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Pagay

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[54] **DEVICE FOR FITTING CAPS TO CONTAINERS**

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[51] **Int. Cl.** **B65b 7/28**

[58] **Field of Search** 53/306, 310, 308, 53/304, 319, 368, 328, 330

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Assistant Examiner—Horace M. Culver
Attorney—Eric H. Waters et al.

[57] **ABSTRACT**

This device for fitting closing caps to containers filled with liquid, semi-liquid or pulverulent products, as they emerge from a filling machine, is easily adapted to most existing filling machines. It comprises essentially a rotary spider having a vertical axis and adapted to receive the containers as they are delivered from the filling machine. Said spider carries a head adapted to revolve in synchronism therewith and to dispense the caps to be fitted to said containers. Said head comprises, in combination with each notch of said spider, a cranked lever fulcrumed about a horizontal axis, each lever having one end directed outwards and centered to the notch associated therewith, and provided on its lower face with cap gripping means enabling it to grip and retain the caps separately, means being provided for displacing angularly towards the neck of the container engaged in the relevant notch the aforesaid free end of said lever, after said lever has picked up a cap during its travel past the downstream end of a cap dispensing channel.

5 Claims, 5 Drawing Figures

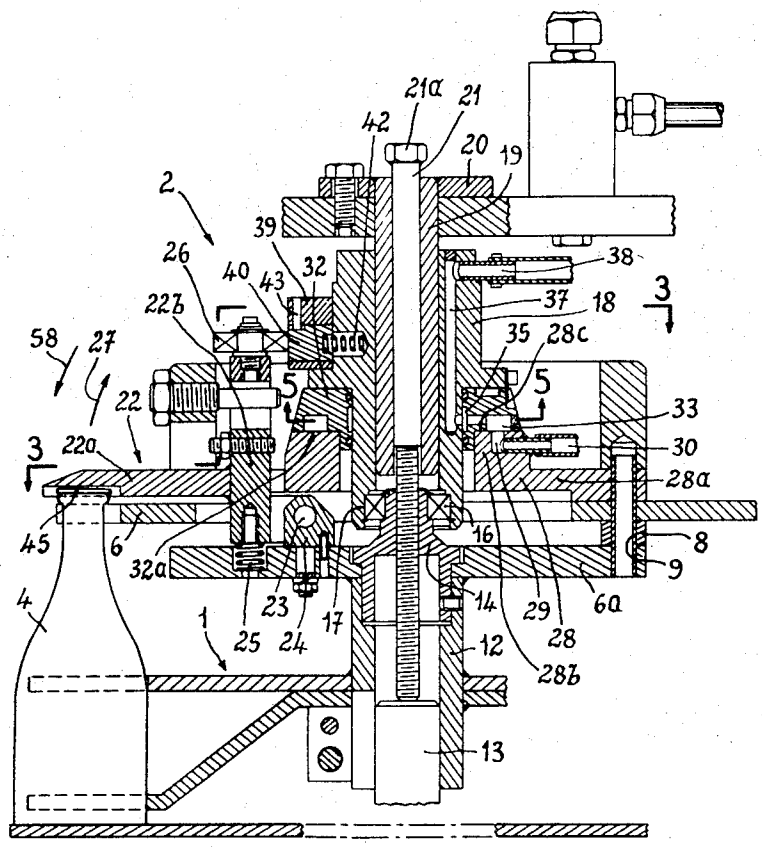

FIG. 1

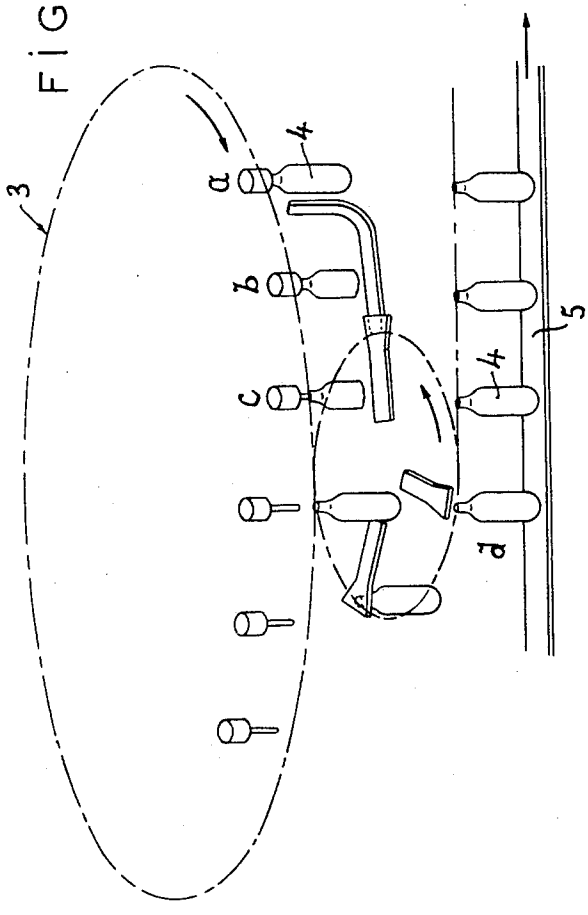

FIG. 4

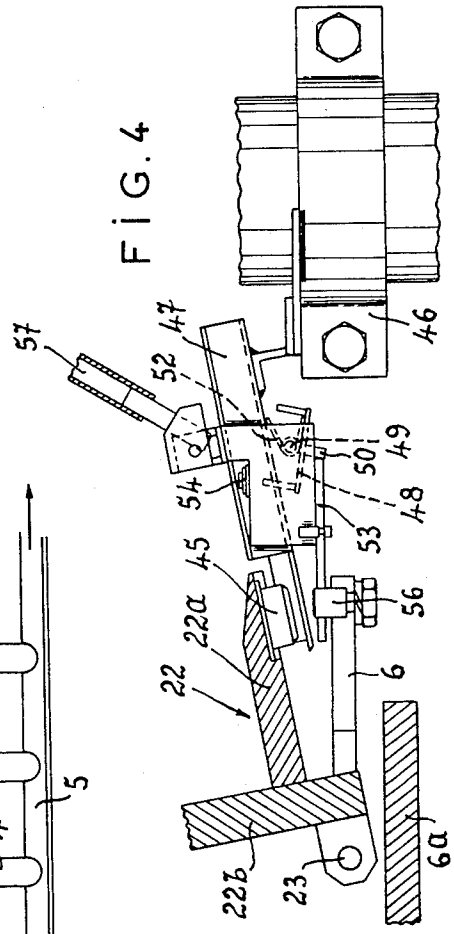

FIG. 5

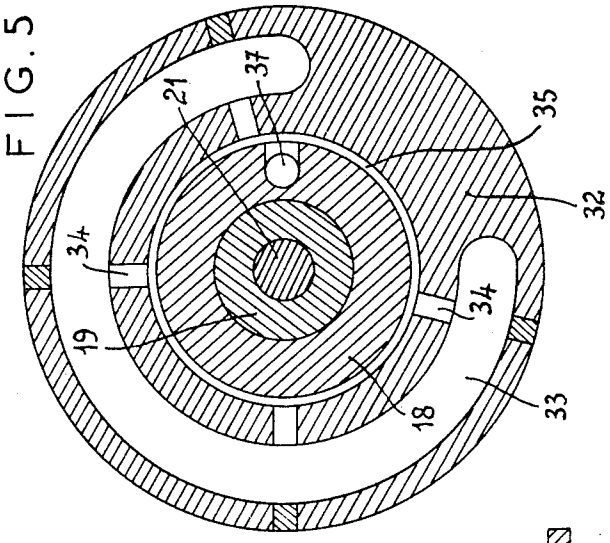
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FIG. 2

