Dec. 21, 1965 D. TERZUOLI 3,224,364

BALLOON MARKING MACHINE

Filed Dec. 16, 1963 3 Sheets-Sheet 1

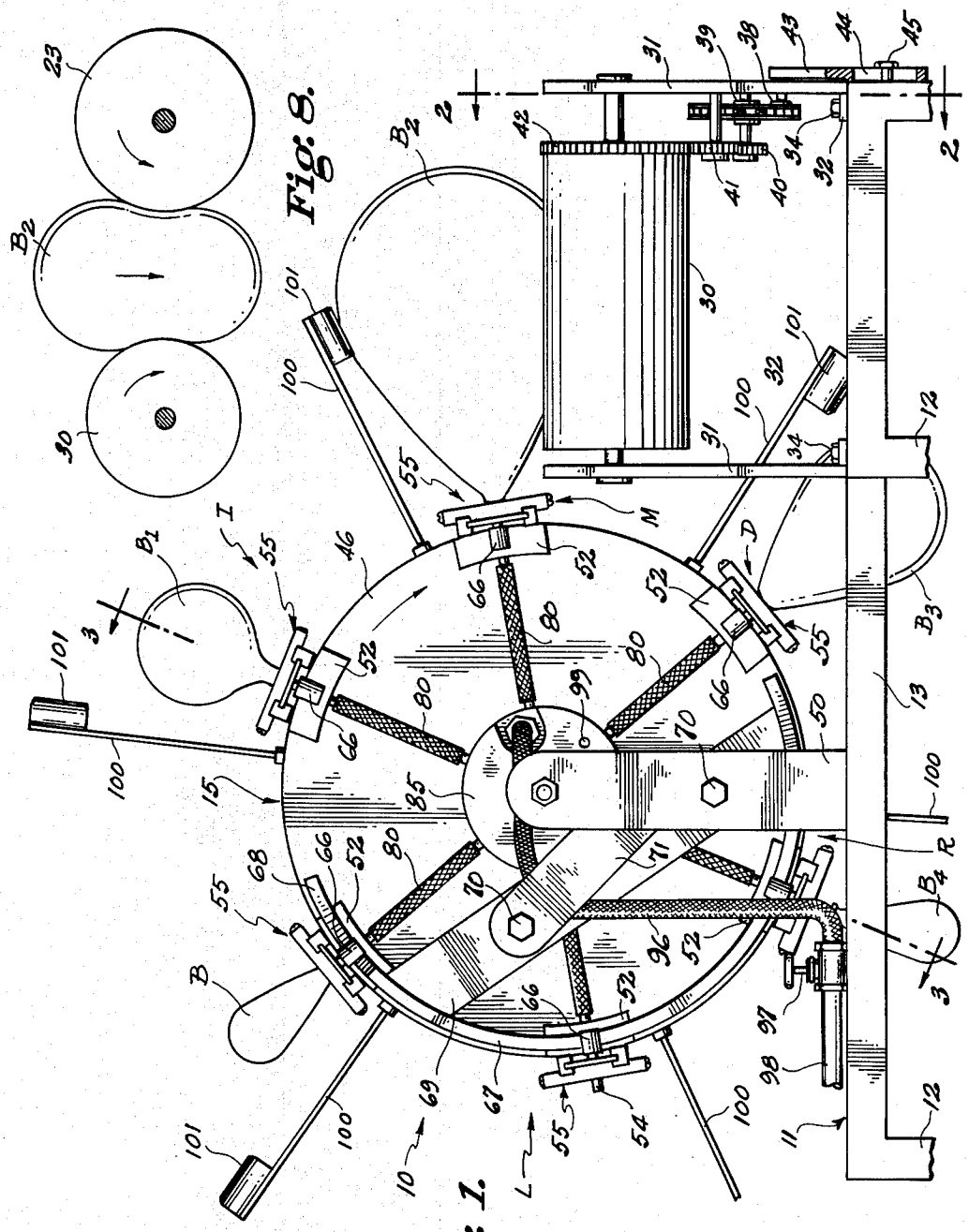

Fig. 8.

Fig. 1.

