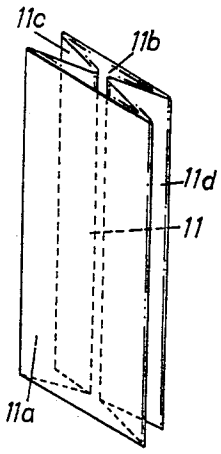
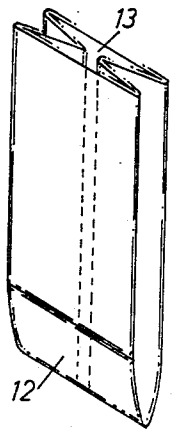
Dec. 3, 1963 R. W. BARRACLOUGH 3,112,588

MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

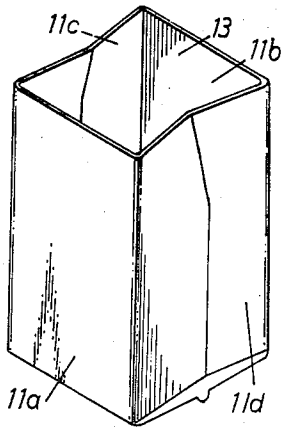
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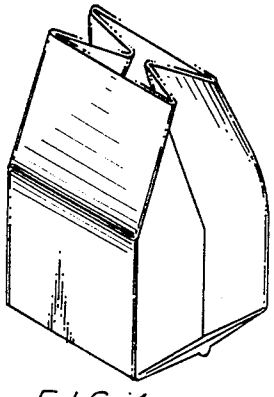
-FIG. 1.-



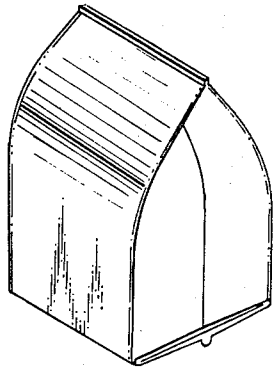
-FIG. 2.-



-FIG. 3.-



-FIG. 4.-



-FIG. 5.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH

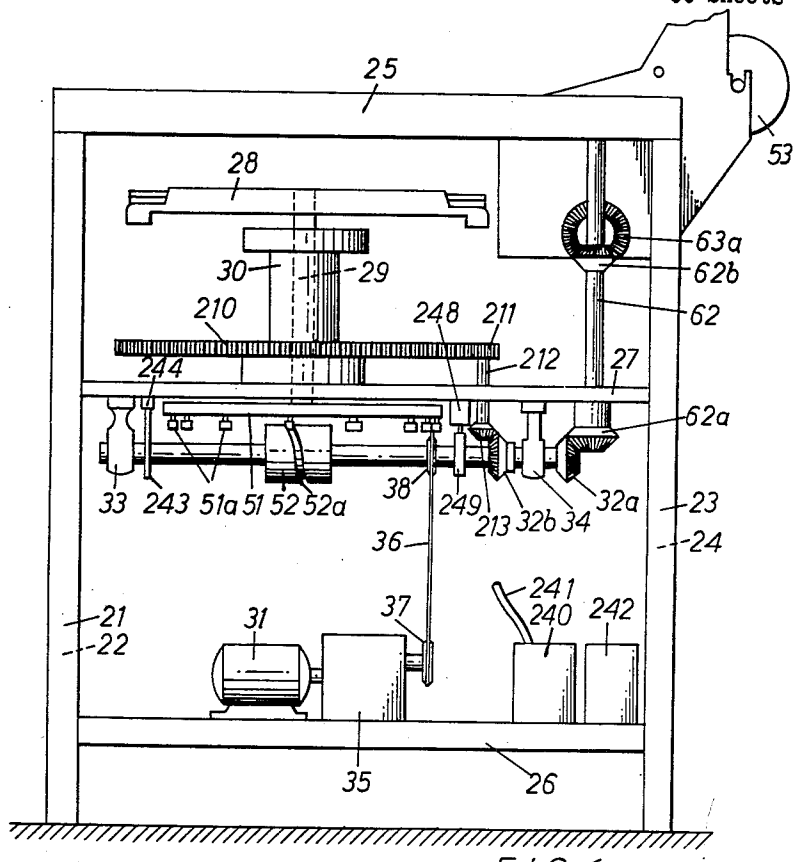
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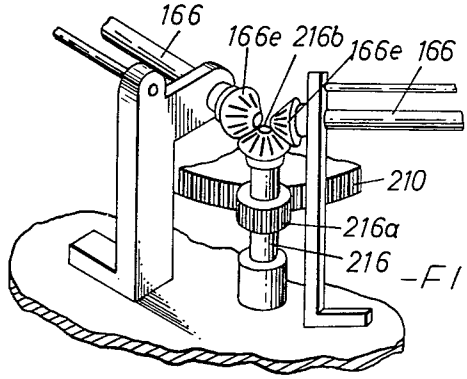
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 6.-



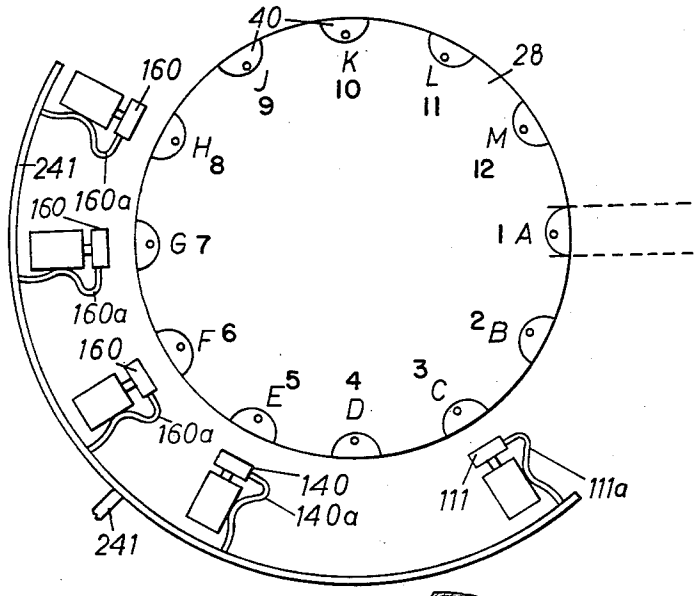
-FIG. 35.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH.
BY Irwin S. Thompson
ATTY.

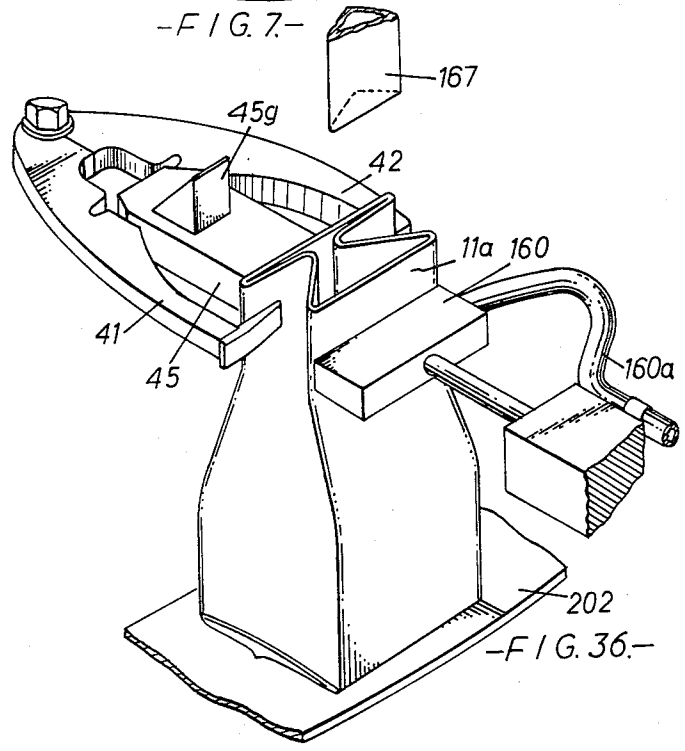
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 7.-



-FIG. 36.-

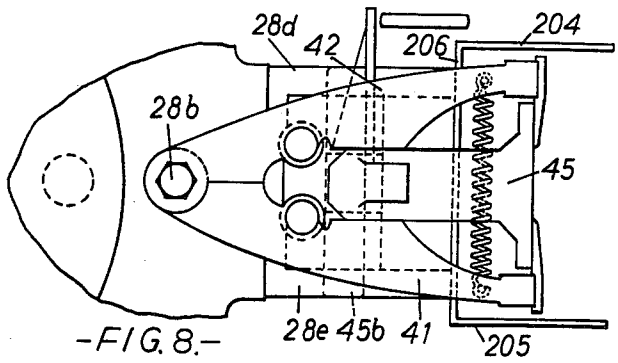
INVENTOR:
RONALD WILLIAM BARRACLOUGH.

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ATTY.

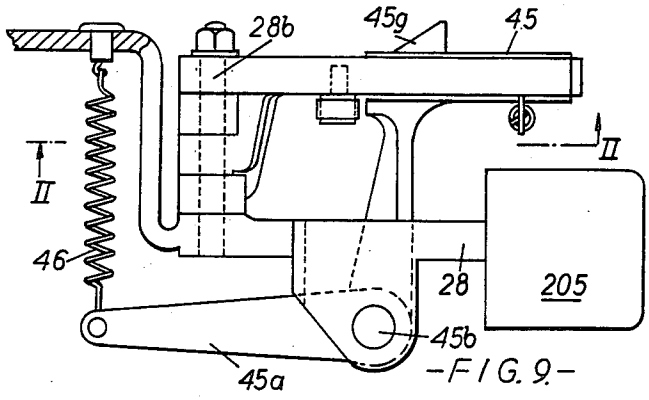
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

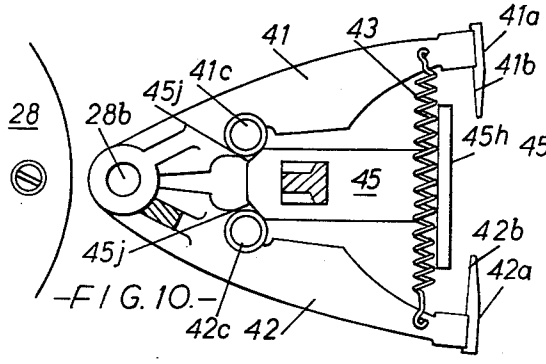
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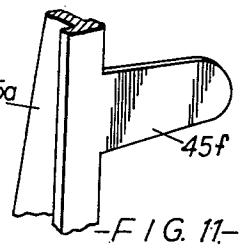
-FIG. 8.-



-FIG. 9.-



-FIG. 10.-



-FIG. 11.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH.

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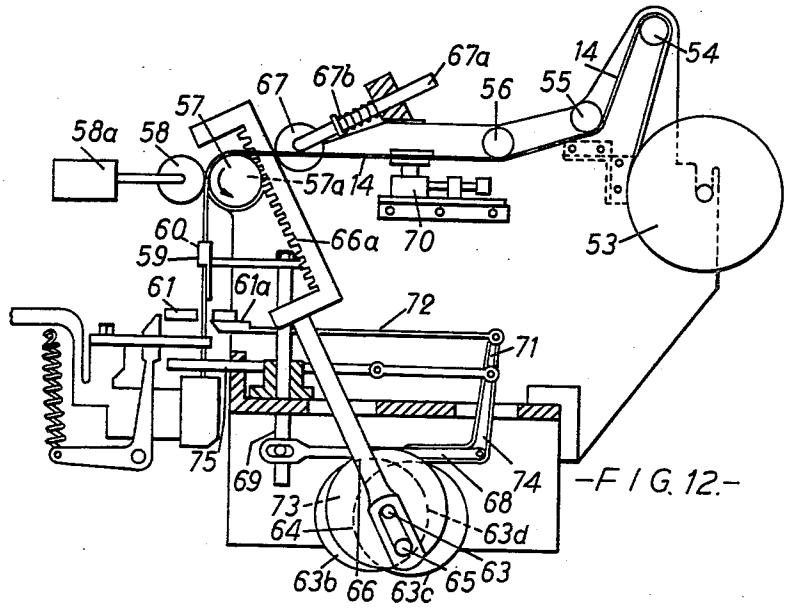
ATTY.

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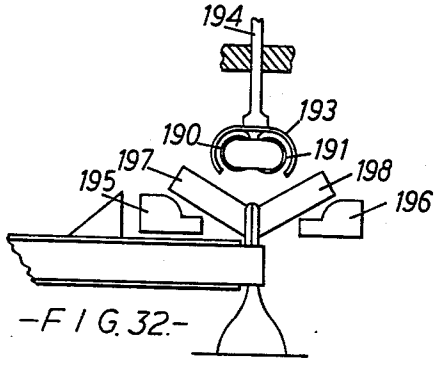
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 12.-



-FIG. 32.-

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INVENTOR:
RONALD WILLIAM BARRACLOUGH

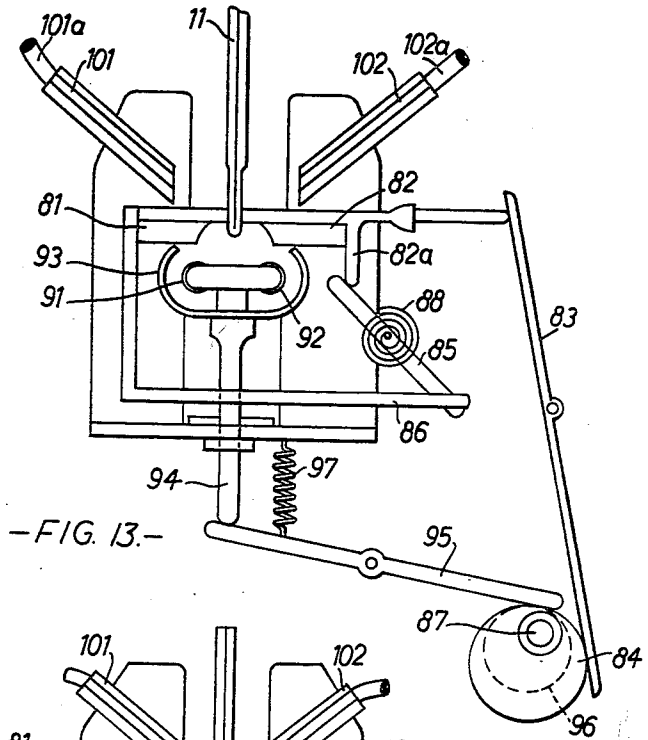
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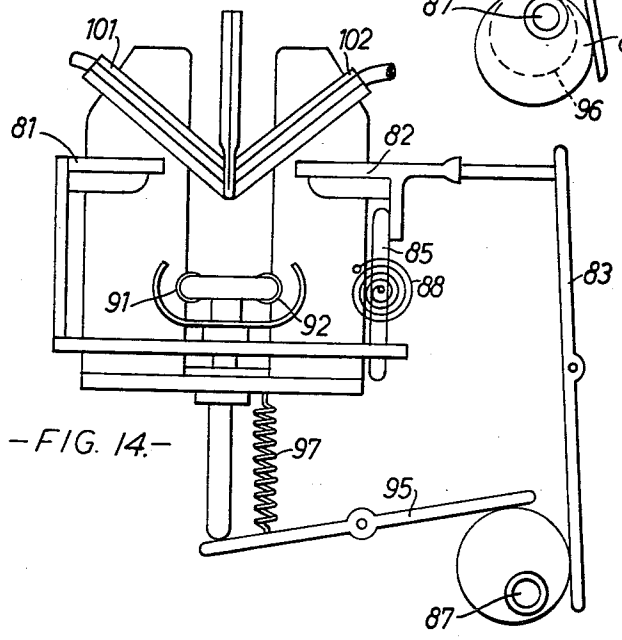
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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—FIG. 13.—



—FIG. 14.—

INVENTOR:
RONALD WILLIAM BARRACLOUGH.

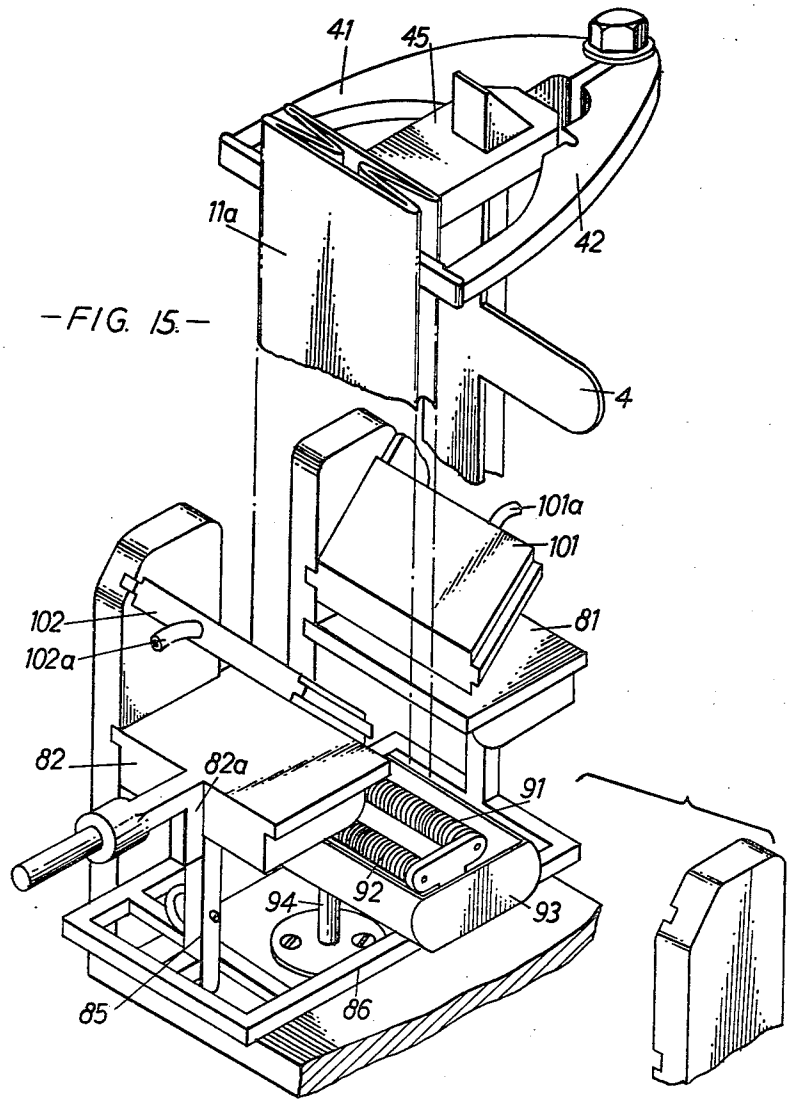
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 15.-

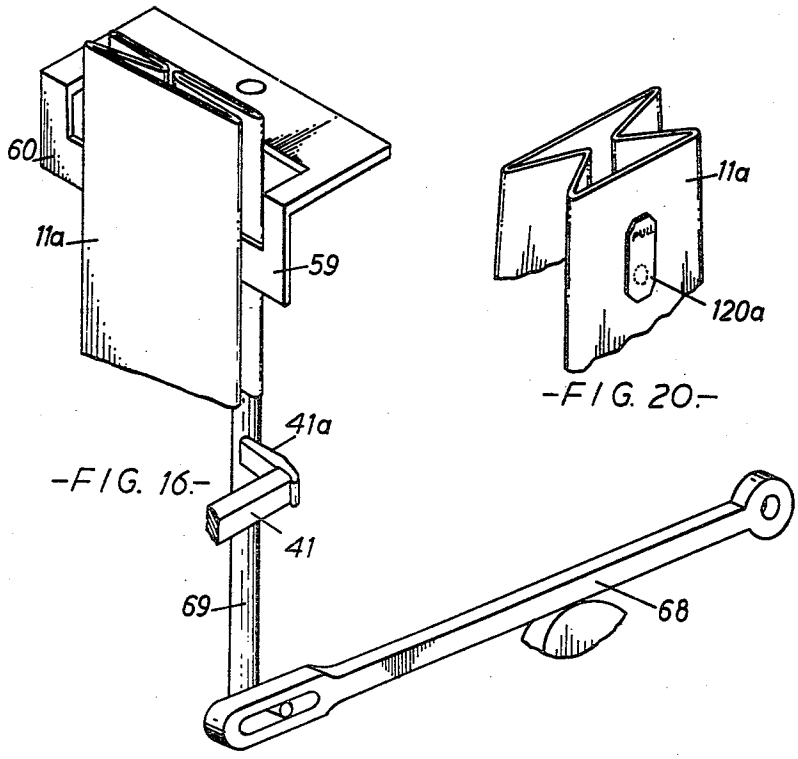
INVENTOR:
RONALD WILLIAM BARRACLOUGH.

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ATTY.

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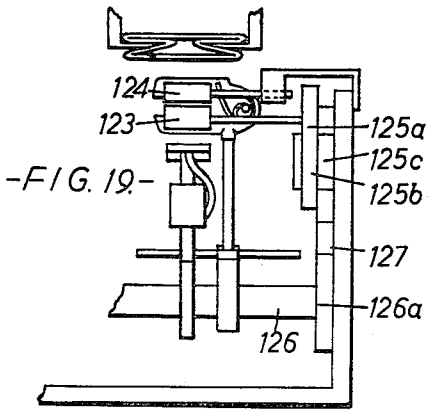
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 16.-

-FIG. 20.-



-FIG. 19.-

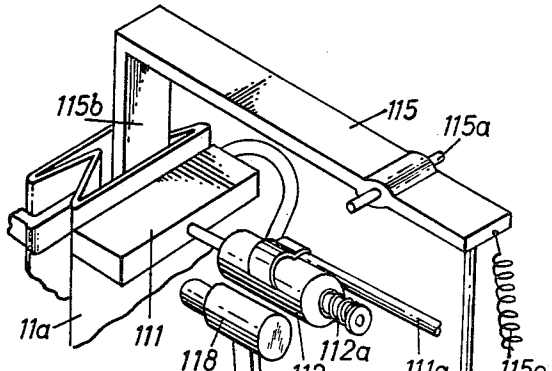
INVENTOR:
RONALD WILLIAM BARRACLOUGH.

BY Irwin S. Thompson
ATTY.

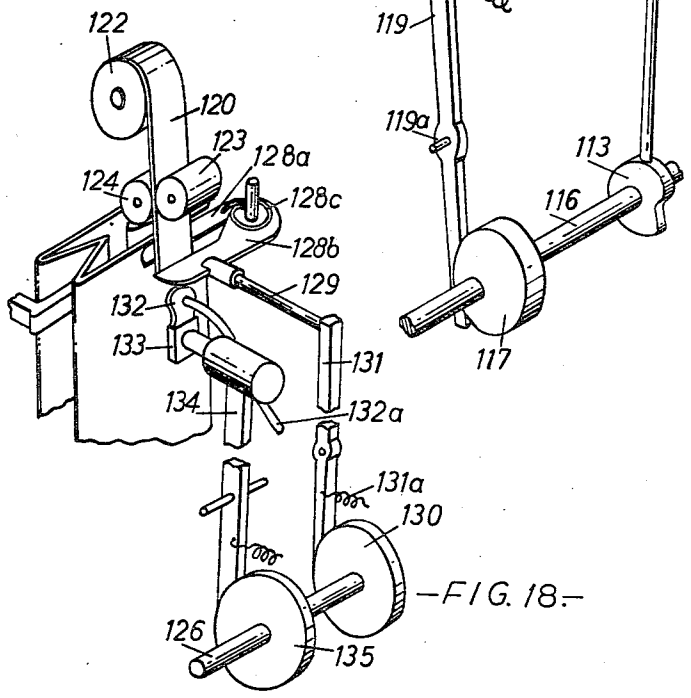
Dec. 3, 1963 R. W. BARRACLOUGH 3,112,588

MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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—FIG. 17.—



—FIG. 18.—

INVENTOR:
RONALD WILLIAM BARRACLOUGH.