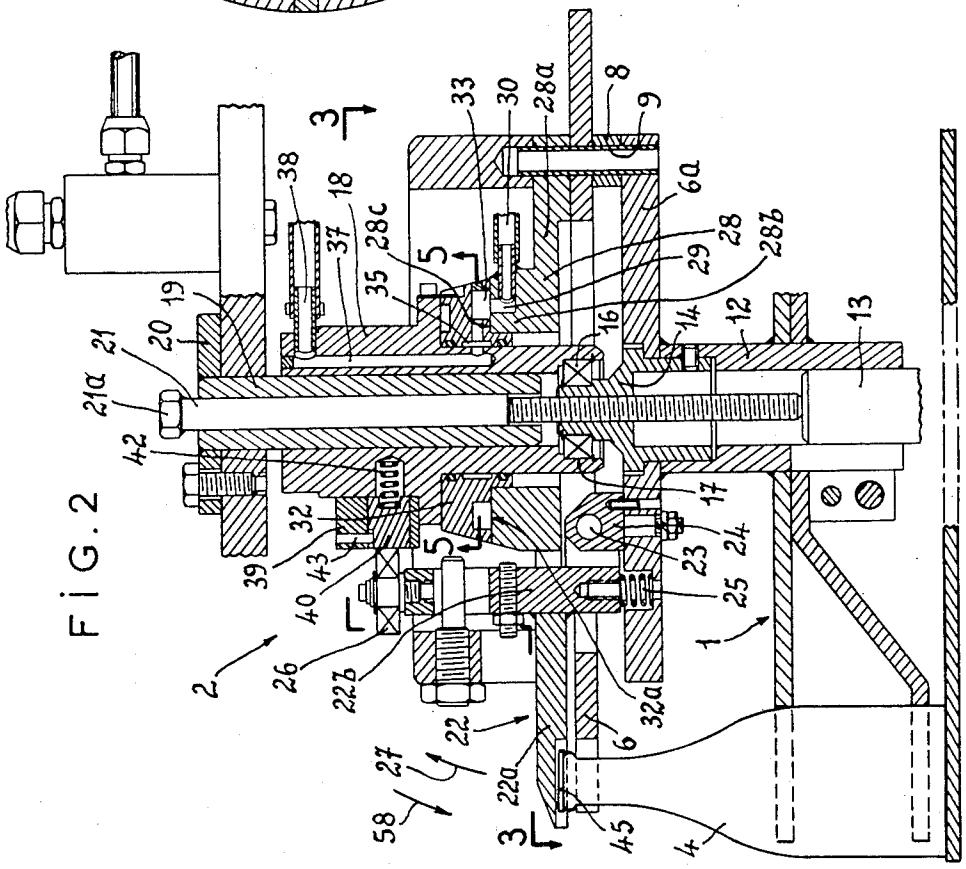
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