May 5, 1970 H. PERRIN 3,509,689

BAGGING MACHINES

Filed Aug. 8, 1967 5 Sheets-Sheet 1

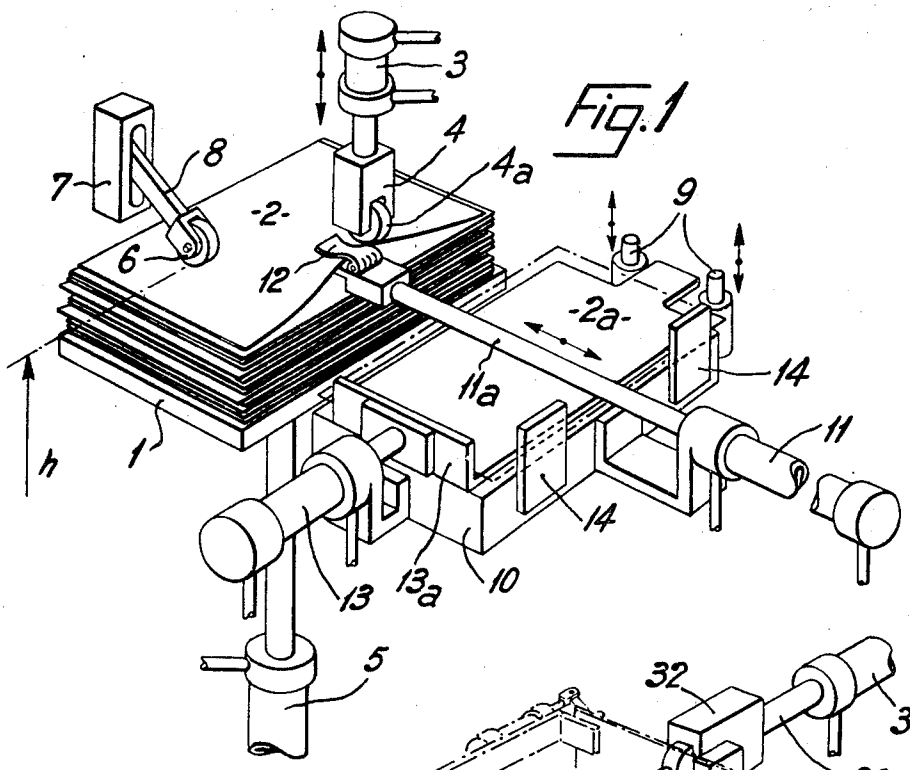


Fig. 1

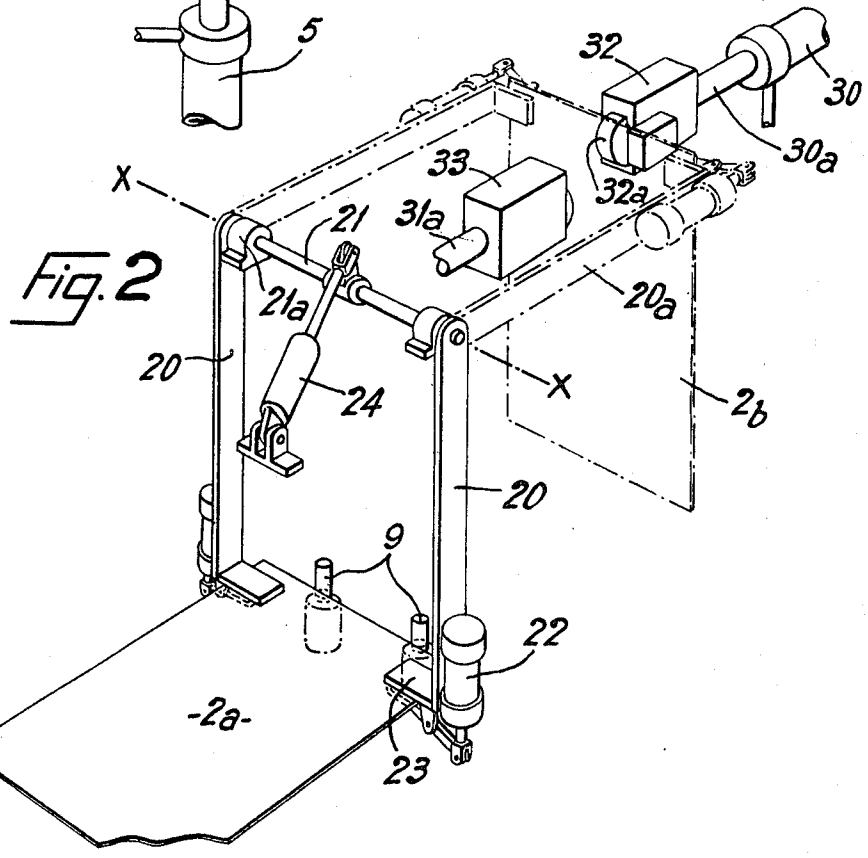


Fig. 2

May 5, 1970 H. PERRIN 3,509,689

BAGGING MACHINES

Filed Aug. 8, 1967 5 Sheets-Sheet 2

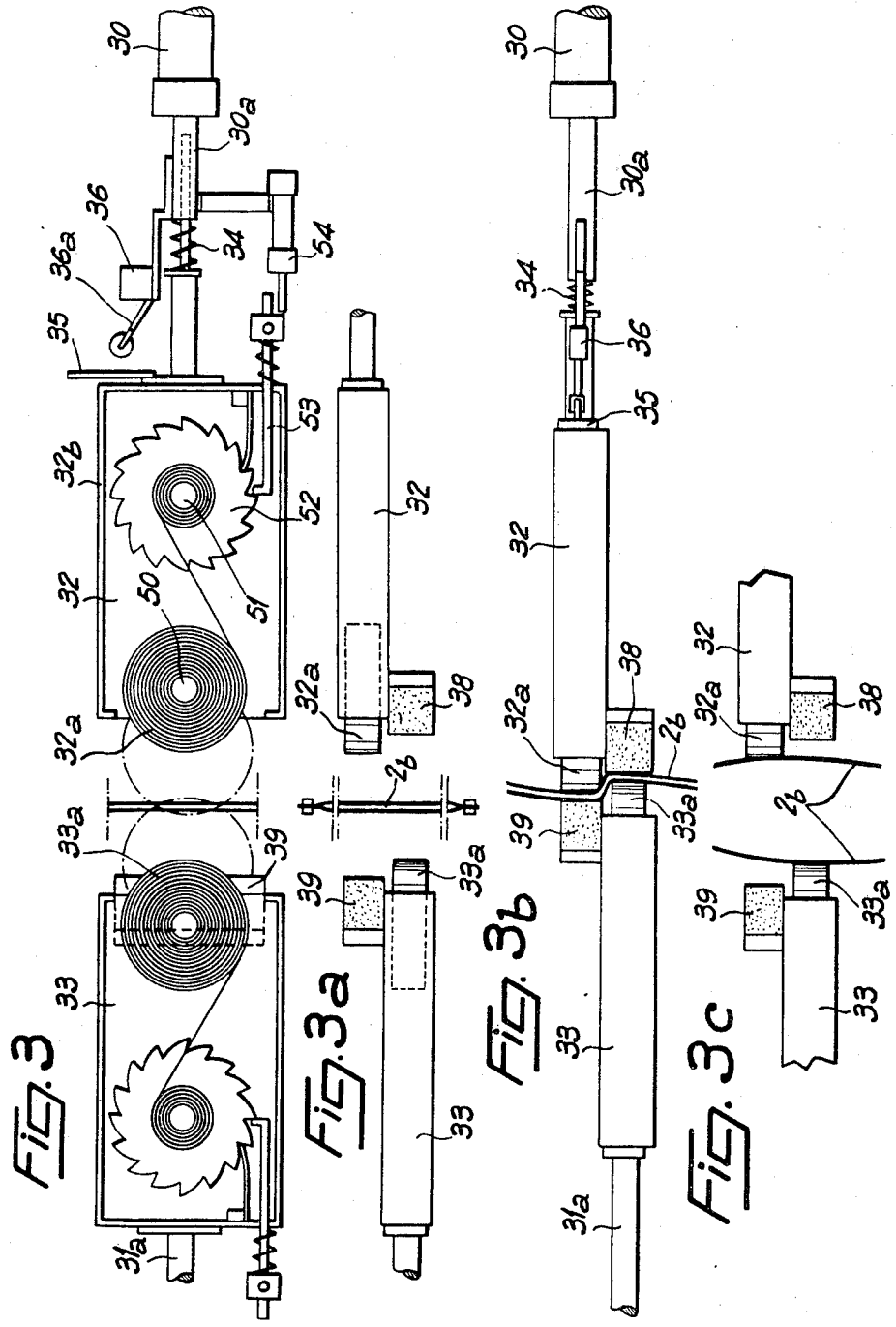


Fig. 3

Fig. 3a

Fig. 3b

Fig. 3c

May 5, 1970 H. PERRIN 3,509,689

BAGGING MACHINES

Filed Aug. 8, 1967 5 Sheets-Sheet 3

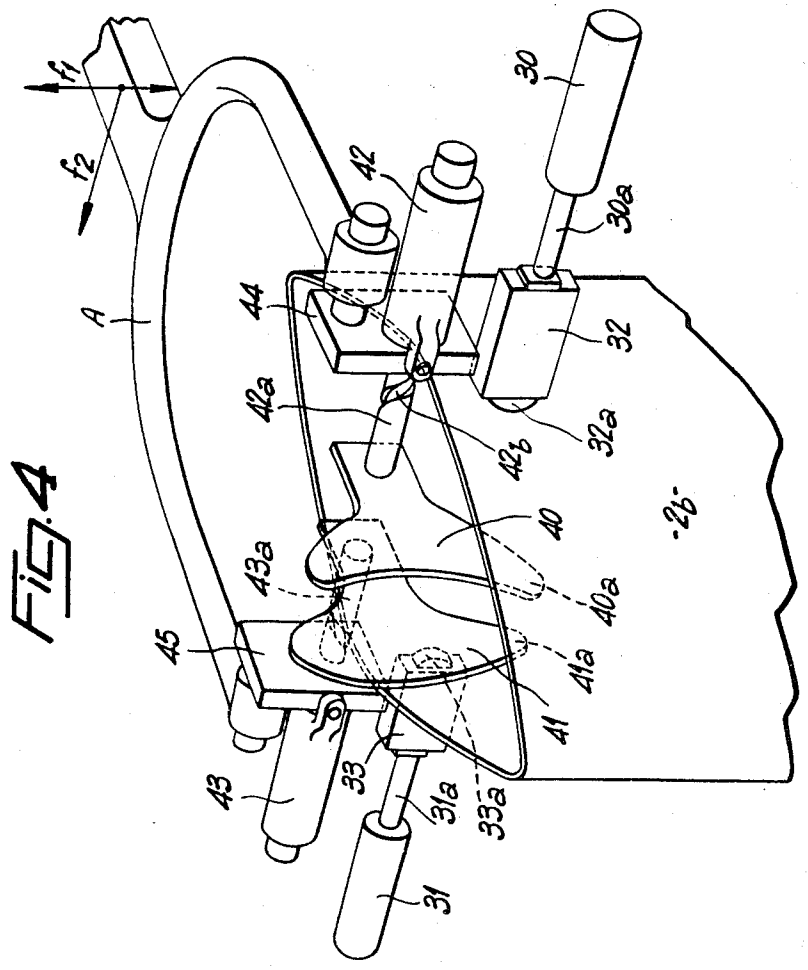


Fig. 4

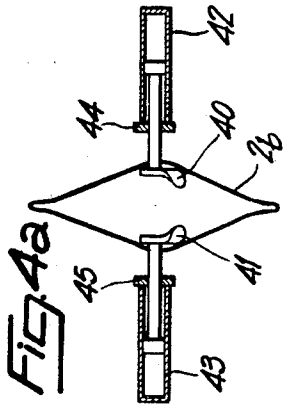


