Nov. 22, 1966 E. E. LAKSO 3,286,436

CAPSULE FILLING MACHINE

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FIG. 1

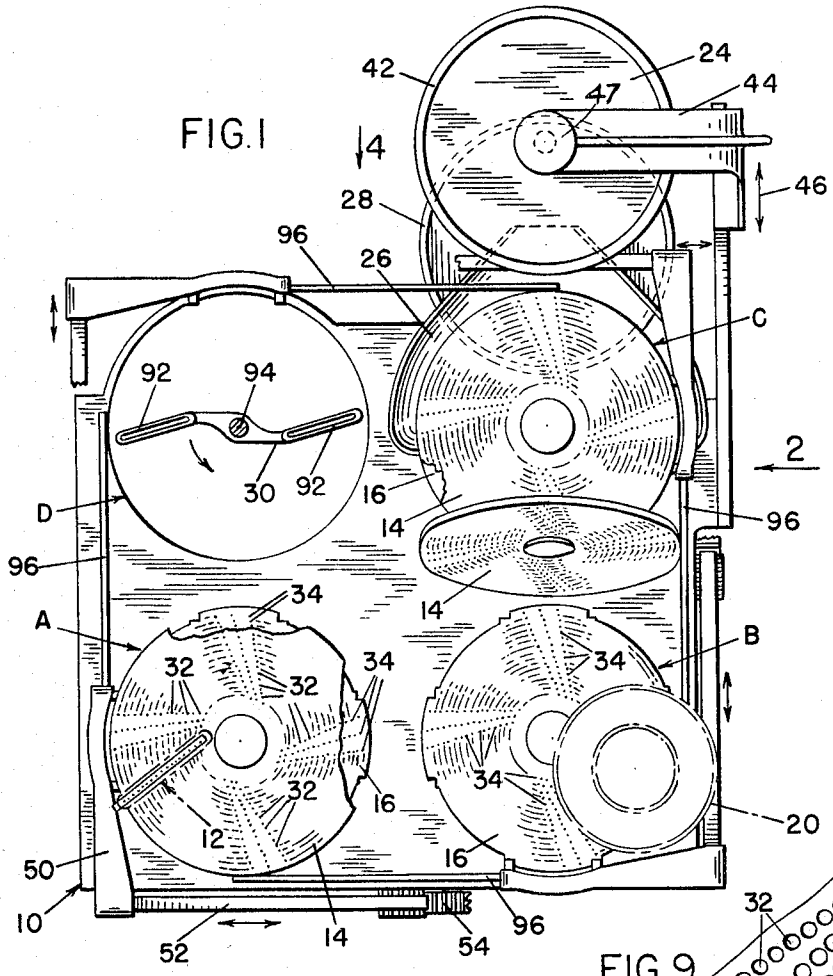


FIG. 3

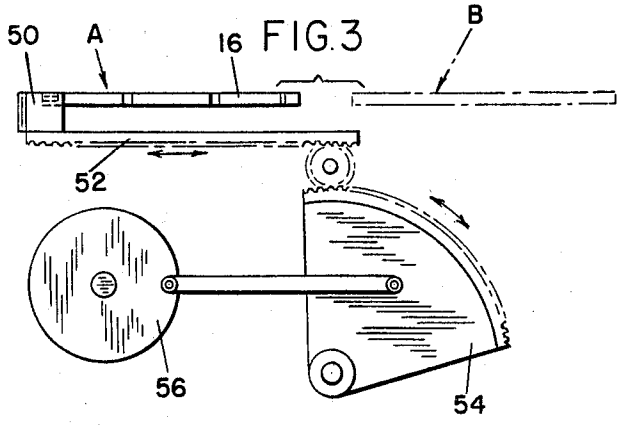
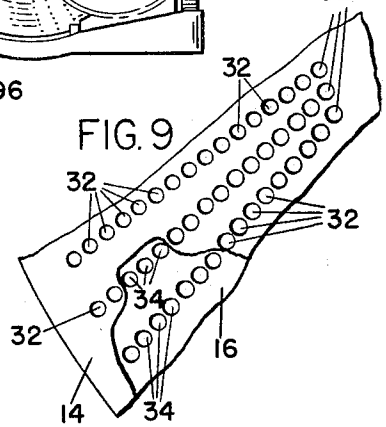


