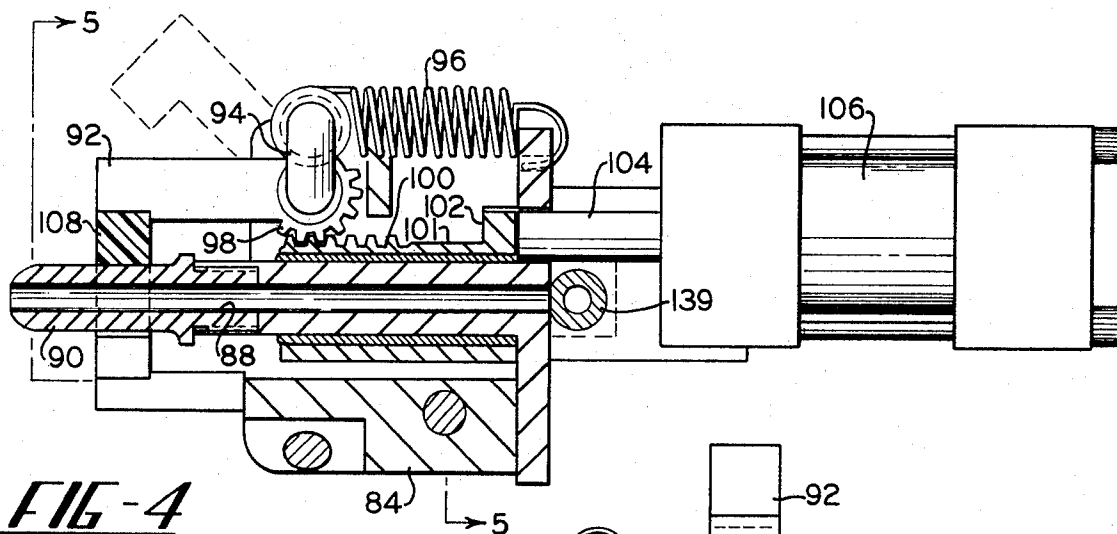
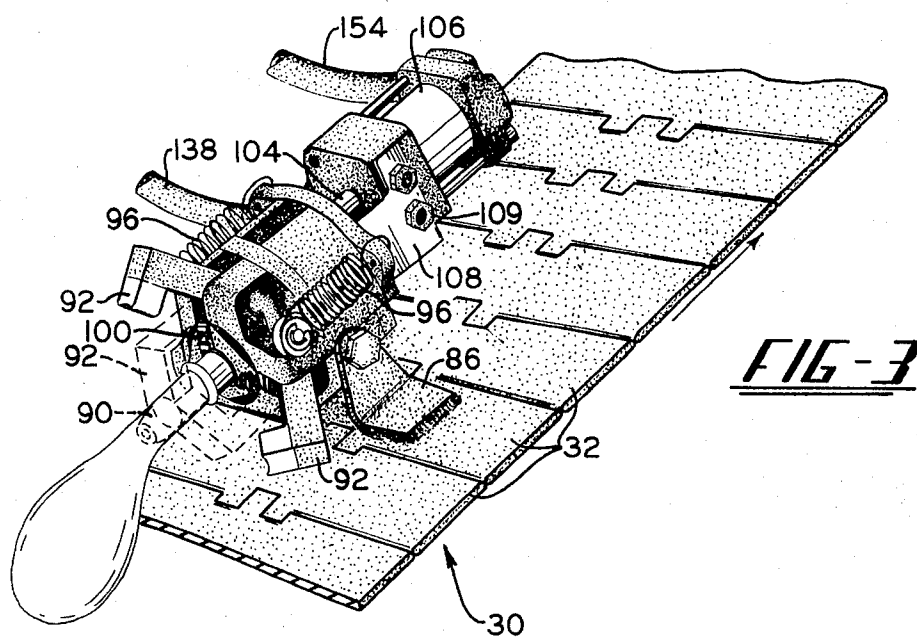
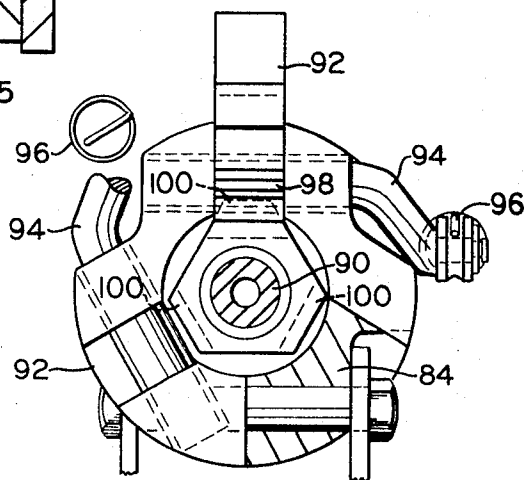


