

Jan. 29, 1946.

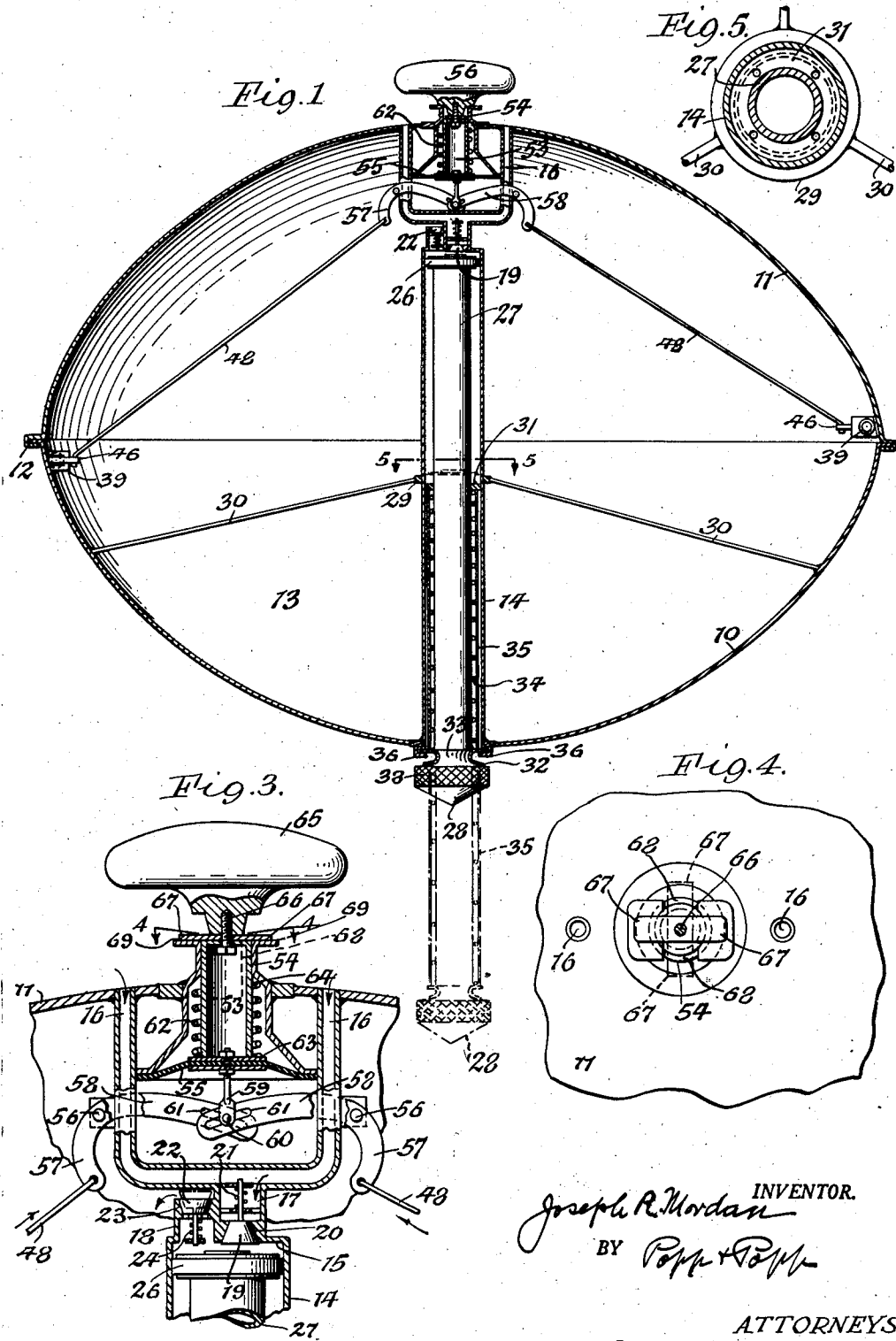
J. R. MORDAN

2,393,796

AIR JET PROPELLED TOP

Filed July 4, 1945

2 Sheets-Sheet 1

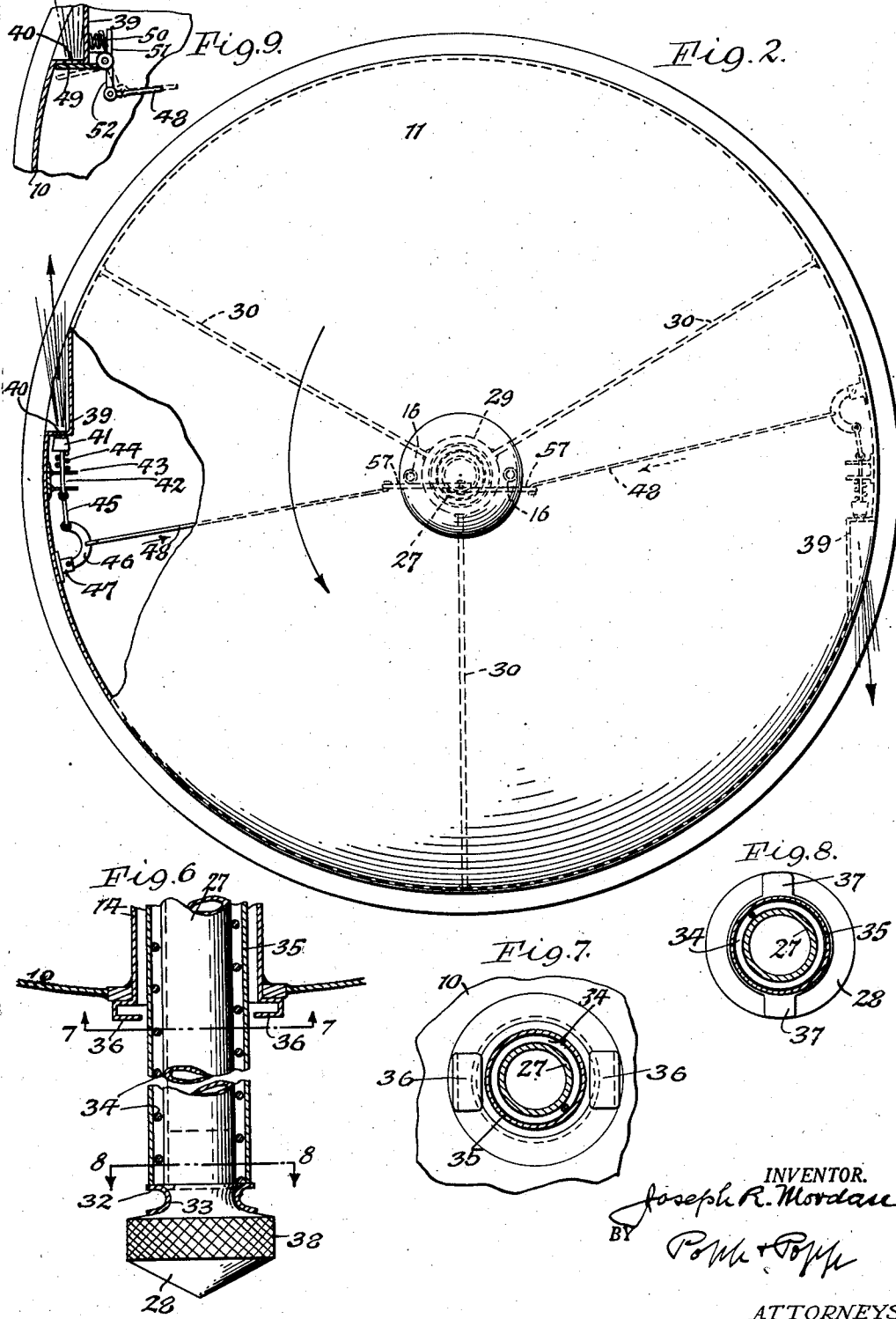


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AIR JET PROPELLED TOP

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Application July 4, 1945, Serial No. 603,235

20 Claims. (Cl. 46-67)

This invention relates to a spinning top which is adapted to be propelled or rotated by means of air which is compressed within a chamber formed in the body of the top and discharged tangentially therefrom so that the reaction of the escaping air will cause the top to turn.