FIG. 9



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FIG. 2

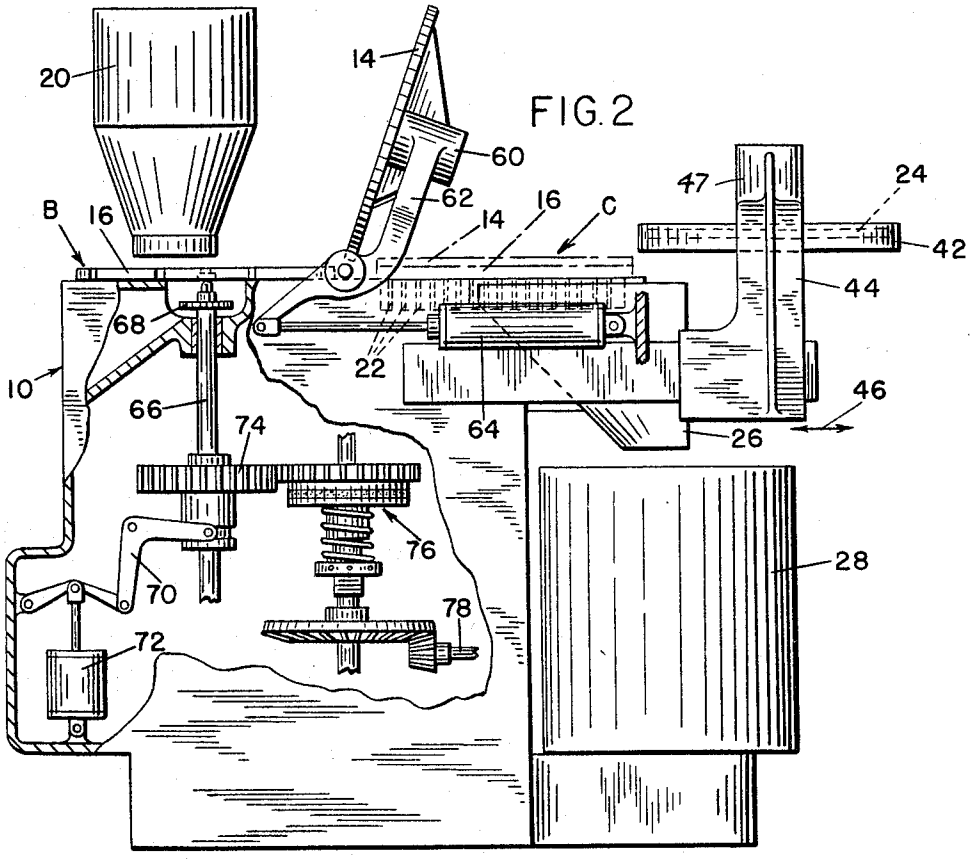
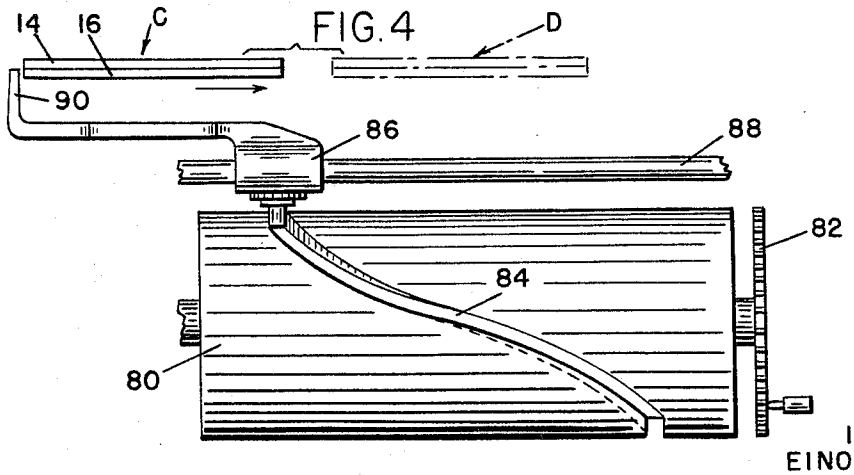