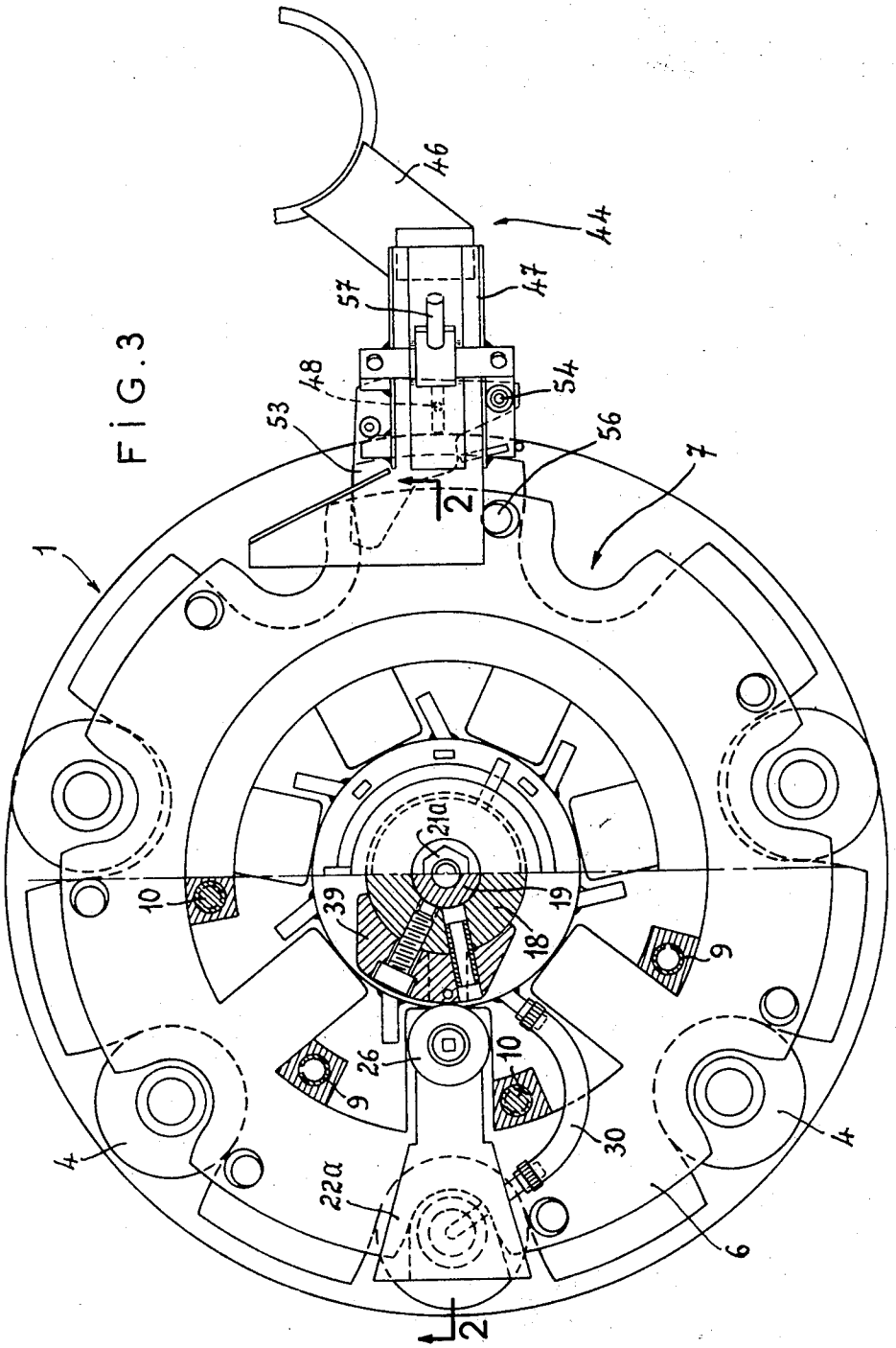
FIG. 3



