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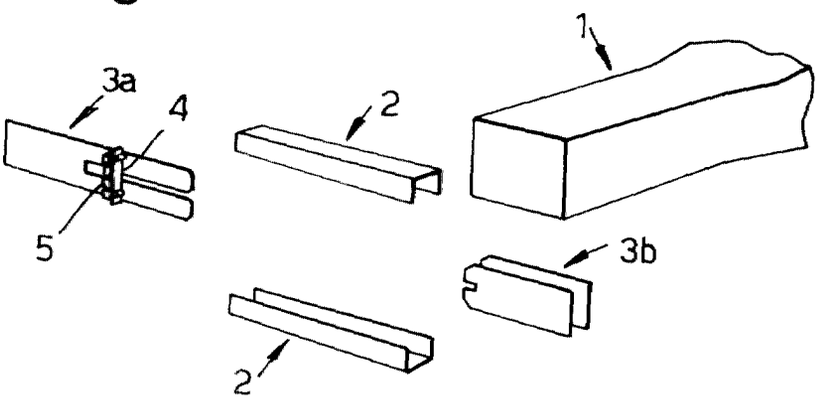
(54) Bag tying machine

(57) A bag tying machine for tying together the end of bag comprising a conveyor travelling in a first direction for conveying a filled bag (1); bag tying means (2, 3, 4, 5) for gathering and applying a seal to the neck of the filled bag, including a tie applicator member (3a) and a reaction member (36); wherein, in use, the bag tying means start in a first position beyond the extent of the passage of the filled bag (1) and move in opposite directions to the neck of the filled bag (1) in a plane substantially perpendicular to the first direction, meeting at the neck of the filled bag to apply a length of adhesive tape (4) around a neck of the filled bag, and move back to the first position in the plane substantially perpendicular to the first direction.

Fig.1.



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Description

[0001] Numerous bag sealing machines exist which apply a strip of adhesive tape around the gathered neck of a bag. Typically these machines require the movement of the bag past the machine on a conveyor. It is only the neck of the bag that passes through the bag tying mechanism, the neck of the bag extending beyond the conveyor perpendicularly to the direction of travel in order for the neck of the bag to pass through the bag tying machine. This means that the components of the tying mechanism can be close together with only small movements required to complete a tying operation. An example of a bag tying machine of this type is described in GB-A-0128687. Given that only small movements are required to complete a tying operation this type of bag tying machine can operate at least as fast as existing bagging machines.

[0002] However, automatic bag tying machines are used as an integral part of a whole bagging and sealing production line and so must be compatible with particular bagging machines if they are to be useful. In at least one bagging machine the bags pass through the bagging machine end on, in other words the neck of the bag is either at the front or at the rear of the bag in the direction of travel. Existing bag tying machines which apply a strip of adhesive tape around the neck of a bag are incompatible with these bagging machines. Systems which transfer filled bags onto another conveyor so that they can be tied by existing machines end up being very bulky and not as fast as the bagging machines. Furthermore with such systems it can be problematic keeping all of the product within the bag when transferring between conveyors. It is therefore preferable to carry out the tying operation immediately after bagging and also at the highest rate at which the bagging machines can perform. There is therefore a need for a bag tying machine which can seal the neck of a filled bag quickly whilst allowing the entirety of the filled bag to pass through the tying mechanism. It is also desirable to have a machine of this type suitable for different sized filled bags.

[0003] According to one aspect of the present invention a bag tying machine comprises:

> a conveyor travelling in a first direction for conveying a filled bag;
> bag tying means for gathering and applying a seal to the neck of the filled bag, including a tie applicator member and a reaction member;
> wherein, in use, the bag tying means start in a first position beyond the extent of the passage of the filled bag and move in opposite directions to the neck of the filled bag in a plane substantially perpendicular to the first direction, meeting at the neck of the filled bag to apply a length of adhesive tape around a neck of the filled bag, and move back to the first position in the plane substantially perpendicular to the first direction.