FIG. 4



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CAPSULE FILLING MACHINE

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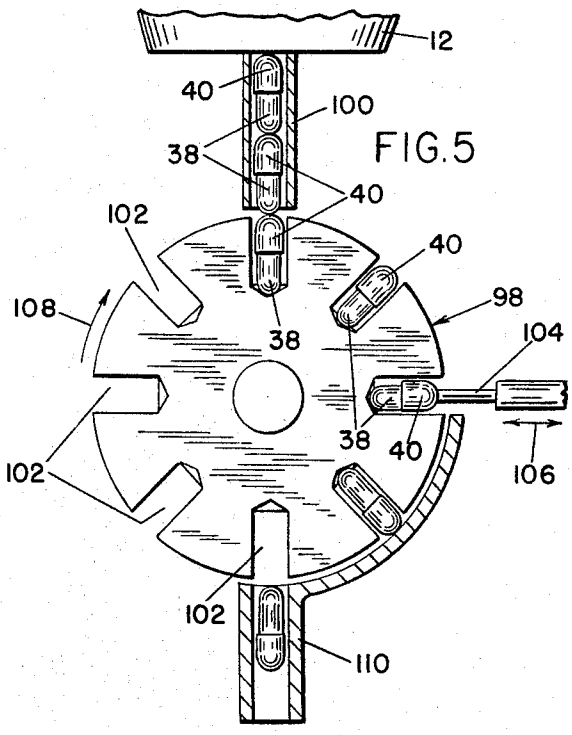


FIG. 5

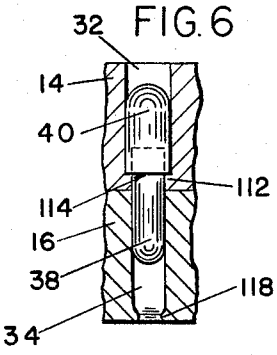


FIG. 7

FIG. 6

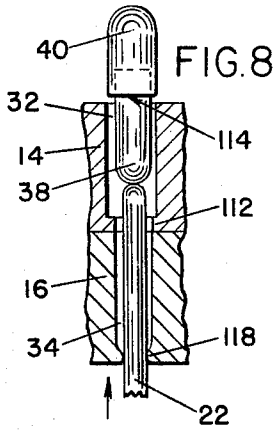


FIG. 8

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United States Patent Office 3,286,436
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3,286,436

CAPSULE FILLING MACHINE

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Filed Sept. 19, 1962, Ser. No. 224,645
4 Claims. (Cl. 53—281)

This invention relates to apparatus for placing empty but capped or joined capsules in a device for removing the caps from the bodies of the capsules generally automatically and then in the same machine in a step-by-step or station-to-station operation filling the capsule bodies, replacing the caps, and ejecting the filled and closed capsules.

In the prior art, these operations are carried out in more or less complicated machines which require a great deal of hand operations. That is, having reference to United States Patents #1,819,936 and #1,545,777 which show in general the way in which this type of capsule is handled, the capsules are indiscriminately supplied to a hopper and fed down into a two-part plate in such a way that when the operator manually lifts the cap part of the plate from the body part, the capsules are decapped; then the operator manually lifts the body plate and places it in position to be filled from another hopper, after which the operator then rejoins the two plates and places them on a device for replacing the caps on the bodies.

It is the general purpose of the present invention to avoid such manual handling of relatively heavy capsule filling plates, etc., and to provide for automatic loading of the empty capped capsules, decapping the capsules, filling the bodies of the capsules, and then reapplying the caps to the bodies of the capsules, all with a very minimum of effort on the part of the operator, to the end that the action is greatly increased as to speed of filling the capsules, this in turn reducing the cost of the filled capsules.

The prior art machines as described and as shown in the above identified United States patents are very low in productive capacity and being manual in operation, the relatively heavy plates have to be shifted between different stations, this causing considerable operator fatigue done away with by use of the present apparatus.

Further objects of the present invention reside in the provision of an automatic machine for increasing the productivity of the prior art machines, six to seven fold, with no increase in floor space required, and by so doing eliminating operator fatigue.