It is the object of this invention to provide a top of this character which is provided with manually operated means for taking air from the external atmosphere and delivering the same in a compressed condition into a chamber in the top and valve means whereby the admission of air into this chamber and the discharge therefrom may be manually controlled, these air compressing and controlling means being incorporated in the top so that the same forms a self-containing unit for performing these functions.

A further object of this invention is to so organize the air compressing means so that the pumping means may be locked in an inoperative condition and the air discharge means may also be locked in an open position for spinning the top whenever this is desired.

A further object of this invention is to provide means for accomplishing these purposes which are compact, easily operable, economical in construction and not liable to get out of order.

In the accompanying drawings:

Fig. 1 is a vertical section of an air propelled top embodying a preferred form of this invention and showing the parts in the position which they occupy when the top has been charged with compressed air and ready to be spun.

Fig. 2 is a top plan view of the same with a part broken away to show one of the air jet discharge nozzles and the mechanism for controlling the same.

Fig. 3 is a fragmentary vertical section of the upper part of the top showing part of the air pumping mechanism and part of the mechanism which controls the discharge of air from the compressed air chamber, this last mentioned mechanism being shown in a position in which the air discharge valves of the air jet nozzles are in an open position.

Fig. 4 is a horizontal section taken on line 4-4, Fig. 3.

Fig. 5 is a horizontal section, on an enlarged scale, taken on line 5-5, Fig. 1.

Fig. 6 is a fragmentary vertical section, on an enlarged scale, of the lower part of the top showing the peg, on which the top spins, and those parts of the pump with which it is connected in a position in which the pump is operating.

Figs. 7 and 8 are horizontal sections taken on the correspondingly numbered lines in Fig. 6.

Fig. 9 is a fragmentary sectional view showing a modified form of an air outlet valve which controls the discharge of compressed air from the storage chamber to one of the air jet delivery nozzles.

In the following description similar characters of reference indicate like parts in the several figures of the drawings.

In general this top comprises a hollow body the interior of which forms a chamber for the storage of compressed air whereby the top is rotated, a pumping device whereby air is taken from the external atmosphere and delivered into this discharge chamber in a compressed condition, air discharge valve means which control the delivery of air from the storage chamber to the atmosphere, and manually operated means whereby the operation of the air discharge means may be controlled as desired.

The body of the top is generally of globular form and composed of lower and upper semi-globular sections 10, 11 which are made of sheet metal and connected at their peripheral edges by means of an interlocking seam or joint 12 so as to form between these two sections a chamber 13 in which compressed air is stored for use in driving the top.

The means for delivering compressed air into the storage chamber in the top, as shown in the drawings, are preferably constructed as follows:

The numeral 14 represents an upright pump cylinder or tube which is arranged centrally within the hollow body of the top and connected thereto at its lower end therewith while its upper end is closed by a head 15 and spaced from the upper part or wall of the storage chamber.

The pump cylinder 14 may be maintained in its upright position within the hollow body of the top by any suitable means but preferably by a retaining ring 29 secured to the exterior thereof about midway of its height, and a plurality of braces or rods 30 arranged in an annular row within this hollow body and around the pump cylinder and each connected respectively at its inner and outer ends by brazing or otherwise with this retaining collar and the lower section of the hollow body, as shown in Figs. 1 and 2.

Valve means are provided whereby air may be conducted from the external atmosphere into the upper end of this pump cylinder and discharged therefrom into the storage chamber of the body, which means comprise an air inlet conduit having two upper branches 16, 16 which open through

the top of the storage chamber on opposite sides of the center thereof, and a lower branch 17 which is connected with the upper head 15 of the pump cylinder and communicates with the upper end of the pump cylinder, an air outlet tube 18 connected with the upper head of the pump cylinder and leading from the upper end of the same to the interior of the storage chamber, an inwardly opening check valve 19 which controls an inlet port 20 leading from the lower inlet branch 17 to the upper end of the pump cylinder and is yieldingly held in its closed position by means of a spring 21, and an air outlet check valve 22 which controls an outlet port 23 in the outlet tube 18 and is yieldingly held in its closed position by means of a spring 24.