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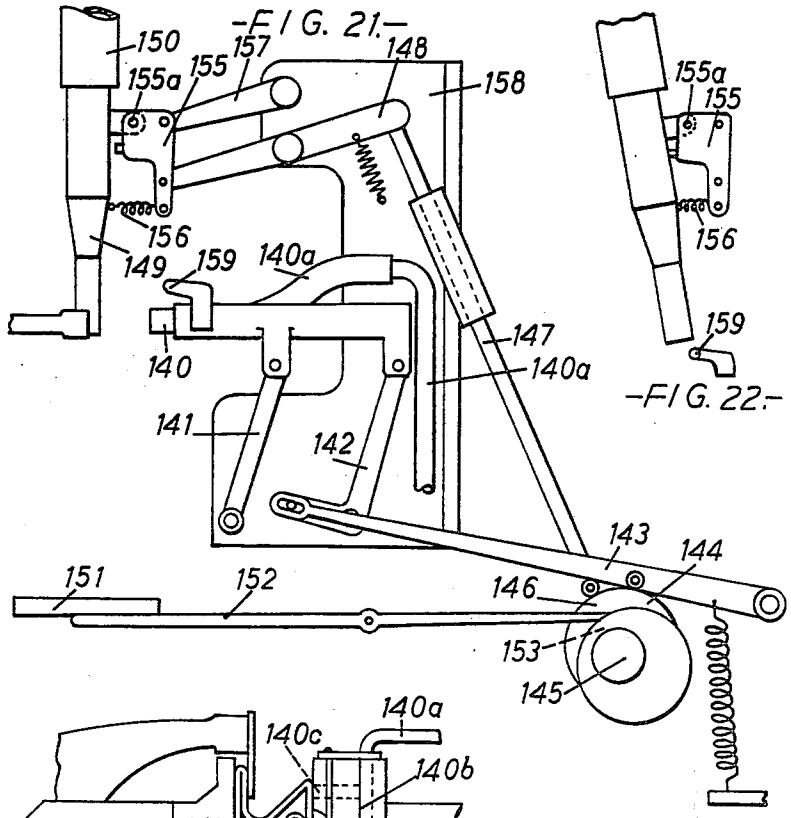
ATTY.

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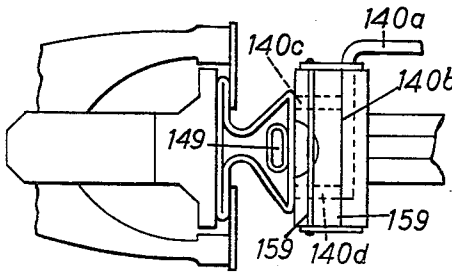
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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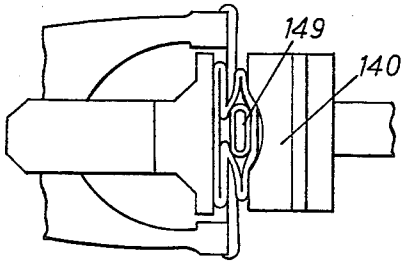
-FIG. 21.-



-FIG. 22.-



-FIG. 23.-



-FIG. 24.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH.

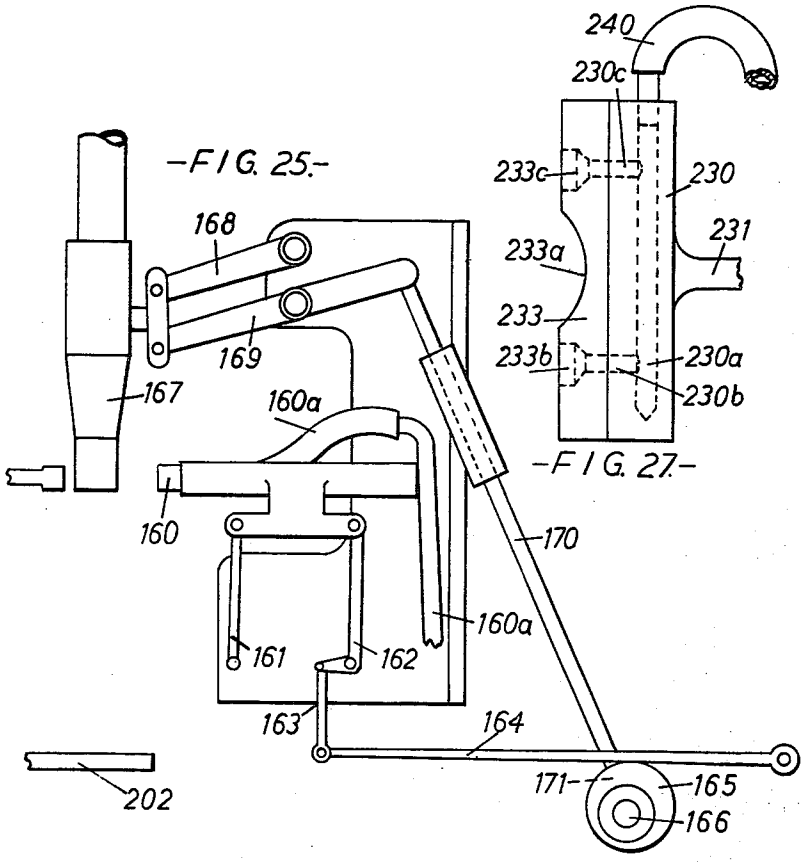
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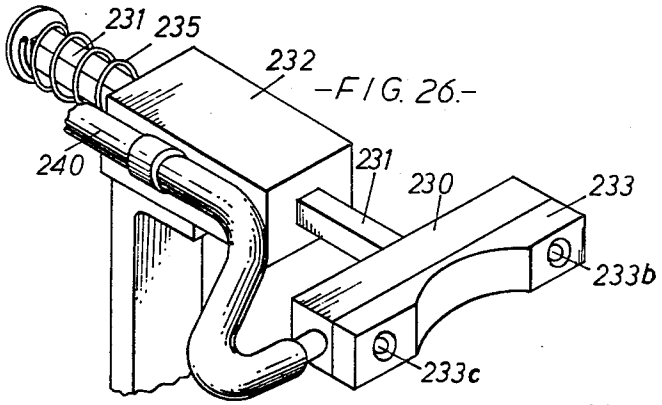
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 27.-

-FIG. 25.-



-FIG. 26.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH.

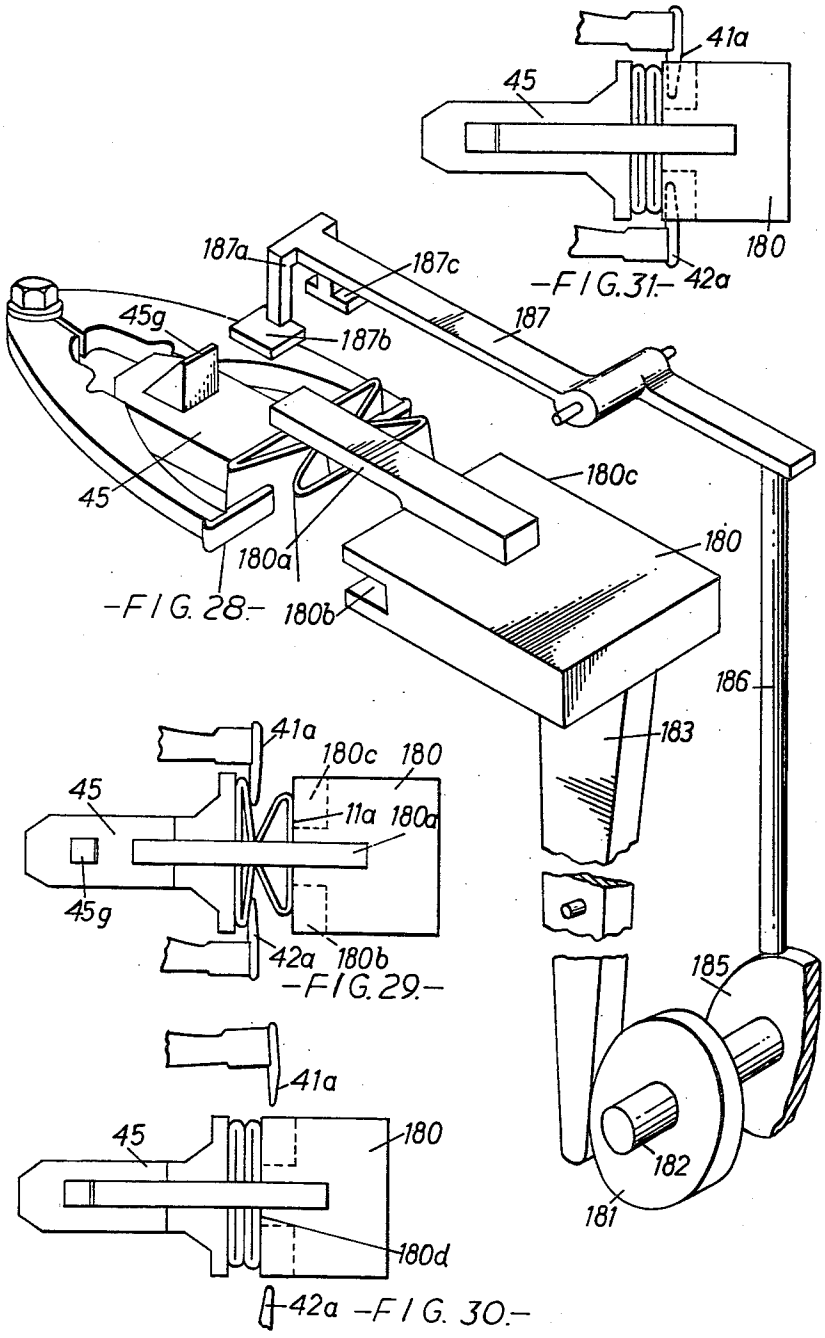
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 31.-

-FIG. 28.-

-FIG. 29.-

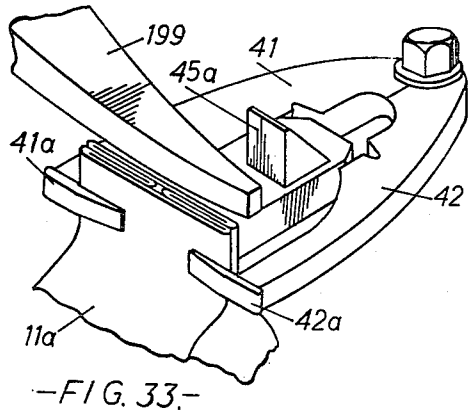
-FIG. 30.-

INVENTOR:
RONALD WILLIAM BARRACLOUGH

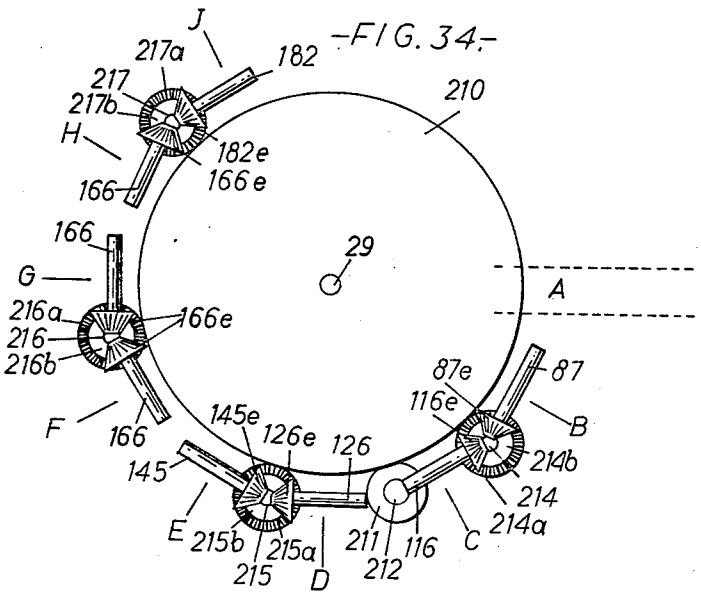
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ATTY

MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 33.-



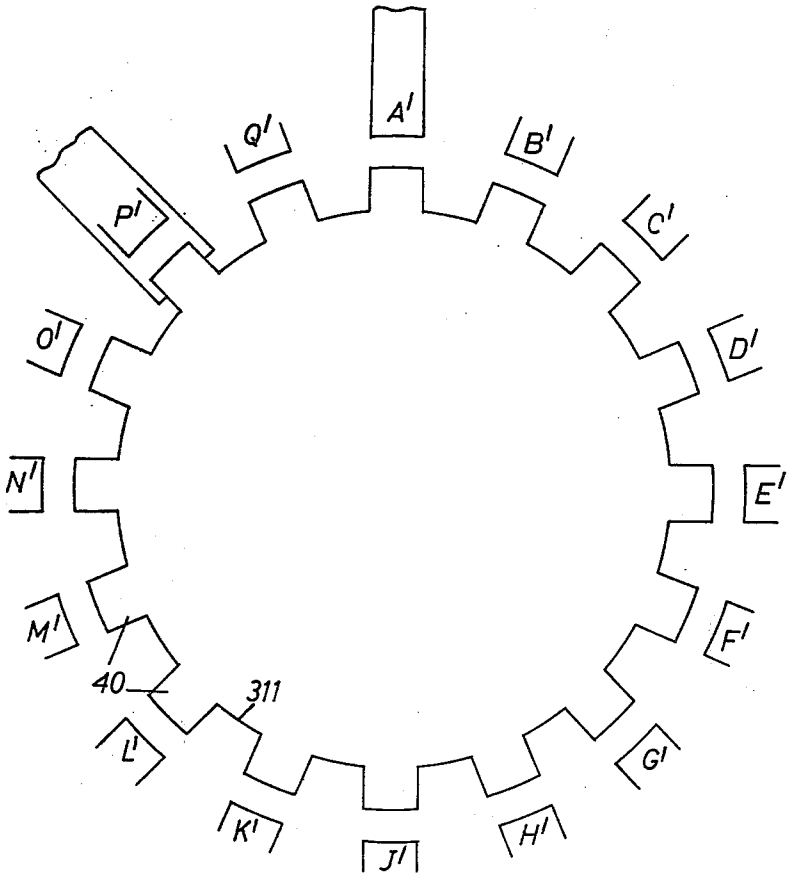
-FIG. 34.-

INVENTOR:
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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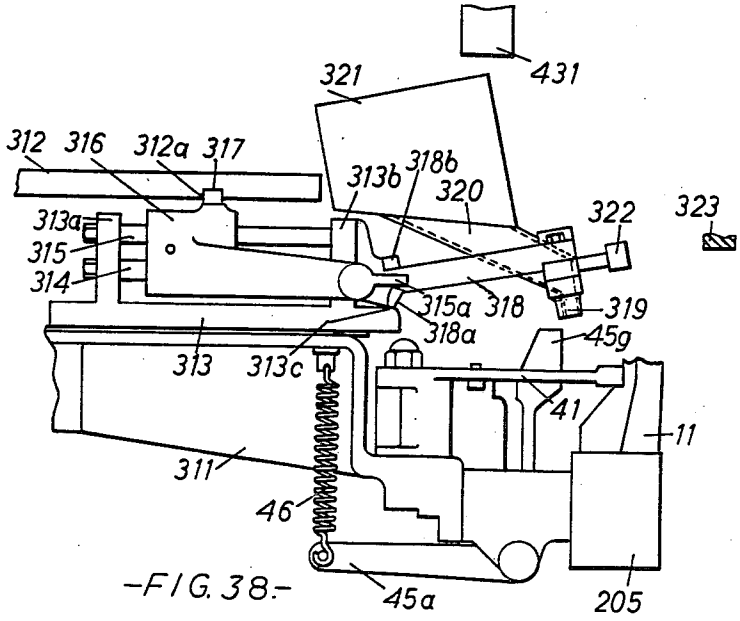
-FIG. 37.-

INVENTOR:
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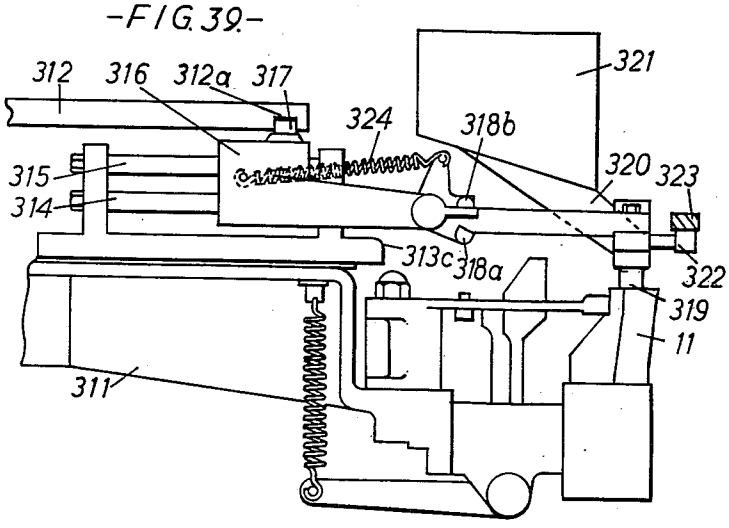
MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 38.-

-FIG. 39.-



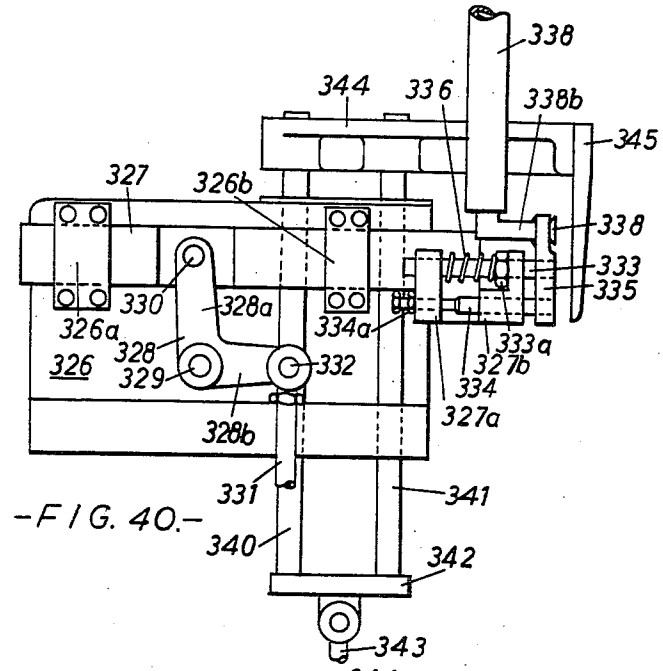
INVENTOR:
RONALD WILLIAM BARRACLOUGH.

BY Irwin S. Thompson
ATTY.

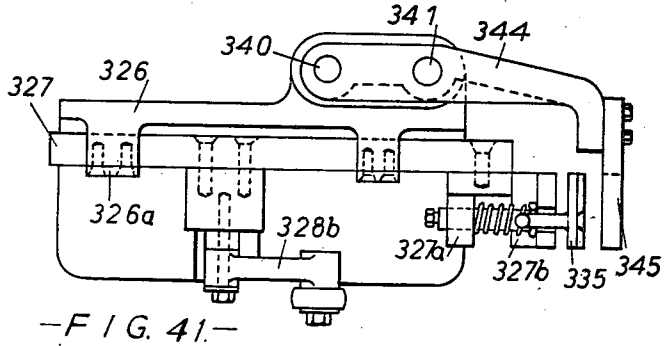
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 40.-



-FIG. 41.-

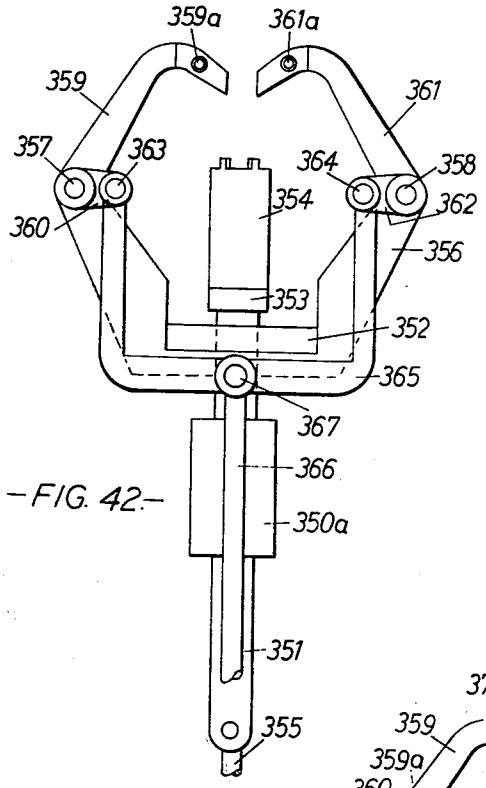
INVENTOR:
RONALD WILLIAM BARRACLOUGH

BY Irwin S. Thompson
ATTY.

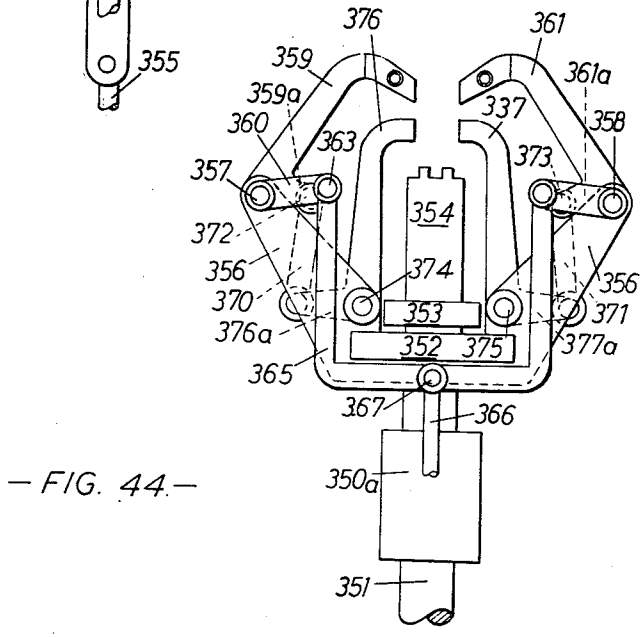
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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— FIG. 42 —



— FIG. 44 —

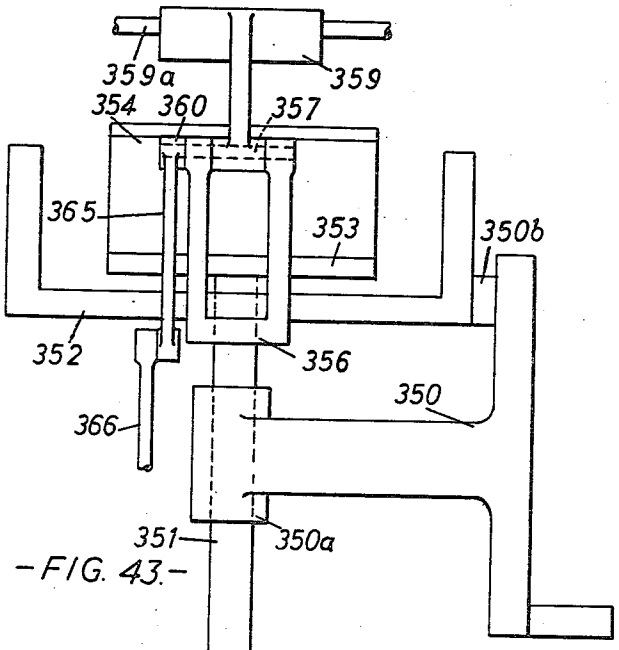
INVENTOR:
RONALD WILLIAM BARRACLOUGH

BY Irwin S. Thompson
ATTY.