INVENTOR.
DOMINICK TERZUOLI
BY
ATTORNEY

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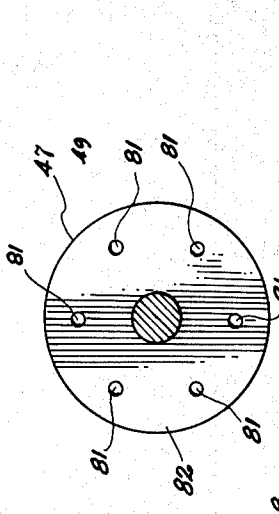

Fig. 7.

Fig. 2

Fig. 6.

INVENTOR.
DOMINICK TERZUOLI

BY Allen Sinsheimer

ATTORNEY

Dec. 21, 1965 D. TERZUOLI 3,224,364

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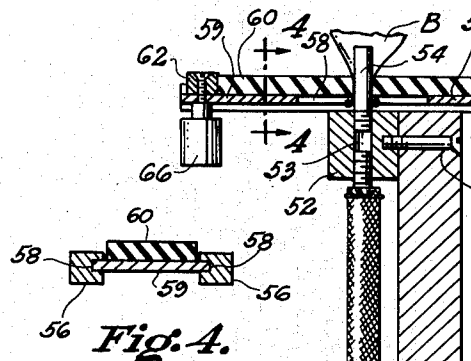

Fig. 4.

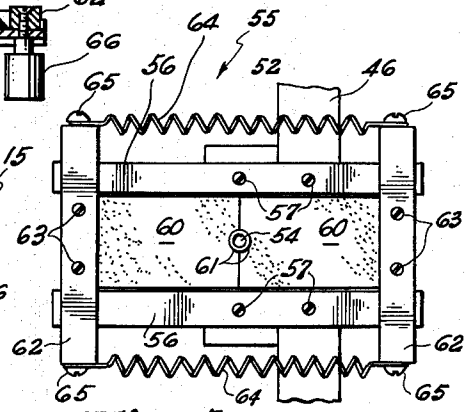

Fig. 5.