Within the upper part of the pump cylinder is arranged a vertically reciprocable piston 26 which upon being moved downwardly will cause air to be drawn inwardly into the pump cylinder through the air inlet conduit 16, 17 and through the inlet port 20 which at this time is uncovered by the inlet valve 19 due to the suction of the piston acting on the same, during which time the outlet port 23 is closed by the suction of the piston together with the action of its closing spring 24. During the upward stroke of the pump piston the air inlet valve 19 is closed and the outlet check valve 22 is opened by the pressure of the air in the pump cylinder, thereby causing the air to be transferred in a compressed condition from the pump cylinder to the storage chamber. During the operation of charging the storage chamber with compressed air the piston 26 is reciprocated repeatedly, a relatively small quantity of air being drawn into the pump and discharged into the storage chamber during each cycle of pumping operations and the number of reciprocations of the pump being continued until the desired amount of compressed air has accumulated in the storage chamber.

The inward or upward movement of the pump piston is effected by means which are operated manually and the downward movement of the same is effected by spring means which operate automatically.

For the purpose of moving the piston upwardly the same is connected with the upper end of a piston rod 27 which is arranged axially within the pump cylinder and has its lower end connected with a peg 28 which is arranged underneath the body of the top and having a downwardly tapering end upon which the top is adapted to spin while the same is in use.

This pump rod and the peg at its lower end are maintained in axial alinement with the pump cylinder by means of an upper stop collar or ring 31 which is arranged in the pump cylinder about midway of its length and secured at its outer edge to the bore of the same, while the hole in the center thereof receives the pump rod 27 and forms a guide therefor.

The spring means which operate to automatically move the piston and the parts connected therewith downwardly, when the same are free, preferably comprise a lower stop collar or shoulder 32 which engages with an annular groove 33 on the pump rod 27 between the lower end thereof and the upper side of the peg 28, and a helical ejecting spring 34 surrounding the pump rod and bearing at its lower end against the lower stop collar 32 while its upper end bears against the upper collar 31 which is secured to the pump cylinder. Means are provided for maintaining

the spring 34 close to the periphery of the pump rod and away from the bore of the pump cylinder in order to permit these parts to work freely relative to each other and also limit the upward movement of the piston and associated parts relative to the pump cylinder. This is preferably accomplished by means of a housing and stop tube 35 which surrounds the ejecting spring 34 within the lower part of the pump cylinder and bears at its lower end against the stop collar 32, as shown in Figs. 1 and 6, while its upper end engages the upper stop collar or shoulder 31.

For the purpose of filling the storage chamber with compressed air the operator takes hold of opposite peripheral parts of the body while the pump piston and spinning peg are projected by means of the spring 34, then engages this peg with the floor or any available surface and then pushes the body toward the peg, whereby the air in the pump cylinder is forced into the storage chamber. Upon thereafter releasing the pressure against the body the spring again moves the body away from the peg and causes another charge of external air to be drawn into the pump cylinder. The pump piston may thus be reciprocated for delivering successive charges of small quantities of air into the storage chamber until the desired air pressure has been established in the storage chamber.

Detent or locking means are provided whereby the piston, piston rod and peg may be released and permit the spring 34 to move the same downwardly relative to the body and cylinder preparatory to operating the air pump for filling the storage chamber with compressed air and which also permit of locking these members in a position in which the peg is close to the underside of the body of the top and thus permits the top to be spun more effectively on a supporting surface. Although various detent or locking means may be employed for this purpose, those shown in Figs. 1, 6, 7 and 8 are preferred and constructed as follows:

The numeral 36 represents two locking or retaining hooks arranged on diametrically opposite sides of the piston rod and preferably formed integrally with the lower end of the pump cylinder. These hooks have their jaws or beaks facing inwardly toward each other and have their opposite sides separated from each other by clearance spaces through which a pair of locking lugs 37 on opposite sides of the stop collar 32 are, at times, adapted to move vertically.