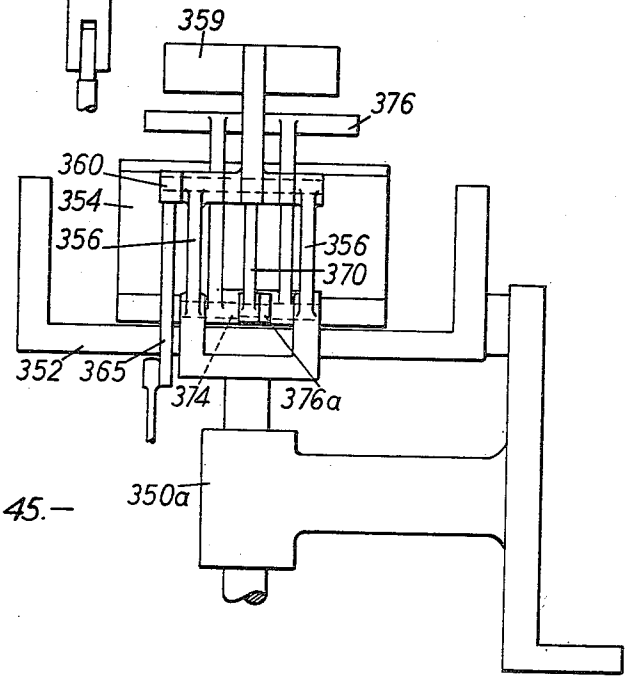
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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— FIG. 43.—



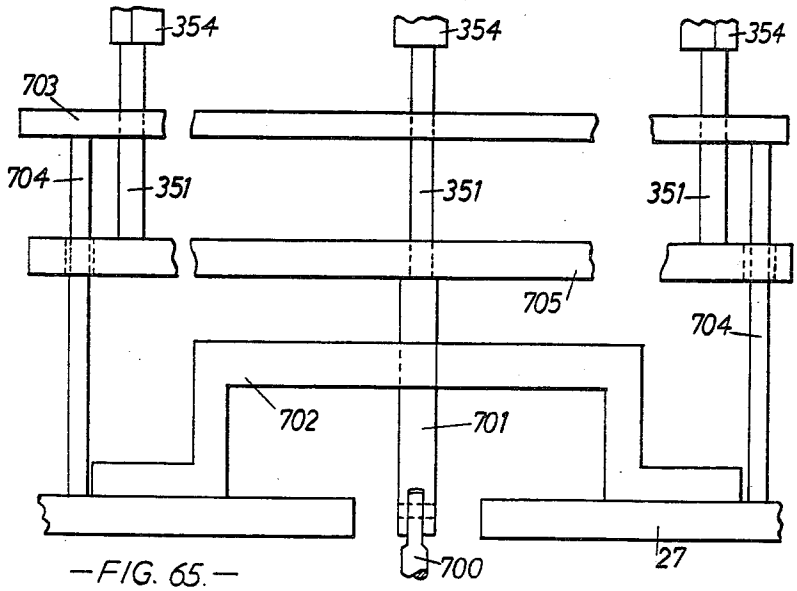
— FIG. 45.—

INVENTOR:
RONALD WILLIAM BARRACLOUGH
BY Irwin S. Thompson
ATTY.

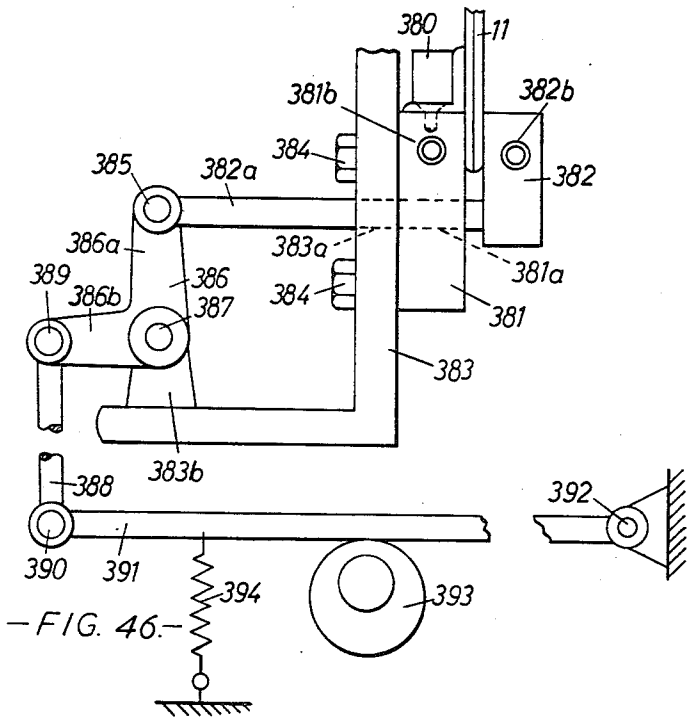
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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—FIG. 65.—



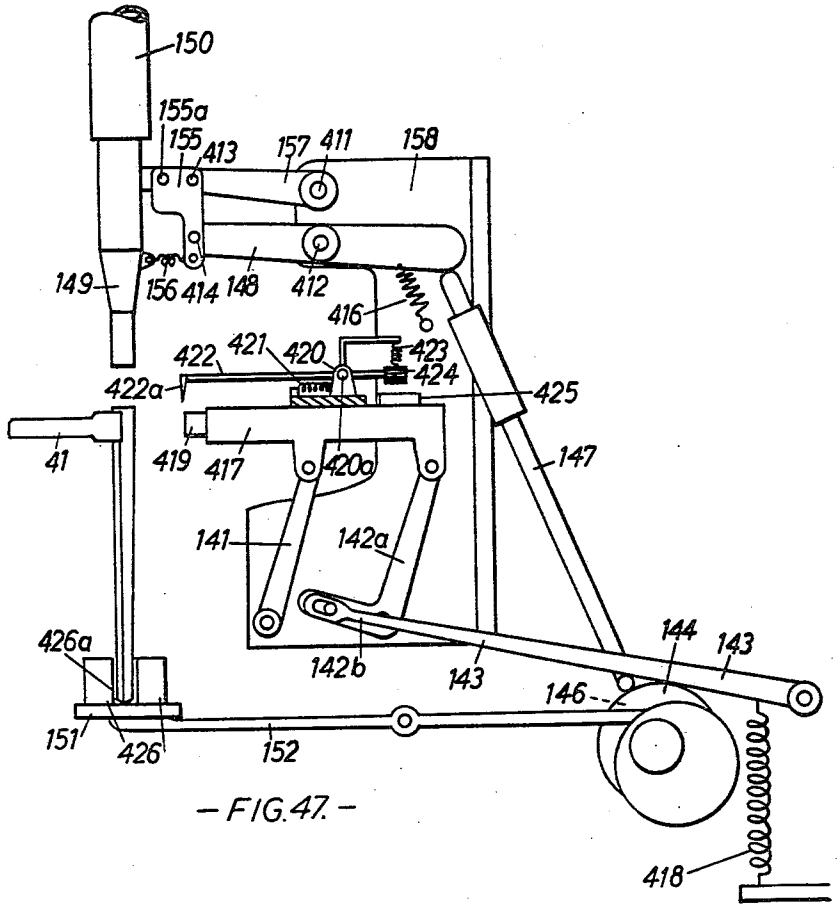
—FIG. 46.—

INVENTOR:
RONALD WILLIAM BARRACLOUGH.
BY Irwin S. Thompson
ATTY.

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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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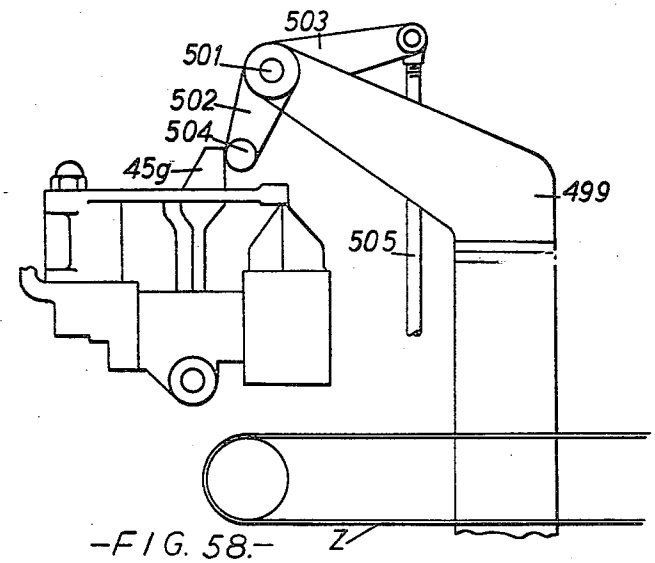
— FIG. 47. —

INVENTOR:
RONALD WILLIAM BARRACLOUGH.
BY Irvin S. Thompson
ATTY.

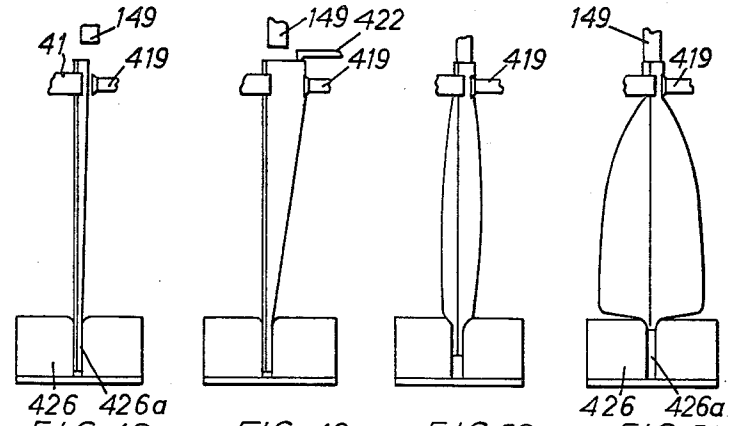
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 58.-



-FIG. 48.- -FIG. 49.- -FIG. 50.- -FIG. 51.-

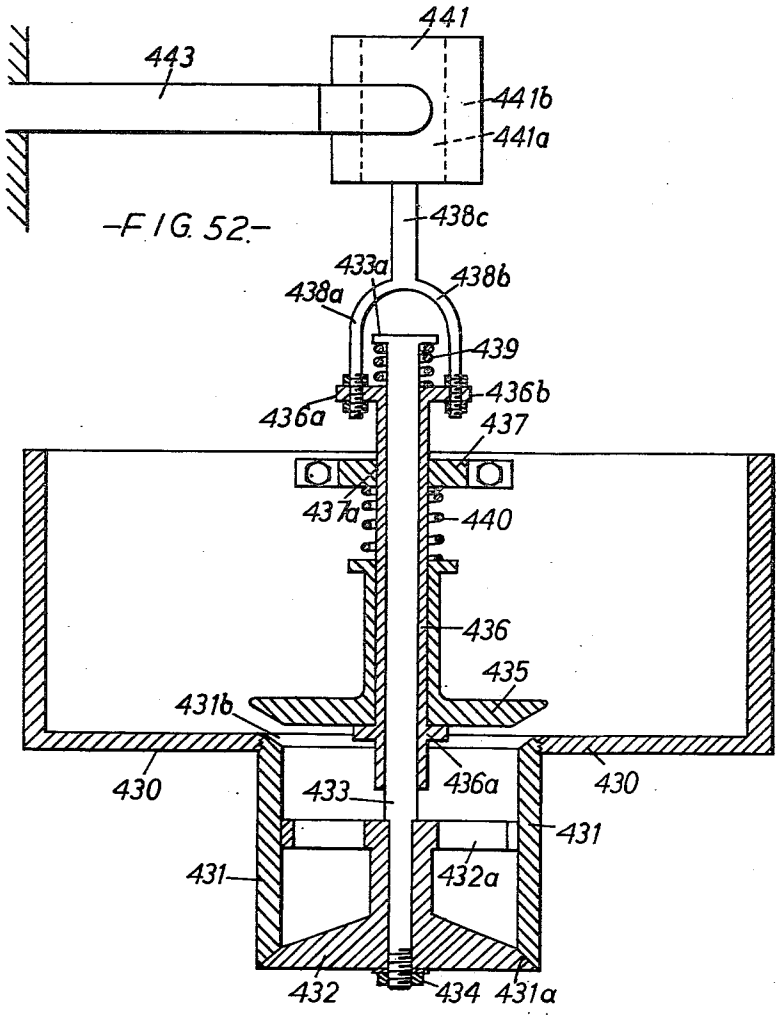
INVENTOR:
RONALD WILLIAM BARRACLOUGH.

BY Irwin D. Thompson
ATTY.

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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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-FIG. 52-

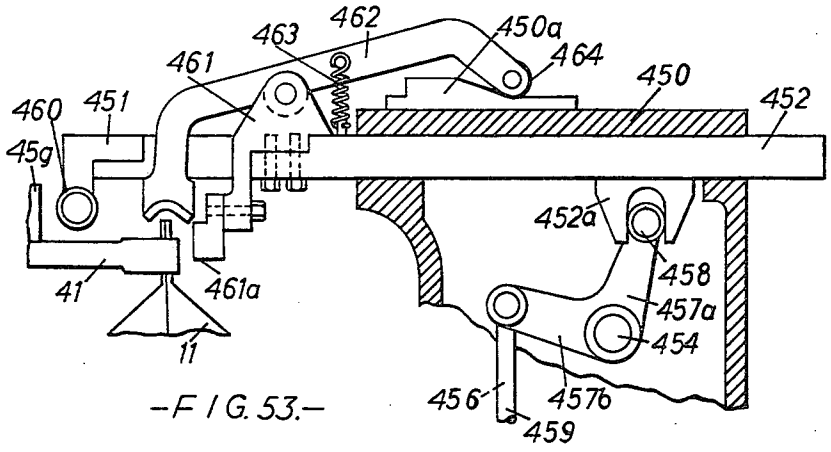
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ATTY.

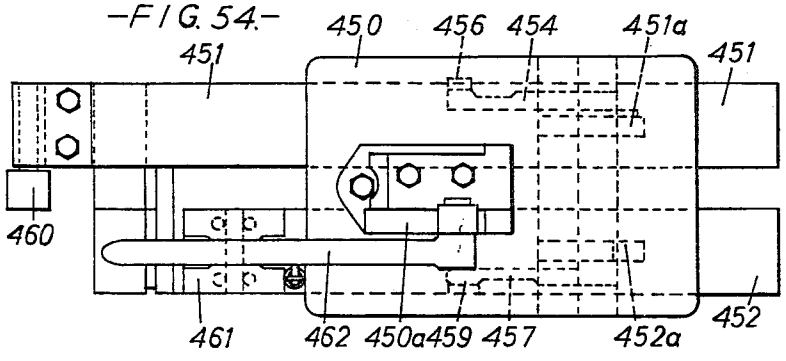
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-FIG. 53.-



-FIG. 54.-

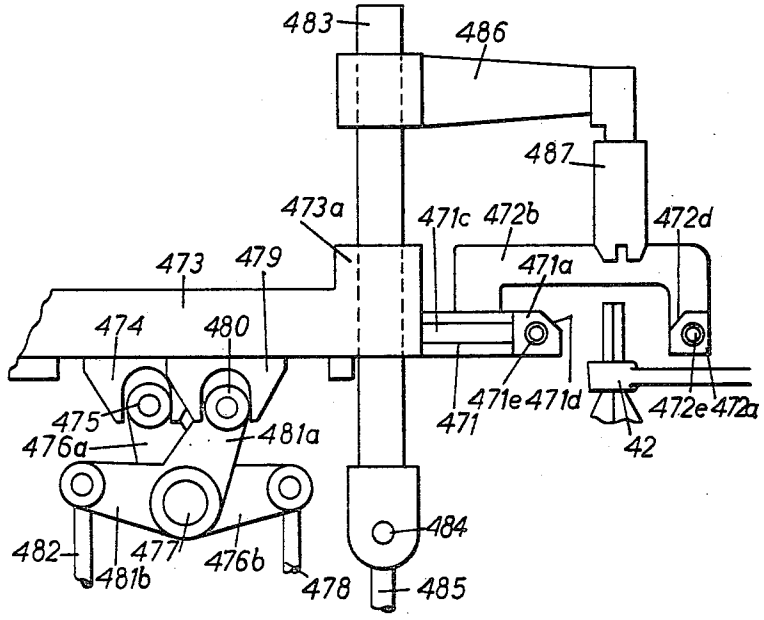
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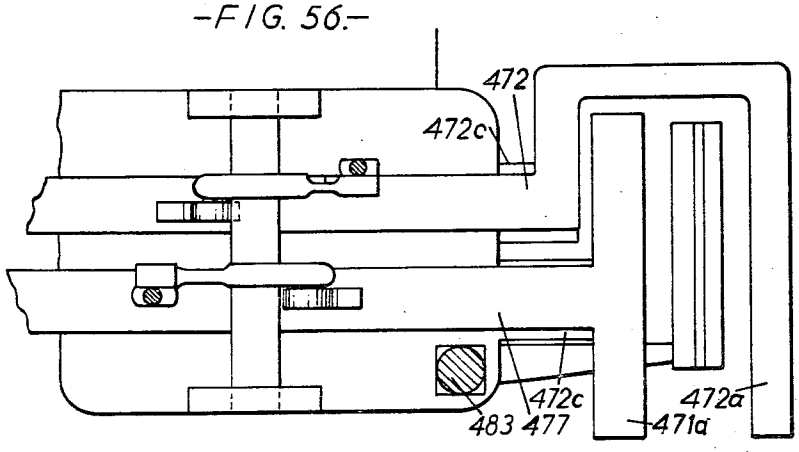
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-FIG. 55.-

-FIG. 56.-

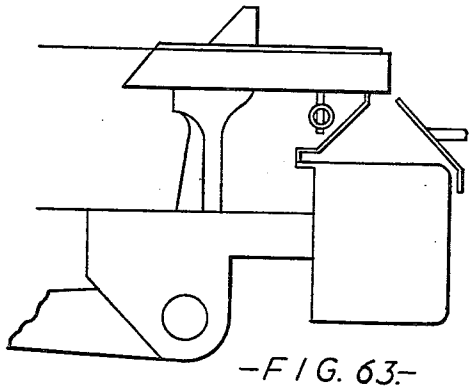


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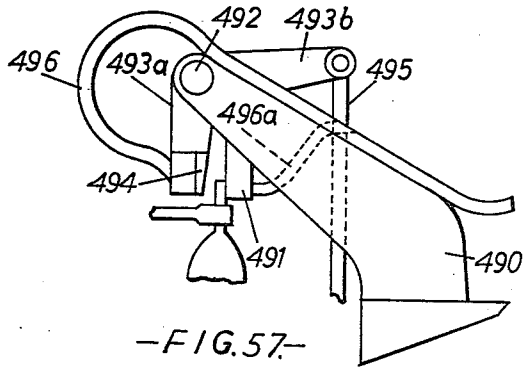
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-FIG. 63.-



-FIG. 57.-

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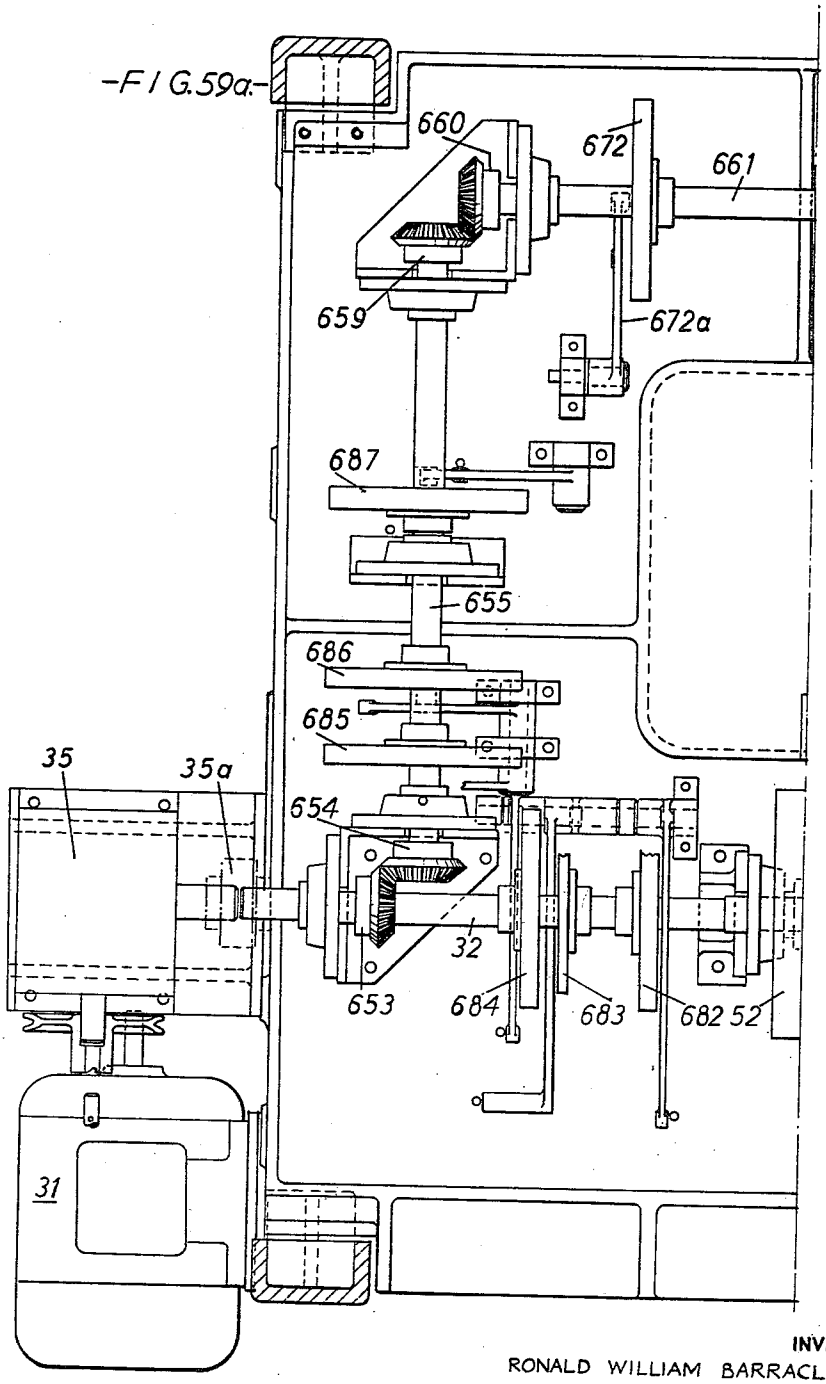
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-FIG.59a-



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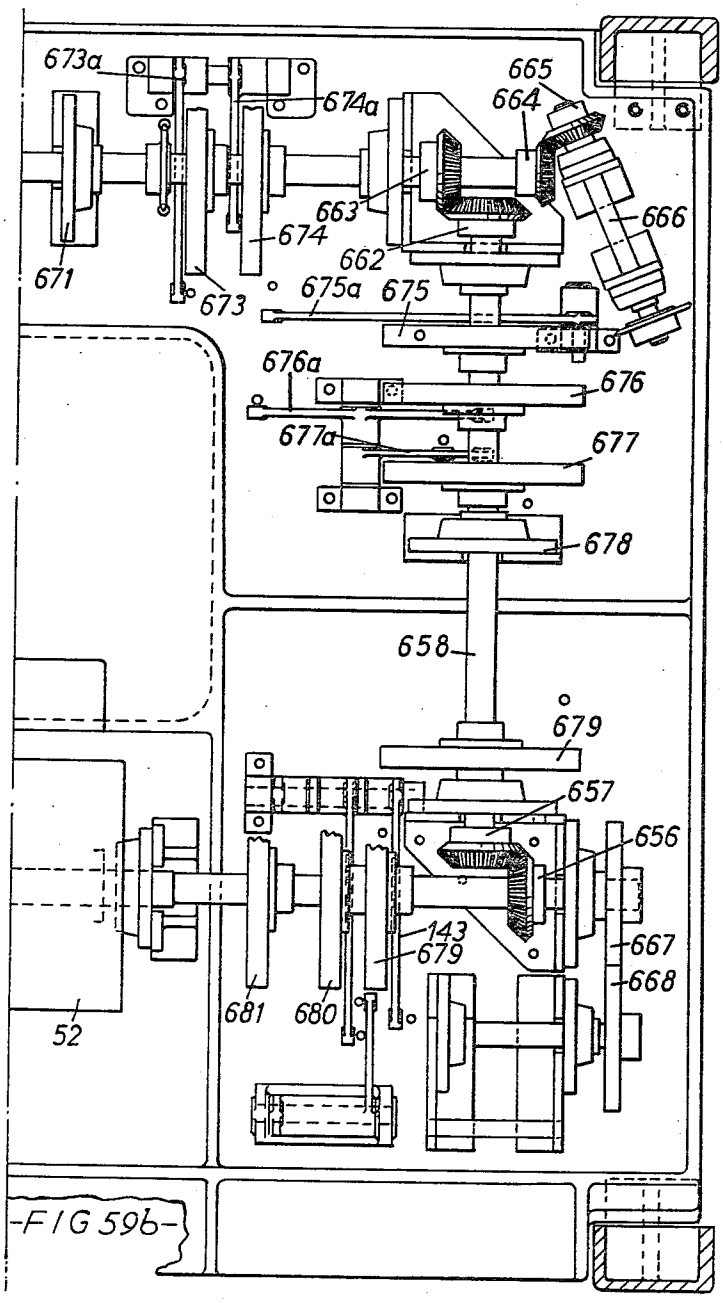


