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**Antoniazzi et al.**

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(54) **PACKING MACHINE**

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(51) **Int. Cl.**[7] ..... **B65B 11/06**; B65B 49/00
(52) **U.S. Cl.** ..... **53/230**; 53/375.9
(58) **Field of Search** ..... 53/463, 466, 228–233, 53/375.9; 493/475, 476, 478, 479

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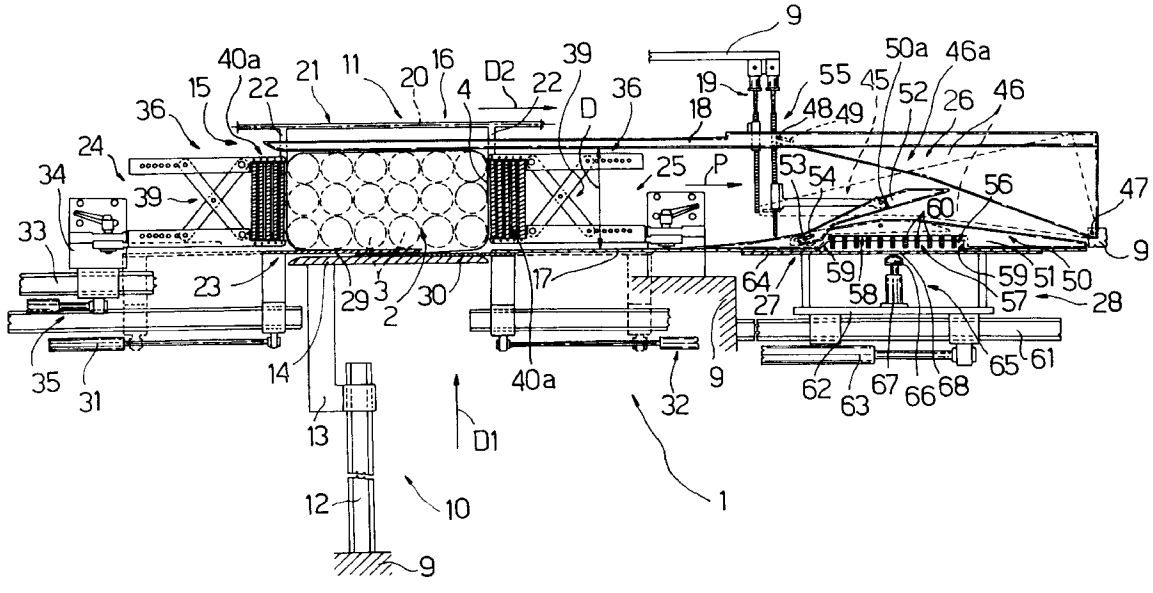
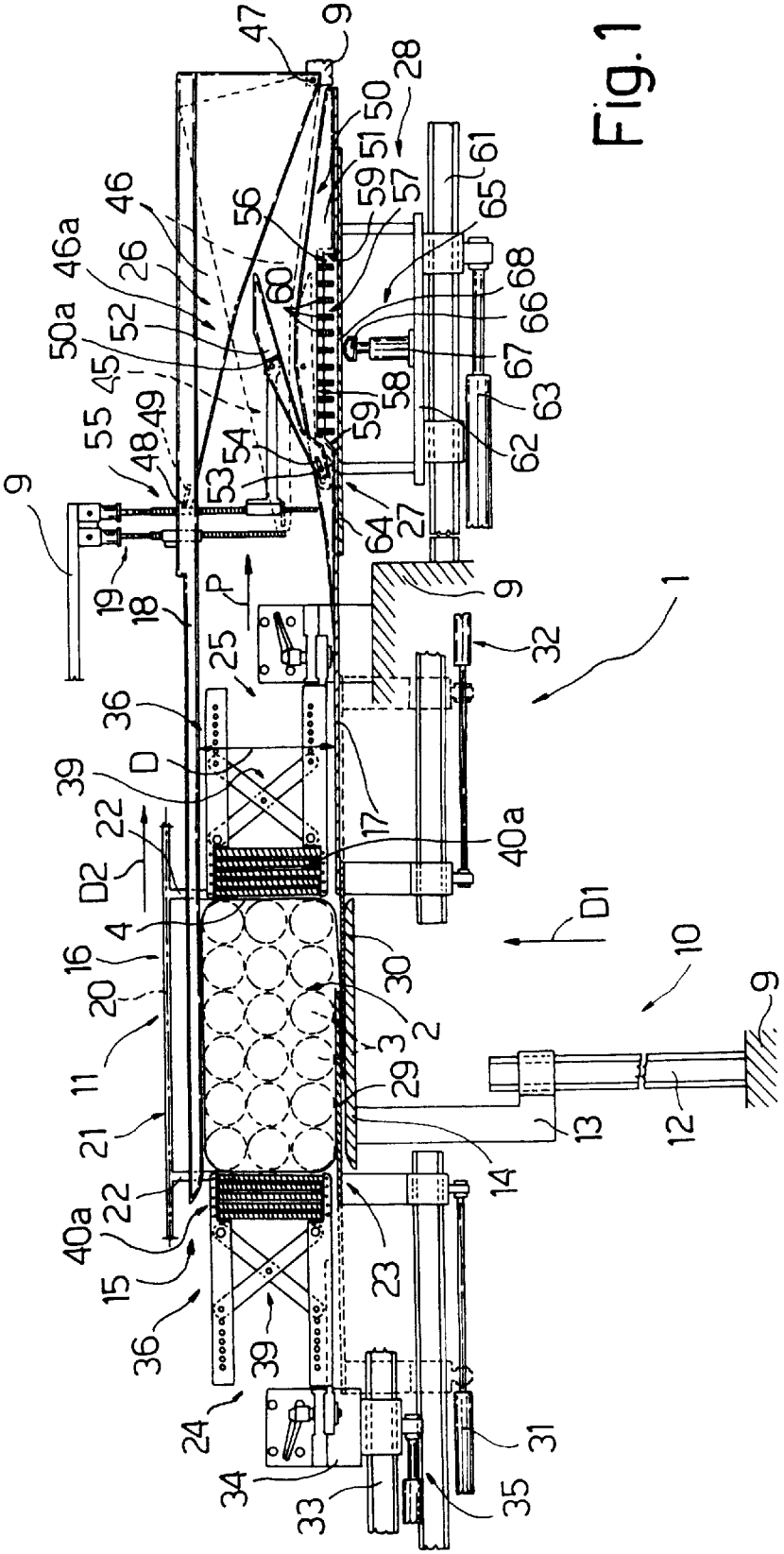
(57) **ABSTRACT**