DEVICE FOR FITTING CAPS TO CONTAINERS

FIELD OF THE INVENTION

The present invention relates to devices for fitting caps, notably plastic caps, to bottles or other containers previously filled with a liquid, semi-liquid or pulverulent product.

The device constituting the subject-matter of this invention is intended more particularly for closing bottles or other containers immediately as they are released from a filling machine.

DESCRIPTION OF THE PRIOR ART :

Conventional arrangements for closing machine filled containers have utilized a separate capping machine disposed downstream of the filling machine proper, to which it is connected through a chain conveyor.

As a rule, these machines constitute a bulky assembly requiring a considerable power expenditure. Moreover, when plastic bottles are used they are frequently subjected to a certain deformation on the conveyor due to the mutual pressure exerted thereon, which causes liquid product to be expelled therefrom. Likewise, the shocks occuring during the transport of these filled but still open containers cause liquid to be spilled and lost.

Moreover, for obvious hygienic reasons the liquid product contained in the bottles or other containers must be sheltered as rapidly as possible from the surrounding atmosphere.

SUMMARY OF THE INVENTION

It is the primary object of the present invention to avoid these inconveniences by providing a new device for fitting caps to bottles and other containers, this device being easily adaptable to most of the known and existing filling machines.

To this end, the device according to this invention comprises a rotary spider having a vertical axis and adapted to receive the containers as they are delivered from the filling machine, said spider carrying a head adapted to revolve in synchronism therewith and to dispense the caps to be fitted to the necks of the filled containers said head comprising, in combination with each notch of said spider, a lever fulcrumed about a horizontal axis, each lever having one end directed outwards and centered to the corresponding notch and provided on its lower face with gripping means adapted to grip and retain the caps, means being provided for displacing angularly towards the neck of the container engaged separately in the relevant notch, the aforesaid free end of said lever, after said lever has picked up a cap during its travel past the downstream end of a cap dispensing channel.

Since the aforesaid free end of the pivoting lever may have a very reduced thickness, it is possible to pass it between the bottleneck and the filling tap immediately after the completion of the filling operation.

To ensure proper closing of the containers even when a certain play develops as a consequence of wear, and according to a particularly advantageous form of embodiment of this invention, a pushmember responsive to a calibrated spring projects from the operative surface of a fixed cam in the path of a roller follower carried by the vertical arm of said lever, at a predetermined location, whereby, when the roller follower engages said push-member, it exerts through a substantially horizontal arm on the free end of said lever a predetermined effort on the cap in order properly to fit same into the neck of the container.

To facilitate the gripping of the caps by the horizontal arms of said bell-crank levers and according to another feature characterizing this invention, a cap-retaining and selecting device is provided in the vicinity of the downstream end of the cap dispensing channel, this last-named device comprising essentially a strap-shaped pawl whereby the first or leading cap in the channel is released while the following caps are retained until, upon release of said first cap, the pawl is returned to its initial position and the first next cap thus released is allowed to slide down and so forth.

On the other hand, to prevent the selected cap from falling from the downstream end of the dispensing channel, the horizontal arm of each bell-crank lever carries in the vicinity of its free end a shoulder acting as a retaining means for limiting the travel of the cap picked up by said lever.

BRIEF DESCRIPTION OF THE DRAWINGS :

FIG. 1 is a diagram illustrating the principle of operation of the device of this invention ;

FIG. 2 is an axial section taken along the line 2—2 of FIG. 3 ;

FIG. 3 is a plan view from above with a half-section taken along the line 3—3 of FIG. 2 ;

FIG. 4 is a fragmentary view showing the cap retaining and selecting device ;

FIG. 5 is a top view in section taken along the line 4—4 of FIG. 2 and showing details of the rotary dispensing device.

DESCRIPTION OF THE PREFERRED EMBODIMENT :

The diagram of FIG. 1 illustrates the general principle of a device 1, 2 for fitting caps to containers, this device, as shown, being positioned downstream of and tangent to a filling machine, the filling path 3 of which is shown very diagrammatically.

This device 1, 2 is adapted to pick up the containers 4 at the end of the filling operation taking place at stations *a*, *b*, *c*, then to fit a cap to each container, and finally to release the capped containers at *d* where they are taken by a conveyor 5 and directed towards storage means (not shown).

The device 1, 2 comprises essentially a single or double spider 1 and a head 2, the latter comprising a disk 6*a* which supports a notched wheel 6. Parts revolve in synchronism about a common, vertical axis. Each notch 7 of wheel 6 is adapted to engage the neck of a container, for example a plastic bottle 4, as shown in FIGS. 2 and 3.

The disk 6*a* and notched wheel 6 are assembled with the interposition of spacers 8 mounted on the disk, where they are centered by tubular split pins 9, and the disk and wheel 6*a*, 6 are assembled by means of screws 10 alternating with said tubular split pins 9 on a common circumference.