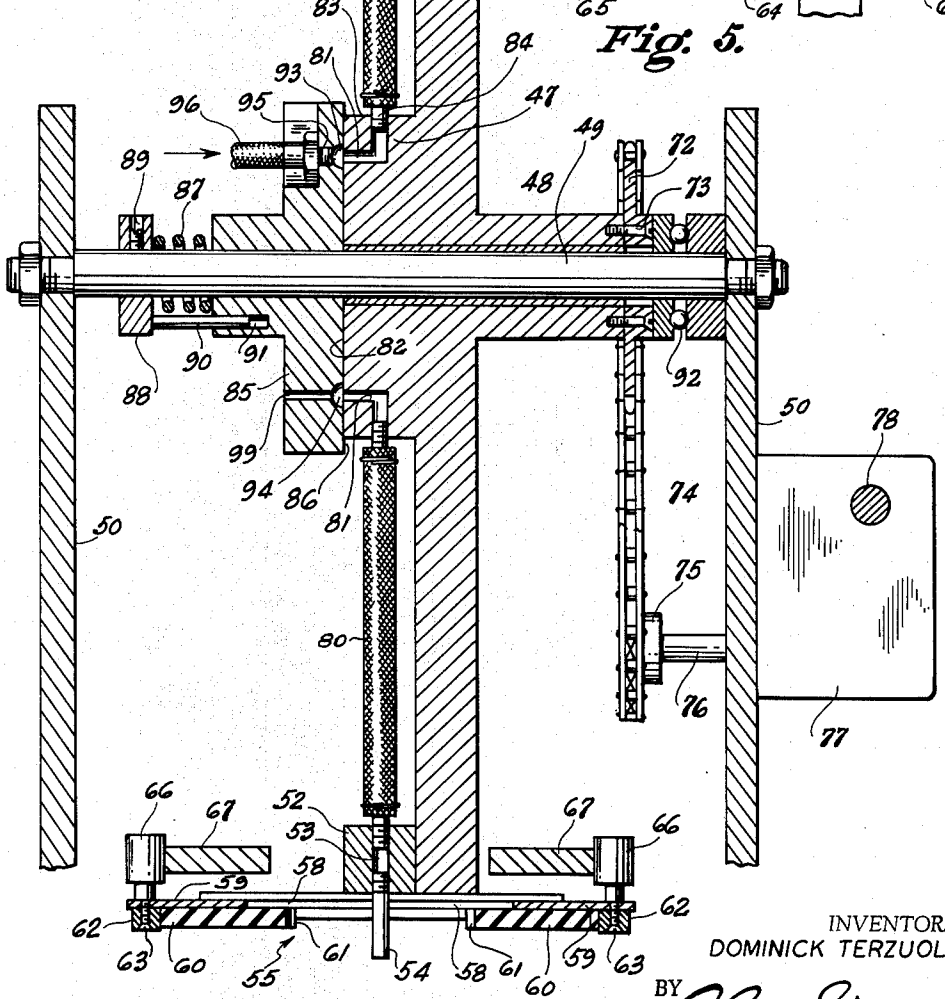

Fig. 3.

INVENTOR.
DOMINICK TERZUOLI
BY
ATTORNEY

United States Patent Office 3,224,364 Patented Dec. 21, 1965

3,224,364

BALLOON MARKING MACHINE

Dominick Terzuoli, Brooklyn, N.Y., assignor to Miner Industries, Inc., New York, N.Y., a corporation of Delaware

Filed Dec. 16, 1963, Ser. No. 330,693
9 Claims. (Cl. 101—37)

This invention relates generally to the marking of toy rubber balloons, and more particularly is directed to a machine for applying inked markings or impressions to toy rubber balloons while the same are in an inflated condition thereby to ensure the clear and sharp delineation of the markings, which may be ornamental or constitute advertisements.

Heretofore, it has been the usual practice to effect the marking or printing of toy rubber balloons by a sequence of manual operations that include engaging each balloon with a nozzle connected to a source of compressed air, actuating a valve or the like so as to achieve the required filling of the balloon with compressed air, removing the inflated balloon from the nozzle and holding the mouth of the balloon closed to prevent the escape of air therefrom, rolling the inflated balloon against the surface of the rotated transfer cylinder of an offset printing unit so that the desired marking is transferred to the surface of the inflated balloon, and then permitting the escape of air from the balloon so that the latter returns to its original deflated condition and can be packaged for shipment or storage. It is apparent that the foregoing sequence of manual operations is time consuming and costly, and further can result in a lack of uniformity in the marking of the balloons, both as to the positioning and clarity of the inked impression.

Accordingly, it is an object of this invention to provide a machine which automatically effects the marking of toy rubber balloons, preferably by offset printing thereon, while the balloons are in an inflated condition.

Another object is to provide a machine of the described character capable of marking the balloon at a rapid rate, and with minimum manual supervision.

In accordance with an aspect of this invention, a balloon marking machine comprises conveyor means having a series of spaced apart nipples movable along a closed path and clamp mechanisms associated with the nipples and being selectively operated so as to open and thereby permit a balloon to be installed on each nipple as the latter passes a loading station and thereafter to close and thereby secure the balloon on the nipple until the latter reaches a discharge or removing station, means for supplying air under pressure to each nipple as the latter passes an inflating station located after the loading station, thereby to inflate the balloon clamped on the nipple, and marking means, preferably in the form of an offset printing unit having a rotated transfer cylinder with which each inflated balloon is contacted to receive an inked impression therefrom during the movement of each nipple carrying a balloon between the inflating station and the discharge or removing station.

In accordance with a further feature of this invention, the balloon marking machine preferably has means for deflating each balloon, that is, for permitting the escape of air therefrom through the associated nipple, during movement of the latter from the marking station to the discharge station so that, upon release of the clamp mechanism associated with the nipple, the freed balloon will not be propelled wildly about by a jet of compressed air issuing therefrom.

The above, and other objects, features and advantages of the invention, will be apparent in the following detailed description of an illustrative embodiment thereof

which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

FIG. 1 is a side elevational view of a balloon marking machine in accordance with this invention;

FIG. 2 is a front view of the balloon marking machine which is shown partly in elevation, and partly in section along the line 2—2 on FIG. 1;

FIG. 3 is an enlarged sectional view taken along the line 3—3 on FIG. 1;

FIG. 4 is a detail sectional view taken along the line 4—4 on FIG. 3;

FIG. 5 is a plan view of one of the clamp mechanisms included in the balloon marking machine, and which is shown in closed condition; and

FIGS. 6 and 7 are elevational views of the contacting faces of parts forming valve means for controlling the inflating and deflating of the balloons in the machine embodying this invention.