A machine for packing groups of rolls of domestic paper in respective sheets of packing material has folding members, each of which has an active portion, which is brought into contact with a flap of a sheet of packing material, and an adjusting device for adjusting the extension of the active portion in a first direction.

**17 Claims, 5 Drawing Sheets**

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63
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27
9
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D
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40a
D2
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D1
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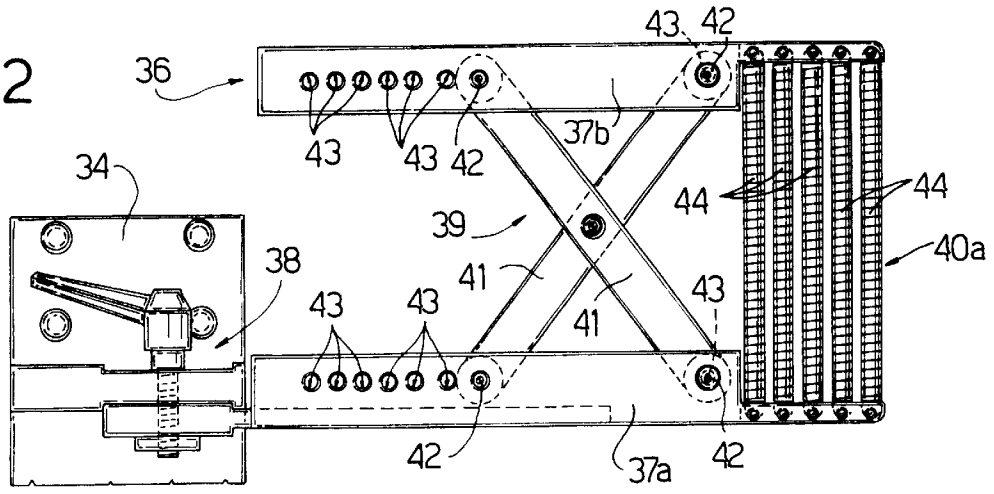
Fig. 1