Another object of the present invention resides in the provision of increasing the productivity of the machine by mechanizing the same so that the manually movable plates of the prior art, which are limited in size and weight due to being manually moved, can be enlarged and a great many more capsules can be handled per plate. Another object of the invention resides in the provision of a power-operated capsule decapping, filling, recapping and ejecting machine which includes a closed path having four stations wherein the double plates are filled at the first station with empty capsules and automatically moved to the second station wherein the caps are removed and the bodies insepected and filled, and from the second station the plate is moved to the third station where the caps are repositioned, and the filled capsules ejected, whereby three pairs of plates are in operation at all times. In addition, an automatic cleaning arrangement is provided to dispose of any surplus powder which may appear on the plates or in the cavities thereof after the capsules have been filled and ejected, preparatory to again filling the cavities with empty capped capsules at the first station.

Reference is to be had to the accompanying drawings, in which

FIG. 1 is a plan view with parts removed showing the machine;

FIG. 2 is a view in side elevation with parts removed and in section, looking in the direction of arrow 2 in FIG. 1;

FIG. 3 is a view in side elevation showing the means by which the plates are moved from one station to another;

FIG. 4 is a view in side elevation, looking in the direction of arrow 4 in FIG. 1, parts being omitted for clarity of illustration;

FIG. 5 is a detail view showing the pre-breaking operation;

FIGS. 6, 7 and 8 are details of the capsules and their relation to the plates, and

FIG. 9 is a fragmentary plan view of the cap and body plates illustrating the relationship of the holes therebetween.

Referring now in general to the drawings, there is shown a machine frame generally indicated at **10** of any convenient construction or description and having on it in general four stations which are labeled A, B, C and D. At Station A there is a hopper which operates in a conventional manner and in which the joined or capped empty capsules are deposited in indiscriminate helter-skelter arrangement and which descend through the hopper as is well known in the art to become lodged in aligned cavities in a double plate. The hopper position is indicated in general at **12** in FIG. 1 and at all stations the cap plate is indicated at **14**, the body plate being indicated at **16**. The hopper in general is well known to those skilled in the art, as for instance in United States Patent #1,545,777 dated July 14, 1925. The difference here is that since the plates **14** and **16** are moved by power, it is possible to enlarge the plates so as to accommodate a row of at least sixteen apertures as shown diagrammatically in FIG. 1 and structurally in FIG. 9, instead of merely five cavities in a row as in the prior art.

When the combined cavities in the plates **14** and **16** have been filled by rotating these plates underneath the hopper **12**, they are then moved to Station B where plate **14** is removed temporarily and the plate **16** which is the body plate and which has the upwardly opening capsule bodies in the cavities therein, are filled from a more or less conventional hopper **20** by rotating plate **16** underneath the orifice of the hopper. Plate **14** is then repositioned in the exact position that it had with reference to plate **16** at Station A, and the combined plates are now moved to Station C where apparatus is provided to rejoin and eject the capsules. This includes a series of fingers generally indicated at **22** (see FIG. 2) extending upwardly through the caivties in the plates, recapping the capsules and ejecting the same onto the top of plate **14** where they are swept off by a ring member **24** into a chute **26**, leading the filled capsules into a collecting container **28**. The combined plates are then moved to Station D where a rotating vacuum arrangement at **30** removes any excess powder from the cavities.

It will be seen that plates **14** and **16** are provided with a plurality of rows of combined apertures which are indicated at **32** as to plate **14** and **34** as to plate **16**, see FIGS. 1 and 9. These appear as shown in section in FIGS. 6, 7 and 8. The body of the capsule is shown at **38** and the cap at **40**. After the bodies **38** have been filled at Station B, the combined plates are then moved as will be explained hereinafter to Station C where the separate caps and filled bodies are joined by means of a set of fingers or pins **22** which automatically move upwardly at the correct interval, pushing the bodies **38** back into complete connection with caps **40** as shown in FIG. 7. At this point the plate **24** is in closely superposed relation with rela-

tion to the cap plate so as to back up the caps and hold them in position to allow the joining to take place. The plate **24** then rises and the fingers or pins **22** then moving upwards further eject the completed filled and joined capsules onto the top surface of the plate **14**, at which time although the plate **24** has been raised, the flange **42** thereof encompasses the ejected capsules and the plate **24** being mounted on a reciprocal arm **44** moving in the direction of the arrows **46**, sweeps the filled capsules from plate **14** at Station C causing the capsules to descend down the chute **26** to container **28**. Plate **24** is vertically reciprocated by means of an air cylinder **47** located on arm **44**.