Fig. 4a

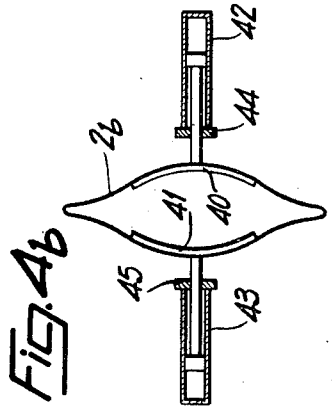


Fig. 4b

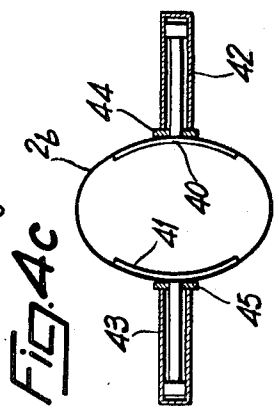


Fig. 4c

May 5, 1970 H. PERRIN 3,509,689

BAGGING MACHINES

Filed Aug. 8, 1967 5 Sheets-Sheet 4

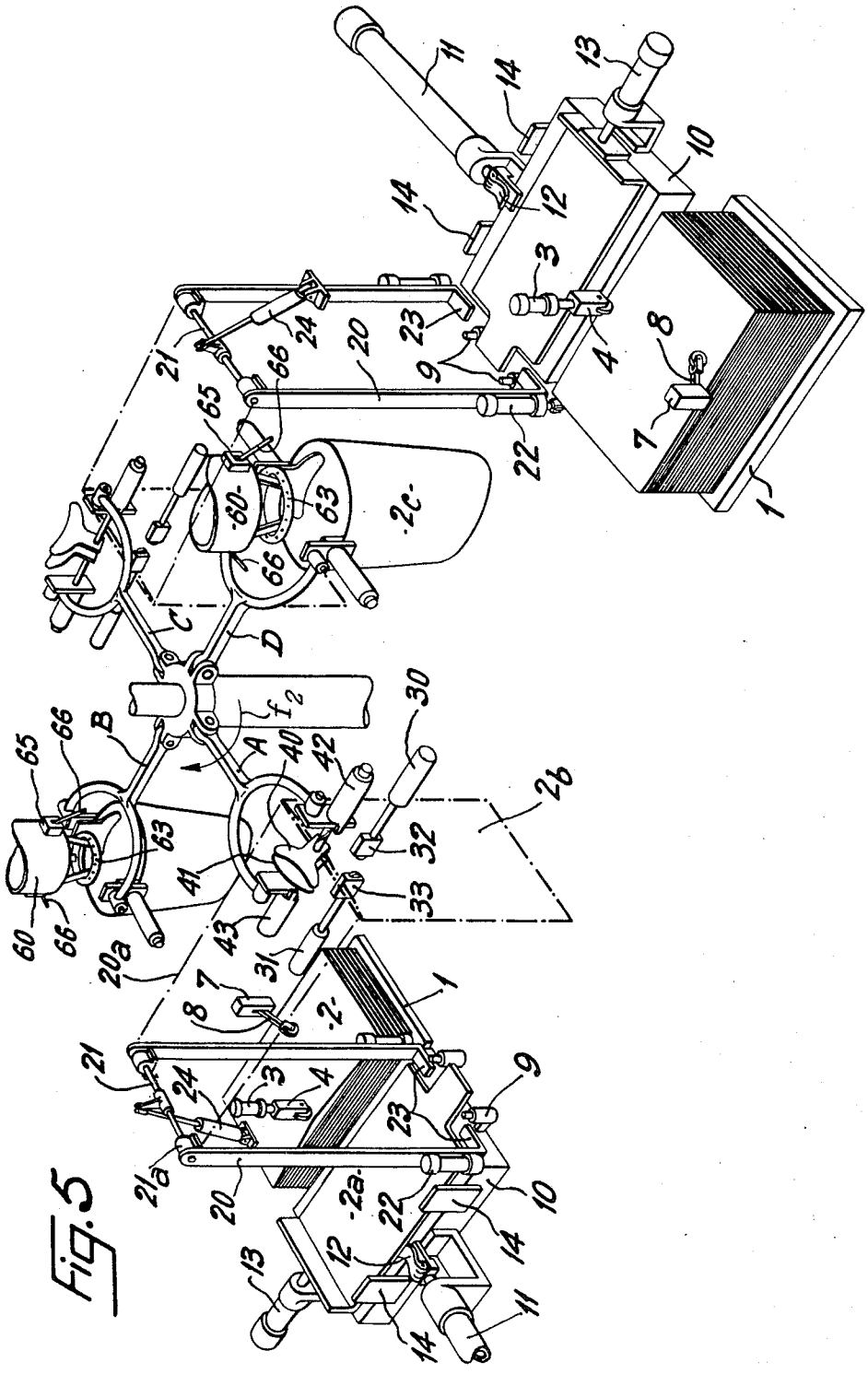


Fig. 5

May 5, 1970 H. PERRIN 3,509,689

BAGGING MACHINES

Filed Aug. 8, 1967 5 Sheets-Sheet 5

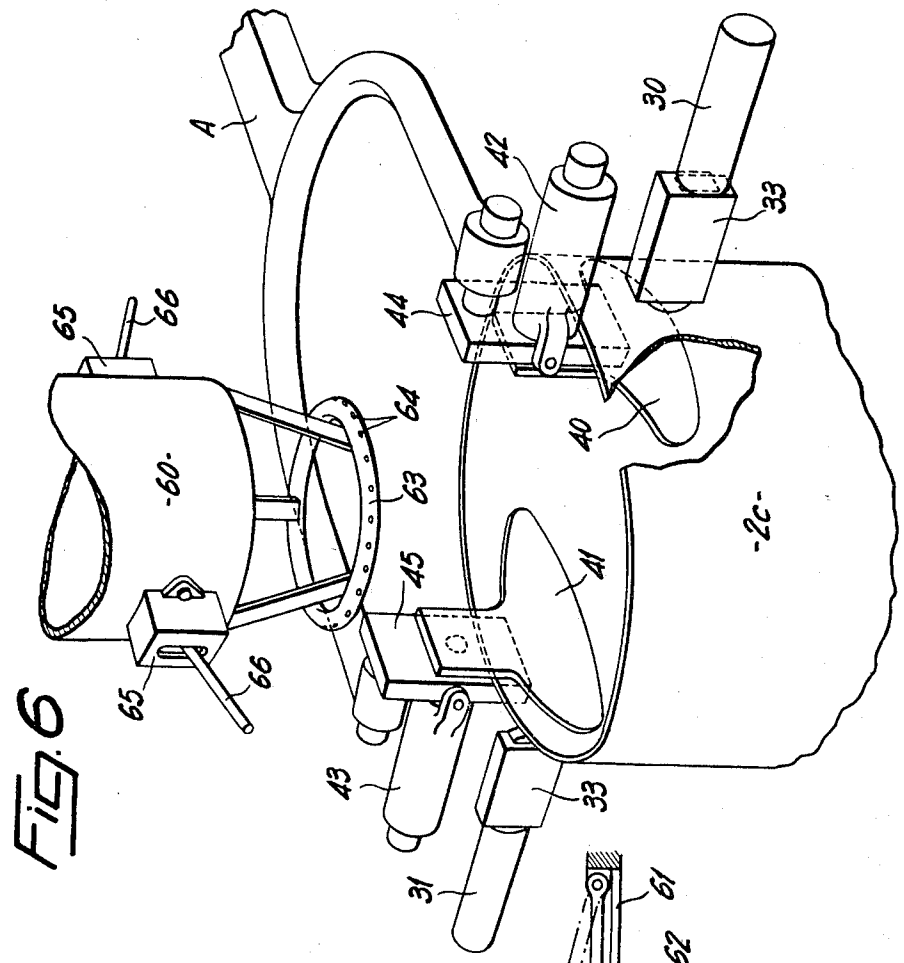


Fig. 6

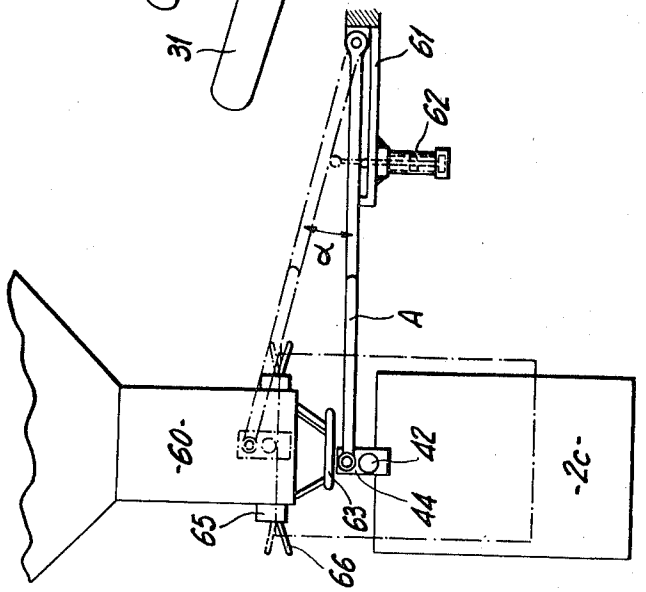


Fig. 7

United States Patent Office

3,509,689
Patented May 5, 1970

3,509,689

BAGGING MACHINES

Henri Perrin, Pau, Basses-Pyrenees, France, assignor to Azolacq, Societe Chimique d'Engrais et de Produits de Synthese du Sud-Ouest, Paris, France, a French body corporate

Filed Aug. 8, 1967, Ser. No. 659,179
Claims priority, application France, Oct. 14, 1966, 80,062
Int. Cl. B65b *43/30*
U.S. Cl. 53—188 13 Claims

ABSTRACT OF THE DISCLOSURE

A bagging machine in which each individual bag is brought into a vertical position, and then partially opened by means of a pair of retractable adhesive members which hold it in the region of its neck, the invention giving provision for the introduction to the neck of a pair of spatulate members which can be retracted to open the bag fully. When the bag is open it is held firmly between, on its inside, the spatulate members and, on its outside, a pair of stops. The adhesive members can then be retracted further so as to release their hold on the bag. The curved spatulate members are introduced in part longitudinally to the bag and then rotated through 90° so that their contours can be taken up by the bag to be filled on the said retraction.