The disk 6*a* comprises a central, open disk portion and a cylindrical socket 12, concentric with the disk 6*a* and welded to its lower, central face. The lower portion of socket 12 is clamped to a driving shaft 13 of corresponding diameter, acting as a support. The socket 12 carries on the other hand at its upper end a nut 14 the

upper portion of which has a cylindrical surface for fitting the inner race of a ball-bearing **16** thereon.

The outer race of bearing **16** is fitted in a corresponding recess **17** formed in the lower portion of a cylindrical vertical member **18** concentric with the notched wheel **6**.

Precision-fitted in the bore of cylindrical member **18** is another tubular member **19** having its upper end welded to a horizontal plate **20** rigid with the frame structure F of the device.

This tubular member **19** receives concentrically therein a relatively long screw **21** engaging the nut **14** and bearing with its lower end against the upper end of shaft **13**. The upper end of screw **21** comprises a hexagonal head **21***a* to permit the necessary adjustment.

With this arrangement, by rotating the screw **21** in one or the other direction it is possible to modify the level of head **2** in relation to spider **1**.

Registering with each notch **7** of wheel **6** and underlying notch of spider **1** is a bell-crank or angle lever **22** fulcrumed substantially at its elbow about a pivot pin **23** carried by a strap **24** secured to the disk **6***a*. Each lever **22** comprises a substantially horizontal arm **22***a* and a substantially vertical arm **22***b*.

The horizontal arm **22***a* of lever **22** extends outwardly from pivot pin **23** over the notched wheel **6** and the vertical arm **22***b* has its lower end upwardly biased by a compression spring **25** housed in a bore formed in disk **6***a* ; on the other hand, this arm **22***b* carries at its upper end a roller follower **26** having a vertical axis.

Thus spring **25** constantly urges the bell-crank lever **22** for pivoting in the clockwise direction, as shown by the arrow **27** in FIG. **2**, so that in the inoperative position the horizontal arm **22***a* of each lever **22** is somewhat inclined, and its free end can overlie the mouth of the container just released from the filling machine.

Secured to the notched wheel **6** is an annular member **28** having a radial portion **28***a* for the fastening it to the notched wheel **6**, and also having cylindrical portion **28***b* coaxially facing the cylindrical member **18** and formed with a radial upper face **28***c*. The cylindrical portion **28***b* has formed therein, peripherally adjacent and oposite to each crnak lever, a conduit **29**. Each conduit **29** has an outer end, where this conduit is connected through a flexible hose **30** to an orifice formed in the vicinity of the free end of the lower face of the horizontal arm **22***a* of the adjacent lever **22**. The other end of conduit **29** opens through the radial face **28***c'*. Above member **28**, which constitutes the rotary element of a pneumatic distributor, is a circular member **32** secured to an external flange formed on cylindrical member **18**, intermediate the ends thereof. The lower radial face **32***a* of this flange bears on the radial upper face **28***c* of annular member **28**. The circular member **32** constitutes the fixed element of said distributor.

Circular member **32** comprises a circular groove **33** covering an arc of about 270° and registering with the outlet orifices of conduits **29** which open through having a radial face **28***c*. *opposite crank*

This groove **33** is connected through four small radial passages **34** to an annular cavity **35** formed in the bore **36** of circular member **32**. On either side of said annular cavity **35** a pair of annular grooves are formed and provided with suitable seals such as O-rings. Opening radially into the annular cavity **35** is the lower end of a longitudinal duct **37** formed in cylindrical member **18**, the upper end of said duct **37** opening also radially at the upper end of said cylindrical member **18** into a union or nozzle **38** connected to a source of vacuum.

The cylindrical member **18** carries a fixed cam **39** coplanar with the roller followers **26**. This cam **39** has formed therein a radial hole receiving a push member **40** responsive to a calibrated spring **42**. A pin **43** engaging with its lower end an axial groove formed in said push member **40** prevents the latter from being ejected from its radial hole.