[0004] Preferably the bag is stationary when the length of adhesive tape is applied to the neck of the bag.

[0005] The present invention allows a neck of a bag to be sealed by a bag tying mechanism and either before or after tying tape around the neck of the bag, the bag can move through the centre of the bag tying mechanism without interfering with it. During the time the bag moves through the machine a new length of tape can be cut and mounted on the bag tying means ready for the next bag.

[0006] Preferably the bag tying machine further comprises gathering means for gathering together the neck of the filled bag prior to the action of the bag tying means.

[0007] Preferably the gathering means comprises a pair of elongate members which approach the neck of the filled bag from opposite directions in the plane substantially perpendicular to the first direction and substantially perpendicular to the path of the bag tying means and sandwich the neck of the bag so that it lies in a plane extending in the first direction. In this case the bag tying means and the reaction member gather together the neck of the bag as they move together in the first direction.

[0008] In a preferred embodiment of the present invention the bag tying means comprises:

> a pair of arcuate surfaces mounted on the tie applicator member, which are biassed to contact each other and against which a non adhesive side of the length of adhesive tape rests;
> wherein when the tape is pushed into contact with the neck of a bag the arcuate surfaces move around opposite sides of the neck thereby tying the tape around the neck and onto itself.

[0009] Preferably the arcuate surfaces are pneumatically biassed against each other.

[0010] Preferably the tie applicator member and the reaction member are driven in a reciprocating fashion on a guide rail by a single drive mechanism. The drive mechanism may be pneumatically driven but preferably it is a cam driven mechanism as this allows for faster movement of the tie applicator member and the reaction member.

[0011] Preferably the bag tying means includes a pair of cantilevered leaf springs attached to the first guide means and positioned in front of the arcuate surfaces in order to further gather the clamped neck of the bag prior to tying the adhesive tape around the neck of the bag.

[0012] An example of a bag tying machine in accordance with the present invention will now be described with reference to the accompanying drawings.

> Figure 1 is a schematic representation of a bag tying machine of at the beginning of a tying cycle according to one embodiment of the invention;

Figure 2 shows the bag tying machine of Figure 1 as the bag is moving through the machine into the required position for tying;

Figure 3 shows the bag tying machine of Figure 1 with the neck of the bag gathered by the gathering means;

Figure 4 shows the bag tying machine of Figure 1 with the bag tying means in the tying position;

Figure 5 shows the bag tying machine of Figure 1 with the bag tied and moving away from the tying point;

Figure 6 shows a side view of the neck of the bag gathered by the gathering means;

Figure 7 shows the stages in mounting a length of adhesive tape onto the bag tying means according to the present invention;

Figure 8 is a side view of a preferred embodiment of the present invention;

Figure 9 shows detail of the bag tying means from Figure 8.

[0013] Figure 1 shows a schematic view of a bag tying machine at the beginning of a tying cycle. The subsequent steps of the tying cycle will now be described. The open bag 1 moves on a conveyor until the open neck of the bag which is to be sealed is aligned with the gathering means 2 and the bag tying means 3. This position is shown in Figure 2. The gathering means 2a,2b move towards the neck of the bag and loosely clamp the neck of the bag against each other to form a flattened neck portion between the gathering means. The gathering means 2 are in the form of a pair of elongate U-shaped members. When clamped together the gathering means form a tunnel across which the clamped neck of the bag extends and through which the bag tying means 3a,3b are permitted to pass. This position is shown in Figure 3.

[0014] The bag tying means comprises a pair of guide members 3a,3b mounted on guide rails. The guide members enter the gathering means from opposite ends and are driven by a single pneumatic mechanism. Means for holding a length of adhesive tape are attached to one of the guide members 3a. This guide member is a plate into which a slot has been cut and which is designed to received the clamped neck of the bag. The other guide member 3b comprises a pair of parallel plates into each of which has been cut a slot for receiving the clamped neck of the bag. The two guide members move towards each other through the gathering means, on guide rails. The guide members are arranged such that the plates of member 3b pass either side of guide member 3a. The guide members gather the clamped neck of the bag until it is compressed into a bundle at the centre of the gathering means and it passes through the adhesive tape holding means.