When it is desired to lock the piston, piston rod and peg in their uppermost or retracted position the locking lugs 37 are turned so that they are arranged in line with the spaces between opposite sides of the locking hooks 36 thereby permitting these lugs to be moved upwardly into a position in which the same are in the same plane as the mouths of the hooks 36, in which position these lugs and the parts connected therewith are held from moving downwardly relative to the body of the top, as shown by full lines in Fig. 1. When the parts are in this position the spinning peg is locked in its retracted position and permits the top to be spun on this peg while engaging a supporting surface. When it is desired to again operate the air pump for refilling the storage chamber with compressed air the locking lugs are turned about the axis of the piston rod and piston a sufficient extent to disengage the same from the locking hooks 36, thereby permitting the spinning peg to be again projected, as shown by full lines in Fig. 6 and

by dotted lines in Fig. 1, and the pump to be operated as before described.

To facilitate turning of the locking lugs 37 into and out of their operative position the peg 28 upon which these lugs are mounted is provided with a knurled periphery, as shown at 38 in Figs. 1 and 6, and thus enables the operator to obtain a firm finger grip on the peg for turning the same and the locking lugs 37.

Rotation of the top is effected by permitting compressed air to escape tangentially in the form of jets from the periphery of the storage chamber so that the reaction of this air will cause the top to spin about the axis of its peg and body on the surface which supports the peg. Although the number of jets of air for causing the top to rotate in this manner may be varied it is preferable for the purpose of balancing the top and also for economy in construction to employ two air delivery nozzles 39 on diametrically opposite sides of the periphery of the storage chamber and so arranging the ports 40 of these nozzles that they open in the same direction circumferentially of the top but in opposite directions when viewed relative to a plane extending lengthwise and diametrically through the top as a whole.

The escape of air through each of these air discharge nozzles may be controlled by valve means of various forms, that shown in Fig. 2, as an example suitable for this purpose, comprising a valve closure 41 arranged within the compressed air chamber and movable toward and from a valve seat formed on the nozzle around the inner side of its discharge port 40 and guided by means of a valve stem 42 secured to this closure and sliding in a guide 43 on the inner side of the hollow top body. This valve closure member is yieldingly held in its closed position by means of spring 44 surrounding this stem and bearing against the closure member 41 and one of the guides 43. Opening of this closure member is effected by means of a pair of toggle links 45, 46 which have their adjacent ends pivotally connected with each other and their opposite extremities pivotally connected with the valve stem 42 and a bracket 47 on the top body, as shown in Fig. 2. When the valve member 41 is in its closed position the two toggle links 45, 46 are in a substantially straightened or unfolded position relative to each other, as shown in Fig. 2, but upon folding these links by moving the rear toggle link 46 inwardly by means of a shifting rod 48 the front toggle link 45 will pull on the stem 42 and withdraw the valve member 41 from the port so as to permit air to escape in the form of a jet from the respective nozzle in a tangential direction and thus propel the top. Upon releasing the inward pull on the rear toggle link 46 the spring 44 closes the valve member 41, in which position the storage chamber can be filled with compressed air by the pumping apparatus for continuing the spinning operation of the top.

As an alternative form of valve means for controlling the escape of compressed air from the storage chamber the port 40 of each jet nozzle 39 may be controlled by a flap valve 49 which is arranged within the air storage chamber and pivoted on the adjacent part of the respective air nozzle so that it can swing toward and from the port 40 for closing and opening the same; a spring 50 interposed between an arm 51 on this flap valve and the respective nozzle and tending constantly to close this valve; and a rock arm

52 connected with this flap valve and adapted to be actuated by a shifting rod 48 for opening the flap valve and permitting a jet of air to escape tangentially through the respective nozzle.

Manually operated control means are provided whereby the air control valves of the nozzles may be held either in an open or closed position, which control means are preferably mounted centrally on the upper part of the body and constructed as follows:

Referring to Figs. 1, 2 and 3, the numeral 53 represents a vertically movable plunger which is guided in a tubular guideway 54 secured to the inner side of the central upper part of the hollow body. In order to prevent the escape of air from the interior of the air storage chamber to the exterior of the top of the body through the joint between the plunger and its guide tube and still permit the plunger to move freely in the guideway the inner end of the plunger is connected with the central part of a flexible diaphragm 55 which has its margin connected with the inner end of this guideway, as best shown in Fig. 3.