Fig.2



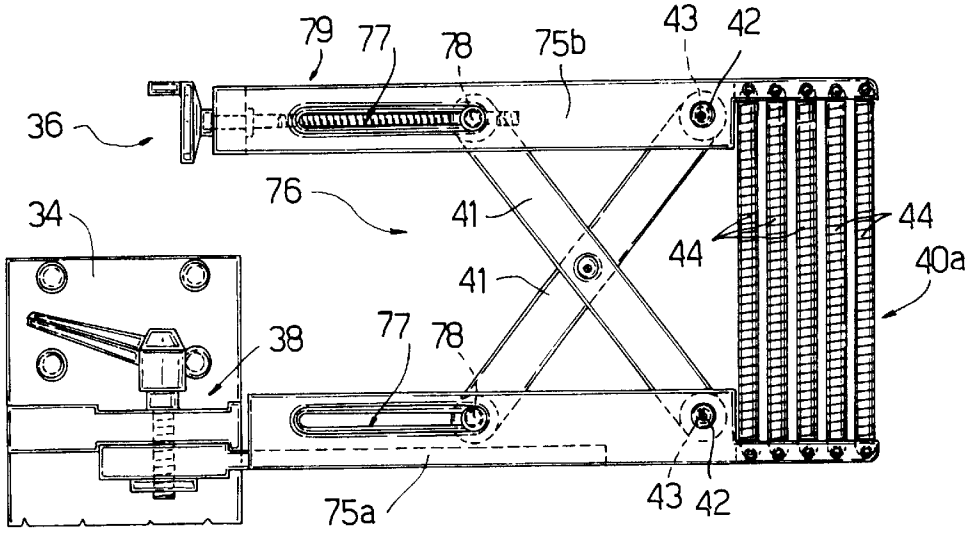




Fig.3

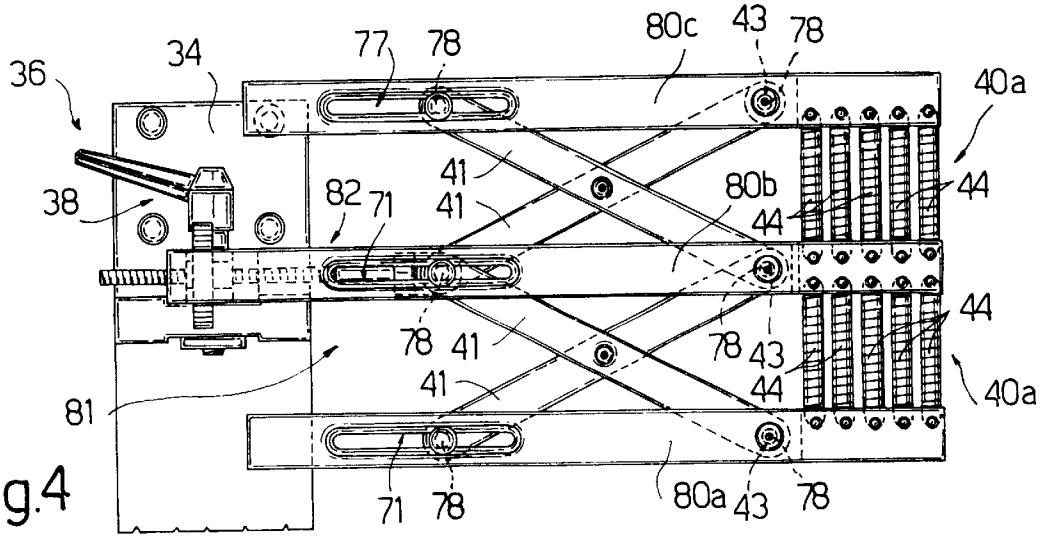