FIG-5



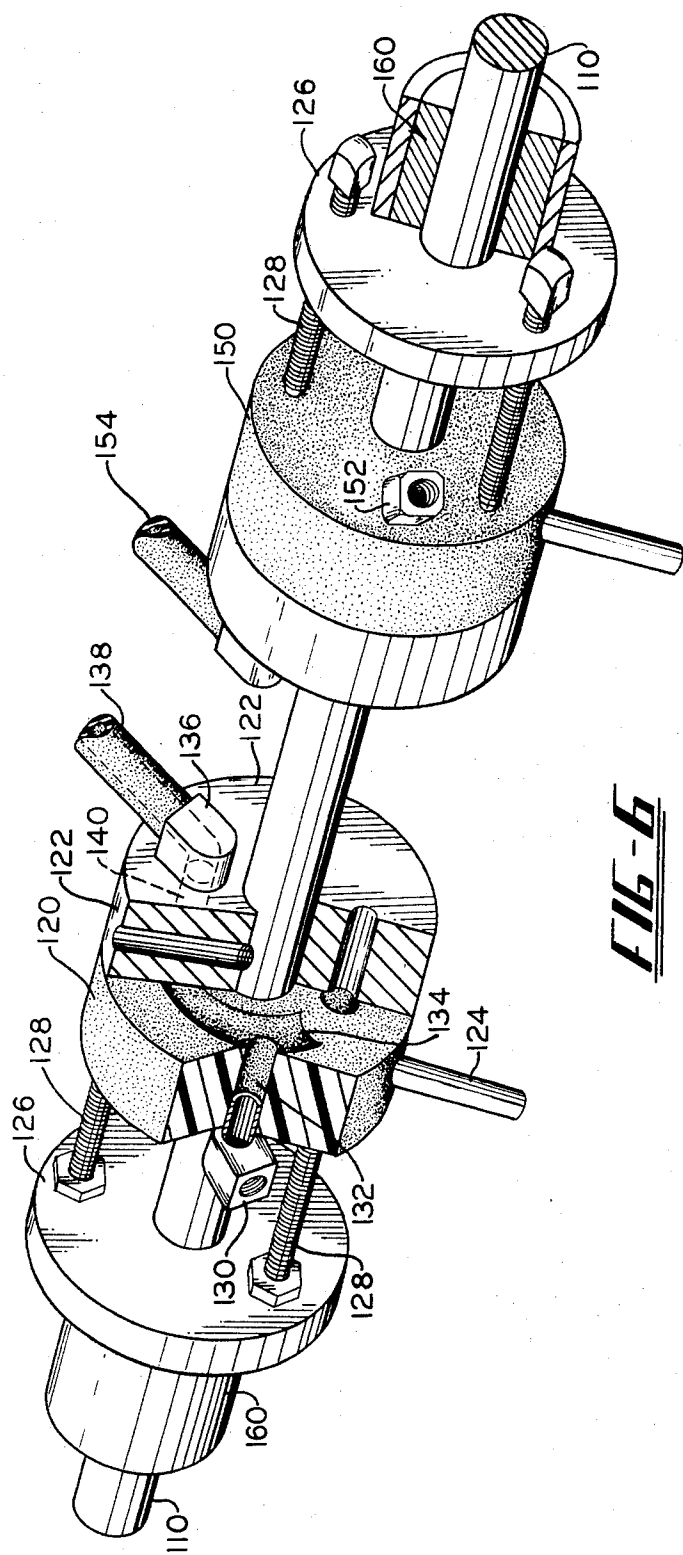


FIG-6

BALLOON PRINTING APPARATUS

BACKGROUND OF INVENTION

This invention relates to balloon printing apparatus, and especially to a substantially automatic apparatus for applying printing impressions to balloons.

In the balloon industry, it frequently is desirable, or required by the customer for the balloons, that the balloons carry a printed impression thereon. At the present time, insofar as we are aware, these balloons are printed by processes that involve a plurality of manual operations such as inflating the balloons, and manually retaining the balloons pressed against a rotating printing cylinder for receiving an impression therefrom. Such manual type of printing operation is necessarily relatively slow and is quite costly to perform.