The inner end of the plunger is also operatively connected with the several shifting rods 48 so that a downward or inward movement of the plunger will cause these rods to move outwardly and permit the springs 44 to close the air jet controlling valves 41, while an outward movement of this plunger will cause these shifting rods to move inwardly and thereby open the air jet controlling valves.

The means for thus transmitting motion from this plunger 53 to these shifting rods 48 which are shown in Figs. 1, 2 and 3, comprise two substantially L-shaped levers which are arranged below the tubular guideway and are pivoted by means of pins 56 on brackets forming part of the air inlet conduit 16 and each of these levers having an outer arm 57 which is connected with the inner end of one of the shifting rods 48 and an inner arm 58 which is connected with the inner end of the plunger 53 by means of a yoke 59 connected with the inner end of this plunger and provided with a coupling pin 60 which slidably engages with slots 61 in the inner arms of these levers. Upon reciprocating this plunger the same causes the L-shaped levers to rock and open and close the air jet valves 41 during which time the pin of the yoke 59 slides in the slots of these levers.

Turning of these levers in the direction for causing the shifting rods to move outwardly and permit the jet valves 41 to close is effected automatically by spring means which preferably comprise a helical spring 62 arranged around the inner part of the plunger and bearing at its inner end against a shoulder 63 on this plunger while its outer end bears against an inwardly facing shoulder 64 on the guide tube 54. Outward movement of the plunger for opening the air jet control valves 41 is effected by means of a button or handle 65 which is connected with the outer end of this plunger so that upon grasping this handle the plunger may be manually moved outwardly and the air valves 41 opened and the spring 62 compressed.

Locking means are provided whereby the plunger may be held in its outward position on the body of the top for the purpose of permitting the latter to spin as long as desired or until all of the compressed air in the storage chamber has become exhausted.

The preferred means for accomplishing this

purpose which are shown in the drawings comprise a screw 66 which connects the inner end of the handle 65 with the outer end of the plunger so that this handle may be rotated manually about the axis of this plunger, and a locking plate operatively connected with this handle so as to turn therewith and provided at its opposite ends with locking arms 67 which are adapted to either move lengthwise in releasing slots 68 on opposite sides of the outer end of the guide tube 54 or with two laterally extending stop shoulders 69 arranged on the outer end of the guide tube at right angles to the releasing slots.

Upon turning the handle 65 together with the locking arms 67 so that the latter are in line with the releasing slots 68 then the plunger is free to be moved inwardly by the spring 62 during which time these locking arms move inwardly in these slots, as shown by dotted lines in Fig. 4, and thus move the shifting levers 57, 58 in the direction for permitting the air jet valve to close, as shown in Fig. 1. Upon moving the handle 65 into its outermost position and then turning the same so that the locking arms 67 engage with the outwardly facing stop shoulders 69, as shown by full lines in Figs. 3 and 4, then the plunger will be held against inward movement and maintain the levers 57, 58 in a position in which the air jet valves 41 are in open position and permit the compressed air from the storage chamber to escape tangentially through the jet nozzles 39 and cause the top to rotate about its axis.

As a whole this top forms an interesting and instructive toy which can be easily operated for amusement and instruction and as most of the parts are arranged within the hollow body they are protected from possible injury and therefore not liable to get out of order.

I claim as my invention:

1. A spinning top comprising a body containing an air chamber, a peg which projects from the underside of the body and upon which the top is adapted to spin, feeding means for supplying compressed air to said chamber, and delivery means whereby compressed air is discharged from said chamber to rotate the top.

2. A spinning top comprising a hollow body, a peg arranged on the underside of said body and about which the top is adapted to turn on a supporting surface, air feeding means for supplying compressed air to said chamber including a pump cylinder mounted on the body, and a piston reciprocable in said cylinder, and connected with said peg.

3. A spinning top comprising a hollow body, a peg arranged on the underside of said body and about which the top is adapted to turn on a supporting surface, air feeding means for supplying compressed air to said chamber including a pump cylinder mounted on the body, and a piston reciprocable in said cylinder and connected with said peg, said peg and piston being reciprocated in unison by manually pressing the same inwardly and pressing the same outwardly by spring means.