[0015] The holding means comprise a pair of rollers 5, connected to pneumatically controlled elements and biassed so as to contact one another at their circumference, as shown in Figure 7, onto which a non adhesive side of a length of adhesive tape 4 can be laid, and a pair of stops 6 for holding the adhesive tape 4 on the rollers 5. The stops 6 may also be pneumatically actuated by pneumatic elements attached to the guide member 3a. The rollers 5 are mounted so that they contact each other at a point overlying the slot, a short distance from the end of the slot.

[0016] Attached to either side of the slot of guide member 3a in front of the rollers and extending across the slot is a pair of cantilevered leaf springs 9, almost contacting each other at their free ends. This is clearly shown in Figure 9. When the clamped neck of the bag contacts the leaf springs 9, the leaf springs provide resistance against the action of the clamped neck of the bag. The neck of the bag is then bunched before the resistance is overcome and the neck of the bag contacts the adhesive tape 4.

[0017] The gathered neck of the bag contacts the adhesive tape 4 and the stops 6 holding the tape against the rollers 5 release the tape simultaneously. The continued motion of the guide 3 members push the neck of the bag against the rollers 5 and through the space therebetween. The action of the rollers 5 folds the adhesive tape4 around the neck of the bag and press the adhesive sides against each other. Preferably the guide member 3b not holding the rollers and tape stops and is locked into position before the application of the tape to the neck of the bag to ensure that the neck is stationary at the time of applying the tape so that the tape is accurately applied.

[0018] The rollers 5 are then moved apart and the guide means 3 retracted away from the neck of the bag. The gathering means 2 are also retracted and the bag moved away on the conveyor. The whole cycle can then be restarted with a new bag.

[0019] A new length of adhesive tape 4 must be mounted on the rollers 5 during each cycle. The method of mounting the tape is shown in Figure 7. The end of a roll of tape is pulled by a gripper 7 across a space into which the rollers 5, mounted on a guide member 3a, are then moved so that the non adhesive side of the tape 4 contacts the rollers 5. The stops 6 are then moved into contact with the adhesive side of the tape 4 in order to hold the tape against the rollers 5. The gripper 7 then releases the end of the tape and the tape is cut at a point between the rollers 5 and the rest of the roll of tape, leaving just a length of tape mounted on the rollers 5. The rollers 5 together with the length of tape 4 move back from the grippers 7 and the roll of tape into a position aligned with the other guide member 3b prior to the tying operation.

[0020] Figure 8 shows a section of an example of a preferred embodiment of the present invention. For illustrative purposes the guide member 3a is shown in a retracted position whilst the guide member 3b is shown in a tying position, however in reality they would both be in the tying position or the retracted position. Both guide members 3a and 3b are driven by a single pneumatic

mechanism 10. From the position shown pneumatic arm 10a is driven outwards to push guide member 3a, via arm 11a, to the tying position. Similarly arm 10b would be drawn in to pull guide member 3b to a retracted position. Guide member 3b comprises four parallel fingers in a rectangular array, however only two can be seen in the view of Figure 8.

[0021] Gathering means 2 are shown their togethermost position, where they would be clamping together the neck of a bag. Point T is marked as the point where the neck of a bag is sealed with the application of a length of adhesive tape. The gathering means 2 are in the form of a pair of elongate U-shaped members which are mounted on guide rods 12 which are moveable to and from the tying point so as to allow a tied bag to pass through the machine.

[0022] Tape is supplied from a tape supply 14 and passes through tape printing machine 15 before being mounted on the rollers 5. The tape printing machine prints information on the non-adhesive side of the tape, such as a sell by date, before the tape is applied to the filled bags. The tape is cut into predetermined lengths by a cutter 13, which cannot be clearly seen in Figure 8.