The general object of the present invention is to avoid some of the manual operations required heretofore in balloon printing operations and to provide an apparatus characterized by its controlled movement of an inflated balloon through a course including a portion tangent to but slightly spaced from a rotary printing cylinder whereby the balloon can be pressed against the printing cylinder for receiving an impression therefrom.

Another object of the invention is to provide an apparatus wherein a worker will attach a balloon to a positioner means on a conveyor and the apparatus then automatically inflates the balloon, moves it through a course for receiving a printing impression, and thereafter discharges the balloon automatically.

Another object of the invention is to provide a plurality of balloon carrying units on an endless conveyor and connect a controlled air pressure supply to such balloon positioning means with rotation of the conveyor through a fixed course; and to exhaust pressure inside the balloons to the atmosphere when discharge of the balloons is desired.

Further objects of the invention are to provide novel means for engaging balloons by the necks thereof to secure them to carrier means on a conveyor; to drive the balloon carrying conveyor and a printing press including a rotary cylinder in synchronized relation to each other; to utilize air pressure for actuating solenoid means on the conveyor and that control the balloon engaging means to secure the balloons in position on the carrier means; to permit adjustment of the position of the printing press in relation to the fixed course of the balloons as moved through the apparatus; to require only the manual attachment of a balloon to a carrier means in a balloon printing apparatus and to have all of the other operations thereon performed automatically; and to provide an improved apparatus for rapidly and efficiently printing desired indicia onto a balloon while it is inflated.

The foregoing and other objects and advantages of the present invention will be made more apparent as the specification proceeds.

Reference now is made to the accompanying drawings, wherein:

FIG. 1 is a side elevation of the balloon printing apparatus embodying the principles of the invention, with a portion of the apparatus being shown diagrammatically;

FIG. 2 is a left side elevation of the apparatus of FIG. 1;

FIG. 3 is an enlarged fragmentary perspective view of a balloon positioning means and a portion of the endless support conveyor therefor;

FIG. 4 is a fragmentary longitudinal section of the balloon positioning means of FIG. 3;

FIG. 5 is a vertical section taken on line 5—5 of FIG. 4; and

FIG. 6 is a fragmentary perspective view, partially broken away and shown in section, of the rotary joint air supply means in the apparatus.

When referring to corresponding member shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

INVENTIVE SUBJECT MATTER

The present invention, as one embodiment thereof, relates to apparatus for printing on balloons and it includes the combination of a printing press including a rotary printing cylinder for carrying an inked printing plate with apparatus for moving inflated balloons through a path tangent to but spaced from the printing cylinder for compressing the balloon against the printing cylinder to receive an impression therefrom. The balloon inflating and movement apparatus includes an endless conveyor moved through a fixed course including a portion tangent to a portion of the periphery of the cylinder, and drive means for the cylinder and the conveyor to drive them at correlated speeds. Also provided are a balloon positioning means on the conveyor, a fixed source of a compressed gas, a rotary seal joint means connected to the gas source, and flexible tube means connecting the rotary seal joint means to the balloon positioning means to connect to the interior of a positioned balloon for connecting the balloon to the gas source or to atmosphere for controlling inflation of the balloon, which action is obtained prior to movement of the inflated balloon past the cylinder to be pressed thereagainst and receive an imprinted impression therefrom. Additionally, the invention relates to jaws pivoted on a frame provided for the balloon positioning means and adapted to clamp a balloon onto a center tube in the balloon positioning means, the jaws having released and operative positions, solenoid means engaging the jaws to move them to one position, and resilient means engaging the jaws for urging them to a second position.

Reference is now made to the structure shown in the drawings and the balloon printing apparatus of the invention is indicated as a whole by the numeral 10. This balloon printer 10 includes a suitable frame 12 on which a conventional rotary printing press means 14 is adjustably positioned. This printing means includes a rotary cylinder 16 which is adapted to be driven and which has any desired printing plate or equivalent member (not shown) secured thereto in a conventional manner for a conventional printing operation as hereinafter described. This rotary printing cylinder 16 has a plurality of ink supply rolls indicated at 18 operatively associated therewith and connecting to a source of ink in a conventional manner. The end roll 20 of these ink supply rolls 18 is in contact with the periphery of the cylinder 16 in the usual manner for supplying ink thereto. Hence, on each rotation of the cylinder 16, a new supply of ink is deposited on the printing plate for transfer to a balloon for printing action as hereinafter described in more detail. Normally this printing press