4. A spinning top comprising a hollow body, a peg arranged on the underside of said body and about which the top is adapted to turn on a supporting surface, air feeding means for supplying compressed air to said chamber including a pump cylinder mounted on the body, a piston reciprocable in said cylinder, and connected with said peg, inlet check valve means for permitting air to pass from the external atmosphere into said cylinder, and outlet check valve means for permit-

ting air to pass from said cylinder to said air chamber.

5. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, and a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning.

6. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, and spring means for moving said piston, rod and peg outwardly.

7. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, and a spring whereby said piston, rod and peg are moved outwardly and which surrounds said rod and bears at its inner and outer ends against a shoulder on said cylinder and a shoulder on said rod.

8. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, a spring whereby said piston, rod and peg are moved outwardly and which surrounds said rod and bears at its inner and outer ends against a shoulder on said cylinder and a shoulder on said rod, and stop means for limiting the inward movement of said piston, rod and peg.

9. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting

air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, a spring whereby said piston, rod and peg are moved outwardly and which surrounds said rod and bears at its inner and outer ends against a shoulder on said cylinder and a shoulder on said rod, and stop means for limiting the inward movement of said piston, rod and peg, including a tube surrounding said spring and connected at its outer end with said rod and adapted to bear at its inner end against said inner shoulder on the cylinder.

10. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, and means holding said piston, rod and peg in their retracted position relative to said body.

11. A spinning top comprising a hollow body forming a chamber for storing compressed air, means for feeding compressed air into said chamber including a pump cylinder mounted on said body and provided with inlet valve means for admitting air from the external atmosphere into said cylinder and air outlet means for permitting air to pass from said cylinder into said chamber, a piston reciprocable in said cylinder, a piston rod arranged in said cylinder and having its inner end connected with said piston, a peg which is connected with the outer end of said rod and upon which the top is adapted to rest while spinning, and means holding said piston, rod and peg in their retracted position relative to said body, including a locking hook arranged on the underside of said body and a locking lug which is mounted on said rod and which is rotatable about the axis of the same into and out of engagement from said locking hook.

12. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same.

13. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body, and valve means for controlling the delivery of air through said nozzles.

14. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said valve closure.

15. A spinning top comprising a hollow body forming a chamber for storing compressed air,

and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said valve closure, including a reciprocable plunger mounted on the upper part of said body, and motion transmitting means connecting said plunger with said valve closure.

16. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said valve closure including a reciprocable plunger mounted on the upper part of said body, motion transmitting means connecting said plunger with said valve closure, and a tubular guide which is mounted on said body and in which said plunger slides.

17. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said valve closure, including a reciprocable plunger mounted on the upper part of said body, motion transmitting means connecting said plunger with said valve closure, a tubular guide which is mounted on said body and in which said plunger slides, and a diaphragm connecting said plunger with said guide.

18. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said valve closure, including a reciprocable plunger mounted on the upper part of said body, and motion transmitting means connecting said plunger with said valve closure, including a shifting rod connected with said valve closure member, and a lever pivoted on said body and having one arm connected with said shifting rod and another arm connected with said plunger.

19. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, manually operated means for actuating said valve closure, and locking means for holding said actuating means in a position in which said valve closure is shut.

20. A spinning top comprising a hollow body forming a chamber for storing compressed air, and means for discharging jets of air tangentially for rotating the same, including a plurality of air delivery nozzles arranged on the periphery of said body and each provided with an outlet port, a valve closure for closing and opening said port, and manually operated means for actuating said

valve closure, including a reciprocable plunger mounted on the upper part of said body, motion transmitting means connecting said plunger with said valve closure, a tubular guide which is mounted on said body and in which said plunger slides, a handle for operating said plunger rotatably connected with the latter, and locking means

for holding said plunger in a position in which said closure is shut including a locking arm connected with said handle and a stop shoulder on the body adapted to be engaged by said locking arm upon rotation of said handle.

JOSEPH R. MORDAN.

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