FIG 59b

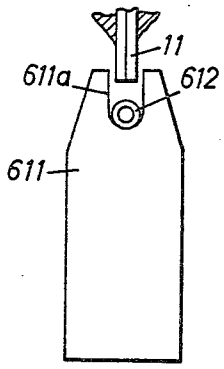
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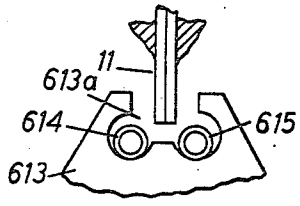
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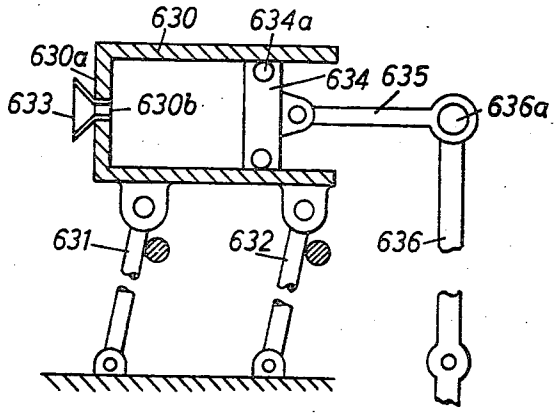


-FIG. 60.-



-FIG. 61.-

-FIG. 62.-



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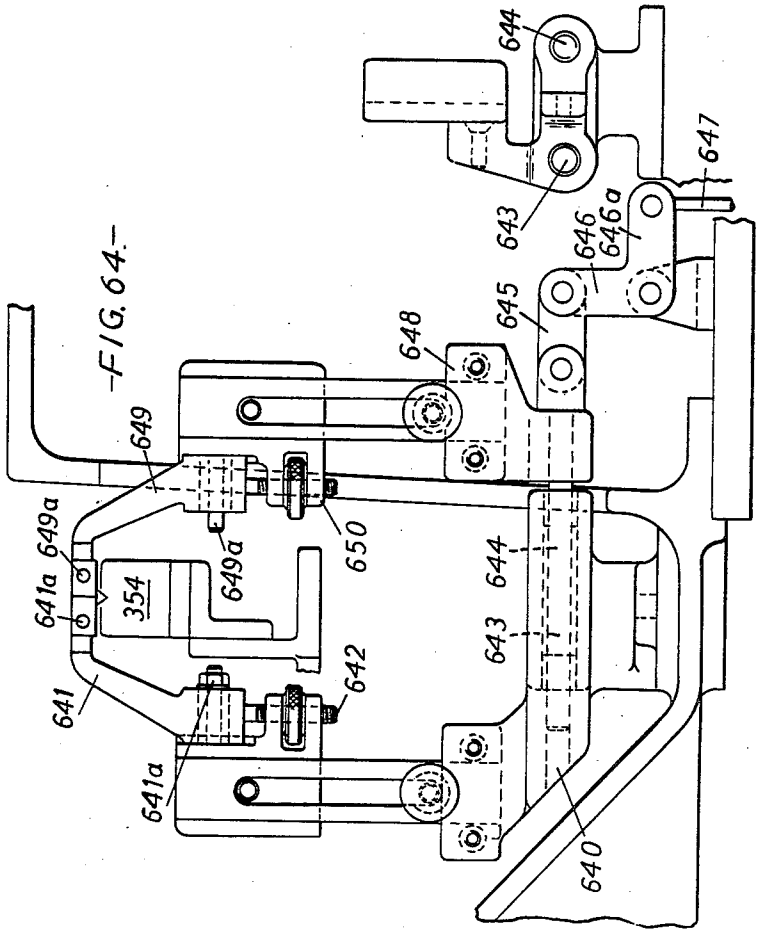
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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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FIG. 64.

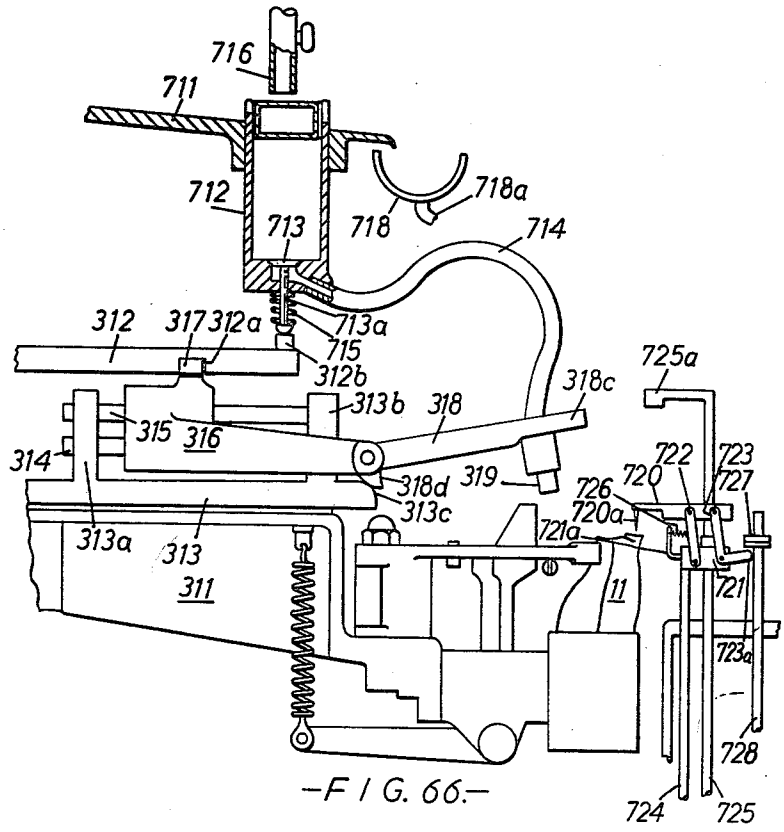


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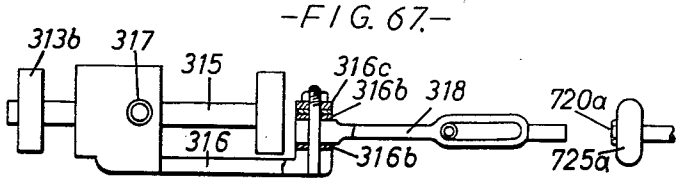
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-FIG. 66.-

-FIG. 67.-



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MACHINES FOR MAKING, FILLING AND SEALING CONTAINERS

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Filed June 5, 1961, Ser. No. 114,728
Claims priority, application Great Britain June 15, 1960
28 Claims. (Cl. 53—187)

The present invention relates to machines for constructing, charging and sealing containers and more particularly to machines for handling containers made from a semi-rigid material.

It is known to form a container from a length of tubular material having two plane sides connected at their adjacent side edges by pleated or gusseted side walls (referred to hereinafter as gusseted tubing).

The method used in forming a container from a length of gusseted tubing comprises the steps of folding one open end of the tube and sealing the open end to form the container bottom. A measured quantity of a commodity can then be charged into the container through the open end thereof and said open end closed by folding, sealing and/or labelling means.

The above method of container construction is widely used in the paper-packaging industry and in recent years has been applied successfully to the manufacture of containers from thin thermoplastic tubing.

One object of the present invention is to provide a machine for constructing containers from a length of gusseted tubing made from a semi-rigid material.

A further object of the present invention is to provide a machine for constructing, charging and sealing a semi-rigid container automatically.

According to the invention, a machine for forming a container from a length of semi-rigid gusseted tubing comprises support means for supporting a length of gusseted tubing, means for closing one end of said length of tubular material to form a container, and means for inflating the container and for forming a block bottom thereon.

According to an aspect of the invention, a machine for indexing a container through a plurality of stations comprises support means for supporting a container near its upper regions and means for indexing said support means, said support means being arranged to support the container in an open condition whilst being indexed to certain of said stations and supporting said container in a closed condition whilst being indexed to other of said stations.

According to another aspect of the invention, a machine for indexing a container through a plurality of stations comprises support means for supporting a container, a charging arrangement associated with said support means, means for indexing said support means together with said charging arrangement through a plurality of stations, feeder means arranged at one of said stations and adapted to discharge a container contents into said charging arrangement between indexing movements thereof and means for discharging said contents from said charging arrangement into the supported container whilst said charging arrangement and support means are being indexed.

According to a further aspect of the invention, a machine comprises support means for supporting a container, indexing means for indexing said suport means and said container through a plurality of stations, a charging nozzle at one of said stations for charging a proportion of the containers contents thereinto between indexing movements of the container and at least one further

charging nozzle for completing the charging of the container between indexing movements thereof.

According to a still further aspect of the invention, a machine comprises a plurality of support means for supporting containers, indexing means for indexing said support means to pass each container sucecssively through a plurality of stations, a measuring vessel associated with each support means and arranged to discharge its contents into a container supported in said support means between a first container-charging station and a last container-charging station and feeder means arranged at stations, not being container charging stations, which discharge container contents into each measuring vessel as each measuring vessel becomes aligned therewith.

The machine preferably includes a plurality of gusseted tubing supporting means arranged equally spaced about a circular turret and the turret is adapted to index the gusseted tubing supporting means simultaneously whereby each supporting means passes sucecssively through said stations.

Semi-rigid containers have, in more recent years, been used extensively for packaging liquids and more particularly soft drinks and milk. In such cases, it is usual to weaken an area of the container walls or top whereby the weakened area can be easily broached and a drinking straw or the like passed into the interior of the container.

In a preferred embodiment a machine in accordance with the present invention comprises a circular turret mounted on a shaft and having a plurality of gusseted tubing supporting means equally spaced about, and projecting forwardly from the peripheral edge of the turret. In this embodiment, twelve gusseted tubing supporting means are mounted on the turret, twelve fixed stations are arranged equally spaced about the turret and the turret is adapted to be indexed periodically through an angle of 30° to bring each and every gusseted tubing holding means into alignment with a fixed station during dwell periods of the turret. It can therefore be seen that each gusseted tubing supporting means passes through twelve stations during one complete revolution of the circular turret and after each indexing movement of the turret the gusseted tubing supporting means will be located exactly opposite a fixed station.

The circular turret is indexed by a disc secured to the lower end of the turret shaft and adapted to present a plurality of rollers successively to a cam mounted on a uniformly rotating driving shaft. The rollers are equal in number to the number of gusseted tubing supporting means and are equally spaced about the circumference of a circle having its centre on the axis of rotation on said turret shaft. The cam is in the form of a cylinder with a cam track extending from side to side across the curved surface thereof, the width of the cam between the two parallel sides being at least equal to the pitch of any pair of adjacent rollers on the disc. In operation, the cam is rotated at constant speed and a roller is engaged in the cam track at one side of the cam, is passed by the cam track across the curved surface of the cam and expelled from the cam on the opposite side of the cam to its entry. As one roller is expelled from one side of the cam, the succeeding roller is engaged in the cam track on the opposite side of the cam. The cam track includes a dwell portion whereby a roller engaged in said dwell portion is held stationary during a set angle of rotation of the cam and this dwell period of the roller and the disc constitutes the dwell period of the turret.

It can now be seen that the turret, turret shaft, disc and rollers are indexed while a roller is traversing the first portion of the cam track, the indexed assembly is held stationary whilst the roller traverses the dwell portion of the cam, and a new indexing movement starts as the engaged roller leaves the dwell portion of said cam.

The initial part of an indexing movement is therefore carried out by a roller leaving the cam track and the latter part of the indexing movement is carried out by the succeeding roller.

With a gusseted tubing supporting means located at the first station a continuous length of gusseted tubing is advanced until a predetermined length of tubing has been advanced into the gusseted tube supporting means. The supporting means then closes to grip the advanced length of tubing and a shearing arrangement closes to sever the length supported by the supporting means from the continuous length. The supporting means, with the length of gusseted tubing supported therein, is then indexed by the turret to a second station where a heat sealing arrangement closes and seals the lower end of the tubing thereby forming the length of gusseted tubing into a container. In this operation the two parallel plane surfaces of the bag and the gusseted side walls therebetween, are welded together in a single transverse seam.

The container, held in the supporting means is then indexed to a punching station where a punch strikes one plane side of the container to weaken an area thereof. At the next station, a label is applied across the weakened area to prevent accidental breakage thereof or seepage of the container contents therefrom.

After the fourth indexing movement of the turret, the supporting means locate the container at an air station where an air pipe is introduced into the upper open end of the container, the open end of the container is squeezed tightly about the air pipe and air or an inert gas under pressure is introduced thereinto. This causes the container to inflate and adopt a substantially rectangular section over the greater part of the length whilst the regions of the container adjacent the lower edge seal are deformed to form a relatively flat base on the container. At this stage, it has been found most helpful in forming a flat base, to apply a pressure in an upward direction to the lower regions of the bag and therefore at this station, a platform is arranged beneath the container, which platform lifts the lower regions of the container during the blow-open operation. The air tube is retracted from the mouth of the container and the turret indexes the container to the next station where the charging of the container contents will commence.

The charging of the container contents is accomplished by introducing a nozzle into the upper open end of the container and discharging a measured quantity of the container contents therethrough. It has been found difficult to discharge the whole of the container contents into the container in one operation within the dwell period of the turret, particularly where the charge is a liquid, and the machine of this embodiment proposes to charge the container in three stages. Stations 6, 7 and 8 therefore, are charging stations, each being arranged to discharge part of the container contents into the container through a nozzle, and after the final charging station (station 8), the container is indexed to a station where its open end is closed, and then to a sealing station where the upper end of the bag is sealed. At a final station the container is released from the supporting means and discharged from the machine.

The supporting means are then indexed through the last station, which is non-operative, before being returned to the first station where they receive a new gusseted tubing length.

One point of considerable importance in a machine of this type is in the construction of the gusseted tubing supporting means. It can be seen that these supporting means must support the gusseted tubing length and at the same time must allow the upper end of the tubing length to open freely. The holding means are therefore constructed as jaws comprising one back jaw, which engages one plane side of the tubing (this being the plane side adjacent the turret), and a pair of side jaws, adapted to enter into the pleat or gusset between the two plane sides, the back jaw being spring loaded against said side jaws in a tubing supporting condition. By this means, the gusseted tubing length is supported between the back jaw and the side jaws which engage only first fold of the pleated or gusseted sides of the tubing and therefore the forward plane side of the tubing i.e. that side remote from the turret, can be pulled outwardly to allow access to the interior of the container. The side jaws are pivotally mounted on a pivot pin secured to the turret and the rear jaw is slidably arranged between the two side jaws and adapted, when displaced rearwardly, to present inclined surfaces to rollers carried by each side jaw thereby causing said jaws to open outwardly against the tension of a spring. When the rear jaw is allowed to return from its rearward position the rollers ride down the inclined surfaces to allow the side jaws to close under their spring load.

The gusseted tubing is arranged as a continuous length mounted on a roll and is led off from the roll through guide rollers and an intermittent roller drive to the first station. Reciprocating guide members entered in the pleat between the two plane sides cause the gusseted tubing to open slightly and these reciprocating guides, in a downward movement during a dwell period of the turret, guide the advancing gusseted tubing such that the side jaws of the supporting means enter into the first pleat of said tubing. In this condition, the rear jaw is in its rear position and the gusseted tubing is therefore quite free to be fed in the manner described above. When the required length of tubing has been advanced, the drive to the tubing stops and the rear jaw of the supporting means is advanced, thereby closing the side jaws, and the gusseted tubing is engaged. A shearing arrangement then severs the tubing to leave a container length of tubing supported by the jaws of the holding means.

In stations 3, 5, 6, 7 and 8 in the above embodiment, the first operation which must be accomplished when a supporting means arrives and is located thereat, is to open the upper end of the container in order to allow an insert thereinto i.e. a rear plate for the punch operation, the air pipe at station 5 or the charging nozzles at stations 6, 7 and 8. The opening of the bag is accomplished by a suction pad which advances against the outside plane side of the tubular length, or the container, remote from the turret and then returns to pull the container mouth open. This displacement of the suction pad is accomplished through a lever system from a cam shaft associated with each of said stations.

In the closing of the container at station 9, it is necessary to change the grip of the side jaws from the first pleat forward of the turret to a position where they can engage forwardly of the plane side of the container remote from the turret in order to achieve a "closed concontainer" condition. This is accomplished by supporting the container on a platform, advancing a pad against the outermost plane side and at the same time causing the rear jaw to be displaced rearwardly. As the rear jaw is displaced the side jaws are displaced outwardly until they clear the sides of the container and as the pad continues to advance, the container mouth is closed and pushed rearward of the closure position of the side jaws. The pad then withdraws and in doing so, allows the rear jaw to advance, thereby allowing the side jaws to close, and the side jaws enter recesses cut in the forward corners of the pad, thus enabling the side jaws to close forwardly of the container mouth. As the side jaws close forward of the front side of the container and the rear jaw is advancing to engage the rear side thereof, a levelling device engages the top edge of the container to level and locate said top edge at a predetermined level. It can thus be seen that all the containers leave this station with their top edges held at a constant level and by this means, uniform heat sealing of the top edges can be effected.

In the above embodiment, the 11th stage is shown as

inoperative and it will, of course, be appreciated that this stage can be used as for example, by inserting a ninth filling station at station 9 and retarding stations 9, 10 and 11 by one station.

The invention will be described further by way of example with reference to FIGS. 1 to 67 of the accompanying drawings in which:

FIGS. 1–5 inclusive show the stages for forming, filling and sealing a container,

FIG. 6 is a side view of a machine showing the arrangement of some of the principal components,

FIG. 7 is a plan view of the turret showing the container opening arrangements,

FIG. 8 is a plan view of a jaw assembly in accordance with the invention,

FIG. 9 is a side view of the jaw assembly shown in FIG. 8,

FIG. 10 is a side view of a jaw assembly from below showing the jaws in the open condition,

FIG. 11 is a detail view of a section of the rear jaw lever assembly,

FIG. 12 is a detail side elevation of the roll feeding assembly,

FIG. 13 is a side elevation of the bottom sealing assembly, the assembly being shown in the heating position,

FIG. 14 is a side elevation of the assembly shown in FIG. 13 in the clamping position,

FIG. 15 is a perspective view of the assembly shown in FIG. 13,

FIG. 16 is a detail perspective view of the tube guiding arrangement,

FIG. 17 is a perspective view of the punching assembly,

FIG. 18 is a perspective view of the labelling assembly,

FIG. 19 is a partial plan view of the assembly shown in FIG. 18,

FIG. 20 is a partial view of a container with a label attached thereto,

FIG. 21 is a side view showing the container blow-open assembly,

FIG. 22 is a detail showing the air tube of FIG. 21 in the inclined position,

FIG. 23 is a detail plan view showing the container mouth in an open condition for receiving the air tube,

FIG. 24 is a plan view showing the air-tube inserted in the mouth of the container,

FIG. 25 is a side view showing a container charging arrangement,

FIG. 26 is a perspective detail showing a container-opening solenoid arrangement,

FIG. 27 is a detail plan view of the suction head of a container-opening solenoid,

FIG. 28 is a perspective view showing the arrangement for changing the grip of the jaws,

FIG. 29 is a detail plan view showing the arrangement of FIG. 28 advancing to open the jaws,

FIG. 30 shows the arrangement of FIG. 29 with the jaws in the full retracted position,

FIG. 31 shows the arrangement of FIG. 29 after the complete operation with the jaws closed about the outside of the container,

FIG. 32 shows a diagrammatic side view of a top sealing arrangement,

FIG. 33 is a perspective detail view showing the ejection cam,

FIG. 34 is a detail plan view showing the driving arrangement to the individual stations,

FIG. 35 is a detail perspective view of a driving arrangement to a station,

FIG. 36 is a detail perspective view of a container and container-opening solenoid at a container charging station,

FIG. 37 is a diagrammatic plan view of a 16 stage machine,

FIG. 38 is a side view of a charging arrangement in the elevated position,

FIG. 39 is a side view of the charging arrangement shown in FIG. 38 in the charging position,

FIG. 40 is a side view of the punching arrangement at station B',

FIG. 41 is a plan view of the punching arrangement shown in FIG. 40,

FIG. 42 is a side view of the heating arrangement at stations B' and C',

FIG. 43 is a side view of the arrangement shown in FIG. 42,

FIG. 44 is a side view of the bottom heating and sealing arrangement at station D',

FIG. 45 is a side view of the arrangement shown in FIG. 44,

FIG. 46 is a side view of the bottom cooling arrangement at station E',

FIG. 47 is a side view of the blow open arrangement at station F',

FIGS. 48, 49, 50 and 51 show progressively the formation of a block bottom on a bag at station F',

FIG. 52 is a section through a feeder for the charging arrangements,

FIG. 53 is a side view partially in section of the change-over arrangement at station L',

FIG. 54 is a plan view of the arrangement shown in FIG. 53,

FIG. 55 is a side view of the heating arrangement at stations M' and N',

FIG. 56 is a plan view of the arrangement shown in FIG. 55,

FIG. 57 is a side view of the top sealing unit,

FIG. 58 is a side view of the ejection arrangement at station P',

FIGS. 59*a* and 59*b* when placed side by side show a diagrammatic plan view of a driving arrangement for the stations,

FIG. 60 is a section through one type of heater assembly,

FIG. 61 is a partial section through an alternative heater assembly,

FIG. 62 shows an alternative arrangement for the suction pads,

FIG. 63 shows a gusseted tubing supporting means with a bag former plate applied thereto,

FIG. 64 is a side view of an alternative arrangement for the bottom heating and sealing jaws,

FIG. 65 is a diagrammatic view showing a method of mounting assemblies at three stations for displacement by a single cam in the main drive,

FIG. 66 is a diagrammatic side view showing an alternative container charging arrangement partially in section, and

FIG. 67 is a plan view showing the carriage and arm arrangement shown in FIG. 66, partially in section.

In the present invention, a length of gusseted tubing is to be formed into a container, the container is to be charged with its contents and then finally sealed. The progressive stage through which the tubular material is passed to the completed, charged and sealed condition are shown in FIGS. 1 to 5 inclusive.

In the drawings, a length of gusseted tubing (generally indicated by numeral 11) comprises two plane and substantially parallel sides 11*a* and 11*b* connected at their adjacent side edges by pleated or gusseted side walls 11*c* and 11*d*. The gusseted tubing 11 is sealed across its lower open end 12 to close one end of the tubing 11 thereby forming a container, the end 12 being clamped during the sealing operation to weld together the two sides 11*a* and 11*b* and the sides 11*c* and 11*d* therebetween in a single seam.

In the next stage, a fluid media under pressure is introduced into the partially formed container through the upper open end 13 thereof, which fluid media causes

the container to inflate. As the internal pressure increases the sides 11*a* and 11*b* are forced apart and walls 11*c* and 11*d* tend to form substantially plane side walls over the greater part of their length.

Due to the lower edges of walls 11*c* and 11*d* being welded between side walls 11*a* and 11*b* at the lower end 12 the tendency of side walls 11*c* and 11*d* to adopt a plane configuration is prevented in the region adjacent the weld and this causes the lower end of the container to become distorted, the side walls 11*c* and 11*d* folding transversely and the side walls 11*a* and 11*b* folding inwardly until the lower part 12 of the container is folded into a relatively flat base. The gusseted tubing 11 is made from a semi-rigid material and therefore the folds adopted by the lower portion of the tubing 11 are retained even when the pressure fluid media is released and the internal pressure returns to atmosphere. The fluid media may be compressed air or a compressed inert gas as for example nitrogen. Although a sufficient increase in the internal pressure can alone form the lower part of the container into a relatively flat base, the process can be assisted by applying an external upward force against the regions adjacent the weld.

When the pressurised fluid media has been removed the container will have adopted a configuration substantially as shown in FIG. 3, the free or upper walls forming a container of substantially rectangular section and the container contents can be charged into the container through the open end 13 thereof.

In the final stage the open end 13 of the container is closed, clamped and sealed as shown in FIG. 5, the seal once again welding sides 11*a* and 11*b*, with walls 11*c* and 11*d* therebetween, into a single seam.