Referring to the drawings in detail, and initially to FIGS. 1 and 2 thereof, it will be seen that a balloon marking machine embodying this invention, and there generally identified by the reference numeral **10**, comprises a base or frame **11** which may be formed of angle irons and is supported at a suitable elevation by depending legs **12**. The frame **11** may be generally T-shaped, when viewed from above, and includes a longitudinal portion **13** (FIG. 1) and a lateral portion **14** (FIG. 2) extending across one end of portion **13**.

The machine **10** further generally comprises a conveyor **15** for transporting the successive balloons as the latter are inflated, marked by a marking or printing unit **16** and then deflated prior to discharge from the machine **10**.

As shown particularly on FIG. 2, the marking unit **16** mounted on the lateral portion **14** of the machine frame to one side of conveyor **15** is preferably of the offset printing type and has side frame plates **17** between which there are rotatably mounted a die or impression cylinder **18** having a rubber or other logotype or die **19** on its surface, a metering roller **20** receiving ink from an inking roller **21** dipping into a supply of ink in an open reservoir or fountain **22** and which is adapted to transfer the ink to the printing surface of the logotype or die **19**, and a transfer cylinder **23** which preferably has a rubber surface and is positioned for rolling contact with the printing surface of die **19** so as to receive an inked impression from the latter for transfer to the surface of an inflated balloon moved into contact with the transfer cylinder by the conveyor **15**, as hereinafter described in detail. The transfer cylinder **23** of marking unit **16** is driven by an electric motor **24** through a belt and pulley transmission **25**. A gear **26** rotatable with transfer cylinder **23** meshes with a gear **27** fixed to die cylinder **18**, and the gear **27** meshes with a gear **28** fixed to metering roller **20** and meshing, in turn, with a gear **29** fixed to the inking roller **21**. Thus, the die cylinder **18**, metering roller **20** and inking roller **21** are all driven from the transfer cylinder **23**.

Spaced from, and parallel to the transfer cylinder **23** is a back-up cylinder **30** (FIGS. 1 and 2) which is journalled between side frame plates **31** adjustable laterally on frame portion **14** so as to vary the distance between cylinders **23** and **30** for accommodating balloons of different sizes. The necessary adjustable mounting of frame plates **31** on frame portion **14** may be achieved by providing plates **31** with inwardly directed flanges **32** along their lower edges formed with slots **33** (FIG. 2) receiving bolts **34** which extend through holes in frame portion **14**. Thus, by loosening the bolts **34**, frame plates **31** may be shifted along lateral frame portion **14** for either increasing or decreasing the distance between transfer cylinder **23** and back-up cylinder **30**.

As indicated on FIG. 2, transfer cylinder 23 is rotated in the counter-clockwise direction, while back-up cylinder 30 is rotated in the clockwise direction so that the confronting surfaces of cylinders 23 and 30 move downwardly at the same linear speed. Back-up cylinder 30 is also preferably driven from transfer cylinder 23 by means of a gear 35 (FIG. 2) meshing with gear 26 and rotatably coupled with a sprocket 36, a chain 37 driven by sprocket 36 and running around a tensioning sprocket 38 and a driven sprocket 39, a spur gear 40 rotatable with sprocket 39 and meshing with a reversing gear 41 which, in turn, meshes with a gear 42 rotatably coupled with the back-up cylinder 30. The gear 35 and sprocket 36 are rotatably mounted on one of the side frame plates 17 of printing unit 16, while the sprocket 39 and gear 40 and the gear 41 are rotatably mounted on one of the side frame plates 31. In order to maintain tension in chain 37 when the distance between cylinders 23 and 30 is adjusted, the sprocket 38 is rotatably carried by an arm 43 (FIG. 1) having a slot 44 through which a bolt 45 extends into frame portion 14. Thus, upon a change in the position of back-up cylinder 30 relative to transfer cylinder 23, bolt 45 can be loosened to permit vertical adjustment of arm 43 and corresponding movement of sprocket 38 for maintaining the requisite tension in chain 37.