Finally, a cap retaining and selecting device **44** is provided at a downstream end of the cap dispensing channel (not shown). This device **44** carried by a support **46** (FIGS. **3** and **4**) comprises essentially a U-sectioned channel section **47** and a rocker or pawl **48** disposed beneath said channel. The pawl **48** is substantially strap-shaped and has its base fulcrumed about a horizontal pivot pin **49**. Moreover, it comprises at its lower portion a central depending stud **50**.

The bottom wall of channel **47** has formed therethrough an elongated aperture permitting the passage of the free end of each arm of said pawl **48** and the latter is constantly urged by a spring **52** to an inoperative position in which the downstream arm of the pawl projects above said bottom wall so as to retain the caps **45** accumulating upstream thereof.

The stud **50** is adapted to co-act with a horizontal cam **53** pivoted to a vertical pin **54** and formed with a portion shaped to project in the path of vertical pins **56** carried by the notched wheel **6** and associated with each crank lever **22**. Thus, during a very short time, these pins **56** are adapted to actuate the cam **53** and rock the pawl **48** in order to retract the downstream arm thereof while causing its upstream arm to project above the bottom wall of the cap dispensing channel **47**.

As a result, the first cap is released by the downstream arm of pawl **48** and slides towards its gripping or pick-up point, the other caps being retained by the upstream arm until the cam **53** is released by the pin **56**. Then, the pawl **48** is returned to its initial position by the spring **52** and the first following cap is released in turn and slides towards the downstream arm, and so forth.

The movement of each released cap is facilitated by the provision of a suitably directed air-jet nozzle **57** controlled in synchronism with the movements of pawl **48** through suitable means (not shown).

The above-described device operates as follows : Successive containers **4**, filled at *a*, *b*, *c* (FIG. **1**) are released from filling machine path **3** and are directly, as shown tangentially engaged by the new spider and head unit, whereon they move around to psoition *d*, while their mouths are capped. They are then released, near *d*, for disposal by conveyor **5**. Meanwhile caps are received in the cap channel (at right in the capping unit), are transferred therefrom to successive levers **22** (FIG. **4**) and are carried around to the point of tangency between the filling and capping paths (FIG. **1**).

The spider **1** and notched wheel **6** are rotatably driven from shaft **13** at a predetermined speed depending on the rate of delivery of containers **4**, i.e. on the rate of filling of these containers in the filling machine **3**.

The containers are carried around shaft **13** by the spider **1** and notched wheel **6**, immediately after the filling thereof, their necks engaging each a notch **7** of wheel **6** (FIG. **2**, **3**).

During the rotation of this notched wheel **6** the free ends of successive horizontal arms **22***a* are caused to move past and closely over the downstream end of the cap dispensing channel **47** and, each time or shortly before, the conduit **29** corresponding to the respective arm, is caused to communicate with the vacuum source via grooves **33 29.** Thus, a cap **45** is sucked and maintained against the lower face of this arm (FIG. **4**). This cap is subsequentely placed in vertical coaxial relationship closely above the neck of a container **4** and at that moment the roller **26** engages the cam **39,** thus causing the rocking of lever **22** in the direction of the arrow **58** of FIG. **2.**

As a result, the cap **45** is engaged with the mouth of the bottle, this movement being enforced by the passage of roller **26** on push-member **40** of cam **39.**

When the roller follower **26** escapes from cam **39,** lever **22** resumes its inoperative position, then the capped container is released and carried away by conveyor **5** directing same to towards storage means. The same sequence of operations is repeated for each lever **22.**

As shown and preferably the free end of lever **22** is extremely thin so that it can be moved to a position above the neck of the container just after the latter has left the filling tap of the filling machine..