Fig.4

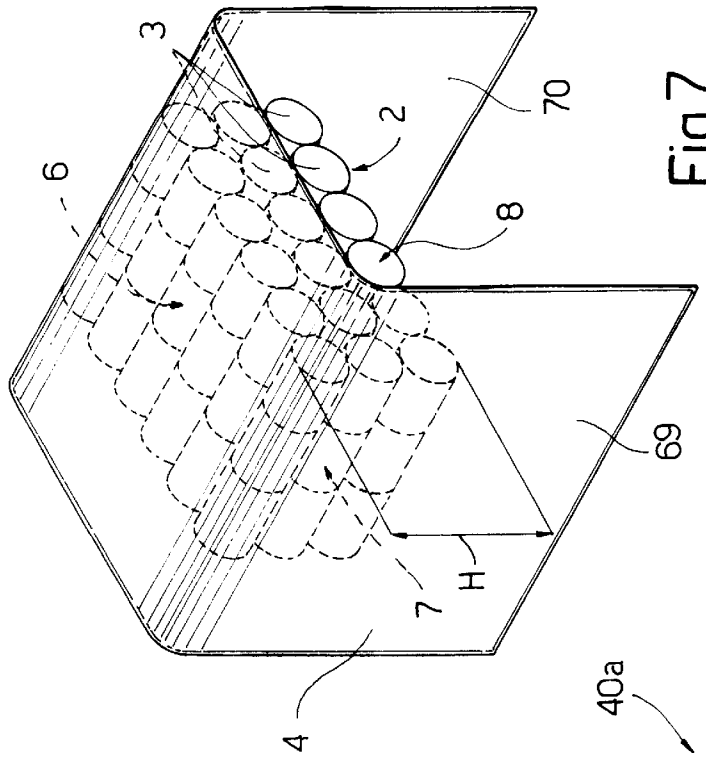



Fig.7