As shown in FIG. 1 at Station A, there is an arm **50** connected to a ram or bar such as that at **52** in FIG. 3 which may be operated by some convenient mechanism such as a sector gear **54** operated by a crank **56** or the like in order to reciprocate the bar **52** and also arm **50** to move the combined plates **14** and **16** from Station A to Station B, and a similar mechanism can be utilized to move the combined plates from Station B to Station C, all in synchronized relation.

In order to separate the plates at Station B, there is provided some mechanism such as for instance an electromagnet **60** which is actuated through a required number of degrees by means of an arm like a crank **62** under action of a solenoid or air motor **64** or the like operated in timed sequence in order to lift the cap plate **14** to allow inspection of the bodies in body plate **16** and also to allow the more or less conventional powder filling magazine to swing in over plate **16** which rotates under it to fill the bodies with the powder.

Both at Stations A and B means is utilized for intermittently rotating the plates and this can be as for instance shown in FIG. 2 applied to Station B in the form of an axially reciprocable shaft **66** which has a clutch member at **68** to engage with the under side of a corresponding member in the plate **16** and is raised in timed relation by means of any kind of construction such as a crank **70**, solenoid or air motor **72**, etc. in timed relation to the rest of the device. At the same time, shaft **66** is rotated by a gear **74** from any kind of rotating power driven mechanism which may be desired or convenient such as for instance the spring clutch arrangement at **76** driven through a shaft from the main drive shaft at **78**.

The pins or fingers **22** may be actuated by a mechanism similar to that at **66** and including a vertically reciprocal shaft operated in timed relation as required, said shaft having at its upper end a disc or the like with fingers **22** thereon which enter the respective cavities in the combined plates, moving the filled bodies upwardly from the FIG. 7 to the FIG. 9 position, and then moving them further upwardly and out. Any kind of reciprocating mechanism can be utilized in timed relation in order to move the ring **24** in the direction of the arrows **46** as shown in FIG. 2 in order to sweep the filled ejected capsules from the combined plates to the chute.

Referring now to FIG. 4 there will be seen to be means to move the combined empty plates **14** and **16** from Station C to Station D. This mechanism is arranged in overhead relation in order to avoid interference with the other parts of the machine, and some means similar to that shown in FIG. 3 could be used but more conveniently a cam roll **80** may be suspended above the table in any desired supports and the same may be driven in timed relationship as required by any kind of gear means or the like indicated at **82**. The cam roll is provided with a groove as for instance at **84** and serves to reciprocate an element **86** on a fixed guide rod **88**, the element **86** having an upturned finger **90** by which to engage the combined plates **14**, **16** and move the same in the direction of the arrow from Station C to Station D after the ring at **24** has completely separated from the plates at Station C as is shown in solid lines in FIG. 1.

At Station D the vacuum cleaner arrangement is suspended overhead in any way desired and preferably comprises a pair of suction nozzles **92**, **92** mounted on a post or shaft **94** supported and rotated by any desired means in the direction of the arrow in order to completely evacuate excess powder from all of the cavities and from the surface of the plate. This minimizes troubles caused in prior art machines by powder clinging to the cavity walls, thus interfering in the prior art with the entry of the next capsules into the cavities at Station A.

Appropriate guide means can be used as indicated at **96**, **96** to guide the plates along the closed path described above and it will be evident that a great many more capsules can be produced per period of time than by any of the plate capsule receiving devices of the prior art.

Referring now to FIG. 5 there is shown a prebreaking device generally indicated at **98**. This is a wheel which is rotated in timed relationship receiving the capsules properly aligned from hopper **12**, this hopper being well known in the art, through a tube **100**. The wheel **98** is provided with a series of radially arranged peripheral cavities **102** each of which receives an individual capsule. Each of these capsules is given a job or tap by a reciprocating finger **104** operated by any desired means such as a solenoid or air motor in the direction of the arrows **106**. This gives each capsule a rap at its end which loosens the cap with relation to the body portion thereof. Rotating in the direction of the arrow **108**, the wheel deposits the tapped or prebroken capsules down through a tube **110** to each of the sixteen cavities outlined by the nozzle of the hopper **12** in FIG. 1.