The present invention relates to bagging machines equipped with a mechanical device for opening the necks of the bags.

A device of this sort is known which comprises two sensing devices each equipped with adhesive areas, which devices, being moved towards one another, are applied against opposite external faces of the vertically held bag, then withdrawn again in order to open the bag in order to accord with the size of the filler apparatus.

In order, in this position, to prevent the neck of the bag from closing inadvertently when filling is taking place, due to loss of adhesion between one of the said faces and one of the said sensing devices, the known device is provided with means for introducing and maintaining in position inside the open neck of the bag, a rigid ring which adapts to the shape of said neck. Nevertheless, the introduction of such a ring is extremely difficult if it is required, once in place, to open the neck of the bag as wide as possible. In other words, during introduction, there is a risk of the said ring fouling and damaging the edges of the neck of the bag.

In addition, in the known machines, the sensing devices incorporate rollers of adhesive material situated opposite one another and, consequently, each adhesive area is limited to the generatrix of the corresponding adhesive roller.

Experience has shown that this area of contact is inadequate.

Moreover, the known machines ususally incorporate a distributor which slides one bag from a horizontal stack of bags arranged on a table, one of the sensing devices gripping the bag at the table location in order subsequently to bring it into a vertical position.

However, experience has shown that it is extremely difficult to make the bags slide over one another and in fact they very often stick together so that instead of picking up one, in fact two or three are taken. Again, the bags are stacked irregularly so that the machine varies in the efficiency of its operation all in accordance with the nature and type of bag employed (paper, jute, plastic).

The present invention seeks to overcome these drawbacks. It enables uniform operation of the bagging machine to take place and also enables a combination of several machines to be operated in a confined space.

In accordance with the invention, the bagging machine equipped with a mechanical device for opening the neck of a vertically held bag, the bag being held open by two sensing devices provided at their mutually opposite extremities with adhesive areas applied to the opposite external faces of the said bag and then spaced away from one another, is characterised in that it comprises a vertically movable carrier on which there is arranged at least one pair of spacers, horizontally movable in opposite directions between a closed and an opened position, these specers having a spatulate form the concave portions of which are mutually opposite and which, through the medium of their convex faces, come into contact in the open or spaced condition with stops which limit their travel. Thus, with the spacers in the closed position, it is possible to introduce them into the half-open neck of the bag by vertical displacement of the said carrier, and then to retract them from one another. Each of the spacers thus deflects one of the mutually opposite faces of the bag, enlarging the neck opening, until these faces are trapped against the said stops. The bag is then held in the vertical direction by those parts of the edge of its neck portion which are trapped between the said spacers and the said stops.

In an advantageous embodiment, the spatulate portions of the spacers comprise a widened area with at least one elongated projecting lateral part, and they are rotationally mounted in relation to an axis of the said carrier which axis is eccentric in relation to the said widened spatulate portion, in such a way that in the closed position the widened area and the projecting part are disposed outside the bag, whilst in the spaced position they are located substantially horizontally inside the bag.

This spatula arrangement, in association with the facility for rotation, on the one hand facilitates their introduction into the neck of the bag since their elongated portions are offered up to it, and on the other hand facilitates the holding of the neck of the bag more or less fully open since the widened portion is disposed horizontally inside the bag.

Preferably, the said carrier will incorporate a fork portion integral with the end of a moving arm, and opposed rams will be mounted on the ends of the branches of the fork, the said spatulate portions being attached to the ends of the piston rods of the said rams, more or less at right-angles thereto, whilst the said piston rods contain helical grooves co-operating with fixed nuts which act as stops for limiting the travel.

Thus, in accordance with the invention the machine can comprise a turret carrying an even number ($2n$) of such arms, pivoting about a horizontal axis, this turret indexing through angular increments of π/n in order to successively bring each arm to a bag distribution and opening station, then to a loading station. In this way, a single vehicle can be loaded simultaneously and from one position in a time which is n times shorter than that obtainable with known machines. Moreover, a machine of this sort can load several vehicles simultaneously.

In an advantageous embodiment of the invention, the sensing devices comprise adhesive areas arranged in neighbouring parallel planes and opposite each one there is arranged an elastic stop that of whose faces facing the bag is set back behind the adhesive area situated at the same side of the bag. Thus, when the said areas are pressed against the corresponding stops, the bag portions trapped by them are deformed in such a way as to be applied more extensively against the said areas. Again, the deformation of the bag facilitates the unsticking of its walls.

Preferably, each sensing device will incorporate an adhesive strip unreeled under the control of a ratchet wheel, the latter moved by the interaction of its pawl with stops which trip it during the travel of the said sensing device.

Advantageously, the movable elements of the machine in accordance with the invention will be controlled by pneumatic rams, this because of their high speed of operation.

The ensuing description, which relates to the attached drawing, given by way of a non-limitative example, will indicate how the invention may be put into effect, the features contained both in the drawing and in the description, self-evidently constituting part of the said invention.

FIG. 1 pictorially illustrates the distributor of the bagging machine.

FIG. 2 illustrates the device for gripping the bags and arranging them in a vertical position.

FIG. 3 is a schematic section through the sensing devices.