Referring now to FIGS. 1 and 3 of the drawings, it will be seen that the conveyor 15 of the illustrated balloon marking machine includes a disk 46 having a central hub 47 provided with a bearing bushing 48 by which disk 46 is rotatably mounted on an axle 49 extending laterally between standards 50 which project upwardly from the opposite sides of frame portion 13. Secured to one side of disk 46, as by screws 51 (FIG. 3), are a number, for example, six as shown, of blocks 52 which are equally spaced apart and disposed adjacent the periphery of the disk. Each block 52 has a bore 53 extending radially therethrough and receiving a tube which projects radially outward to define a nipple 54 for insertion into the mouth or nozzle of a toy balloon. Associated with each block 52 and its projecting nipple 54 is a clamp mechanism 55 (FIGS. 3 and 5).

Each clamp mechanism 55 includes a pair of parallel, spaced apart laterally extending guide rails 56 secured to the outer periphery of disk 46 and the outer surface of the related block 52, as by screws 57. The confronting longitudinal surfaces of guide rails 56 are formed with longitudinal grooves 58 slidably receiving the edges of a pair of slides 59 which are movable toward and away from the associated nipple 54 at the opposite sides of the latter. Pads 60 of rubber or other elastically resilient material are secured, as by adhesive, on slides 59 and project inwardly beyond the latter. The inner or confronting edges of pads 60 have aligned, semi-circular recesses 61 which, when pads 60 are brought together as on FIG. 5, closely embrace the related nipple 54. Cross bars 62 are secured, as by screws 63, to the outer end portions of slides 59. The ends of cross bars 62 project beyond guide rails 56, and helical tension springs 64 (FIG. 5) are suitably connected to such projecting ends of the cross bars, as by screws 65, thereby to urge the cross bars 62 toward each other, that is, to be the closed position of the clamp mechanism 55, where the recesses 61 of pads 60 closely embrace the related nipple 54, as shown at the top of FIG. 3 and in FIG. 5.

In order to effect movement of each clamp mechanism 55 to its open position illustrated at the bottom of FIG. 3, each clamp mechanism further has cam follower rollers 66 mounted rotatably at the outer ends of the slides 59 and being engageable with the outer edges of fixed, arcuate cam members 67. The cam members are mounted at the opposite sides of disk 46 and extend along substantially one-half of the circular path of travel of the clamp mechanisms 55. When a clamp mechanism is located along the cam members 67, and thus has its cam follower rollers 66 engaged by the latter, the slides 59 and rubber pads 60 are moved laterally away from each other against the forces of springs 64, thereby to space the inner ends of pads 60 from the related nipple 54. As shown on FIG. 2, the ends 68 of cam members 67 are obliquely cut, thereby to facilitate the travel of the rollers 66 onto and off of the cam members. In the illustrated machine 10, the fixed mountings for the cam members 67 include chordal bars 69 welded, at their ends, to the cam members 67 and being supported on bolts 70 extending from the standards 50 and from arms 71 projecting upwardly and rearwardly from the standards.

Further, as shown on FIG. 1, the half of the circular path of travel of the clamp mechanisms 55 along which the cam members 67 extend is remote from the space between the transfer cylinder 23 of offset printer 10 and the back-up cylinder 30. Thus, as disk 46 is rotated in the clockwise direction, as viewed on FIG. 1, each clamp mechanism 55 is opened or released as it reaches a location at the bottom of disk 46, which location constitutes a discharge or removal station R, and remains in its open condition as it moves along the cam members 67 through a loading station L up to a position at the top of the disk 46 where rollers 66 run off the cam members 67 and thus permit closing of the clamp mechanism 55 by the springs 64 of the latter. During the remainder of the movement of each clamp mechanism 55 along its circular path of travel, the closed clamp mechanism moves successively through a balloon inflating station I, a balloon marking station M and a balloon deflating station D prior to returning to the removal station R where the clamp mechanism is again opened.

As shown particularly on FIG. 3, the hub 47 of disk 46 has a sprocket 72 secured thereon, as by screws 73, and engaged by a chain 74 driven by a sprocket 75 on the output shaft 76 of change speed gearing 77. The gearing 77 has an input shaft 78 which, as shown on FIG. 2, extends into the offset printing unit 16 and carries a pinion 79 meshing with the gear 26 that rotates with transfer cylinder 23. Thus, the conveyor disk 46 is rotatably driven from the transfer cylinder 23, and the various gear and sprocket ratios are selected so that the linear speed of movement at the periphery of disk 46 is substantially equal to the peripheral speed of transfer cylinder 23 and back-up cylinder 30. Further, as shown on FIG. 2, the conveyor disk 46 is axially located along axle 49 so that the vertical plane of rotation of the nipples 54 is substantially centered in the space between cylinders 23 and 30.