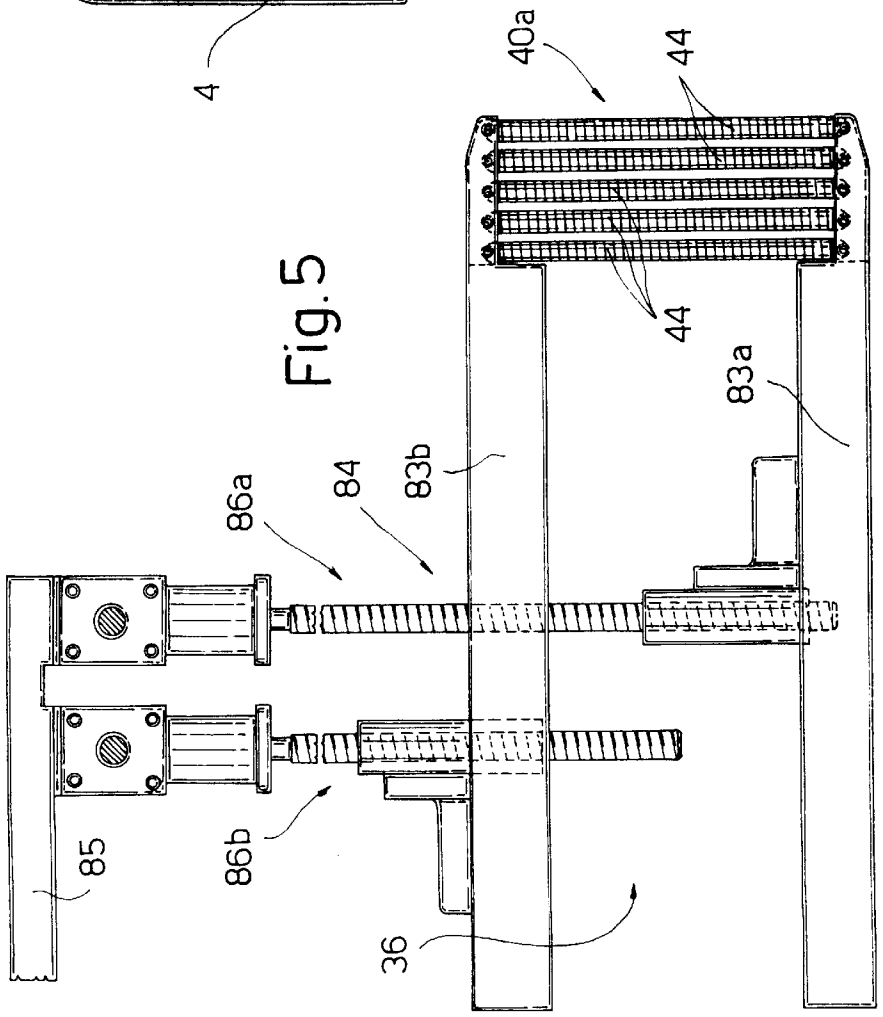
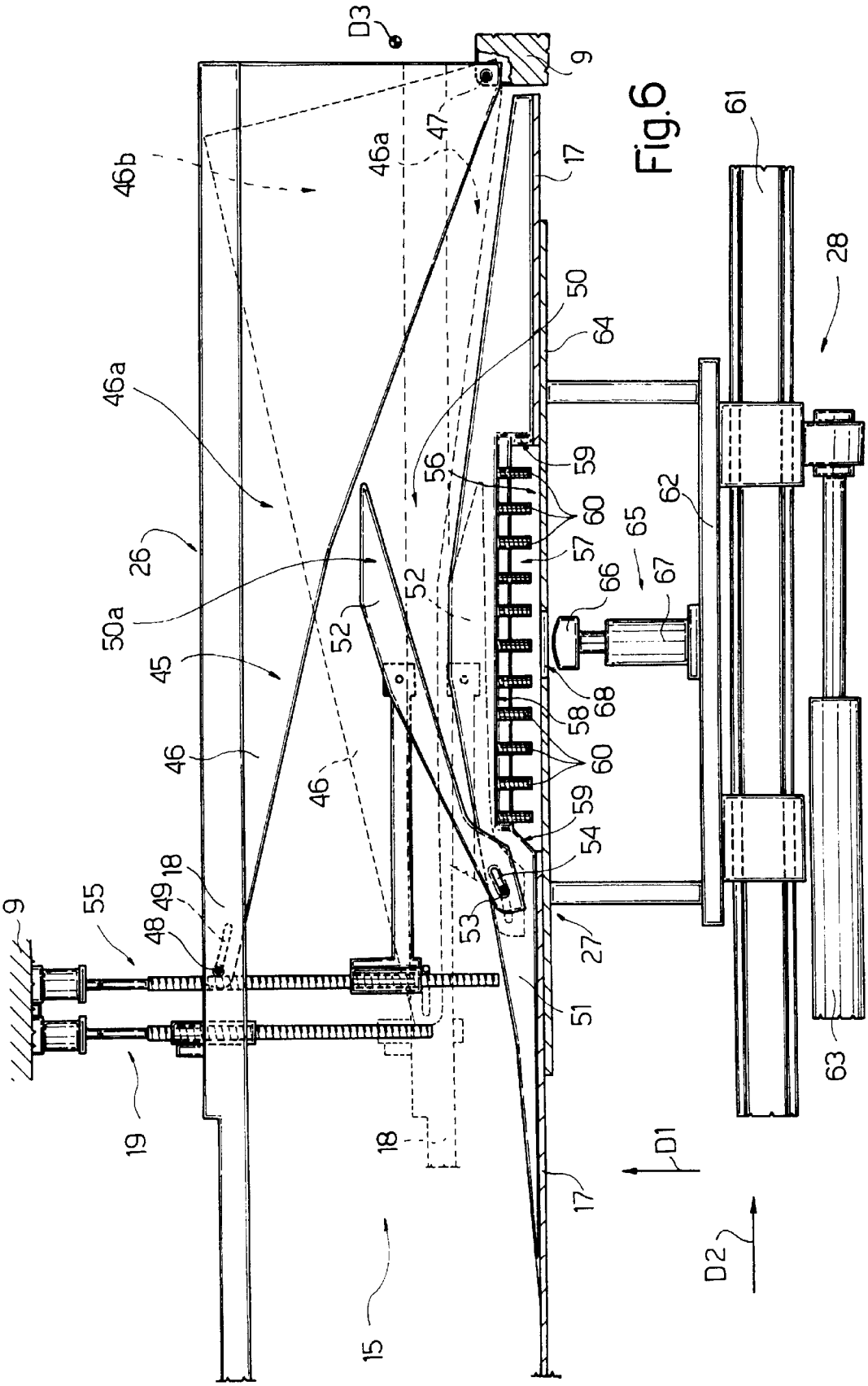