FIG. 3*a*, 3*b*, 3*c* schematically illustrate in plan view, three successive positions of the sensing devices.

FIG. 4 illustrates the adhesive sensing devices and the spacers for the neck of the bag, mounted at the tip of a transfer fork.

FIG. 4*a*, 4*b*, 4*c*, illustrate the spacers in three successive positions.

FIG. 5 illustrates two bagging machines as described hereinbefore, feeding the two opposite arms of a turret whose two other arms are located at respective filling stations.

FIG. 6 illustrates on a larger scale, the opened bag in position beneath the filler orifice.

FIG. 7 illustrates the same bag in full line, in the position corresponding to that of FIG. 6, and in broken-line in the raised position in which filling is about to commence.

The distributor illustrated in FIG. 1 comprises the plate **1** on which there are stacked bags **2** (for example 400 for loading a 20 metric ton vehicle). The height *h* of the top bag of the stack is maintained constant vis-a-vis the reference datum of the machine, thanks to the provision of a contact-breaker **6**, **7**, **8** controlling a ram **5** the moving part of which is integral with the said plate **1** so that the latter automatically raises and lowers by the required amount in order to maintain the top bag level with a table **10**.

Each bag is transferred from position **2** to position **2***a* on the table **10**, through the medium on the one hand of a sensing device **4** equipped with an adhesive area **4***a* and movable vertically in both directions by means of a ram **3**, and on the other hand of a gripper **12** movable horizontally, also in both directions, under the control of a ram **11**.

To this end, the sensing device **4** is brought down into contact with the top bag of the pile carried by the plate **1**, then lifted away again in order to raise the bag to the level of the gripper **12**. At the end of the outward travel of the piston rod **11***a* of the ram **11** which it carries, the gripper **12** closes on the bag through the agency of a known device, such as a piston moving against a spring inside the piston rod **11***a* as soon as the latter is retracted. With this retracting movement, the bag is picked up and separated from the stack. When that edge of the bag facing the table **10** arrives in contact with stops **14** integral with the table, the gripper **12** opens, the rod **11***a* continuing its retracting movement. The bag is thus deposited upon the said table in such a fashion that the said edge is in contact with the stops **14**.

A doctor plate **13***a*, operated by a ram **13** whose axis is perpendicular to that of the ram **11**, pushes the bag across the table **10** until it touches the retractable stops **9**, after which the ram **13** returns to its initial position.

All these co-ordinated movements finally leave the single bag which has been extracted from the pile, on top of the horizontal table **10** in a position **2***a* which has been precisely determined by the stops **9** and **14**. The bags are initially stacked on the plate **1** in such a fashion that in this position **2***a*, their necks are in contact with the stops **9**.

The gripper device illustrated by FIG. 2, then comes into action to place the sack in a vertical position. This latter device, comprises a pair of parallel arms **20** mounted upon a shaft **21** which pivots, about its horizontal axis XX, in bearings **21***a* in the machine frame (not shown, the pivoting motion being produced by a ram **24** also mounted on the said frame; at their free ends, the arms **20** carry grippers **23** operated by rams **22**. In the vertical position of the arms **20**, these grippers are open at either side of the retractable stops **9**, so that the ram **13** (FIG. 1) forces the bag **2***a* between the jaws of the grippers **23**. At the desired moment in the cycle of operations, these jaws close over the two corners of the bag adjacent the neck, the stops **9** retract and, simultaneously, under the action of the ram **24**, the arms **20** rotate through 90° about the shaft **21**, returning to the horizontal position **20***a*. The bag is now vertical (marked **2***b* in the figure), with its bottom part hanging down and the neck at the top.

In this position (see in particular FIG. 4), the bag, held by the two corners at the neck, is located between two horizontal opposed rams **30** and **31** carried on the frame, whose rods are provided at their free ends with adhesive sensing devices **32** and **33**. At the instant at which the arms **20** commence to rotate, the rods of the rams **30** and **31** advance towards one another in order to place the adhesive rollers **32***a*, **33***a* against the opposite faces of the bag when the latter has reached the vertical position. In order, in accordance with the invention, to increase the area of contact between the adhesive rollers and the external faces of the bag, the rollers are arranged in two parallel planes, here vertical, which are staggered in relation to one another (see FIGS. 3*a* to 3*c*). Moreover, opposite each of the rollers **32***a* and **33***a*, there is provided, integral with the other roller, an elastic stop **39** or **38** of whose faces nearest the bag are set back from the position of the associated roller, the stop coming into contact with the said bag. Also, when the rollers are pressed against their respective stops, the bag which they thus entrap, is deformed so that it is applied over a large area of the adhesive rollers. The area between the latter and the bag is thus increased and, additionally, the deformation of the bag promotes the subsequent unsticking.

FIG. 3 illustrates a vertical section through the sensing devices **32** and **33**. The roller **32***a* is rotatable, albeit the friction torque is high, about a detachable horizontal shaft **50** connected to the housing **32***b*, the detachable arrangement of the shaft facilitating the replacement of a worn roller. The assembly is such that the adhesive face is presented externally outside the housing of the sensing device along an adequate arcuate length of the cylindrical surface, this even when the roller is virtually completely worn.

The tape unreels from the shaft **50** onto a shaft **51** in section of 2 or 3 mm. at a time, this under the control of the rotation of a ratchet wheel rotating in rotation to the said housing **32***b* and driven by pawl **53**. The housing can slide, against the action of a spring **34**, on the rod **30***a* of the ram **30**. In addition, the latter carries a stop **54** which cooperates with the pawl **53** in order to index the wheel **52** one step each time the roller **32***a* hits a bag.