means 14 is of the offset type and it is adjustable longitudinally of the frame 12 as by slidably mounting the printing press or means 14 on the frame and by providing a control shaft 22 that has a threaded portion thereon that engages a member operatively secured to the printing means or unit 14. The control shaft 22 is journaled on the frame 12 and includes a frame handle 24 whereby rotation of this handle 24 will rotate the control shaft 22 and move the printing press 14 longitudinally inwardly or outwardly of the frame 12 along the axis thereof, depending upon the relative positioning of the printing press required in relation to the other means in the apparatus.

A balloon carrying means or system is provided in association with this printing press 14 and it includes an endless conveyor 30 that preferably is formed from a plurality of transverse bars 32 pivotally connected together in a conventional manner as best shown in FIG. 3. These bars 32 of the conveyor 30 may have any traction or friction drive means secured to the inner surfaces thereof and the conveyor 30 is operatively positioned on and extends around a plurality of drums 34, 36 and 38 journaled on the frame in conventional manners. This conveyor has one operative course, as indicated in the line A-B, which is positioned tangent to a periphery of the cylinder 16, but spaced therefrom.

The conveyor 30 has suitable drive means, such as a motor 40 positioned on the frame 12 and connecting through a speed reducer 42 to an output pulley 44 for supplying drive to the entire printing apparatus 10. A suitable drive belt 46 engages the pulley 44 and connects to and drives a pulley 48 on a shaft 50 journaled on the frame 12. This shaft 50 carries a sprocket 52 thereon that engages a drive chain 54 that extends around the frame 12 for positive drive action of the various components of the apparatus. The drive chain 54 extends to and engages a sprocket 56 on a shaft 58 journaled on the frame. The shaft 58 carries a gear 60 engaging a drive gear 62 operatively engaging the print cylinder 16 for positive drive thereof.

The drive chain 54 extends to and engages a drive sprocket 64 on a shaft 66 journaled on the frame and also engages a sprocket 68 on a shaft 70 on which the drum 36 is mounted for positive drive of the conveyor 30. The drive chain 54 also extends to a conventional spring take-up member, such as a sprocket 72 on a shaft journaled on a control arm 76 which pivotally connects to an arm or member 78 on the frame of the apparatus. A spring 80 draws the arm 76 in a direction away from the chain 54 to maintain an automatic tension upon the drive chain.

The conveyor 30 carries one or more balloon engaging means 82 thereon at longitudinally spaced portions of such conveyor. These balloon engaging or support means 82 are best shown in FIGS. 3, 4 and 5. Such means 82 each include a support member 84 which is attached to one of the transversely extending conveyor bars 32 by members such as brackets or angles 86. Each of the supports 84 has a center bore 88 formed therein or in a member carried thereby connecting to a balloon engaging tube 90 at an exposed end of the support 84. The tube 90 is of a diameter to have balloon necks engaged therewith slightly stretched.

Each balloon support means includes a plurality, usually three, of lock fingers 92 that are pivotally positioned on the support 84 in equally circumferentially spaced relationship to each other. Each of these fingers

92 is positioned by a shaft that has a crank arm 94 provided thereon and which operatively engages a control spring 96 at the free end of the crank arm 94 so that the springs 96, which are attached to an operative portion of the support 84 at their other ends, normally urges the lock arms or fingers 92 to an inoperative or release position as indicated in FIG. 4. These lock fingers 92 are journaled in the supports 84 for pivotal movement, and have gear segments or means 98 formed on or operatively secured to an end portion of each lock finger. The gears 98, in turn, are adapted to be engaged with a rack gear 100 positioned for longitudinal reciprocating movement in the support 84. A rack gear 100 is provided for each finger 92 on a sleeve 101 at equally spaced peripheral portions around the center bore 88. The sleeve 101 has a control flange 102 at one end thereof to control reciprocation of the sleeve 101 and thus of the rack gears 100.