[0023] The features of the bag tying means are shown in Figure 8 but can be more clearly seen from Figure 9. Figure 9 shows the tying means mounted on guide member 3a. Rollers 5 are mounted on pneumatically extendable arms 15 via T-shaped members 16 and mounting members 17. Stops 6 are similarly mounted on pneumatically extendable arms 18. Cantilevered leaf springs 9 are shown contacting each other in front of the rollers 5.

[0024] In use a length of tape is mounted on the rollers 5. The arms 18 are extended so that the stops 6 hold the tape in place. The guide member 3a is moved towards guide member 3b. The clamped neck of the bag gathers up against the leaf springs 9. Eventually the movement of the guide members against the neck of the bag will force the gathered neck of the bag through the leaf springs and into contact with the adhesive side of the length of tape. The relative movement of guide 3a and the neck of the bag pushes the tape and the neck of the bag between the rollers 5 until the ends of the tape are pressed against each other. The guide members 3a, 3b then retract from the neck of the bag. In order that the tying means does not interfere with the tied neck of the bag as the guide member retracts the stops 6 are pneumatically retracted on arms 18 and the rollers 5 separated by movement of mounting members 17. The separation of the rollers is effected by the retraction of arms 15. The T shaped member 16 rotates about pin 19 which in turn causes the outward movement of arms 17. Once the guide member 3a is clear of the tied neck of the bag the rollers are again biassed into contact with each other by extension of arms 15. When guide member 3a is in the fully retracted position the rollers 5 are ready to receive another length of tape.

Claims

1. A bag tying machine comprising:

   a conveyor travelling in a first direction for conveying a filled bag;
   bag tying means for gathering and applying a seal to the neck of the filled bag, including a tie applicator member and a reaction member;
   wherein, in use, the bag tying means start in a first position beyond the extent of the passage of the filled bag and move in opposite directions to the neck of the filled bag in a plane substantially perpendicular to the first direction, meeting at the neck of the filled bag to apply a length of adhesive tape around a neck of the filled bag, and move back to the first position in the plane substantially perpendicular to the first direction.

2. A bag tying machine according to claim 1, wherein, the bag is stationary when the length of adhesive tape is applied to the neck of the bag.

3. A bag tying machine according to claim 1 or 2, further comprising gathering means for gathering together the neck of the filled bag prior to the action of the bag tying means.

4. A bag tying machine according to claim 3, wherein, the gathering means comprises a pair of elongate members which approach the neck of the filled bag from opposite directions in the plane substantially perpendicular to the first direction and substantially perpendicular to the path of the bag tying means and sandwich the neck of the bag so that it lies in a plane extending in the first direction.

5. A bag tying machine according to any one of the preceding claims, wherein bag tying means comprises:

   a pair of arcuate surfaces mounted on the tie applicator member, which are biassed to contact each other and against which a non adhesive side of the length of adhesive tape rests;
   wherein when the tape is pushed into contact with the neck of a bag the arcuate surfaces move around opposite sides of the neck thereby tying the tape around the neck and onto itself.

6. A bag tying machine according to claim 5, wherein the arcuate surfaces are pneumatically biassed against each other.

7. A bag tying machine according to any one of the preceding claims, wherein the tie applicator member and the reaction member are driven in a recip-

rocating fashion on a guide rail by a single drive mechanism.

8. A bag tying machine according to claim 7, wherein the drive mechanism is a cam driven mechanism.

9. A bag tying machine according to any one of the preceding claims, wherein the bag tying means includes a pair of cantilevered leaf springs attached to the first guide means and positioned in front of the arcuate surfaces in order to further gather the clamped neck of the bag prior to tying the adhesive tape around the neck of the bag.

Fig.1.