Thus, with each extension of the rod of the ram **30**, an impulse is given to the wheel **52**, stemming from the stop **54** integral with the rod **30***a*, which impulse serves to partially renew the adhesive on the roller.

A retractable sensing device **32** of this sort, which can extend over a certain distance and grip an object sufficiently firmly to return it properly, can reproduce this action around 15,000 times before a roller **32***a* is used up, the latter usually embodying 32 metres of adhesive

tape unreeled by 2 mm. with each impulse. The roller does not have to be replaced (considering 50 kg. bags) until after 750 metric tons of product have been bagged.

The sensing device **33** is similar and symmetrically disposed in relation to the sensing device **32**, and their times of contact with the bag are simultaneous. However, the sensing device **33** is attached directly to the rod **31***a* of the ram **31**. In this case, the rotation of the roller **33***a* which renews the adhesive surface, is produced by co-operation of the pawl (similar to the pawl **53**) of the corresponding ratchet-wheel, with a retracted end-of-travel stop. In addition, the housing **32***b* of the retractable sensing device **32** carries a stop **35** which collaborates with a mobile element **36***a* on a relay **36** attached to the bar **30***a*, the said relay controlling the rams **22, 24, 30** and **31**.

Thus, as soon as the sensing devices **32** and **33** come into contact with the bag (FIG. 3*b*), the fixed sensing device **33** collapses the retractable sensing device **32**, compressing the spring **34**. The stop **35** operates the relay **36** which causes the jaws of the gripper **23** to open, causes the arms **20** to return to the original position and causes the rams **30** and **31** to retract; the sensing devices **32** and **33**, which now hold the bag, each take with them one of the sides of the bag (FIG. 3*c*) during the retracting movement, so that the neck is half-opened. The neck tends to take up a generally rectangular form. However, since it is an object here to introduce a filler orifice of fairly large diameter, it is necessary to produce in the neck of the bag a more or less elliptical cross-section so that the neck is opened to a maximum extent.

The machine in accordance with the invention is to this effect provided with mutually opposite spacers equipped with spatulate portions **40** and **41**, the concave parts of which are opposite one another (FIG. 4). These spatulate portions are mounted eccentrically at the ends of the rods **42***a* and **43***a*, substantially at right-angles thereto. Each of the spatulate portions comprises, in that of its regions furthest away from the particular rod, a widened area having at least one elongated lateral projection part **40***a* or **41***a*, outside the bag. The rods **42***a* and **43***a*, belonging to the rams **42** and **43**, contain a helical groove (e.g. **42***b*) cooperating in each case with a fixed threaded guide **44** or **45** acting as cylinder end block and fixed nut. The rams **42** and **43**, their rods **42***a* and **43***a*, and the guides **44** and **45**, are arranged coaxially upon the two arms of the forked carrier arrangement A which is vertically movable and horizontally rotatable, as will be described hereinafter (arrow f_2 and double-headed arrow f_1).

The spacers thus close and part, executing about half a turn as they do so. When the adhesive rollers **32***a* and **33***a* commence to open the bag, the spatulate portions **40** and **41** are introduced with their projecting portions **40***a* and **41***a* into the neck of the bag (see FIG. 4) under the action of a ram (not shown) which depresses the fork A in the direction indicated by the arrow f_1. After this, the rams **42** and **43** are operated and the helical grooves in their rods, the latter retracting, cause the spacers to part, turning as they do so, so that at the end of the travel the walls of the bag are trapped between the spatulate portions **40** and **41** and the guides **44** or **45**.

The bag, now held firmly in place, cannot follow the retracting movement of the adhesive blocks any further, these blocks having completed their function and continuing to retract in order not to interfere subsequently with the transfer of the open bag.

The neck of the bag successively takes up the shapes illustrated in FIG. 4*a* and 4*b*, and, finally, the desired elliptical shape seen in FIG. 4*c*, all this thanks to the fact that the convex faces of the spatulate portions bear against the internal wall of the said bag.

All the controlling of the operations of the rams, hereinbefore described, can obviously be undertaken by a program equipment.

The bag thus being suitably held open between the spatulate portions and the blocks, it is now ready for transfer to the filling station. In accordance with a further feature of the invention, this transfer can be effected by means of a turret whch can simultaneously serve several opening and filling stations. FIG. 5 illustrates a turret with four forked arms A, B, C and D, attached in articulating fashion to the vertical spindle of the said turret and indexing round through 90° steps in clockwise direction (arrow f_2) about the vertical axis. A mechanism, not shown, is provided for producing this indexing motion and at the same time lowers or raises the arms two at a time, i.e. A and C or B and D, through a certain angle in relation to a datum plane. It will thus be understood that in each indexed position, two of the arms, e.g. A and C, are in a lowered position, each opposite an opening station, whilst the other two arms, e.g. B and D, are in a raised position, opposite filling stations.

It will also be noted that the fork D arrives at the opening station and receives a new bag for opening, whilst the preceding one is commencing to be filled. Thus, with two feed stations, two 50 kilo bags can be filled every six seconds, meaning 60 metric tons of product per hour.

FIG. 6 illustrates an arm such as A and C carrying an open sack **2***c* which arms arrived after substantially horizontal rotation through 90° at a filler station, having been raised at this station through an angle α such that the bag embraces the loading hopper **60**. This latter position is illustrated in broken-line in FIG. 7, this figure also schematically illustrating a kind of circular rail **61**, coaxially disposed in relation to the turret, upon which the arms can slide during their horizontal movement. This rail can be traversed to a position opposite the filler station by a ram **62** which raises the arms through the requisite angle α at this point.