In the illustrated embodiment of a machine in accordance with the invention a length of gusseted tubing is to be severed from a continuous length of such tubing and is progressively passed through a series of stations where the severed length is formed into a container, is punched to weaken an area in one wall, is labelled to protect the weakened area, the so formed container is charged with a commodity and is finally sealed and ejected from the machine.

The machine generally comprises a frame of four upright frame members 21, 22, 23 and 24 which form the supporting columns for a rectangular upper frame 25, a base plate 26 and an intermediate plate 27. A turret 28 mounted on a vertical shaft 29 is arranged between the intermediate plate 27 and upper frame 25, said intermediate plate 27 supporting a bearing block 30 for shaft 29, and shaft 29 passes through intermediate plate 27 to the underside thereof.

The drive for the assembly is provided by one electric motor 21, mounted on base plate 26, which drives a main driving shaft 32, rotatably supported in bearings 33 and 34 on the underside of intermediate plate 27, the drive from motor 31 to shaft 32 being by way of a gear box 35, and an endless band 36 passing over pulleys 37 and 38.

The turret 28 is arranged to carry twelve gusseted tubing supporting means, generally indicated by numeral 40, equally spaced around its peripheral flange 28*a* and is indexed by a disc 51, secured to the lower end of shaft 29, having twelve rollers 51*a* equally spaced about a pitch circle and adapted to successively engage a cam 52 on driving shaft 32.

The cam 52 has a cam track 52*a* cut in its curved surface, cam track 52*a* extending across the cam 52 from one side to the other side thereof, and by this arrangement, a roller 51*a* engaged in the entrance of the cam track 52*a* at one side of the cam follows the track 52*a* across the curved surface to the opposite side of the cam. By carefully arranging the diameter of the pitch circle of the roller 51*a* one roller is arranged to leave the cam track 52*a* at one side of the cam whilst the next roller in succession is entering the track 52*a* and continuity of the drive to disc 51, and thereby shaft 29 and turret 28, is established. The cam track 52*a* includes a dwell portion where a roller 51*a* is held relatively stationary during a set angle of rotation of cam 52 and by this means the continuous rotation of driving shaft 32 is transmitted as an intermittent or indexing rotation of disc 51, shaft 39 and turret 28.

Due to the roller 51*a* being equally spaced about a pitch circle having its centre on the centre of rotation of shaft 29 and the supporting means 40 on the turret 28 also being arranged equally spaced about the peripheral flange 28*a* of turret 28, the turret is indexed through the same angle (in this case 30°) during each indexing rotation or displacement.

Each gusseted tubing supporting means 40 comprises two side jaws 41 and 42, pivotally mounted on a pin 28*b* and spring loaded towards one another by a coil spring 43, and a back jaw 45 between said side jaws 41 and 42. The back jaw 45 is mounted on the upright limb of a bell crank lever 45*a* which lever 45*a* is pivotally mounted on a pin 45*b* between side walls 28*d* and 28*e* of turret 28, and the lever 45*a* is spring loaded to urge back jaw 45 outwardly relative to the turret 28 by a coil spring 46. Bell crank lever 45*a* has a side projecting portion 45*f* and the jaw 45 has an abutment 45*g* projecting upwardly therefrom, parts 45*f* and 45*g* being individually adapted to be engaged by a push rod or the like from any one of the stations to cause jaw 45 to be rearwardly displaced against the tension of spring 46. Each of the side jaws 41 and 42 carries an inwardly directed shoe 41*a* and 42*a* respectively on its outer end, said shoes 41*a* and 42*a* presenting inner surfaces 41*b* and 42*b* respectively which cooperate with the forward edge 45*h* of jaw 45 to form the gripping surfaces of the jaws. Each side jaw 41 and 42 also has a roller 41*c* and 42*c* respectively, which rollers are engaged by inclined surfaces 45*j* on the back jaw 45. In a closed position of the supporting means 40, jaw 45 is tended forwardly by its spring 46 and jaws 41 and 42 are urged inwardly against the sides of jaw 45 by their spring 43, and the forward edge 45*h* of jaw 45 applies a forward pressure against the surfaces 41*b* and 42*b* of the jaw shoes 41*a* and 42*a* respectively.

When a push rod or the like is advanced against part 45*f* or 45*g*, jaw 45 is rearwardly displaced against the tension of spring 46, jaws 41 and 42 remaining closed until the inclined surface 45*j* of jaw 45 engage rollers 41*c* and 42*c*. Further rearward displacement of jaw 45 causes rollers 41*c* and 42*c* to be forced outwardly thereby opening jaws 41 and 42 against the tension of spring 43.

The above sequence of operations is reversed as the jaw 45 is allowed to advance forwardly, that is, as jaw 45 advances rollers 41*c* and 42*c* ride down inclined faces 45*j* to allow jaws 41 and 42 to adopt a closed position and in the final stages of the advancement, jaw 45 advances to engage surfaces 41*b* and 42*b*.

At the first station, designated by reference "A," a continuous length of gusseted tubing 14, in a relatively closed position i.e. with its pleats or gussets closed, is led off from a roll 53 over guide rollers 54, 55 and 56, between rollers 57 and 58, past vertically reciprocating guides 59 and 60 and through a shearing arrangement 61. The drive for the arrangement is taken from a pinion 32*a* mounted on driving shaft 32 to a pinion 62*a* mounted on vertical shaft 62 and through a pinion 62*b* to a pinion 63*a* on a shaft 63. Shaft 63 carries a disc 64 having a radially adjustable pin 65 adapted to carry a connecting rod 66, connecting rod 66 having a rack 66*a* on its upper end arranged to engage a gear wheel 57*a* secured for rotation to the driving wheel 57. It can thus be seen that as shaft 32 rotates at constant speed, shaft 63 is also rotated at constant speed and connecting rod 66 drives the gear wheel 57*a*, first in one direction and then in the other direction, during each revolution of shaft 63. A clutch mechanism (not shown) may be interposed between driving wheel 57 and gear wheel 57*a* to allow the

roller 57, to be rotated in one direction only and a jockey wheel 67 mounted on a sliding bar 67a and spring loaded by a coil spring 67b is provided to maintain the rack 66a in engagement with gear wheel 57a. The shaft 63 also carries a number of cams one of which, cam 63b, acts against a cam follower 68 to reciprocate a slide 69, which slide 69 carries the reciprocating guides 59 and 60. Guides 59 and 60 are arranged one on either side of the gusseted tubing 14 and each presents an inwardly projecting portion 59a and 60a which engages in the pleat of the gusseted side walls of the tubing 14 to cause the gussets, and thereby the tubing 14, to become partially opened. The roller 58 is controlled by a solenoid 58a actuated by a photo-electric means 70, said photo-electric means 70 being effective, in conjunction with markings on the tubing, to control the length of tubing 14 advanced in each operation.

The moving blade 61a of the shearing arrangement 61 is displaced by a cam 63c on shaft 63 acting through a bell crank lever 71 and a push rod 72, and a further bell crank lever 74 follows a cam 63d to advance and withdraw a push rod 75.

In operation, with a gusseted tubing supporting means 40 located at station "A," shaft 63 rotates at constant speed and through connecting rod 66, rack 66a and gear wheel 57a causes driving roller 57 to rotate in an anticlockwise direction, as seen in FIG. 12. At this stage, roller 58 is forwardly advanced by its solenoid 58a to press the continuous length of tubing 14 against roller 57 and therefore as roller 57 rotates the continuous length of tubing 14 is advanced. As the continuous length of tubing 14 is advanced the reciprocating guides 59 and 60 move downwardly towards the supporting means 40 and push rod 75 is advanced by cam 63d, through bell crank lever 74, to engage side extension 45f of the rear jaw 45 on the supporting means 40 and thereby cause the rear jaw 45 to be rearwardly displaced and the side jaws 41 and 42 to open. The reciprocating guides 59 and 60 guide the advancing tubing 14 over the side jaws 41 and 42 of the supporting means 40 so that the tips of the shoes 41a and 42a can enter into the pleated or gusseted side walls of the tubing 14.

When the tubing 14 has been advanced a predetermined amount, the photo-electric means 70 detect a marking on the tubing 14 and cause solenoid 58a to operate to withdraw roller 58 thereby removing the "nip" from the tubing 14 and roller 57 skids freely without advancing the tubing 14 until the forward displacement of the rack 66a is completed. As the pin 65 passes through top dead centre, the rack 66a is displaced downwardly (see FIG. 12), the gear wheel 57a is rotated clockwise and the clutch (not shown) slips to prevent clockwise rotation of the roller 57. Push rod 75 retires through the action of its cam 63d, acting through bell crank lever 74, to allow jaw 45 to advance and thereby close jaws 41 and 42, the tubing 14 being supported in the supporting means 40 by shoes 41a and 42a, located in the pleats or gussets on either side of the tubing 14 and the rear jaw 45.

Cam 63c then displaces bell crank lever 71 causing push rod 72 to advance the moving blade 61a of the shearing arrangement 61 against the fixed blade 61b, which action shears the length of tubing 11 from the container length of tubing 14 and leaves the said length of gusseted tubing 11 supported in the supporting means 40. When the turret has been indexed through 30° the next supporting means 40 will be located at station "A" and the above operation will be repeated.

In the first indexing movement the turret 28 carries the gusseted tubing supporting means 40, with the length of tubing 11 supported therein, to the second station, station "B" where the lower edge regions of the length of tubing 11 are to be sealed.

At station "B" the length of tubing 11 is brought to a stationary position between a pair of clamps 81 and 82 which are advanced by a cam follower 83 actuated by a cam 84. The cam 84 is mounted on a horizontal shaft 87 and cam follower 83 acts against the rear clamps 82, the displacement of clamps 82 being converted to an equal but opposite displacement of clamp 81 through a pivotal lever 85 which engages a downward extension 82a of clamp 82 and a frame 86 connected to clamp 81. In this arrangement cam 84 is rotated by shaft 87 to displace cam follower 83 and cause clamp 82 to be displaced inwardly against one side 11a of the length of tubing 11. In being advanced, clamp 82 rotates pivotal lever 85 about its fixed pivotal connection in an anticlockwise direction and the lower end of pivotal lever 85 draws frame 86 to the right as seen in FIG. 13, to cause clamp 81 to be advanced against the opposite side 11b of the length of tubing 11. The tubing 11 is therefore clamped between the clamps 81 and 82 with a smaller portion of its lower end projecting downwardly therebetween.

A heater, comprising two heating elements 91 and 92 supported within a reflector 93, arranged to be vertically reciprocated on a slide 94 is arranged directly beneath the tubing 11. A cam follower 95, actuated by a cam 96 on shaft 87, acts against the lower end of slide 94 to raise the heater so that the heating elements 91 and 92 approach the lower end of the tubing 11 projecting from the clamps 81 and 82 and this portion of the tubing 11 is thereby heated up to its welding temperature. After a time interval, equivalent to a determined angle of rotation of shaft 87, cam 96 allows cam follower 95 to lower slide 94 and thereby remove the relatively intense heat from the tubing 11. At the same time, cam 84 allows cam follower 83 to be displaced in a clockwise direction (as seen in FIGS. 13 or 14) and the clamps 81 and 82 are returned to an open condition by a spring 88 acting on pivotal lever 85, which rotates the lever 85 in a clockwise direction to push clamps 81 and 82 apart and clear of the tubing 11. Spring 88 is, of course, permanently loading the clamps 81 and 82 to an open position and thereby maintains cam follower 83 in engagement with cam 84. A coil spring 97 maintains cam follower 95 in engagement with cam 96. As the clamps 81 and 82 move apart to free the heated end of tube 11, pressure pads 101 and 102 close to apply a pressure to said heated end of tubing 11 and thereby cause the heated portion to fuse or weld into a single seam. The pressure pads 101 and 102 are water cooled through pipes 101a and 102a to cause the heated and welded portion of the tubing 11 to lose heat quickly and thereby prepare the tubing 11, now formed into a container 11, for the next operation. The pressure pads 101 and 102 are inclined as shown in FIGS. 13 and 14 and can be advanced to engage the heated lower portion of the tubing 11 only when the clamps 81 and 82 are in the open condition.

In the next indexing of the turret the supporting means 40 carry the container 11 to the third station, station "C," where a solenoid-operated suction pad 111 is advanced to engage the upper portion of side 11a of the container 11, a low pressure air supply is connected to pipe 111a and the solenoid 112 actuating suction pad 111 is then disconnected so that it returns under a return spring 112a to draw side 11a of the container 11 outwardly and thereby opening the upper open end or mouth of the container 11. A cam 113, mounted on a shaft 116 and acting through a push rod 114, causes an arm 115 to rotate about a pivotal pin 115a thereby lowering a downwardly extending portion 115b of arm 115 into the open mouth of the container 11. A punch 118 is then advanced by a cam 117, also mounted on shaft 116, through a cam follower 119 and the punch 118 strikes side 11a to weaken an area thereof. It can therefore be seen that the suction pad 111 draws side 11a outwardly to allow extension 115b to enter into the open mouth of the container and punch 118, operated by cam 117 through cam follower 119, strikes face 11a to cause an area of face 11a to be weakened. Further rotation of shaft 116 frees the punch 118 and arm 115 and both these parts are displaced

clear of the container, punch 118 being retracted by a spring 119*b* and arm 115 being rotated in an anticlockwise direction to remove extension 115*a* from the mouth of the container 11 by a coil spring 115*c*. The low air pressure supplied to the suction pad 111 by pipe 111*a* is disconnected and the turret 28 can then be indexed to the next position, position D.

At position D, a heat sealable label 120*a* is to be applied to the container wall 11*a* to cover the area weakened by the punch 118 and the assembly for carrying out this operation is as follows:

A continuous length of labelling 120 is fed downwardly between rollers 123 and 124, from a roll 122, roller 123 being a driving roller and roller 124 being a freely rotating roller, which nips the continuous length of labelling 120 against the driving roller 123. Driving roller 123 is driven through a Geneva mechanism comprising a star wheel 125*a* and a driving cam 125*b*, cam 125*b* being driven from a shaft 126 by way of gear wheels 126*a*, 127 and 125*c*. By this means, the continuous length of labelling 120 is advanced a predetermined amount and is then held stationary during the dwell of the Geneva mechanism 125 for each revolution of shaft 126. The continuous length of labelling 120 passes between driving rollers 123 and 124 and between the blades 128*a* and 128*b* of a shearing arrangement 128, shearing arrangement 128 being closed by a cam 130 on shaft 126 through a cam follower 131 and a push rod 129 to sever an advanced length from the continuous roll 120 when the drive to the roll is removed. The shearing blade 128*a* of shearing arrangement 128 is held relatively fixed and push rod 129 acts against moving blade 128*b* to open and close the shearing device, the blades being tended to an open condition by a spiral spring 128*c* arranged with one of its two ends connected to blade 128*a* and the other end connected to blade 128*b*. A further spring 131*a* is provided to assist the opening of the blades 128*a* and 128*b* and also to maintain cam follower 131 in engagement with push rod 129 and cam 130. A suction pad 132, with a heater 133 arranged directly therebelow, is mounted on a cam follower 134 arranged to be actuated by a cam 135 secured on shaft 126.

In operation, the supporting means 40 carry a container 11 from station "C" to station "D" and during this displacement, the drive 125 to the roller 123 causes the continuous length of labelling 120 to be advanced by one label length. The suction pad 132 and heater 133 are located just forwardly of the advanced label strip 120 i.e. on that side of the label strip 120 remote from the turret 28, and as the drive to the roller 123 is completed and the label strip 120 becomes stationary, a low pressure source is connected to suction pad 132 by way of air pipe 132*a* and the advanced label length is held on the suction pad 132. The blades 128*a* and 128*c* then close through the action of cam 130, follower 131 and push rod 129 to sever the advanced label length from the continuous length of labelling 120 and the severed label length 120*a* is then completely supported by the suction pad 132. At this stage, the supporting means 40 arrive and are located at station "D" with the heater 133 located directly in line with the punched area on the side 11*a*.

The label 120*a* advanced and now supported by the suction pad 132 is of such length as to extend downward to at least the lower edge of heater 133 and the area of heater 133 and the portion of the label lying between the heater 133 and the container 11 must be of such dimensions as to completely cover the weakened area. Cam 135 then acts through cam follower 134 to advance the suction pad 132 and heater 133 against the side 11*a* of the container 11 and the heater 133 then operates to heat seal the label 120*a* across the weakened area. The low pressure source to pipe 132*a* is then cut off and suction pad 132 releases the label 120*a* and is retracted, together with heater 133, by cam 135 through cam follower 134. In this operation, the label is heat sealed to the side 11*a* in the manner shown in FIG. 20, the lower portion of the label only being heat sealed to the wall 11*a* leaving the upper portion of the label 120*a*, i.e. that portion which was supported by suction pad 132, to act as a flap or finger grip for use when the label is to be removed to expose the weakened area in wall 11*a*. Upon full retraction of the suction pad 132 and heater 133 the turret 28 is indexed to carry the container 11 to station "E" and during this period, the drive to the continuous strip of labelling 120 takes place to present a new label length to the labelling assembly.

As the supporting device 40 indexes the container 11 to station "E," a suction pad 140, mounted on a pivotal arm 141 and a bell crank lever 142 is advanced by a cam 144 on a shaft 145 acting through a cam follower 143. Suction pad 140 is advanced until it engages side 11*a* of the container 11 and a low pressure source is then connected to a suction pipe 140*a*, cam 144 acting through cam follower 143 and bell crank lever 142 causes suction pad 140 to be withdrawn thereby opening the mouth of the container 11. A second cam 146 also mounted on shaft 145 then acts against one end of a pivotal lever 148 through a push rod 147 to lower an air nozzle 149 into the open mouth of the container 11. The air nozzle 149 is connected to a high pressure source by way of a pipe 150, and upon entry of the nozzle 149 into the open end of the container 11, cam 144 acts through cam follower 143 and bell crank lever 142 to advance the suction pad 140 a second time. Suction pad 140 includes a cut away portion 140*b* between its two suction outlets 140*c* and 140*d* and as the pad 140 is advanced, this time with the low pressure source disconnected, it closes the open mouth of container 11 tightly about the air nozzle 149 in the manner shown in FIG. 24. The high pressure source is then connected to pipe 150 and high pressure air is discharged through nozzle 149 into the interior of the container 11 to cause said container 11 to inflate. As the initial pressure increases within the container 11, the lower regions of the container 11 fold themselves into a relatively flat base in the manner shown and described hereinbefore and this process is assisted by a rising platform 151 which supports the underside of the container 11. Platform 151 is mounted on one end of a cam follower 152, actuated by a third cam 153 on shaft 145.

When the blow-open operation is being completed, pad 140 and nozzle 149 are withdrawn to leave the container 11 suspended by the supporting means 40 in an open condition.

Due to the fact that the nozzle 149 is advanced by pivotal levers 157 and 148, it can be seen that this nozzle 149 cannot advance into the open mouth of the container 11 in a straight line and in order to avoid damage to the container 11 by the high pressure air, which may still be issuing from the nozzle 149 during the extraction thereof, a withdrawing means is provided which cants the nozzle after it has been extracted a predetermined amount thus avoiding this difficulty.

The air nozzle 149 is supported from a plate 155 by a pivot connection 155*a* and by a coil spring 156 which extends between nozzle 149 and plate 155. The plate 155 is in turn supported by a pivotal lever 148 and a second pivotal lever 157, the pitch of the pivotal connections of pivotal levers 148 and 157 between plate 155 and the assembly support 158 being equal. By this means, the push rod 147 acting against the outer end of pivotal lever 148 swings the plate 155 in a relatively upright position and the spring 156 locates the nozzle 147 in a substantially vertical position on its pivotal connection 155*a*.

The nozzle 149 in its upper inoperative condition is held in an inclined position by the tension spring 156. As the nozzle 149 is lowered by its levers 148 and 157, the lowered end of the nozzle, prior to entering the lowered end of the tube, engages a bar 159 which extends across the pad 140 and as the displacement of the nozzle 149 in the downward direction is continued, the lower end

of the nozzle is arrested by the bar 159 and the nozzle 149 enters the mouth of the bag in a substantially vertical position. During the retraction of the nozzle 149, the bar 159 prevents the nozzle 149 from adopting an inclined position until the lower end of said nozzle 149 is raised above the bar 159 and the nozzle 149 is then free to adopt the attitude shown in FIG. 22.

Upon retraction of the air nozzle 149 and suction pad 140, the turret 28 indexes the supporting means 40 and the container 11 to a station "F" where the first container-charging operation takes place.

At the first charging station "F," a suction pad 160 is advanced against wall 11*a* by a lever 161 and bell crank lever 162, bell crank lever 162 being actuated by a connecting rod 163 and cam follower 164 from a cam 165 on a shaft 166. A low pressure supply is connected to pad 160 by way of air pipe 160*a* and the suction pad 160 is then retracted to open the mouth of the container 11 and allow charging nozzle 167 to enter thereinto. Nozzle 167 is lowered on a link 168 and a pivotal lever 169 by a push rod 170 engaging a cam 171 mounted on shaft 166. The charging nozzle 167 is lowered into the open mouth of the container 11 and the suction pad 160 is then forwardly advanced to close the mouth of the container 11 about the nozzle 167 to prevent the container contents, discharged through the nozzle 167, from splashing or being blown out of the open mouth of the container 11. A measured quantity of the container contents is discharged through the nozzle 167 and suction pad 160 is then retracted and nozzle 167 displaced upwardly to free the container 11 and allow further indexing thereof.

Stations "G" and "H" are then successively passed by the container and the assembly at these two points is identical with that located at station "F" and therefore will not be described in detail.

At each station "F," "G" and "H" a measured quantity of the container contents is discharged into the container 11 and upon leaving station "H," the container 11 is charged with the desired weight or volume of a commodity. After leaving station "H" the supporting means 40 carry the container 11 to station "J" where the upper end of the container 11 is to be closed and in order to achieve this, it is necessary to change the grip of the side jaws 41 and 45 from their position inside the plate or gusset of side walls 11*c* and 11*d* to the outside of the container 11 where they engage wall 11*a*. This operation is accomplished by a block 180, having a forwardly projecting beam 180*a* mounted thereon and recesses 180*b* and 180*c* cut in the forward regions of its side edges. The width of the recesses 180*b* and 180*c* are slightly greater than the thickness of the side jaws 41 and 42. With the supporting means 40 supporting the charged container at station "J," the block 180 is advanced by a cam 181, mounted on a shaft 182 and acting through a cam follower 183, until the forwardly projecting beam 180*a* engages the buttress 45*g* atop rear jaw 45. As the block 180 continues to advance the beam 180*a* pushes the rear jaw 45 rearwardly until the side jaws 41 and 42 open by at least the width of the container 11. During this period, the forward face 180*d* of block 180 has engaged side face 11*a* of the container 11 and has partially closed the container mouth so that the entire upper end of the container 11 is being rearwardly displaced by the block 180. When the block 180 reaches its maximum advanced position, the closed end of the container 11 is rearwardly of the shoes 41*a* and 42*a* on side jaws 41 and 42 and as the block 180 begins to withdraw, rear jaw 45 begins to advance under action of its return spring 46 and side jaws 41 and 42 close. In the advance of jaw 45 shoes 41*a* and 42*a* of side jaws 41 and 42 respectively enter the recesses 180*b* and 180*c* on block 180 and are therefore forward of the side 11*a* of the container 11. During this period a cam 185, mounted on shaft 182, acts through a push rod 186 to lower the forward end of a pivotally mounted levelling beam 187 which includes a fork shaped levelling portion 187*a* having levelling shoes 187*b* and 187*c* thereon. As the forward end of the beam is lowered the fork shaped levelling portion passes its two legs one on either side of the beam 180*a*, and therefore does not interfere with the operation thereof, to allow its levelling shoes 187*b* to engage the top edge of the container 11. The continued withdrawal of the block 180 allows the rear jaw 45 to regain its forward position and the closed container mouth is thereby gripped between the shoes 41*a* and 42*a* and the rear jaw 45. The levelling shoes 187*b* and 187*c* have held the container mouth until the container is fully gripped and supported by the jaws and therefore the top edge of the container has been arranged at a height determined by the levelling device. Block 180 then retracts clear of the supporting means 40 and container 11.