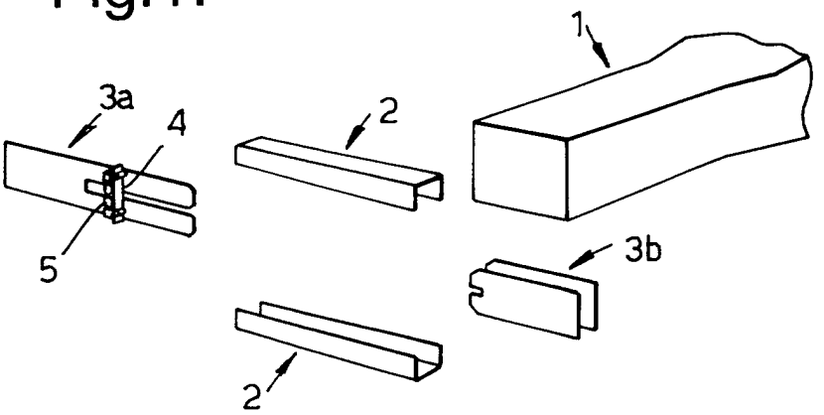


Fig.2.

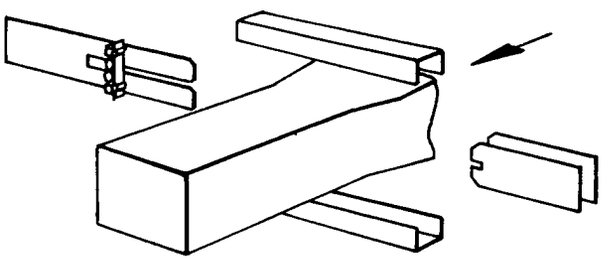


Fig.3.

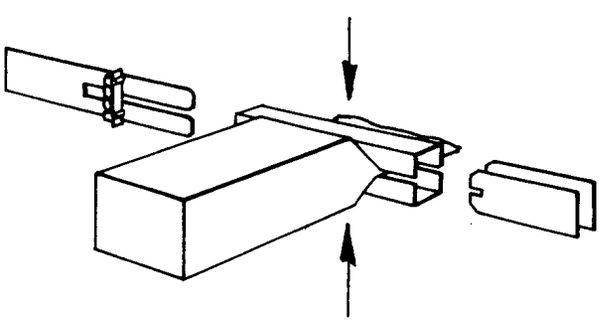


Fig.4.

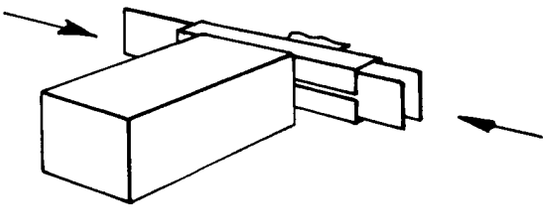


Fig.5.

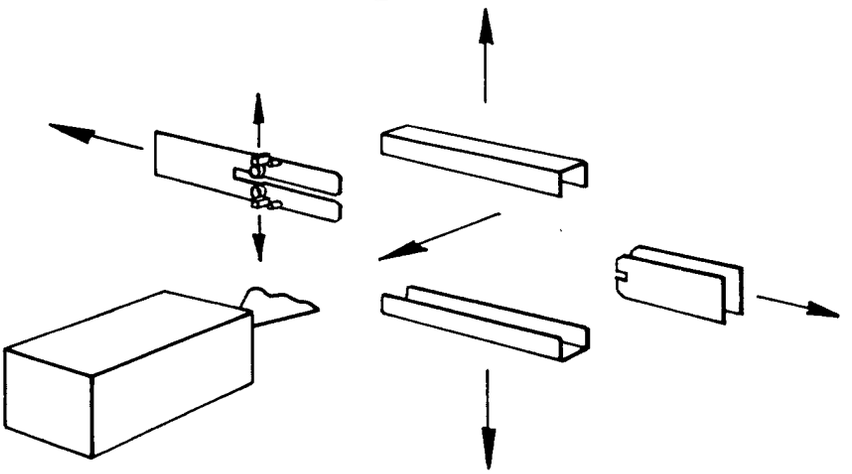


Fig.6.