The invention can advantageous be complemented by a device which monitors and safeguards the filling operation.

When the fork has been raised in order to enter the filler orifice into the neck of the bag, the edges of the neck may in some cases interfere with proper positioning. In this context, the invention provides a ring **63** containing holes **64**, through which compressed air is blown whilst the fork is being raised. As soon as the bag is in the top position, a program control causes a loading top to be discharged and a bag support element is operated (automatic bag closing device, or support flap, all in accordance with the nature of the installation).

However, the top should not be able to discharge if the bag is not correctly open, if it is improperly registered or if in fact there is not a bag in place. To this end, the loading hopper **60** is provided in accordance with the invention with two contact-breaker stops schematically illustrated by **65**, the arms **66** of which are only operated (in co-operation with the edges of the bag) to trigger the discharge of the top, if the bag is correctly positioned, if this is not the case the bag is released and drops onto the floor where it can be recovered and replaced on the stack carried by the plate **1**.

The support elements are released as soon as the bag is full and the latter drops onto a conveyor belt which removes it from the machine. The fork descends again and the spacers are raised ready to receive the bag presented at the next opening station.

It goes without saying that the embodiments which have been described hereinbefore are open to modification in particular by the substitution of equivalent technical means, without departing from the scope of the present invention.

What I claim is:

1. A bagging machine of the type including a loading hopper and a mechanical device for opening the neck of a vertically held bag, said device comprising: first and second sensing devices provided at their mutually op-

posite extremities with adhesive areas adapted to be applied against opposite external faces of said bag and then spaced apart; a carrier adapted for movement towards said loading hopper; a pair of spacers arranged for mutually opposite horizontal movement between a closed and an open position, mounted on said carrier, each spacer having a portion of a curved spatulate form to have a concave and a convex surface, said concave surfaces of said pair being mutually opposite; means for rotating said spacers about a horizontal axis substantially perpendicular to said spacers; and a pair of stops arranged mutually opposite said convex surfaces, whereby during use of the device a bag is held between said stops and said convex surfaces when in said open position.

2. A bagging machine according to claim 1, in which each of said spacers comprises a widened area having an elongated laterally projecting portion and is rotatably mounted about an axis substantially perpendicular thereto on said carrier, the axis being eccentric in relation to said widened area.

3. A bagging machine according to claim 1 wherein said spacers are attached to the ends of rods movable by opposing hydraulic rams, each of said rods being provided with a helical groove, and wherein the carrier is provided with fixed threaded guides each associated with a rod, said guides also comprising said pair of stops.

4. A bagging machine according to claim 3, in which said carrier comprises a two-limbed fork and a movable arm having one end integral therewith, and in which said arms are mounted on the extremities of said fork limbs.

5. A bagging machine according to claim 1, in which said adhesive areas are laterally displaced on from the other and lie in parallel planes, each of said sensing devices being provided with a stop member situated beside and behind said adhesive area and in which stop member of each device is located opposite said adhesive area of the other of said devices.

6. A bagging machine according to claim 1, in which each of said sensing devices includes a roll of adhesive strip material, a part of which provides said adhesive area, a ratchet wheel, a pawl co-operating therewith and a stop for tripping said pawl and ratchet wheel incrementally to unreel said strip material when a bag previously supported by said sensing devices is held by said spacers.

7. A bagging machine according to claim 1 provided with a bag distributing device which comprises: a vertically movable adhesive block capable of lifting the top bag from a stack; a substantially horizontally located rod carrying a gripper at one end, said gripper serving to grip said lifted bag; a rod retracting means; a table to which said bag can be brought by said rod under the action of said retracting means; a first set of stops associated with said table and against which said bag is brought to bear under the action of said retracting means; bag displacement means; a second set of stops against which a neck portion of said bag is brought to bear by said bag displacement means; a pair of horizontally pivoted gripper arms which grip said bag when said neck portion bears against said second set of stops; and gripper arm rotating means for rotating said gripper arms about said horizontal pivots to bring said bag to an upright position between said sensing devices.

8. A bagging machine according to claim 7 in which said bag displacement means includes a doctor plate mounted for substantially horizontal movement in a direction at right angles to said horizontally located rod.

9. A bagging machine according to claim 8 in which said second set of stops are retractable.

10. A bagging machine according to claim 1 in which said loading hopper is provided with a ring located to be within the neck of a bag immediately prior to filling the bag, said ring being provided with orifices whereby compressed air supplied to the inside of said ring may issue through said orifices.

11. A bagging machine according to claim 7 in which each of said spacers comprises a widened area having an elongated laterally projecting portion and is rotatably mounted about an axis on said carrier, the axis being eccentric in relation to said widened area.

12. A bagging machine according to claim 11 in which said spacers are attached to the ends of rods movable by opposing hydraulic rams, each of said rods being provided with a helical groove and associated with a fixed threaded guide, and in which said guides also comprise said pair of stops.

13. A bagging machine according to claim 12 in which said adhesive areas are laterally displaced one from the other and lies in parallel planes, each of said sensing devices being provided with a stop member situated beside and behind said adhesive area and in which said stop member of each device is located opposite said adhesive area of the other of said devices.

References Cited

UNITED STATES PATENTS

2,702,150	2/1955	Vogt	53—188
2,926,475	3/1960	Lee	53—63 X
2,949,714	8/1960	Davis	53—63
2,973,612	3/1961	McGowan	53—384

TRAVIS S. McGEHEE, Primary Examiner

U.S. Cl. X.R.

53—63, 384