From station "J" the supporting means 40 carry the closed container 11 to a top sealing unit at station "K," which sealing unit is, in fact, an inverted model of the bottom sealing unit at station "B" and comprises a pair of heating elements 190 and 191 arranged within a reflector 193 and adapted to be vertically displaced on a slide 194. The heating elements 190 and 191 are advanced to heat the upper edge of the container 11 left projecting upwardly of closed clamps 195 and 196, which clamps 195 and 196 open and close in a similar manner to the clamps 81 and 82 actuated through the frame 86 and swivel lever 85 arrangement of station "B." When the upper projecting edge of the container 11 is heated to the required temperature, the clamps 81 and 82 open and the heater assembly is raised to allow inclined pressure pads 197 and 198 to close, thereby pressing the heated upper end of the container into a single welded seam. It should be noted at this point that the container presented to station K for heat sealing, has its top edge set at a height determined by the levelling device at station "J" and therefore the top sealing unit can effect uniform sealing of the top edge of all the containers presented thereto. The inclined pressure pads 197 and 198 may be water cooled in a similar manner to pressure pads 101 and 102 at station "B." The inclined clamps 197 and 198 open to release the upper end of the container when the weld has been completed and the supporting means 40 carry the container 11 to a discharged or rejecting station "L." During the passage of the supporting means 40 between station "K" and station "L" a fixed cam 199 engages the abutment 45*g* on rear jaw 45 to rearwardly displace the rear jaw 45. As jaw 45 is displaced the side jaws 41 and 42 open such that the filled and the charged container is released at, or in the immediate approaches to, station "L."

The filled, charged and ejected container may be removed from the machine by means (not shown), as for example a chute, conveyor band or the like.

In order to prevent the weight of the charged container 11 from tearing the gripped portion of the container 11 away from the supporting means 40, and for maintaining the base of the container 11 substantially flat during the filling stages, a fixed platform 202 (FIGS. 25 and 34) may be provided to extend from the reciprocating platform 151 at station "E" to the ejection point on the approaches to station "L," the container base sliding easily on this platform and thereby removing the greater part of the weight of the jaws 41, 42 and 45 of the supporting means 40. As a further aid side plates 204 and 205 connected by a back plate 206, secured to the turret 28 are provided, the side plates 204 and 205 being so arranged as to easily accommodate the container 11 in all its conditions whilst helping to maintain said container 11 in a relatively upright condition during indexing thereof.

The individual drives to the stations, that is to say, to shaft 87 at station "B," shaft 116 at station "C," shaft 126 at station "D," shaft 145 at station "E," the three shafts 156 at station "F," "G" and "H" and shaft 182 at station "J," is achieved by a gear wheel 210 which is rotatably

mounted on the bearing block 30 and rotated from the driving shaft 32 through a pinion 32*b*, a pinion 213, a vertical shaft 212 and a gear wheel 211. The gear 210 engages gear wheels 214*a*, 215*a*, 216*a* and 217*a* mounted on vertical shafts 214, 215, 216 and 217, each of which presenting a crown wheel 214*b*, 215*b*, 216*b* and 217*b* respectively for engagement with pinions 87*e*, 116*e*, 126*e*, 145*e*, the three pinions 166*e* on the three shafts 166 and the pinion 182*e*.

A detail of vertical shaft 216 is shown in FIG. 35.

The advantages obtained by the drive arrangement described above are obvious and it can easily be seen that each of the shafts 87, 116, 126 and 145, the three shafts 166, and shaft 182 can each be rotated at the same speed as the driving shaft 32 and the time sequence for each operation, and for the operations relative to one another, may be easily determined and adjustment readily made.

The suction pads located at stations "C," "E," "F," "G" and "H" may be identical with the pad shown in detail in FIGS 26 and 27. The suction pad in accordance with the detail comprises a metal base block 230, mounted on the slider 231 of a solenoid 232. The block 230 is bored at 230*a* to provide an air passage to inlets 230*b* and 230*c* which cooperate with inlets 233*b* and 233*c* in a resilient block 233 mounted on the front face of block 230. Resilient block 233 is provided with a recess 233*a* as shown and an air pipe 240 is entered in the block 230 to connect the suction pad with an air supply.

In operation a low pressure air supply is connected to pipe 240 and air flows into inlets 233*b* and 233*c* in resilient block 230 and thus into inlets 230*b* and 230*c* and passage 230*a* of block 230.

When the solenoid circuit is complete and the solenoid 232 operates, slider 231 is displaced and carries block 230, with resilient block 233 attached thereto, outwardly of the solenoid against the tension of the solenoid return spring 235. When the solenoid circuit is broken, the slider withdraws under the action of spring 235 to withdraw block 230 and resilient block 233.

In the illustrated embodiment all the suction pads 111, 140 and the three pads 160 arranged at stations "F," "G" and "H" are connected to a common low pressure reservoir 240 by way of a communal air pipe 241 and the high air pressure delivered to the nozzle 149 at station "E" is supplied by a reservoir 242.

At stations "C," "E," "F," "G" and "H," the first operation is for a suction pad to advance against container 11 and then to withdraw to allow the suction pad to open the said tubing or container 11 to allow an insert to enter thereinto. Once the insert is entered the suction pad must again be advanced, and held in the forward position, in stations "E," "F," "G" and "H." No disadvantage would be effected if the suction pad at station "C" also advanced at the same time as those previously stated. The final operations is for all the pressure pads to withdraw from the container 11. It will therefore be seen that the timing for the suction pads is the same and therefore all the suction pads may be solenoid operated with the make and break contacts for the solenoids actuated by the same means.

A cam 243 mounted on driving shaft 32 is arranged to actuate a relay 244 whereby the make and break contacts in all the suction pad solenoid circuits are operated simultaneously.

It will also be observed that the timing of the low air pressure supply to the suction pads is identical and therefore a single air valve 234 adapted to be actuated by a cam 249 on shaft 32 is arranged to control the air supply to all the suction pads at stations "C," "E," "F," "G" and "H."

In the second embodiment to be described many assemblies and elements are constructed and function in identical manner with assemblies and elements already described and illustrated in the first embodiment and therefore, to avoid repetition, assemblies and elements found in the second embodiment having the same reference numbers as assemblies and elements in the first embodiment will indicate that the two parts are identical.

In this embodiment the machine frame comprises four upright members 21, 22, 23 and 24, which support a rectangular upper frame 25, a base plate 26 and an intermediate plate 27, plate 27 supporting a bearing block 30 which rotatably supports a substantially vertical shaft 29.

Shaft 29 carries a disc 51 secured to its lower end which has sixteen rollers 51*a* equally spaced about a pitch circle and the rollers 51*a* successively engage a cam track 52*a* in a cylindrical cam 52 mounted on a substantially horizontal shaft 32.

The track 52*a* on cam 52 is cut in the curved surface thereof, each roller 51*a* entering the track 52*a* at one side of the cam 52 when the preceding roller 51*a* is leaving the track 52*a* on the opposite side, and each roller 51*a*, when engaged, is passed from one side of the cam 52 to the other side so as to traverse a "dwell" period defined by the track 52*a* near the mid-length thereof. By the above means the disc 51 and shaft 29 are indexed through 22½° for each rotation of shaft 32 and the dwell period of disc 51 and shaft 29 takes place when a roller 51*a* is in the dwell near the mid-length of the cam track 52*a*.

The shaft 29 has a turret 311 mounted near its upper end and turret 311 has sixteen gusseted tubing supporting means 40 arranged at spaced intervals about its periphery, turret 311 being secured to shaft 29 so as to be indexed therewith to successively pass the supporting means 40 through sixteen radially fixed stations for each rotation of shaft 29.

Turret 311 also has a charging arrangement (FIGS. 38 and 39) above each supporting means 40 and in radial alignment therewith, the charging arrangements being radially displaced by a cam 312 arranged above the turret 311 and held stationary relative to the machine frame.

The charging arrangements are mounted on plates 313 secured to the turret 311 and each plate 313 presents two bearing blocks 313*a* and 313*b* which support two substantially horizontal guide bars 314 and 315. A carriage 316 is slidably mounted on the guide bars 314 and 315 and presents a roller 317 to a cam track 312*a* on the underside of stationary cam 312 and the position of carriage 316 on guide bars 314 and 315 is thereby dependent upon the radial position of the carriage 316 relative to fixed cam 312. The forward regions of the carriage 316 pivotally support a forwardly extending arm 318, and two abutment members 318*a* and 318*b* on the member 318 are located on either side of a lug 315*a* on carriage 315 to limit the angular displacement of arm 318.

The forward end of arm 318 supports a plurality of nozzles 319 which are connected by way of a duct 320 to the interior of a hopper 321 and the nozzles 319 form the outlet by which the contents of hopper 321 are discharged.

The angular position of arm 318 relative to carriage 315 is determined by a cam roller 322 which engages a cam 323 fixed relative to the machine and extending over a fixed radial distance which includes station H', J', and K', cam 323 when engaged by roller 322 causing the arm 318 to be rotated clockwise against the action of a tension spring 324 which normally retains the arm 318 in its uppermost position.

With the above arrangement it will be seen that carriage 316, arm 318, nozzles 319, duct 320 and hopper 321 are radially advanced and retracted according to the radial position of the turret 311 and the rotatable assembly, comprising arm 318, nozzle 319, duct 320 and hopper 321, is held in the uppermost position by spring 324 except for the period when cam roller 322 engages stationary cam 323.

The turret 311 angularly displaces all the gusseted tubing supporting means 40 through 22½ degrees during

each indexing movement and as the supporting means 40 are equally spaced about the periphery of turret 311 it will be seen that each supporting means 40 is passed through sixteen stationary positions during each revolution of turret 311.

As the turret 311 passes each supporting means 40 through one radially fixed position, to be referred to hereinafter as station A', a gusset tubing length 11 is fed to the supporting means 40 by a feeding arrangement identical with that described in the first embodiment at station A so that the means 40, when indexed to their next stationary position, have a gusseted tubing length 11 supported therein.

When a length of tubing 11 supported by a support means 40, with jaws 41 and 42 of the support means 40 engaged behind the first pleat in the tubing sides, is indexed by the turret 311 from station A' to the second station B', the lower regions of the tubular length 11 are located in a bottom heating arrangement (FIGS. 42 and 43) and the upper regions of the tubular length 11 are located in alignment with a punching arrangement (FIGS. 40 and 41).

The punching arrangement at station B' comprises a casting 326 which provides bearing blocks 326*a*, 326*b* for a substantially horizontal slider bar 327 and also vertical bearings for a pair of parallel vertically reciprocating spindles 340 and 341.

A bell crank lever 328 is pivotally supported near its mid-region on a pivot pin 329 secured to the casting 326 and lever 328 presents an arm 328*a* which is pivotally connected to slider 326 by a pivot pin 330 and a second arm 328*b* which is connected to a push rod 331 by a pivot pin 332. Slider bar 327 has two blocks 327*a*, 327*b* secured to its forward end which support a horizontal spindle 333 and a punch 334, both of which project outwardly of the forwardmost block 327*b*, and spindle 333 has a plate 335 secured to its forward end. The spindle 333 is slidably supported in blocks 327*a* and 327*b* and has a collar 333*a* secured thereto. A coil spring 336 acts between the collar 333*a* and block 327*a* to tend spindle 333 outwardly and thereby loads plate 335 to a forward position spaced from block 327*b*.

The punch 334 is threadedly engaged in a tapped bore in block 327*a*, locknuts 334*a* being provided for locking the position of punch 334 relative to block 327*a*, and passes through block 327*b* so that its forward end can pass through an opening in the plate 335.

In the above construction plate 335, is supported by spindle 333, angularly located relative to block 327*b* by punch 334 and spring loaded outwardly of the block 327*b* by coil spring 323*b*. By forcing plate 325 towards block 318*b* to compress coil spring 323*b* the forward end of punch 324 is advanced through the opening in the plate 335 to project forwardly thereof.

A suction pad 338 carried by plate 335 on the forward face thereof is connected by way of conduits 338*a* and 338*b* to a vacuum chamber 240.

The two parallel vertical reciprocating spindles 340 and 341 are connected at their lower ends by a rigid plate 342 which is pivotally connected to a push rod 343 and spindles 340 and 341 support a casting 344 at their upper ends which rigidly supports a backplate 345. It will be seen that with the above arrangement the push rod 343 can reciprocate spindles 340 and 341 to vertically displace casting 344 and thereby raise or lower backplate 345 relative to plate 335.

The bottom heating assembly at station B' (FIGS. 42 and 43) generally comprises a casting 350, secured to a fixed part of the machine frame, which provides a bearing 350*a* for a vertically reciprocating shaft 351 and also a mounting block 350*b* for a heater guard 352. The shaft 351 carries a mounting plate 353 upon which a heater assembly 354 is securely mounted and shaft 351 is reciprocated by a push rod 355 to vertically displace the heater assembly 354. A casting 356 is secured to the heater guard 352 and provides bearing means for two rotatable pins 357 and 358, pin 357 having a jaw 359 secured near the mid region thereof and an arm 360 secured at one end whilst pin 358 also has a jaw 361 and an arm 362 secured thereto. The two arms 360 and 362 each support a pivot pin 363, 364 respectively and pins 353 and 354 are connected by a U-shaped member 365 which is pivotally secured at its mid region to a push rod 366 by a pivot pin 367.

With the above bottom heating unit the displacement of the heater assembly 354 is independent of the jaws 359, 361 and the angular displacement of jaws 359, 361 on their respective pivot pins 357 and 358 is dependent upon the vertical displacement of a common member (U-shaped member 365).

The operation carried out at station C' is a further bottom heating and the assembly arranged at this station is substantially identical with the bottom heating arrangement provided at station B' and therefore, to avoid repetition, the assembly at C' will not be described.

At station D' the tubular length 11 is located with its upper regions aligned with a labelling arrangement and its lower regions, which have been heated at stations B' and C' are located in a bottom sealing unit (FIGS. 44 and 45).

The bottom sealing unit is constructed in similar manner to the units at stations B' and C' although in this case a pair of sealing jaws are provided.

The unit comprises a casting 350 which supports a substantially vertical shaft 351 and a heater guard 352, shaft 351 having a mounting plate 353 with a heater assembly 354 mounted on its upper end, and guard 352 having a casting 356 secured thereto which provides bearings for pivot pins 357 and 358. The pins 357 and 358 each carry a jaw 359 and 361 respectively and a short arm 360 and 362 respectively, arms 360 and 362 being linked by a U-shaped member 365, but in this case jaws 359 and 361 also present short arms 359*a* and 361*a* respectively which are connected to link members 370 and 371 respectively by pivot pins 372 and 373 respectively.

The casting 356 supports two pins 374 and 375 which pivotally support sealing jaws 376 and 377, respectively. Jaws 376 and 377 each having a rearwardly extending arm 376*a* and 377*a* respectively which is pivotally connected to the lower ends of link members 370 and 371 respectively.

In the above arrangement the U-shaped member 365 controls both sets of jaws 359, 361 and 376, 377 which all lie open when member 365 is in a mid position. A vertical displacement of member 365 in the upward direction from its mid position causes jaws 359 and 361 to open further and jaws 376 and 377 to close whilst a vertically downward displacement of member 365 from said mid position causes jaws 376 and 377 to open further and jaws 359 and 361 close.

The labelling machine at station D' is substantially identical with the labelling arrangement described at station D in the first embodiment (illustrated in FIGS. 18 and 19) and applies a label such as label 120*a* (FIG. 20) across the opening or scored area of the length 11 produced by punch 334 at station B'. The length 11 passed from station D' to station E' has now been formed into a container 11 and is located between cooling jaws at station E' which close to remove heat from the sealed bottom regions thereof.

As the container 11 is indexed from station D' to station E' the lower sealed regions of the container 11 are engaged by a guide rail 380 secured to the top of a fixed jaw 381, said rail 380 serving to guide the low regions of container 11 such that when the turret 311 becomes stationary the bottom of container 11 lies between jaw 381 and a moving jaw 382.

Jaw 381 is bolted to a bracket 383 by bolts 384 (bracket 383 being secured to a fixed part of the machine frame) and jaw 382 has a horizontally extending portion 382*a* which is slidably engaged in an opening 381*a* in jaw 381

and in an opening 383*a* in bracket 383. The portion 382*a* of jaw 382 extends rearwardly of bracket 383 and is pivotally connected by a pivot pin 385 to an arm 386*a* of a bell crank lever 386, lever 386 being pivotally mounted near its mid region on a pivot pin 387 held on an upstanding portion 383*b* of the bracket 383. The other arm 386*b* of bell crank lever 386 is pivotally connected to a push rod 388 by a pivot pin 389 and rod 388 is pivotally connected by a pin 390 to a cam follower 391. Cam follower 391 is pivotally connected by a pin 392 to a fixed part of the machine frame and is held in engagement with cam 393 by a tension spring 394.

Station F' is the blow open station and the general arrangements for effecting the container 11 at this station are illustrated in FIG. 47.

A casting 158 presents pivot pins 411 and 412 for pivotally supporting two pivotal levers 157 and 148 respectively each of which is pivotally connected by pivot pins 413 and 414 respectively to a nozzle mounting plate 155. The link members 157 and 148 are arranged substantially parallel and the pitch between the two pivotal connections on each pivotal lever 157 and 148, i.e. the pitch between pins 417 and 413 and the pitch between pins 413 and 414, is the same so that the vertical disposition of mounting plate 155 is always the same.

The plate 155 has a nozzle 149 pivotally mounted thereon by a pivot pin 155*a* and a coil spring 156 is provided for maintaining nozzle 149 in a substantially vertical position. Nozzle 149 is connected to a high pressure source (air reservoir 242) by way of a flexible conduit 150.

Pivotal lever 148 extends rearwardly beyond pivot pin 412 and is rotated in an anticlockwise direction by a push rod 147 actuated by a cam 146, a coil spring 416 being provided for tending pivotal lever 148 in a clockwise direction to maintain the said lever 148 in engagement with a push rod 147.

Casting 158 also pivotally supports a pivotal arm 141, which is pivotally connected at its upper end to a pad carrier 417, and a bell crank lever 142, which is pivotally connected near its mid region to casting 158, has one of its arms 142*a*, pivotally connected to the pad carrier 417 and its other arm 142*b* connected to a cam follower 143. The cam follower 143 is engaged by a cam 144 and is held in engagement with cam 144 by a coil spring 418.

The pitch of the two pivotal connections on pivotal arm 141 is the same as the pitch of the mid pivotal connection of bell crank lever 142 and the pad carrier pivotal connection on arm 142*a*, whereby the axis of pad carrier 417 remains substantially constant for all the positions thereof.

Pad carrier 417 has a substantially resilient pad 419 mounted on its forward end and a bearing bracket 420 slidably mounted on its upper regions, bracket 420 being loaded by a spring 421 towards the pad 419. A lever 422 is pivotally connected to bracket 420 by a pin 420*a* and a spring 423 tends lever 422 to rotate in an anticlockwise direction. The lever 422 has an electromagnet 424 mounted near its rear end, which cooperates with a soft iron block 425 secured to the pad carrier 417, and a beak 422*a* is securely mounted on the forward end of lever 422.

As a container is delivered to station F' the lower regions of the container 11 are guided into a slot 426*a* in a block 426, block 426 being mounted on a platform 151 secured to one end of a cam follower 152 and block 426 thereby centralises the lower regions of the container and also serves to assist the formation of a block bottom when the container is being inflated.

When the turret 311 indexes a container from station F' to station G' the charging arrangement on the turret 311 immediately above the container 11 is located directly beneath the hopper feeding arrangement (FIG. 52) which discharges a complete container contents into the hopper 321 during the stationary period of the turret 311.

The hopper feeding arrangement comprises a reservoir 430 and a valve arrangement which is arranged to discharge a measured quantity of material from the reservoir down a nozzle 431 in the bottom of reservoir 430.

The valve arrangement comprises a bottom valve member 432 adapted to cooperate with a valve seat 431*a* at the lower end of the nozzle 431 and a valve member 435 adapted to cooperate with a valve seat 431*b* at the upper end of nozzle 431, valve member 432 having a spider guide 432*a* within nozzle 431 which maintains the valve arrangement concentric therewith. Valve member 432 is axially bored to receive a valve spindle 433 therethrough, spindle 433 presenting a shoulder to the spider 432*a* and a threaded end portion whereby valve member 432 can be secured on spindle 433 by a nut 434. The second valve member 435 is coaxially bored and is slidably engaged on a sleeve 436, sleeve 436 in turn being bored to allow spindle 433 to slidably pass therethrough, and sleeve 436 presents a flange 436*a* which engages the underside of valve member 435.

Sleeve 436 is slidably engaged in a bearing 437*a* presented by a transverse member 437, which extends across reservoir 430 and two diametrically opposite lugs 436*b* and 436*c* on the upper end of sleeve 436 are secured to the two limbs 438*a*, 438*b* respectively of a yoke 438.

A coil compression spring 439 is arranged between the top surface of sleeve 436 and a flange 433*a* surrounding the top of spindle 433 and a second compression spring 440 is arranged between the top of valve member 435 and the underside of bearing 437.

The central limb 438*c* of the yoke 438 extends upwardly to and has the soft iron core 441*a* of a solenoid 441 secured thereto the windings 441*b* of which are held stationary relative to the machine frame by an arm member 443.

As a container 11 becomes located at station L' it will be fully charged and the charging arrangement will have been retracted leaving the upper regions of the container 11 free.

The engagement of the container with the jaws 41, 42 and 45 at this stage is such that jaws 41 and 42 are entered behind the first pleat or gusset and at station L' the position of the jaws 41 and 42 are to be changed so as to close the open end of the container 11.

At this station L' (FIGS. 53 and 54) a bracket 450 provides bearing means for two slider bars 451 and 452 arranged in side by side relationship and substantially parallel, each slider bar 451 and 452 having a downwardly extending fork member 451*a* and 452*a* secured thereto. A bell crank lever 453 is rotatably mounted on a shaft 454 and has a roller 455 rotatably mounted on one of its arms 454*a*, roller 455 engaging between the two limbs of fork member 451*a*, and the other arm 454*b* of lever 454 is pivotally connected to a push rod 456. A second bell crank lever 457 is also rotatably mounted on shaft 454 and presents a roller 458 between the limbs of fork member 452*a* and a pivotal connection to a push rod 459.

The slider 451 has a downwardly extending limb 451*b* at its forward end and a roller 460 is pivotally supported thereon, roller 460 being located to engage the buttress 45*g* atop the rearward jaw 45 of a supporting means 40 when slider 451 is advanced. The second slider 452 carries a bracket 461 which pivotally supports a lever 462, lever 462 being spring loaded by a coil spring 463 to maintain a roller 464 pivotally mounted to the rearward end of lever 462, in engagement with a fixed cam track 450*a* on the casting 450. The forward end of lever 462 presents two inclined under surfaces 462*a* and a downward projecting portion 461*a* of the bracket 461 presents a substantially flat vertical forward surface and is cut away so as to allow portion 461*a* to pass between the outer jaws 41 and 42 of a supporting means 40.

The container indexed from station L' to station M'

has its upper end closed and at station M' the closed upper end is heated to prepare said end for sealing.

The upper end of a container 11 at station M' (FIGS. 55 and 56) is located between jaws 471*a* and 472*a* mounted on slider bars 471 and 472 which are slidably supported by a casting 473 held stationary to the machine frame.