Positive means are provided for engaging the flange 102 and reciprocating the sleeve 101 whereby, as shown in the drawing, an armature rod 104 of a solenoid 106 operatively engages this flange 102 so that on actuation of the solenoid, as hereinafter described, the racks 100 can be moved longitudinally for driving the lock fingers 92 down into the operative positions shown on FIG. 4. Or, the armature rod 104 can be released to permit the springs 96 to pull the lock fingers up to inoperative position. When the lock fingers of a means 82 are in their operative positions, they engage the center tube 90 of each balloon positioning means and retain the neck of a balloon in sealed engagement therewith. Resilient pressure members 108 can be provided on the radially inner portions of each of these lock fingers 92 to facilitate secure engagement between the lock fingers 92 and a balloon being processed by the apparatus. The solenoid 106 can be secured to the support 84 in a conventional manner as by brackets 108, bolts 109 or the like.

For air supply control to the means 82, yet a further drive shaft 110 is provided in the apparatus, and such shaft 110 has power supplied thereto, as by a chain or equivalent member 112, engaging the shaft 110 and extending to and operatively engaging the shaft 66 to be driven thereby. Such drive shaft 110 is positioned within the conveyor 30 and extends transversely of the frame 12. Preferably this drive shaft 110 is substantially at the center of the operative fixed course of the conveyor 30.

It will be seen that the center tube 90 of the balloon engaging means 82 extends in a downstream direction in relation to the normal operative course of movement of the conveyor 30. As previously indicated, when a balloon is positioned on this tube 90, it will trail from the balloon attaching means and, by adjusting the relationship of the printing press 14 with relation to the conveyor 30 and its operative course adjacent the printing press, a synchronous movement of the balloon and periphery of the printing cylinder 16 can be obtained for an effective printing action on the inflated balloon.

The centered drive shaft 110 is adapted to provide inflation gas to the individual balloon attaching means 82 on the conveyor 30, and also control means for actuating the solenoids 106 in the apparatus at proper intervals in the operative course of the balloon positioning conveyor. The solenoids 106 are air actuated.

FIG. 6 best shows that the drive shaft 110 positions a pressure supply disc 120 in operative engagement therewith and such pressure supply disc couples with a rotary disc or plate 122 positioned in abutting relation to one side face of the disc 120 to form a rotary seal connection for transmitting pressure to the individual balloon engaging means of the apparatus. Any suitable member, such as a pin or rod 124 positioned by the frame 12 engages the pressure supply disc 120 and retains it in a stationary position on the drive shaft 110. The pressure distributor disc 122 is suitably secured to the drive shaft 110 to rotate therewith. The pressure distributor disc 122 normally is made from metal whereas the pressure supply disc 120 preferably is made from a low friction plastic, such as nylon or other equivalent material, to aid in obtaining and maintaining a good slip joint connection between adjacent abutted faces of the discs to avoid air pressure loss therebetween. A control disc 126 is affixed to the drive shaft 110 adjacent the pressure supply disc 120 and adjustable length members, such as bolts or cap screws 128 are carried by the disc 120 and bear on the disc 120 to force it into the desired sealed or friction engagement with the distributor disc 122.

An air pressure supply line (not shown) connects to a fitting 130 secured to the disc 120 and connecting to a bore 132 extending axially of this disc 120. The bore 132 connects to an arcuately directed slot or recess 134 provided on the face of the pressure supply disc 120 abutting against the distributor disc 122. In turn, the distributor disc 122 has a plurality of fittings 136 secured to equally spaced peripheral portions of the disc and having individual pressure supply lines 138 connected thereto. These lines or tubes 138 extend individually to the supports 84 provided on each one of the balloon attaching means and operatively coupled to the center bores 88 in the supports 84 as by bores or fittings 139. Hence, when pressure is supplied to the line 138 by the fitting 136 connecting to the slot 134, then pressure can be transmitted to the balloon attaching means for inflating the balloon. Such connection of the fitting 136 to the slot 134 naturally is controlled by the relative positioning of the discs 120 and 122.

The fitting 136 preferably connects to an axially extending bore 140 formed in the pressure distributor disc 122 and suitably radially positioned for engaging the slot 134 for a portion of the rotation of the distributor disc 122. Hence, for such duration of time as the bore 140 engages the slot 134, balloon inflating pressure can be supplied and maintained to a balloon indicated at B as attached to and carried by the tube 90.

When a balloon on the tube 90 is to be released therefrom, then the bore 140 will connect to another bore or flow conducting portion provided in the pressure supply disc 120 to exhaust air in the tube 138, balloon, and associated means to the atmosphere.