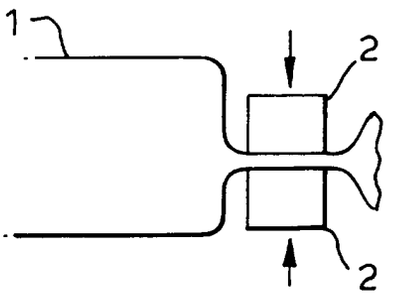


Fig.7a.

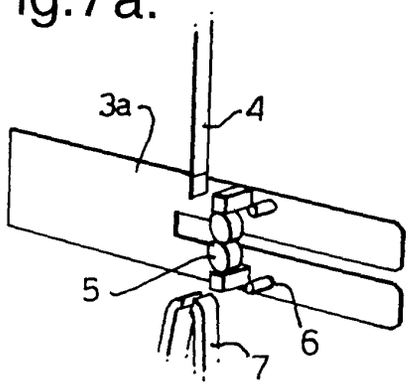


Fig.7b.

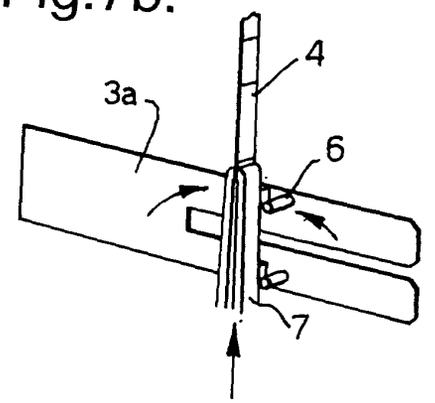


Fig.7c.

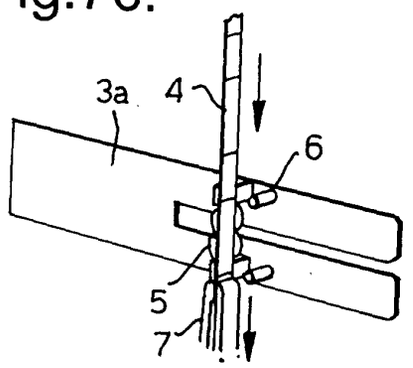


Fig.7d.

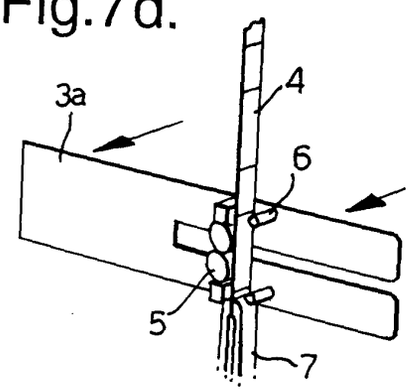


Fig.7e.

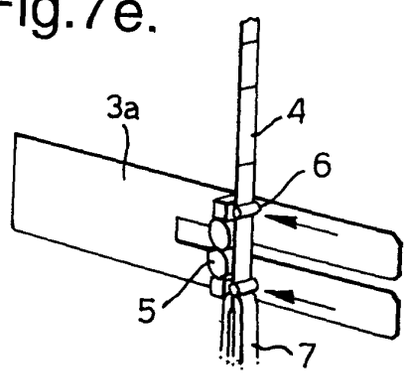


Fig.7 f.

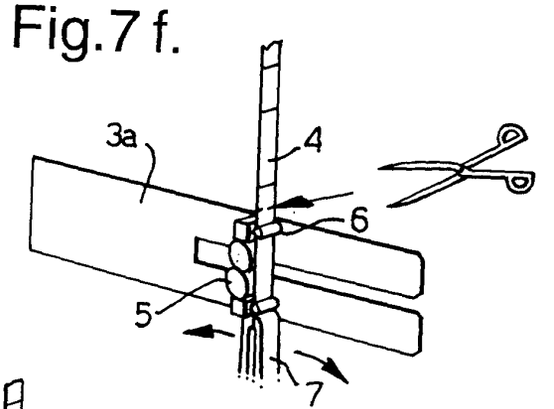
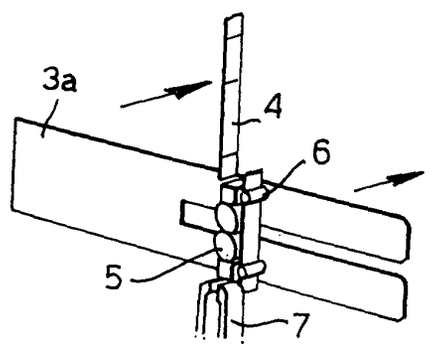


Fig.7g.