Jaw 472*a* is suspended from a slider bar 472 by a U-shaped portion 472*b* which allows the jaw 472*a* to be located behind the closed mouth of the container 11 without hampering the entry or exit of the container 11 to station M'. Slider bar 472 has a downwardly projecting fork member 474 secured thereto and a roller 475 mounted on an arm 476*a* of a bell crank lever 476 is engaged between the limbs of said fork member 474. The bell crank lever 476 is rotatably mounted on a fixed shaft 477 and the second arm 476*b* of lever 476 is connected to a push rod 478. Slider bar 471, in like manner, has a downwardly projecting fork shaped member 479 secured thereto and a roller 480 mounted on one arm 481*a* of a second bell crank lever 481 is engaged between the limbs of member 479, bell crank lever 481 being rotatably mounted on the shaft 477 and having its second arm 481*b* pivotally connected to a push rod 482. The slider bars 471, 472 may be supported on dovetail slides 471*c*, 472*c* respectively and the upper surface of the jaws 471*a* and 472*a* may be chamfered as at 471*d* and 472*d* respectively. Casting 473 also provides a bearing 473*a* for a vertically reciprocating slider bar 483 which is connected by a pivotal pin 484 to a push rod 485 and slider bar 483 has an arm 486 secured near its upper end which supports a heater assembly 487. The container 11 with its closed upper end preheated at station M' is indexed to station N' where a second preheating assembly, identical with that described for station M', is provided for further heat treating the upper closed end of said container. From top heat-treatment station N' the container 11 is indexed to station O' and arrives at station O' with its upper edge raised to a temperature suitable for welding. At station O' (FIG. 57) a casting 490 is secured to a fixed part of the machine frame and has a fixed jaw 491 suspended therefrom so as to engage the upper region of a container 11 at this station. Casting 490 also provides bearing means for a pivotal pin 492 and a bell crank lever 493 is pivotally mounted near its mid region on pin 492 so as to present a substantially downwardly extending arm 493*a*, and a substantially horizontal arm 493*b*, arm 493*a* having a jaw 494 supported thereon which cooperates with the fixed jaw 491 and arm 493*b* being pivotally connected to a push rod 495. Jaw 494 is provided with a cooling media by way of a conduit 496 and fixed jaw 491 is also provided with a cooling media by way of branch line 496*a*.

The filled and sealed container is indexed from station O' to station P' where it is ejected from its supporting means 40.

A bracket 499 (FIG. 58) arranged at station P' rotatably supports a spindle 501 and spindle 501 has an arm 502 secured on one end thereof and a second arm 503 secured in the opposite end thereof. Arm 502 has a roller 504 rotatably supported thereon and arm 503 is pivotally connected to a push rod 505.

With the above arrangement vertical displacement of push rod 505 causes angular displacement of arm 503, spindle 501 and arm 502 whereby roller 504 is arcuately displaced to engage an abutment 45*g* aligned with station P'.

Station Q' in this embodiment is a spare station and the tubing supporting means 40 are indexed through this station to station A' without being effected thereby.

The operation of the machine will now be described.

With the turret 311 stationary the jaws 41, 42 and 45 of a supporting means 40 located at station A' (FIG. 12) are open by a push rod 75 acting against the projecting portion 45*f* of the bell crank lever 45*a* and a continuous length of gusseted tubing 14 is advanced by a predetermined amount into the open jaws 41, 42 and 45 such that jaws 41 and 42 lie behind the first pleat in opposite sides of said tubing 14. The tubing 14 is guided into jaws 41, 42 and 45 by reciprocating guides 59 and 60 and as the drive to the tubing 14 is removed the push rod 75 is retracted such that the tubing 14 is gripped between jaws 41, 42 and 45. A shearing arrangement 61 is then closed to sever a length of tubing 11 supported in the jaws 41, 42 and 45 from the continuous length of tubing 14.

The above operation, as previously stated, is carried out substantially identical with the feeding of a length of tubing 11 to the jaws described in the first embodiment.

On the first indexing movement of the turret 311 the length of gusseted tubing 11 is carried by the jaws 41, 42 and 45 from the first station, station A', to the second station, station B'. As the indexing movement of the turret 311 is completed the length of the tubing 11 is located at station B' and the jaws 41, 42 and 45 of the succeeding supporting means 40 are located at station A' ready to receive a length of tubing 11 from the continuous length 14 as previously described.

When the container length 11 becomes stationary at station B', push rod 331 is lowered to rotate bell crank lever 328 in a clockwise direction to advance slider 327 towards the exposed wall 11*a* of the length 11 and a low pressure air source is connected to suction pad 338 by way of conduits 338*b* and 338*a*. The advance of slider 372 is continued until the suction pad 338 contacts wall 11*a* when the direction of rotation of rod 331 is reversed so that bell crank lever 328 is rotated in an anticlockwise direction to retract slider 327. The return of slider 327 causes the wall 11*a* which is being attracted to suction pad 338, to be drawn outwardly from the supporting means 40 and thereby the upper end of the length 11 is opened.

A push rod 434 is displaced downwardly to lower spindles 340, 341 and the casting 344 supported thereby and this displacement causes backplate 345 to enter into the upper open end of the length 11. At the same time push rod 366 is downwardly displaced to lower U-shaped member 365 and thereby cause jaws 359, 361 to close on the lower regions of the bag to centralise and maintain the lower regions of the length 11 substantially in vertical alignment with the heater assembly 354. Shaft 351 is then vertically displaced upwardly to raise heater assembly 354 towards the lower regions of the length 11 and said lower regions are thereby subjected to the heating effect of heater 354.

Jaws 359 and 361 are provided with a cooling media by way of conduits 359*a* and 361*a* which restrict the heating of length 11 to the bottom regions projecting downwardly from the nip of said jaws 359 and 361.

Push rod 331 is then downwardly displaced to rotate bell crank lever 328 in a clockwise direction to advance slider bar 327 and the blocks 327*a*, 327*b* and plate 335 are thereby carried forward in spaced relationship until the outer wall 11*a* is being pressed against the lowered backplate 345 when the forward displacement of plate 335 is arrested and further forward advance of slider 337 causes coil spring 336 to be compressed and punch 334 to be advanced through the opening in plate 335 to engage and pierce the wall 11*a* of the length 11. Push rod 331 is now upwardly displaced to rotate bell crank lever 328 anticlockwise thereby retracting slider 337, plate 335 maintaining wall 11*a* against backplate 345 until the collar 333*a* engages block 327*b*, and the further rearward displacement of slider 327 carries the block 327*a*, block 327*b* and the plate 335 rearwardly in spaced relationship. The low pressure supply to the suction pad 338 will have been discontinued as the slider 327 begins its forward displacement for a punching operation and therefore when slider 327 is retracted the wall 11*a* will not be attracted to suction pad 338.

Push rod 343 is then upwardly displaced to cause back-

plate 345 to be elevated clear of the length 11 and at the same time shaft 351 is lowered to withdraw heater 354 from its elevated position, an upward displacement of push rod 366 causes jaws 359 and 361 to open and the length 11 is released ready for its next displacement movement.

With the equipment at station B' released from the length 11 the turret 311 makes another indexing displacement and the length 11 is carried from station B' to station C' where the lower regions of the length 11 are subjected to a further preheating. The preheating unit at C' is substantially identical with that at station B' and, as the length 11 becomes stationary, push rod 366 is downwardly displaced to lower U-shaped member 365 and thereby close jaws 359 and 361 to centralise the lower regions of the length 11. Shaft 351 is then displaced upwardly to cause heater assembly 354 to approach the lower regions of the length 11 and to transmit heat thereto. Shaft 351 is then lowered to lower heater assembly 354 and push rod 366 is upwardly displaced to open jaws 359 and 361 to allow the next indexing movement of the turret 311 to take place.

The turret 311 indexes the length 11 from station C' to station D'.

During the period when the length 11 with its lower regions preheated at stations B' and C', are stationary at station D' push rod 366 is downwardly displaced to lower U-shaped member 365, causing shaft 357 to be rotated anticlockwise, and jaws 359 and 361 close on the lower regions of the length 11 and to centralise said lower regions jaws 376 and 377 open to allow the heater assembly 354 to be vertically displaced. The shaft 351 is then vertically displaced upwardly to cause heater assembly 354 to approach the lower regions of the length 11 and further heating of said lower regions takes place.

Push rod 366 and shaft 351 then undergo a vertical displacement downwardly causing heater assembly 354 to be downwardly displaced clear of the lower regions of the length 11 and the vertical displacement of U-shaped member 365 causes jaws 359 and 361 to open and, simultaneously through the link mechanism, jaws 376 and 377 are closed on the heated lower regions of the length 11 to cause said lower regions to be transversely welded thereby closing and sealing the lower open end of the length 11. The pressure on the lower region of the length 11 is applied by jaws 376 and 377 for a sufficient time period to bond the heated lower edges of said length and push rod 366 is then upwardly displaced to its mean position where jaws 359 and 361 and jaws 376 and 377 are all in the open position and the length 11 is released ready for its next displacement.

During this period a labelling arrangement (shown in FIGS. 18 and 19) has been operative on the upper regions of the length 11.

A continuous length of labelling 120 is advanced between feed rollers 123, 124, downwardly between the open blade 128*a*, 128*b* of a shearing arrangement 128 so that a length of said labelling lies forwardly of a suction pad 132 and a heater 133. A low pressure air source is connected to suction pad 132 causing length of labelling to be attracted to pad 132 with the lower regions of the label lying forwardly of heater 133. A cam follower 131 is then displaced to close blades 128*a*, 128*b* of the shearing arrangement 128 thereby severing the length of label supported by the suction pad 132 from the continuous length 120 and immediately following the shearing operation the blades 128*a*, 128*b* are allowed to open. A cam follower 134 then advances suction pad 132, slider 133 and the label length supported forwardly thereof against the wall 11*a* of the length 11 and the location of the label applying assembly is such that the opening or scoring punched in the wall 11*a* by the punch 334 at station B' lies directly in alignment with the heater 133 and as pressure is applied by the cam follower 134 heater 133 causes the label length to adhere across the opening in the wall 11*a* to form a closure thereof. The low pressure air source is then removed from the suction pad 132 and pad 132 and heater 133 are retracted by the cam follower 134 to release the length 11 ready for its next indexing movement.

It will be seen from the above that only the lower regions of the label length adheres to the wall 11*a* and that portion of the label length upwardly of the heater 133 (forwardly of suction pad 132) will not adhere to the wall 11*a* and will in fact form a tab by which the label 129*a* can be removed.

At this station the length 11 will have been sealed across one end to form a container 11.

As the turret 311 indexes the container 11 from station D' to station E' the lower regions of the container 11 are engaged by guide rail 380 which guides the lower regions of said container 11 between jaws 318 and 382. Cam follower 391 is then downwardly displaced by cam 393 to lower push rod 388 and thereby cause bell crank lever 386 to rotate anticlockwise causing jaw 382 to slide towards jaw 381 to grip the lower regions of the container 11 therebetween. A circulating cooling media, fed to jaws 381 and 382 by way of conduits 381*a* and 382*b*, removes heat from the lower regions of the container 11 and thereby effect a rapid cooling thereof. Cam follower 391 is then upwardly displaced to rotate bell crank lever 386 in a clockwise direction to outwardly displace jaw 382 relative to fixed jaw 381 and the lower regions of the container 11 are thereby released to allow said container 11 to be indexed during the next indexing displacement of turret 311.

As a container 11 is carried by the jaws 41, 42 and 45 towards station F' the lower regions of the container 11 are guided into the slot 533*a* in block 533 and the upper regions of container 11 are substantially in vertical alignment with nozzle 515 and directly opposite to pad 522*a* on the pad carrier 522. As the cam shaft 519 rotates, fork ended cam follower 524 cooperates with its cam 525 under the action of coil spring 526 to rotate bell crank lever 523 in an anticlockwise direction whereby pad 522 is advanced against the exposed face 11*a* of the container 11. During this displacement the electromagnet 531 is energised and is thereby attracted towards the soft iron block 532 causing lever 529 to rotate in a clockwise direction to elevate the beak 529*b* to its high vertical position. The coil spring 528 is holding the bearing bracket 527 in its forwardmost position and the beak 529*b* is therefore in advance of the resilient pad 522*a*. In the forwardmost position of pad carrier 522 the electromagnet 531 releases and the lever 529 is rotated anticlockwise under the action of coil spring 530 such that the beak 529*b* enters into the open end of the container 11. Fork ended cam follower 524 is then rotated by cam 525 in a clockwise direction to retract the pad carrier 522 with its associated parts and, in retracting, the beak 529*b* pulls the exposed wall 11*a* of the container 11 outwardly from the turret 311 causing the mouth of the container 11 to be opened sufficiently to allow nozzle 515 to enter thereinto.

Push rod 517 is then advanced by cam 518 acting against lever 513 and nozzle 515 is lowered into the open mouth of the container 11 and when this operation has been completed the electromagnet 531 is again energised to withdraw the beak 529*a* from engagement with the container 11. Cam 525 then allows cam follower 524 to be rotated in an anticlockwise direction to advance pad carrier 522 a second time, the forward displacement in this second movement being greater than in the first and resilient pad 522*a* engages wall 11*a* to close the open mouth of the container 11 tightly about the nozzle 515. During this second advance of said pad carrier 522 the beak 529*b* engages the nozzle 515 before the pad carrier 522 has completed its forward displacement and the lever 529, which is of substantially rigid construction, forces the bearing bracket 527 to be rear-

wardly displaced relatively to pad carrier 522 against the action of spring 528.

The nozzle 525 is then connected to the high pressure source and the high pressure air is discharged from the nozzle 515 into the container 11 to cause said container 11 to inflate. As the container 11 inflates its lower regions are drawn upwardly out of the slot 533*a* in the block 533 and in passing over the upper edges thereof a folding action takes place which enables the subsequently formed block bottom to remain after the high pressure source has been removed. It has been found advantageous in practice to elevate the block 533 after the container 11 is fully inflated and the block bottom has been blown, such elevation assisting in the formation of a substantially flat base on the container 11. This elevation of block 533 is obtained by a cam 536 acting through pivoted lever 535. When the container 11 has been fully inflated and a block bottom formed thereon cam 536 allows pivoted lever 535 to rotate anticlockwise to lower the block 533, cam 525 allows fork ended cam follower 524 to rotate clockwise to retract the pad carrier 522 and cam 518 allows push rod 517 to be downwardly displaced under the action of coil spring 520 to rotate lever 513 in a clockwise direction and elevates the nozzle 515 clear of the container 11. The container 11 is now clear of the apparatus at station F' and is ready for displacement to station G' on the next indexing movement of the turret 311.

As the turret 311 is rotating the container 11 from station A' through stations B', C', D', E' and F' the charging arrangement would be in a rearward position with the rotatable parts elevated and, in traversing between station F' and station G', the mouth of the container 11 would be substantially in an open condition following the blow open operation. In traversing between station F' and station G' the roller 317 engaged in track 312*a* of fixed cam 312 advances carriage 316 to forwardly displace the charging arrangement and roller 322 engages fixed cam 323 to cause the rotatable part of the charging arrangement to be rotated in a clockwise direction so that the nozzle 319 of the charging arrangement enters into the open mouth of the container 11. Upon arrival at station G' the carriage 316 is in the fully advanced position, the arm 318 is rotated clockwise until nozzles 319 are entered into the open mouth of the container 11 and hopper 321 is located directly beneath the nozzle 431 of the hopper feeding arrangement.

During the indexing movement of turret 311 the solenoid 441 will be operated to draw soft iron block 441*a* upwardly into the windings 441*b*. This position of the solenoid causes sleeve 436 to be drawn upwardly and, with valve member 435 engaged by flange 436*a*, valve member 435 will be unseated. An elevated position of sleeve 436 also causes spring 439 to be tensioned thereby drawing spindle 433 upwardly to seat valve member 432.

In this position the material in reservoir 430 can flow into nozzle 431 to fill said nozzle in a very short time and the volume of material in the nozzle 431 when fully charged constitutes the complete contents for one container 11.

When the nozzle 431 has been completely filled and turret 311 is stationary with a hopper 321 located beneath nozzle 431 the time cycle of the solenoid 441 terminates and solenoid 441 releases.

With solenoid 441 released the soft iron block 441*a* is no longer supported by the field of windings 441*b* and the supported assembly is thereby released. Sleeve 436 begins to move downwardly under the weight of the suspended parts and also due to the force exerted by coil spring 440 which acts against valve member 435 and through flange 436*a*. The first portion of the downward movement of sleeve 436 causes valve member 435 to be displaced downwardly towards its seat 431*b*, the tension of spring 440 maintaining valve member 435 against flange 436*a* of sleeve 436. This displacement of sleeve 436 does not affect valve member 432 which is still being urged against its seat 431*a* by coil spring 439 and when valve member 435 is seated to close the interior of nozzle 431 for the reservoir 430 valve member 432 is still seated.

With valve member 435 seated the sleeve 436 continues its downward displacement, sliding through the bore in member 435 until the lower edge of said sleeve 436 engages spider 432*a* of valve member 432 and valve member 432 is thereby unseated to allow the material to flow outwardly from the nozzle 431 and into the feed hopper 321 therebelow.

It will be observed that with this arrangement valve members 432 and 435 must never be unseated at the same time, and the operation sequence of members 432 and 435 is obtained by allowing a lost motion of sleeve 436 in that the distance between the top surface of the spider 432*a* and the underside of valve member 435 is greater than the distance between lower edge of sleeve 436 (that is the edge which engages member 432) and the top surface of the flange 436*a*.

By the above feeder arrangement a complete container charge is deposited in the hopper 321 associated with the container 11 at station G' and the container contents then flow downwardly from the hopper 321 through duct 320 and through nozzles 319 into the container 11. The nozzles 319 remain in the container 11 discharging the contents thereinto as the turret 311 indexes the container 11 through stations H', J' and K' and at station K' the charge deposited by the feeder arrangement will have been completely discharged into said container 11. In traversing between station K' and station L' stationary cam 323 allows roller 322 to be upwardly displaced under the action of spring 324, which is tending to rotate the rotatable portion of the charging arrangement in an anticlockwise direction and the hopper 321, duct 320, nozzle 319 and arm 318 adopt their elevated position so that nozzles 319 are withdrawn from the open mouth of the container 11.

The roller 317 engaged in track 312*a* of cam 312 also causes the carriage 316 to be rearwardly displaced and thereby the charging arrangement is moved clear of the container at the next station, station L'.

As the container 11 arrives at station L' it is supported on a bottom rail 202 and push rod 456 is downwardly displaced to rotate bell crank lever 453 anticlockwise. The engagement of roller 455 with the downwardly extending fork member 451*a* on slider 451 causes slider 451 to be advanced and the roller 460 on the forward end of slider 451 engages the buttress 45*g* on the rear jaw 45 of the jaws supporting the container 11 and rear jaw 45 is then displaced as slider 451 continues to advance. The displacement of jaw 45 causes the jaws 41 to be outwardly displaced clear of the sides of the container 11 to adopt positions substantially as illustrated in FIG. 10. Push rod 459 is then downwardly displaced to rotate the second bell crank lever 457 thereby causing slider 452 to advance so that the downwardly projecting portion 461*a* of the bracket 461 engages the front wall 11*a* of the container 11 and forces said front face towards the rear jaw 45. The advance of slider 452 also causes roller 464 to ride up fixed cam track 450*a* and lever 462 is pivotted about its pivotal connection with bracket 461 against the action of spring 463. This causes the forward end of lever 462 to be displaced downwardly and the two inclined undersurfaces of lever 462 engage the top edge of the container 11, which has been substantially closed by the downwardly projecting portion 461*a* of the bracket 461, so that the continued downward movement of lever 462 aligns the top edge of the container 11. In this position the downwardly projecting portion 461*a* of the bracket 461 will have carried the front wall 11*a* of the container 11 rearwardly of the jaws 41, 42 and slider 451 is then retracted to allow jaw 45 to advance, the advance of jaw 45 allowing said jaws 41, 42 to close and these jaws 41, 42 now close around the forward wall 11*a* of the container.

The lower projecting portion 461*a* of the bracket 461 has relieved portions at its sides to allow the jaws 41, 42 to close while portion 461*a* is still in engagement with the wall 11*a*. As the jaws 41, 42 and 45 close around the container 11 with the open mouth thereof closed the top edge of the container 11 will have been set at a predetermined level by the lever 462 and therefore the top edges of all the containers passing through station L' will be aligned at the same height thus allowing accurate setting and substantially uniform sealing of said top edges in the latter stages of operation. Push rod 459 is then displaced upwardly to return slider 452, roller 464 riding down cam track 450*a* and lever 462 being rotated clockwise under the action of its coil spring 463. As both sliders 451, 452 are fully retracted the turret 311 indexes the container 11 to station M'.

The container 11 arrives at station M' from station L' and said container 11 passes beneath U-shaped portion 472*b* such that, when stationary, the upper region of the container 11 lies between jaws 471*a* and 472*a*. Push rods 478 and 482 are then downwardly displaced to rotate bell crank levers 476 and 481 in opposite directions to drive slider 472 rearwardly, thereby advancing jaw 472*a* against the rear face of the closed mouth of the container 11, and slider 471 forwardly to advance jaw 471*a* against the front side of the container 11. The container 11 thereby nipped between jaws 471*a* and 472*a* and shaft 483 is then lowered, together with the arm 486 supported thereon, and the heater assembly 487 is downwardly displaced towards the regions of the container 11 projecting upwardly from the jaws 471*a*, 472*a*. Jaws 471*a* and 472*a* have a cooling media passed therethrough by way of conduits 471*e* and 472*e* which restricts the heating effect of heater assembly 487 to that portion of container 11 projecting above jaws 471*a*, 472*a*. Shaft 483 is then elevated to remove the heater assembly 487 upwardly from the open end of the container 11 and push rods 482, 478 are upwardly displaced to advance slider 472 and retract slider 471 and thereby cause jaws 471*a* and 472*a* to open to release the open mouth of the container 11 ready for the next indexing movement thereof.

The container 11 passes from station M' to station N' where it undergoes a second preheating of its upper regions in an identical manner to that described with regard to station M' and from station N' the container 11 is indexed to station O' where the upper regions of the container 11 are to be sealed.

As the container 11 is indexed to station O' the portion of the container 11 projecting above jaws 41, 42 and 45, preheated at stations M' and N', is located between fixed jaw 491 and moving jaw 494. Push rod 495 is vertically displaced to rotate bell crank lever 493 causing the moving jaw 494 to approach fixed jaw 491 and the upper heated portion of the container is thereby squeezed between jaws 491 and 494 to effect a sealing thereof.

As previously stated jaws 491 and 494 are cooled by a circulating media flowing through conduits 496 and 496*a* which effect a rapid cooling of the jaws and, thereby, the welded seam across the upper region of the container 11. A push rod 495 is then downwardly displaced to rotate bell crank lever 493 in a clockwise direction to displace jaw 494 away from fixed jaw 491 and the container is thus released ready for indexing by turret 311 to the ejection stage at station P'.

As the container 11, now completely filled and sealed, is indexed by turret 311 to station P', push rod 505 is downwardly displaced to rotate arms 502 and 503, thereby causing roller 504 to engage the buttress 45*g* on top of jaw 45 to rearwardly displacing jaw 45 and causing jaws 41, 42 to open. The opening of jaws 41, 42 and 45 causes the container 11 to be released therefrom and the filled container drops from the turret 311 on to a conveyor Z as shown in FIG. 58 which carries the completed container away from the machine. Push rod 505 is then upwardly displaced to allow arms 503 and 502 to rotate anticlockwise with spindle 501, whereby the roller 504 allows jaw 45 to be advanced and jaws 41 and 42 are closed.

The next indexing movement of turret 311 passes the tubular supporting means 40 through station Q' which, in this example, is a spare station and on the next indexing movement of turret 311 the supporting means 40 are indexed to lie in the path of the continuous length 14 supplied by the reel feed to begin a new cycle.

The heater assemblies 354, 487 proposed by this invention may have a single heater coil or a double heater coil and two constructions for the heater are shown in FIGS. 60 and 61. In the single coil heater shown in FIG. 60 a ceramic block 611 has a recess 611*a* in its upper regions and a single coil filament heater 612 is arranged in said recess 611*a*.

With this construction the block 611 is advanced towards an end region of the container 11 so that said end region actually enters the recess 611*a*. In the double coil heater shown in FIG. 61 a ceramic block 613 has a recess 613*a* in the top surface thereof which allows two coil heaters 614, 615 to lie in spaced relationship and once again an end region of the container 11 may be entered into the recess 613*a* when being exposed to the heating effect of heater coils 614, 615. It should be pointed out at this stage that whilst the second heater assembly described uses two heater coils 614, 615 said coils may comprise a single heating element wound to form two coils 614 and 615.

In the first and second embodiment it has been necessary at certain stations to provide suction means for opening the mouth of the container and it will be apparent that such suction pads can, in many instances, be replaced by opening arrangement such as the lever 422 illustrated in FIG. 47.

As a further alternative to a centralised low pressure system independent suction arrangements can be provided and FIG. 62 shows one construction for such an arrangement.