In order to effect the controlled inflation and deflation of a balloon while the latter is secured by a clamp mechanism 55 on the nipple 54, the inner end of each tube forming a nipple is connected to a flexible hose 80 extending radially inward toward the hub 47. A bore 81 is formed in hub 47 for each nipple 54 and opens, at its opposite ends, at the radical face 82 of the hub 47, and at the outer annular surface 83 of the hub. Further, the opening of each bore 81 at the annular surface 83 receives a threaded tube length 84 over which the inner end of the related flexible hose 80 is attached.

The supplying of compressed air through each bore 81 to the related nipple 54 for inflating a balloon secured on the latter, and the venting to atmosphere of the bore 81 for deflating the balloon, are controlled by a non-rotatable valve member 85 mounted on axle 49 and having a radial face 86 in contact with the radial face 82 of hub 47. As shown particularly on FIG. 3, valve member 85 is pressed axially toward hub 47, so as to secure tight engagement of the faces 82 and 86, by means of a helical compression spring 87 interposed axially between valve member 85 and a collar 88 which is secured, as by a set screw 89, on axle 49. The collar 88 may further carry an axial pin 90 received slidably in a bore 91 of valve member 85 for holding the latter against rotation on axle 49. The thrust of spring 87 is preferably taken

by a ball bearing **92** mounted on axle **49** between the sprocket **72** which drives the conveyor disk and the adjacent standard **50**.

As shown on FIG. 6, the face **86** of valve member **85** is formed with spaced apart arcuate grooves **93** and **94** at the same distance from the axle **49** as the openings of bores **81** in face **82** of conveyor hub **47**. Thus, as the conveyor disk **46** is rotated, each bore **81** communicates with the groove **93** during movement of the related clamp mechanism through the inflating station I and, after the clamp mechanism has moved through the marking station M, the related bore **81** then communicates with the groove **94** during movement of the clamp mechanism through the deflating station D.

Compressed air is supplied to the groove **93** by way of a tapped, axial bore **95** receiving a threaded nipple at the end of a flexible hose **96** extending from a manually controlled valve **97** which is connected to a compressed air supply line **98**. The groove **94** is vented to atmosphere by way of a bore **99** which extends from that arcuate groove and opens at the face of valve member **85** remote from face **86**. It is to be noted that the angular extent of the arcuate groove **93** which defines the inflating station I is preferably less than the angular spacing between the openings of adjacent bores **81** at the face **82** of hub **47**. Thus, at any time only a single bore **81** can communicate with, and receive compressed air from the groove **93**.

The conveyor **15** of machine **10** is completed by arms **100** extending generally radially from the periphery of conveyor disk **46** at locations in back of the clamp mechanisms **55**. Each arm **100** supports, at its outer end, an arcuate pad or pusher **101** which, as hereinafter described in detail, is engageable with an inflated balloon secured to the related nipple **54** by the clamp mechanism for assisting the movement of the inflated balloon between cylinders **23** and **30** at the marking station R.

The above described balloon marking machine **10** operates as follows:

As each nipple **54** passes the loading station L with its clamp mechanism **55** in the open condition, an operator places the mouth or nozzle of a balloon B over the nipple. As the nipple **54** with a balloon B thereon moves toward the top of its circular path of travel, the cam follower rollers **66** of its clamp mechanism **55** move off the cam members **67**, thereby permitting the springs **64** of the clamp mechanism to move the latter to its closed position where the rubber pads **60** of the clamp mechanism securely hold and seal the mouth or nozzle of the balloon on the nipple **54**. Continued travel of the nipple with a balloon secured thereon brings the nipple to the inflating station I where the associated bore **81** of the conveyor hub **47** registers with the groove **93** of valve member **85** which is in communication with the source of compressed air. Thus, upon registration of the bore **81** with the arcuate groove **93**, the balloon secured on the associated nipple **54** receives compressed air and is inflated thereby, as at B_1. Inflation of the balloon continues so long as the bore **81** registers with the arcuate slot **93**, so that the extent of the inflation of the balloon is determined by the speed of movement of the conveyor disk **46** and by the adjustment of the valve **97** interposed in the compressed air supply line **98**. As previously mentioned, the angular extent of the groove **93** is preferably less than the angular spacing between the openings of the adjacent bores **81** at the face **82**. More specifically, in the illustrated machine having six equally spaced nipples **54** arranged along the periphery of the conveyor disk **46**, and thus having an angular spacing of 60° between the adjacent bores **81**, the angular extent of the groove **93** is preferably slightly less than 60°, thereby ensuring that, at any time, only one bore **81** registers with groove **93** to supply compressed air from the groove **93** to only one balloon. The foregoing feature has been found to be desirable in avoiding the unequal inflation of balloons that results when two or more balloons having different wall thicknesses or elasticities are simultaneously supplied with compressed air from a single source, in which case the balloon with the weakest or most easily stretched wall is inflated to the greatest extent.

Following inflation of the balloon to the desired extent, as at B_2, the nipple **54** to which such balloon is secured arrives at the marking station M, while the associated bore **81** moves out of registry with the groove **93** and is confronted or sealed by the portion of the face **86** of valve member **85** between groove **93** and the venting groove **94**, thereby to maintain the balloon in its inflated condition during the marking thereof. At the marking station M, the inflated balloon B_2 moves downwardly between transfer cylinder **23** and back-up cylinder **30**. As indicated schematically on FIG. 8, the position of back-up cylinder **30** is adjusted relative to the transfer cylinder **23** so that the space therebetween is substantially smaller than the cross-sectional diameter of the inflated balloon B_2. Thus, the balloon B_2 is deformed from its normal inflated shape during passage between cylinders **23** and **30** and thereby contacts transfer cylinder **23** over a substantial axial and peripheral extent of its surface. Further, the deformation of the inflated balloon during its contact with cylinder **23** provides the desired rolling action of the balloon surface against the surface of the transfer cylinder. Since the conveyor disk **46** is driven from the printing unit **16**, as previously described, the movement of the conveyor disk is easily synchronized with the operation of the printing unit so as to ensure that each inflated balloon contacts the portion of the surface of transfer cylinder **23** bearing the inked impression received from the die or logotype **19** on die cylinder **18**. Since the inflated balloon B_2 yieldably resists its deformation for passage between cylinders **23** and **30**, the pusher or pad **101** on the arm **100** positioned after the nipple **54** to which the inflated balloon is secured gently engages the balloon and urges the latter downwardly between the cylinders **23** and **30**.

Upon completion of the marking of the balloon, the bore **81** associated with the nipple **54**, to which the marked balloon is secured comes into registration with the groove **94** of valve member **85** which is vented to the atmosphere through the bore **99**. Thus, the air escapes from the marked balloon so as to deflate the latter, as at B_3. When the balloon has been deflated, the cam follower rollers **66** of the clamp mechanism holding the balloon come into engagement with cam members **67**, thereby to open the clamp mechanism **55** for freeing the deflated marked balloon at the removal station R located at the bottom of the circular path of travel of the conveyor **15**. When the deflated balloon is freed, as at B_4, the same falls by gravity from the nipple **54** and may be collected in a suitable receptacle (not shown) located below frame portion **13**. Since the marked balloon is deflated before its release by the clamp mechanism **55**, there is no possibility that compressed air escaping from the balloon will produce a jet causing the freed balloon to move wildly about.

After the marked balloon has been freed from the nipple **54** at the removal station R, the bare nipple and its open clamp mechanism **55** then proceed to the loading station L for again receiving a balloon to be marked.

From the above description of the structure and operation of the machine **10**, it is apparent that the present invention provides a machine capable of reliably and uniformly marking or printing toy rubber balloons, and that human supervision or labor is required only for the loading of the balloons to be marked onto the nipples **54** of the machine which successively pass the loading station L.