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for the various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new is:

1. A device for closing containers with closure means comprising:

a. a vertical driving shaft;

b. a spider having notches for receiving each container from a filling machine and for carrying the container along an arc of a circle about the shaft;

c. a head comprising a disk rotatable coaxially and in synchronism with the spider;

d. cranked levers on the head, one above each notch of the spider, each lever having a first, then generally horizontal arm for receiving a closure means and for carrying it to a position opposite a container on said arc, and having a second arm extending generally vertically from said first arm, and means for fastening the closure means to the container on said arc;

e. a vacuum source; a source of closure means; distributor means for maintaining communication between said vacuum source and a point on the underside of the first arm of each lever, along said arc, to pick up closure means from the source of closure means and to release the closure means at a predetermined point of said arc; and

f. cam means on said head and follower means on said second arm for actuating each lever at said point to perform said fastening of the released closure means to the container.

2. Device as set forth in claim **1** wherein each cranked lever has means to pivot it to the head for rocking motion of the first arm from very slightly above horizontal position to very slightly below horizontal position and reverse, whereby the driving shaft, spider and head can be installed so that the spider receives the containers directly from the filling machine, the horizontal arms of the cranked levers passing between the filling machine and the containers immediately after the filling operation.

3. Device as set forth in claim **1,** wherein the source of closure means comprises channel means for delivering the closure means, one after the other, at the periphery of the head, to the undersides of the horizontal arms of the levers, at a predetermined position relative to each arm and lever.

4. A device for fitting caps in the process of automatically capping containers, which is disposed downstream of a filling machine, and comprises a spider having a vertical axis, adapted to receive the containers as they are released from said filling machine, said spider carrying a head rotating in synchronism therewith and adapted to distribute caps for closing said containers, said head comprising in combination with each notch of said spider a lever adapted to pivot about a horizontal axis and having one end directed outwards, centered to said notch and provided on its lower face with gripping means for gripping and retaining said caps, means being provided for moving angularly said free end of said lever towards the neck of the container engaged in said notch after said free end has picked up a cap during its travel past the downstream end of a cap dispensing channel, said means for causing the angular movement of said pivoting lever comprise on the one hand a roller carried by said lever and on the other hand a fixed cam, spring means constantly urging said roller against the operative contour of said cam each time said roller moves past said cam, said pivoting lever being a cranked lever fulcrumed at a point adjacent its elbow and having a substantially horizontal arm directed outwards, and comprising cap gripping means on the lower face of its free end, the other arm of said lever extending substantially vertically and carrying a roller follower having a horizontal axis, said roller follower being constantly urged by spring means against the operative contour of said fixed cam, said fixed cam imparting to said roller a downward tilting movement each time said roller moves past said cam, said fixed cam being so positioned angularly that the downward tilting movement of said lever takes place above the neck of a container immediately at the end of the filling thereof, said cap gripping means provided on the horizontal arm of each crank lever consisting of an orifice opening into the lower face of said arm in the vicinity of the free end thereof and connected via a rotary distributor to a vacuum source, said distributor being adapted to maintain the fluid communication between said orifice and said vacuum source only during that fraction of the revolution performed by said head which corresponds to the travel of said crank lever between the cap gripping action and the sinking of the cap into the neck of said container, a disk provided with a central socket permitting the fitting and locking thereof to a driving shaft, said disk supporting a notched wheel adapted to engage with each notch the neck of a container, and the pivot pins of a cranked lever, and further supporting a movable annular member of a distributor connected to flexible hoses leading to the suction orifices for gripping the caps, said movable annular member being covered by a fixed annular member of a distributor connected to said vacuum

source, and secured to an outer cylindrical member held against rotation but adapted to slide vertically along an inner tubular member rigid with the frame structure of the filling machine, said inner tubular member receiving coaxially therein a screw bearing with its lower end against the aforesaid driving shaft and having its screw-threaded shank engaged in a nut rigid with said disk, the outer cylindrical member supporting said fixed cam for actuating said cranked levers.

5. Device as set forth in claim 4, wherein a push member responsive to a calibrated spring projects from the operative face of said fixed cam and also in the path of the roller follower carried by the vertical arm of said cranked lever at a predetermined location, whereby, when said roller engages said push member it is adapted, through the horizontal arm of said lever, to exert a predetermined effort on the cap in order to properly sink same into the neck of the container.

* * * * *