Referring now to FIGS. 6, 7 and 8, the details of the cavities in the plates is shown. The plates **14** each have a plurality of cavities **32** which are indented slightly at their very lower end portions by means of an inturned flange or the like indicated by the reference numeral **112**. This is an inturned annular ring against which the lower edge portion at **114** of the cap rests and is held thereby, the lower portion of the capsule, i.e., body **38**, depending down into the cavity **34** in the plate **16**. As shown in FIG. 7, a suction hose **116** then comes into play at Station A operating to draw the body portion **38** of each capsule down away from the cap **40**, coming to rest on an inturned annular ring **118** at the lower end portion of cavity **34**.

Thus it is seen that when the combined plates reach Station B, the caps and bodies have been separated, and when plate **14** swings up, the upper open ends of the bodies **38** are exposed for inspection and for filling. Then at Station C the fingers **22** relatively rise in the cavities as shown in FIG. 8 pushing the loaded or filled bodies **38** back into the caps joining the capsules. The fingers **22** eventually push the filled capsules out onto the top of plate **14**.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. In a machine for decapping, filling and recapping capsules, a support, said support accommodating four stations on a closed circuit, a plurality of capsule-receiving plates, there being one less number of capsule-receiving plates than stations, each plate being in two parts including a horizontal capsule body plate and a superposed capsule cap plate, said body plates being coplanar and all the plates having cavities therein for receiving the capsules, the cavities in the body plate being less in diameter than the cavities of the cap plate, the cavities in the respective plates being aligned in pairs for the reception of the capsules, the body portions of the capsules being placed first in the combined cavities and the cap plate having a restriction against which the edges of the caps are lodged for limited motion into the cavities, vacuum means for separating the bodies of the capsules from the caps within the cavities, power means moving the combined superposed plates loaded with empty capsules from the first station to the second station, power means at the second station for lifting the cap plate revealing the open

ends of the capsule bodies, means for filling the capsule bodies at the second station, said lifting means reapplying the cap plate to the body plate in timed relation to the operation of the filling means, power means for traveling the combined plates containing caps and filled bodies in separated condition to a third station, movable pins at the latter station for thrusting the filled bodies upwardly into the caps, said pins continuing upwardly to thrust the filled capsules out of the cap plate, power means to operate the pins in timed relation to the plate moving means, means operating in timed relation with respect to the operation of the pin operating means to remove the filled capsules from the cap plate, power means operating in timed sequence to move the now empty combined plates to a fourth station, means to clean the cavities, means to then move the cleaned combined plates back to the first station for reloading, and means to tap the empty capsules prior to loading in the combined cavities to loosen the caps relative to the bodies of the capsules.

2. The machine of claim **1** wherein said capsule tapping means comprises a wheel, means to rotate the wheel, radial cavities in the wheel, and a reciprocal element arranged radially of the wheel to tap each capsule in each cavity as the wheel rotates.

3. In a machine for decapping, filling and recapping capsules, a support, said support providing a plurality of stations in a closed circuit, a plurality of capsule-receiving devices, each said device including a capsule body plate and a normally superposed capsule cap plate, each plate having cavities therein for receiving the capsules, the cavities in the respective plates being aligned in pairs for the reception of the capsules, means for separating the bodies of the capsules from the caps within the cavities while the plates are superposed, means for moving the combined superposed plates loaded with separated empty capsules from one station to the next station, means at the said next station for lifting the cap plate revealing the uppermost open ends of the capsule bodies located

in the cavities in the body plate, means for filling the capsule bodies, means for reapplying the cap plate to the body plate in original orientation as to the cavities, means traveling the combined superposed plates containing caps and filled bodies to a succeeding station, joining means at the last-named station, said joining means including a set of upright pins arranged for vertical motion to enter the cavities in the plates and thrust the filled bodies upwardly to join with the caps, means to move the pins in timed relation to the motion of the plates, a solid plate, means supporting and vertically reciprocating the solid plate above the cap plate at the last-named station, said solid plate having a low position on the cap plate to stop the caps temporarily during the joining action of the pins and a high position spaced from the cap plate to allow the pins to move further upwards and eject the filled and now joined capsules onto the top surface of the cap plate, and means to sweep the ejected and filled capsules from the cap plate to a collection point.

4. The machine recited in claim **3** wherein the last-named means comprises a depending edge flange on the solid plate and means to move the solid plate which in its high position is a horizontal direction with the flange sweeping over the cap plate in closely spaced relation thereto.

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