In the example illustrated in FIG. 63 a cylinder 630 is pivotally supported by the two link members 631, 632 which have their lower ends pivotally supported on a fixed part of the machine frame. The pitch of the pivotal connection on levers 631 and 632 is the same and the axes of said levers 631, 632 lie in parallel planes whereby the axis of cylinder 630 lies in a constant plane relative to the horizontal for all rotational positions of levers 631, 632. The forward end of cylinder 630 is closed by an end plate 630*a* and a suction pad 633 projects downwardly of said plate 630*a* and is connected to the interior of cylinder 630 by a relatively small bore 630*b*. A piston 634 having a sealing ring 634*a* thereon is slidably mounted in cylinder 630 and is pivotally connected to a con rod 635, con rod 635 being pivotally connected at its rearward end to an oscillating lever 636.

In operation the friction force necessary for driving the piston 634 along cylinder 630 would be slightly less than the friction force required to swing the cylinder 630 on its pivotal links 631 so that as oscillating lever 636 moves its upper pivotal connection 636*a* to the left (as shown in FIG. 62) the first portion of the displacement is taken up advancing piston 634 into cylinder 63 and the remainder of the displacement swings cylinder 630 on its levers 631, 632 so that cylinder 630 also moves to the left until suction pad 633 engages the front wall 11*a* of the container. The engagement of suction pad 633 with the exposed wall 11*a* of the container prevents further forward displacement of cylinder 630 and therefore continued displacement of oscillating lever 636 causes piston 634 to advance fully into cylinder 630 discharging air forwardly thereof through opening 630*b* and outwardly between the suction pad 633 and the engaged wall 11*a*. Oscillating lever 636 then reverses its direction of displacement so that pivotal connection 636*a* begins to move to the right. As this motion is transmitted by con rod 635 to the piston 634, pis-

ton 634 will tend to be displaced outwardly of the cylinder 630 and thereby the air pressure in the forward regions of the cylinder 630 will be reduced. The substantially resilient suction pad 633 will prevent air from entering into the cylinder between the outer edge of said pad 633 and the wall 11*a* and thereby the wall 11*a* will adhere to pad 633 so that the continued displacement of connection 636*a* causes cylinder 630 to move to the right and thereby draw the wall 11*a* radially outwardly relative to turret 311 to open the container mouth.

FIG. 64 shows an alternative embodiment for a bottom heating, sealing or cooling arrangement for use at stations B', C', D' or E' and comprises a casting 649 which supports a jaw 641, jaw 641 being mounted for vertical displacement relative to casting 640 by a screw thread 642 and having a clamping bolt 641*a* by which jaw 641 is clamped to casting 640. In this assembly jaw 641 is a stationary jaw and is only displaced relative to casting 640 to carry out vertical adjustment thereof. Casting 640 has two horizontal bores therein which slidably support two guides 643, 644, 644 being connected by a connecting member 645 which is in turn pivotally connected to a bell crank lever 646 pivotted near its mid region to a fixed part of the machine frame. Bell crank lever 646 has an arm 646*a* which is connected to a push rod 647. A casting 647 fixedly mounted on guides 643, 644 carries a jaw 649 thereon, jaw 649 being clamped to casting 648 by a clamping bolt 649*a* and being vertically adjustable relative to casting 648 by means of an adjusting screw 650.

The arrangement operates as follows: With push rod 647 in its lowermost position and bell crank lever 646 rotated in a clockwise direction to its forwardmost position guides 643, 646 are drawn out of the bores in the casting 640 and the outward displacement thereof carries casting 648 with jaw 649 mounted thereon to the right to define an open condition of jaws 641, 649. When push rod 647 is upwardly displaced bell crank lever 646 is rotated anticlockwise to push guides 643, 644 inwardly of the bores in the casting 640 whereby casting 648 is moved to the left to carry jaw 649 towards jaw 641 and, in an extreme condition, defines the closed condition of jaws 641 and 649. When the assembly requires a heater assembly, heater assembly 354 may be provided.

Jaws 641 and 649 are, when required, arranged to allow a cooling media to circulate therethrough, said media being supplied by conduits 641*a* and 649*a* as shown.

The driving arrangement to the individual stations in the second embodiment may be arranged in a similar manner to the driving arrangement shown in the first embodiment, i.e. using a gear wheel 210 to drive horizontal spindles at each station by way of vertical spindles carrying gear wheels engaged by gear wheel 210.

In an alternative driving arrangement (FIGS. 59*a* and 59*b*) shaft 32 is driven by an electric motor 31 through a reduction box 35 and the take off shaft of reduction box 35 is coupled directly to shaft 32 by a coupling 35*a*. The shaft 32 carries turret indexing cam 52 which has a track (such as track 52*a*) cut in its curved outer surface to pass rollers 51*a* successively across the face thereof. Shaft 32 has a pinion 653 mounted thereon which engages a pinion 654 to drive a shaft 655 arranged at right angles to shaft 32 and a second pinion 656 on shaft 32 drives a pinion 657 to rotate a shaft 658 arranged substantially in parallel with shaft 655. Shaft 655 carries a pinion 659 which drives a pinion 660 mounted on a shaft 661 arranged substantially parallel with shaft 32 and shaft 658 carries a pinion 662 which drives a second pinion 663, mounted on shaft 661. Shaft 661 carries a third pinion 664 which engages with a pinion 665 to rotate a shaft 666 and shaft 32 carries a gear wheel 667 which cooperates with a gear wheel 668 to drive a shaft 669.

With motor 31 rotating at constant speed shafts 32, 566, 658, 661, 666 and 669 are also rotating at constant speed and said shafts each carry cams and gears for operating the apparatus at the stations as follows:

Shaft 661 carries a gear wheel 671 which rotates shaft 62 to drive the roll feed and this shaft 661 also carries a cam 672 engaged by a cam follower 672*a* which operates push rod 505 at station P' a cam 673 engagaed by a cam follower 673*a* which operates push rod 343 at station B' and a cam 674 engaged by a cam follower 674*a* which operates push rod 331 at station B'.

Shaft 658 carries a cam 675 which acts through a cam follower 675*a* to vertically displace push rod 700 (FIG. 65) to elevate a plurality of heater assemblies and a cam 676 engaged by a cam follower 676*a* and a cam 677 engaged by a cam follower 677*a* respectively displace push rods 355 at stations B' and C' respectively. Shaft 658 also rotates a gear wheel 678 which drives the labeiling arrangement at station D' and a cam 679 which elevates the block bottom forming platform 426 at station F'.

Shaft 32 carries a cam 679 which engages the cam follower 143 at station F' and also a cam 680 which actuates push rod 147. A cam 681 on shaft 32 operates the apparatus for opening the container at station G' and a cam 682 is provided for elevating, the charging arrangement at station K'.

Cams 683 and 684 respectively actuate push rods 456 and 459 to operate the charge over sliders at station L'.

Shaft 655 carries three cams 685, 686 and 687 of which cam 685 drives a single vertical shaft for vertically displacing the heater assemblies at station M' and N', cam 686 drives the push rods 482 and 478 at stations M' and N' and cam 687 actuates push rod 495 at station P'.

It will be observed that at many stations an identical and simultaneous movement of a part takes place as for example at stations B', C' and D' a heater assembly 354 at each of these stations is upwardly displaced and downwardly displaced whilst the turret is stationary. It is possible to link these identical movements to a single element as for example, a single cam. One such method of accomplishing this object is shown at FIG. 65 where a single push rod 700 vertically displaces a shaft 701, shaft 701 being supported by a bearing block 702 and a bearing plate 703 supported by column 704 from the intermediate plate 27. Shaft 701 carries a plate 705 which is slidable on column 704 and plate 705 carries three shafts 351 each of which is crowned by heater assembly 354, the shafts 351 being slidably mounted in bearings in the bearing plate 703.

It will be seen that with the above arrangement a vertical displacement of shaft 701 causes mounting plate 705 to be vertically displaced thereby carrying shafts 351 and the heater assemblies 354 mounted thereon upwardly by the same amount and, in like manner, when shaft 701 is displaced downwardly the heater assemblies are lowered.

In FIGS. 66 and 67 an alternate arrangement for charging the containers is illustrated, the arrangement being shown at station G'.

In this arrangement the turret 311 supports a plate 313 rearwardly of each set of support means 40 and each plate 313 presents bearing blocks 313*a* and 313*b* for supporting guide bars 314 and 315. A carriage 316 is slidably supported on guide bars 314 and 315 and presents a roller 317 to a track 312*a* in a fixed cam 312, and also a pin 316*a* for pivotally supporting an arm 318, friction washers 316*b* and a dished washer 316*c* being provided to enable arm 318 to be frictionally retained at any angle relative to carriage 316 in the absence of external influences.

A second turret 711 is mounted above fixed cam 312 and arranged to be indexed with turret 311, turret 711 supporting a measuring vessel comprising an open topped cylinder 712 substantially in radial alignment with each support means 40. Each cylinder 712 has a valve 713

arranged in the lowermost regions thereof and adapted to connect the interior of the cylinder 712 with a flexible conduit 714 when the valve 713 is open. Valve 713 has a stem 713*a* which engages a track 312*b* on the fixed cam 312 and a coil spring 715 is provided to tend valve 713 to a closed condition.

The conduit 714 has its outer end connected to a nozzle 319 supported on arm 318 and it will be seen that when valve 713 is open the contents of cylinder 712 will flow down conduit 714 and through the nozzle 319.

In traversing between station L' and station F' the carriage 316 is in a rearward position with the arm 318 elevated, arm 318 being held in its elevated position by the frictional effect of washers 316*b* and by the positive engagement of a lug 318*d* on arm 318 which engages an inclined surface 313*c* a plate 313, and the cylinder 712 passes beneath a plurality of feeder means 716 which each discharge container contents into said cylinder 712. The actual volume of container contents delivered to the cylinder 712 exceeds the volume to be delivered to the container 11 and this excess volume leaks from the cylinder 712 through a slot 712*a* thereon, slot 712*a* defining the measured volume the cylinder 712 can contain.

A float 717 is arranged in cylinder 712 to reduce the spillage which would occur when the charged cylinder 712 was being indexed and a channel member 718 is arranged to collect the spillage from the over-charged containers and returns the spillage to the feeder means by way of a conduit 718*a*.

The cylinder 712 is therefore charged by any number of stations between station L' and station F' and arrives at station F' charged with a measured volume of container contents and, as the turret 711 indexes the cylinder 712 to station G', the roller 317 drives the carriage 316 radially outwardly until the nozzle 319 is located directly above the open mouth of a container 11 ready to discharge the cylinder 712.

At station G' an arm 720 is pivotally supported from a block 721 by a pivotal lever 722 and a bell crank lever 723, block 721 being mounted on a push rod 724 and being slidably engaged on a shaft 725. Arm 720 has a beak 720*a* on the forward end thereof and a coil spring 726 anchored to an arm 721*a* of block 721 tends arm 720 to a forward position i.e. tends arm 720 to the left as seen in FIG. 66.

The position of arm 720 relative to block 721 is determined by a block 727 secured in a push rod 728 and arranged to engage the arm 723*a* of the bell crank lever 723. Shaft 725 is vertically displaceable relative to the block 721 and is provided with a shoe 725*a* on its upper end.

As a support means 40 becomes stationary at station G' with its associated carriage 316 radially advanced, arm 720 is in a high rear position and is advanced horizontally when push rod 728 is elevated to allow rotation of bell crank lever 723 in an anticlockwise direction under the action of spring 726. The forward displacement of arm 720 locates beak 720*a* directly above the open mouth of the container 11 and push rods 724 and 728 are then downwardly displaced together to allow beak 720*a* to enter into the open mouth of the container 11. The downward displacement of push rod 724 is then arrested and the continued downward displacement of push rod 728 acts through bell crank lever 723 to retract arm 720, beak 720*a* in being rearwardly displaced drawing the wall 11*a* of the container outwardly to open the upper end of the container 11. Shaft 725 is then lowered, sliding through block 721, shoe 725*a* engages the extending portion 318*c* of arm 318 to rotate arm 318 clockwise whereby the nozzle 319 enters the open mouth of the container. Push rod 724 is then upwardly displaced together with push rod 728 to extract the beak 720*a* from the container 11.

At this stage the valve 713 is closed and as the turrets 311 and 711 are indexed to carry the container 11 from station G' the stem 713*a* of valve 713 rides up the track 312*b* on cam 312 to open valve 713 and the contents of cylinder 712 then flow through conduit 714 and through nozzle 319 into the container 11.

The discharge of the cylinder 712 is continued whilst the container is stationary at stations H', J' and K' and whilst the container is being indexed between said stations, so that upon arrival at station K' the charging of the container 11 will be complete.

At station K' a push rod (not shown) is upwardly displaced against portion 318*c* to elevate arm 318, thereby withdrawing the nozzles 319 from the container 11, and in indexing between stations K' and L' valve stem 713*a* runs down cam 312*b* to close valve 713 whilst at the same time carriage 316 is retracted by the roller 317.

It will be seen that with the above arrangement the charging of the cylinders 712 can take place over some twelve stations and, by allowing the cylinders 712 to discharge whilst the turrets 311 and 711 are being indexed as well as when stationary, an adequate time period for the charging of the containers is ensured.

It will be understood that the machine in accordance with the invention, is not limited to the precise arrangements and many alterations and modifications may be made by those skilled in the art without departing from the scope of the invention.

The important aspect of the machine is in the provision of means for forming a substantially flat base on a length of gusseted tubing, welded across one end, by inflating the said tube.

I claim:

1. A machine for forming, filling and closing containers and comprising a container support means arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length open at both its ends in the side edge support afforded by the support means, container bottom forming means spaced from said feed means, container closing means spaced from said container bottom forming means, container charging means for charging containers with their contents between said bottom forming means and said closing means, and a drive arrangement for indexing said support means with a tubular container length supported therein successively through said bottom forming means, container charging positions and container closing means.

2. A machine according to claim 1 and wherein a severing device is provided and said feed means include a roll feed and a driving arrangement for advancing a continuous length of tubular material by an amount equal to one container length towards and into said support means when said support means lie in the path of the continuous length, said severing device serving to sever a container length from the end of the continuous length advanced into the support means when the drive arrangement is discontinued.

3. A machine according to claim 1 and wherein the bottom forming means comprise means for closing the lower open end of the tubular length and means for forming the closed lower end of the tubular length into a block bottom.

4. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the turret and each arranged to grip opposite lateral side edges of a container supported therein, a drive arrangement for indexing said turret, feed means for feeding and locating a tubular container length open at both its ends in the side edge support afforded by the support means as each support means is indexed to said feed means, container bottom forming means spaced from said feed means, container closing means spaced from said container bottom forming means and container charging means for charging a container contents into each container at positions between said

bottom forming means and said container closing means, said turret drive arrangement being adapted to index said support means successively to said feed means and then to index each support means with a tubular container length supported therein successively through said bottom forming means, said container charging positions and said container closing means.

5. A machine according to claim 4 and wherein the turret drive arrangement includes a scroll cam, a plurality of rollers equally spaced about a plate, and a track in said cam within which said rollers are successively engaged.

6. A machine according to claim 4 and wherein the feed means include means for advancing one end of a continuous length of tubular material into each support means indexed thereto and a severing device arranged to sever a container length from the advanced end of the continuous length each time the advance of the continuous length is arrested.

7. A machine according to claim 4 and characterised in that the bottom forming means comprise means for closing the lower open end of the tubular length and means for forming the closed lower end of the tubular length into a block bottom.

8. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the periphery of said turret, each support means including jaws arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length open at both its ends in the jaws of each support means located adjacent thereto by the turret, container bottom forming means spaced from said feed means, container closing means spaced from said bottom forming means, container charging means for charging a container contents into containers at positions between said bottom forming means and said container closing means and a drive arrangement for indexing said turret thereby to index said support means successively to a position adjacent the feed means where a tubular container length is fed thereinto and to index each support means successively through said bottom forming means, container charging positions and container closing means.

9. A machine for forming, filling and closing containers as claimed in claim 8 and wherein each support means comprise a back jaw, a pair of side jaws a shoe on each side jaw, a common pivot pin for said side jaws and inclined surfaces linking said side jaws for mutual displacement with said back jaw.

10. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the periphery of said turret each of said support means including jaws arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length open at both its ends into the jaws of each support means located adjacent to said feed means by said turret, a container bottom forming means spaced from said feed means, container charging means spaced from said bottom forming means and comprising at least one nozzle for charging a portion of the container contents thereinto and at least one further nozzle for completing the charging of the container, container closing means spaced from said container charging means and a drive arrangement for intermittently displacing said turret thereby to index said support means successively to a position adjacent the feed means where a tubular container length is fed thereinto and to index each support means successively through said bottom forming means, container charging means and container closing means.

11. A machine according to claim 10 and wherein said nozzles are arranged at adjacent stop dwell positions of the support means, and during dwell periods of the turret so that each support means is indexed successively to each nozzle position.

12. A machine according to claim 10 and wherein each nozzle is supported on pivoted levers so as to be vertically displaceable.

13. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the periphery of the turret each of said support means including jaws arranged to grip opposite lateral side edges of a container supported therein, a container charging means individual to each support means, feed means for feeding and locating a tubular container length open at both its ends into the jaws of each support means in a position adjacent to said feed means, container bottom forming means spaced from said feed means, container closing means spaced from said container bottom forming means and a drive arrangement for intermittently displacing said turret thereby to index said support means and said charging arrangements successively to said position adjacent said feed means and to index each support means and its charging arrangement from the position adjacent the feed means successively through said bottom forming means, and said container closing means.

14. A machine as claimed in claim 13 in which each charging arrangement comprises a nozzle, a measuring vessel, a duct between said measuring vessel and said nozzle and valve means for releasing container contents from said charging vessel through said duct and said nozzle when the charging arrangement lies between said bottom forming means and said container closing means.

15. A machine according to claim 13 in which each container charging means comprises a nozzle, a hopper, and a duct between said nozzle and said hopper.

16. A machine according to claim 13 and wherein means are provided for releasing container contents from each container charging arrangement into a container supported in its associated support means only during the passage of the support means between said container bottom forming stations and said container closing stations.

17. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the periphery of the turret each of said support means including jaws arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length of heat sealable material open at both its ends into the jaws of each support means located adjacent to the feed means by the turret, container bottom forming means spaced from said feed means and comprising heater means and sealing jaws, container closing means spaced from said container bottom forming means, container charging means for charging a container with its content between said bottom forming means and said container closing means and a drive arrangement for indexing said turret thereby to index said support means successively to a position adjacent the feed means where a tubular container length is fed thereinto and to index each support means successively through said bottom forming means, and container closing means.

18. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the periphery of the turret each of said support means including jaws arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length of heat sealable gussetted material open at both its ends into the jaws of each support means located adjacent to the feed means by the turret, container bottom forming means spaced from said feed means and comprising heater means, sealing jaws and block bottom forming means spaced at a stationary position of the support means subsequent to the sealing jaw position, said bottom forming means including a slot between rigid side walls in which slot the lower sealed regions of a container are positioned and means for inflating the container so as to expand the said container lower

regions out of said slot, container closing means spaced from said container bottom forming means, container charging means effective to discharge a container content into each container between said bottom forming means and said container closing means and a drive arrangement for indexing said turret thereby to index said support means successively to a position adjacent the feed means where a tubular container length is fed thereinto and to index each support means successively from said feed means and through said bottom forming means and container closing means to a container release means.

19. A machine according to claim 18 and wherein each support means comprise a back jaw, two side jaws, a shoe on each side jaw adapted to be engaged in the gussetted side walls of a container supported in the support means, a pivot pin common to said side jaws, a coil spring tending said side jaws towards one another and a coil spring tending the back jaw radially outwardly relative to the turret.

20. A machine for forming, filling and closing containers and comprising a container support means arranged to grip opposite lateral side edges of a container supported therein, feed means for feeding and locating a tubular container length open at both its ends in the side edge support afforded by the support means, container bottom forming means spaced from said feed means, container closing means spaced from said container bottom forming means, container charging means for charging containers with their contents between said bottom forming means and said closing means, a punch arrangement at a position between said feed means and said container charging positions arranged to strike one wall of each tubular container length or container indexed thereto to weaken an area in one wall of the container, and a drive arrangement for indexing said support means with a tubular container length supported therein successively from said feed means through said bottom forming means, past said punch arrangement and through said container charging positions and container closing means.

21. A machine as claimed in claim 20 and wherein label dispensing means are provided adjacent the punch arrangement or between said punch arrangement and said container charging means and said label dispensing means is actuated to apply a label across the weakened area of each container indexed thereto by the turret.

22. A machine for forming, filling and closing containers and comprising a turret, a plurality of container support means equally spaced about the turret and each arranged to grip opposite lateral side edges of a container supported therein, a drive arrangement for indexing said turret, feed means for feeding and locating a tubular container length of heat sealable material open at both its ends in the side edge support afforded by the support means as each support means is indexed to said feed means, container bottom forming means spaced from said feed means, container closing means spaced from said container bottom forming means, said container closing means comprising sealing jaws and at least one heater element, container charging means for charging a container contents into each container at positions between said bottom forming means and said container closing means, and wherein said turret drive arrangement is adapted to index said support means successively to said feed means and to index each support means with a tubular container length supported therein successively through said bottom forming means, container charging positions and container closing means.

23. A machine for forming, filling and closing containers comprising, in combination, a support means including jaws, feed means for feeding a length of gussetted heat sealable tubular material to said support means, severing means for severing said tubular material to leave a tubular container length supported in said support means, a plurality of bottom forming means comprising heater means and sealing jaws spaced from said feed means, container closure means spaced from said bottom forming means and comprising heater means and sealing jaws, a drive arrangement for indexing the support means with a container length supported therein successively through said bottom forming means, through positions between said bottom forming means and said container closure means and through said container closure means, container charging means arranged to discharge a container contents into the container whilst the container passes through said positions between said container bottom forming means and said container closure means, means for levelling the top edge of the container between said container charging positions and said container closure means, and means for releasing the charged and filled container following operation of the container closure means thereon.

24. A machine according to claim 23 and wherein a punch arrangement is operative on the container between said feed means and said container charging positions, said punch arrangement is actuated to weaken an area in one wall of the container as the container is indexed thereinto and a labelling arrangement is effective before the charging of the container to apply a label across the weakened area.

25. A machine according to claim 23 and wherein a plurality of said support means are equally spaced about the periphery of a turret, said drive arrangement indexes the turret to pass each support means successively through said feed means, said bottom forming means, said container charging positions, said levelling means said container closure means and said container release means, each support means indexed to the feed means has a container length fed thereto and supports said container length and subsequently the container formed therefrom in an open condition between said feed means and said levelling device and changes the support afforded to the container to hold the container closer between said levelling device and said container release means.

26. A machine according to claim 23 and wherein the support means comprises a back jaw including a front face, two side jaws arranged one on either side of said back jaw, a common pivotal axis for said side jaws, a shoe on each side jaw directed towards the opposite side jaw and arranged to be forwardly of and parallel with front face of said rear jaw in a container supporting condition of the support means, a coil spring urging the back jaw in the direction of its front face, a coil spring urging said side jaws towards one another and inclined faces between said back jaw and said side jaws for linking said jaws for mutual displacement, said jaws supporting a container length and the container subsequently formed therefrom between said feed means and said levelling means by engaging a shoe in each gussetted side of the container length and urging the front face of the back jaw against one plane face of the container length and supporting the charged container between said levelling means and the container release means by engaging the front face of the rear jaw against one plane face of the container and engaging the shoes forwardly of the other plane face of the container.

27. A machine according to claim 17 and wherein said bottom forming means include heater means, at least one stationary position of the support means spaced from the feed means, and sealing jaws at the last stationary position of the support means, said sealing jaws having heater means comprising a heater element, and means for displacing said heater element so that it lies adjacent the extreme lower edge of the tubular container length indexed thereto, said sealing jaws being arranged to close on and to heat seal the heated lower regions of each tubular container length indexed thereto.

28. A machine according to claim 17 and wherein said bottom forming means include heater means, at least one

stationary position of the support means spaced from the feed means, and sealing jaws at the stationary position of the support means immediately following the last stationary position, said sealing jaws having heater means comprising a heater element, and means for displacing said heater element so that it lies adjacent the extreme lower edge of the tubular container length indexed thereto, said sealing jaws being arranged to close on and to heat seal the heated lower regions of each tubular container length indexed thereto.

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