Fig.5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9
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17
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46a
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D1
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Fig.6

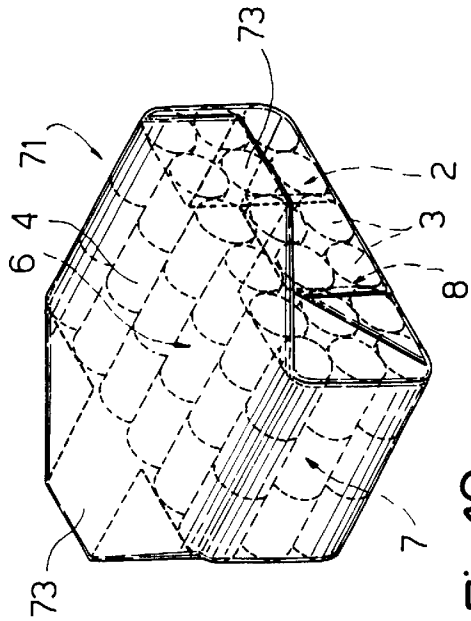


Fig.10

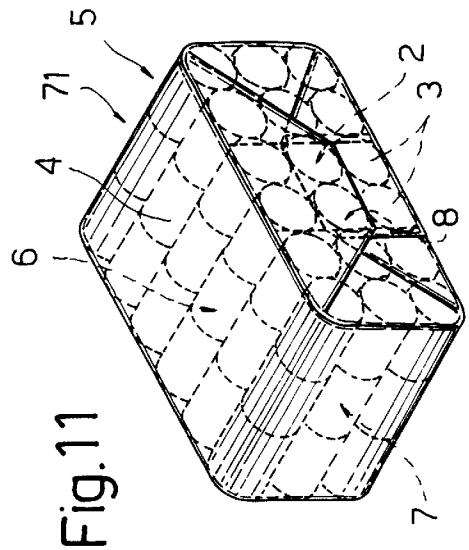


Fig.11

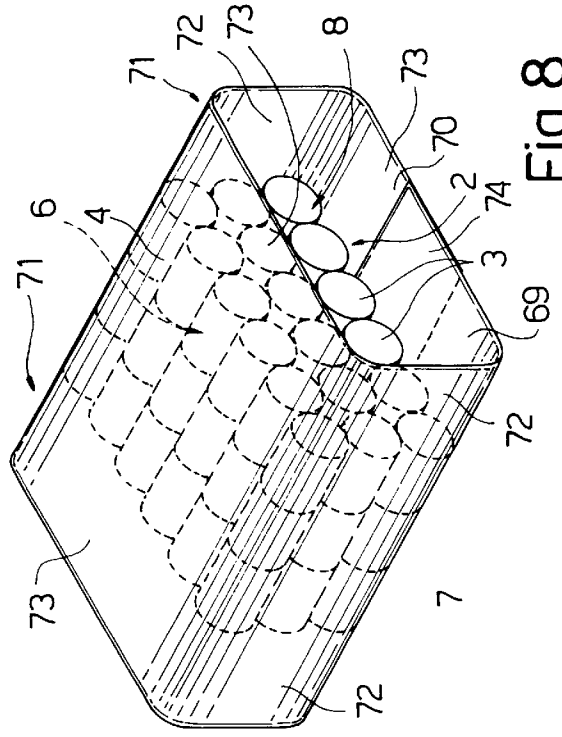


Fig.8

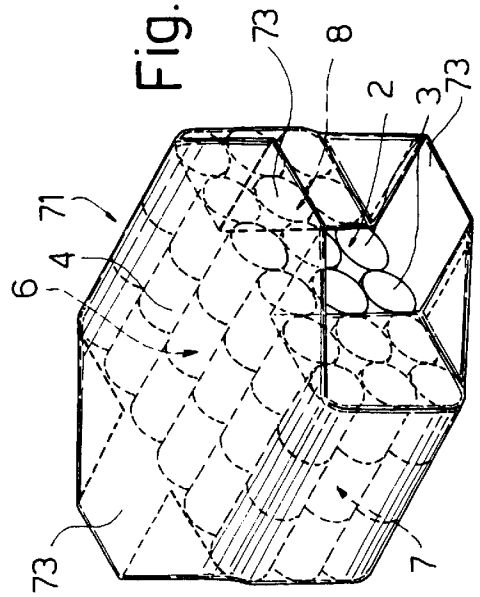


Fig.9

# PACKING MACHINE

The present invention relates to a packing machine.

More specifically, the present invention relates to a machine for packing orderly groups of rolls of domestic paper, to which the following description refers purely by way of example.

## BACKGROUND OF THE INVENTION

Known machines for packing groups of rolls of domestic paper normally comprise folding members located along the path of the groups to fold flaps of a sheet of packing material, and each of which comprises an active portion which is brought into contact with a corresponding flap to fold it on to the group. To obtain a fold with no creases, the active portion must be brought into contact with the whole surface of the flap being folded, but without interfering with the rest of the sheet of packing material. The size of the flaps depends on the size of the group, which in turn depends on the size and number of individual articles in the group, whereas currently used packing machines have the drawback of being designed to pack groups of constant size and as such are not very versatile.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a highly versatile packing machine designed to pack groups of articles of various sizes.

According to the present invention, there is provided a machine for packing groups of articles in respective sheets of packing material, the machine comprising at least one folding member having at least one active portion which is brought into contact with a flap of a sheet of packing material; and being characterized in that said folding member comprises an adjusting device for adjusting the extension of said active portion at least in a first direction.

## BRIEF DESCRIPTION OF THE DRAWINGS

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

FIG. **1** shows a side view, with parts in section ad parts removed for clarity, of a machine for packing groups of articles in accordance with the present invention;