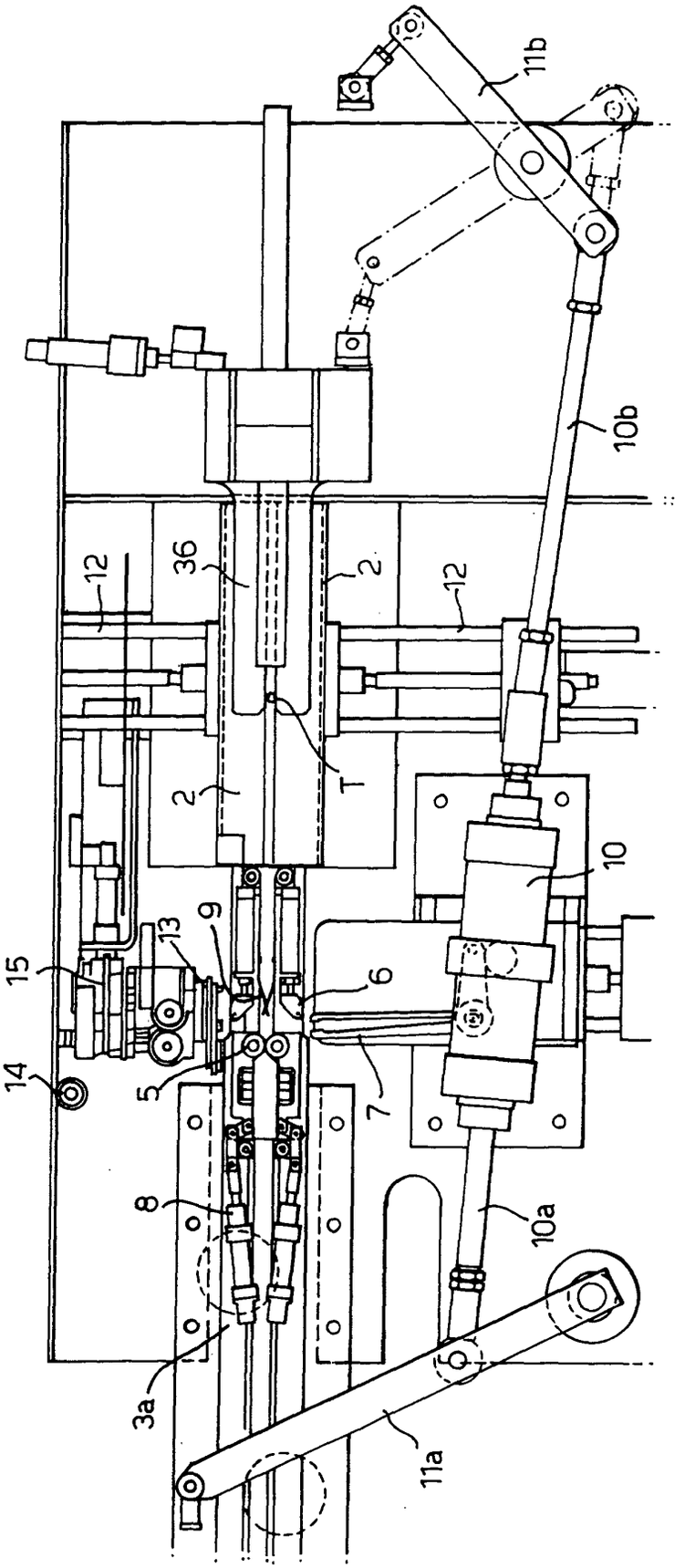


Fig.8.

Fig.9.