It will be seen from FIG. 6 that a second rotary joint air pressure supply means 150 is also carried by the drive shaft 110. Such means have air pressure supplied thereto through a tube (not shown) connecting to a fitting 152 on this stationary portion of the rotary joint means, and then pressure will be transmitted to the individual solenoids by individual pressure supply tubes 154 extending from the rotary joint coupling means and connecting to the individual solenoids for actuation thereof for desired portions of the endless course of movement of the conveyor 30. Obviously, the two

rotary joint coupling means of the invention are adapted to correlate the action of the solenoids 106 with the balloons and inflation and printing action thereon. The second air supply means has a suitable circumferentially extending distributor slot therein, like the slot 134, for supply of air pressure to the solenoids for actuation thereof for the desired part of the orbital movement of the conveyor.

The stop discs 126 in the rotary coupling means can be backed up by suitable thrust means such as a ball bearing and collar unit 160 secured to the shaft 110.

The rotary joint air supply means each have two circumferentially spaced slots therein for connecting the bore 140, or equivalent, to an air supply therefor (and then seal off the supply) or to an air exhaust vent for the balloon or solenoid pressure.

The rotary joint is shown in more detail in our pending application Ser. No. 267,701. It has suitable air passage means therein for the functions stated. For convenience and clarity, the fittings 136 and flexible tubes 138 and 154 are shown for only one balloon attaching means but obviously each such means has its own pressure or control tubes.

Of course, the air pressure supplied to the flexible tubes 138 is adjusted so that it inflates the balloons the desired amount which usually is to substantially their normal size. These tubes 138 and 154 readily move with the conveyor 30 and shaft 110, and are at one side of the conveyor.

The balloons are automatically blown off the tubes 90 when the jaws 92 are released and the tube bore is connected to exhaust to the atmosphere. Preferably the interior of the balloons, by the fitting 139, tubes 138 and pressure control means 122 and/or 120 is connected to the atmosphere for slowly exhausting air therefrom starting when the balloon is resiliently pressed against the printing cylinder for printing action. This avoids creating a bursting pressure on the balloons. The air will still be exhausting when the jaws 92 move to release positions at an area downstream from the printing cylinder. This blows the balloons off for deposit in a container placed under the return course of the conveyor 30.

The solenoids 106 are shown to be pneumatically actuated but may be otherwise powered, as desired.

Guides 170, such as a pair of spaced metal rods, are positioned above the printing roll 16 to aid in feeding the balloons smoothly into engagement with the print cylinder.

An effective balloon printing apparatus has been provided. One worker can engage balloons with the tubes 90 as the conveyor 30 moves through its orbit prior to air supply to such tubes. The apparatus will function automatically for good production with minimum maintenance.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention.

What is claimed is:

1. Apparatus for printing on balloons and including in combination a printing press comprising a rotary printing cylinder for carrying an inked printing plate and apparatus for moving inflated balloons through a path tangent to said printing cylinder and characterized by an endless conveyor movable through a fixed course

including a straight portion adjacent a portion of the periphery of said cylinder and which straight portion would be tangent to said portion of the periphery of said cylinder but is spaced therefrom, drive means for said cylinder and said conveyor to drive them at correlated speeds, a balloon positioning means on said conveyor having a balloon engaging tube extending in the direction of movement of said conveyor, a fixed source of a compressed gas, rotary seal joint means connected to said gas source, and flexible tube means connecting said rotary seal joint means to said balloon engaging tube to connect to the interior of a balloon positioned on said engaging tube to connect the balloon to said gas source or to atmosphere to control the pressure in the balloon and inflate it prior to movement past said cylinder, the balloon being pressed against said cylinder for receiving a printed impression therefrom by said straight portion of said conveyor, said balloon engaging tube positioning any said balloon to extend directly

rearwardly therefrom in relation to the direction of movement of said conveyor, to pull a balloon past said printing cylinder while held thereagainst by said straight portion of the fixed course of said conveyor, the conveyor and the periphery of said printing cylinder being adapted to be moved at substantially equal speeds.

2. Apparatus as in claim 1 where said balloon positioning means include clamp members for securing a said balloon to said balloon positioning means, means to release said clamp members after a said balloon has been moved past said cylinder, and means are operatively connected to said balloons for slowly releasing the pressure in a said balloon about as it is receiving a printing impression and continuing the air release after said clamp members are released so that a said balloon will blow itself off of said balloon positioning means on release of said clamp members.

* * * * *

20

25

30

35

40

45

50

55

60

65