Although an illustrative embodiment of this invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment, and that various changes and modifications may be effected therein by one skilled in the art without departing from

the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. A machine for marking toy balloons comprising

conveyor means including a plurality of nipples moving in spaced apart relation along a closed path and each adapted to extend into a balloon to be marked, and a clamp mechanism associated with each nipple for securing a balloon on the latter;

control means for said clamp mechanism operative to open the latter during movement of the clamp mechanism and associated nipple along a first portion of said path for permitting the placement of a balloon on the nipple and to cause closing of the clamp mechanism during movement along the remaining portion of said path, thereby to secure the balloon on the nipple;

means for supplying compressed air to each nipple during movement of the latter along an initial part of said remaining portion of the path, thereby to inflate the balloon secured on the nipple;

marking means located adjacent said remaining portion of the path at a location following said initial part and being engageable with each inflated balloon to mark the latter; said

means for venting each nipple to atmosphere after passing said marking means and prior to return to said first portion of the conveyor path so that each marked balloon is deflated before being freed by the clamp mechanism for removal from the related nipple.

2. A machine as in claim 1; wherein each clamp mechanism includes jaw members movable toward and away from the related nipple at the opposite sides of the latter so as to grip and free, respectively, a balloon on said nipple, spring means urging said jaw members toward the related nipple, and cam followers extending from said jaw members; and

wherein said control means includes fixed cam members extending along said first portion of the conveyor path at the opposite sides of the latter and engageable by said cam followers of each clamp mechanism for moving said jaw members of the latter away from said related nipple.

3. A machine as in claim 2; wherein said conveyor means includes a circular rotatable support having said nipples and clamp mechanisms mounted at the periphery thereof and a central hub having a radial face with a bore in said hub for each nipple opening at said face and connected with the related nipple; and

wherein said means for supplying compressed air to each nipple includes a stationary valve member adjacent said hub, said valve member having a radial face pressed against said face of the hub and formed with an arcuate groove for registration with the successive bores of said hub during rotation of the circular support, and means for supplying compressed air to said groove.

4. A machine as in claim 3; wherein the angular extent of said arcuate groove is smaller than the angular spacing between said nipples on the circular support so that only a single nipple receives compressed air from said groove at any time.

5. A machine as in claim 3; wherein said means for venting each nipple to atmosphere includes a second arcuate groove in said face of the valve member for registration with the successive bores of said hub, and means communicating said second groove with the atmosphere.

6. A machine as in claim 1; wherein said marking means includes a cylinder rotated at a peripheral speed equal to the speed at which the inflated balloon secured on each of said nipples is conveyed past said location of the marking means and engaged by the inflated balloon for transferring a marking to the surface of the latter.

7. A machine as in claim 6; further comprising a back-up cylinder arranged parallel to the first mentioned cylinder so that each inflated balloon passes between said first and back-up cylinders, said back-up cylinder being spaced from said first cylinder by a distance smaller than the transverse dimension of the inflated balloon so that the latter is deformed into contact with a substantial portion of the surface of said first cylinder during passage between said cylinders, and means rotating said back-up cylinder at the same peripheral speed as said first cylinder and in the opposite direction.

8. A machine as in claim 7; further comprising a die cylinder having a die on the surface thereof and being rotatably mounted adjacent said first cylinder for rolling contact of said die with the surface of said first cylinder, and means for inking said die so that inked impressions are applied by the latter to said first cylinder for offset printing on the inflated balloons.

9. A machine for marking toy balloons comprising

rotatable conveyor means including a plurality of nipples moving in spaced apart relation along a closed circular path lying in a vertical plane, and a clamp mechanism associated with each nipple and being urged to a closed position to secure a balloon on the related nipple;

control means for said clamp mechanism operative to open the latter during movement of the clamp mechanism and associated nipple along approximately one-half of said path extending from the bottom to the top of the latter, and to permit closing of the clamp mechanism during movement along the other half of said path;

means for supplying compressed air to each nipple during movement of the latter along an initial part of said other half of the path, thereby to inflate a balloon secured on the nipple;

marking means located adjacent said other half of the path at a location following said initial part and being engageable with each inflated balloon to mark the latter; and

means for venting each nipple to atmosphere after passing said marking means and prior to return to the bottom of the conveyor path so that each marked balloon is deflated before being freed by the clamp mechanism and thereby permitted to fall from the related nipple.

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ROBERT E. PULFREY, *Primary Examiner.*

WILLIAM B. PENN, *Examiner.*