FIG. **2** shows a larger-scale side view, with parts removed for clarity, of a folding member of the FIG. **1** machine;

FIG. **3** shows a larger-scale side view, with parts removed for clarity, of a first variation of the FIG. **2** folding member;

FIG. **4** shows a larger-scale side view, with parts removed for clarity, of a second variation of the FIG. **2** folding member;

FIG. **5** shows a larger-scale side view, with parts removed for clarity, of a third variation of the FIG. **2** folding member;

FIG. **6** shows a larger-scale side view, with parts in section and parts removed for clarity, of a second detail of the FIG. **1** machine;

FIGS. **7** to **11** show views in perspective of various steps in the packing of groups of articles on the FIG. **1** machine.

## DETAILED DESCRIPTION OF THE INVENTION

Number **1** in FIG. **1** indicates as a whole a machine for packing groups **2** of rolls **3** of domestic paper in relative sheets **4** of packing material to form packs **5**, one of which is shown in FIG. **11**.



With reference to FIG. **7**, each group **2** is substantially in the form of a parallelepiped of height H and having two main faces **6**, two lateral faces **7**, and two end faces **8**. Faces **6** and **7** have undulated surfaces formed by the cylindrical surfaces of adjacent rolls **3**, whereas end faces **8** have substantially flat surfaces.

In a variation not shown, group **2** comprises rolls **3** positioned vertically as opposed to horizontally as shown in FIGS. **1**, **7**–**11**.

With reference to FIG. **1**, machine **1** comprises a frame **9** supporting a conveyor **10** for conveying groups **2** in a vertical direction D1, and a conveyor **11** for conveying groups **2**, partly wrapped in respective sheets **4** of packing material, in a horizontal direction D2.

Conveyor **10** comprises a guide **12** integral with frame **9**; a carriage **13** running along guide **12** in vertical direction D1; and a platform **14** integral with carriage **13** and for lifting and feeding a group **2** in direction D1 to conveyor **11**. Carriage **13** and platform **14** are operated by a known actuator not shown.

Conveyor **11** comprises a tunnel **15** extending in direction D2 and defining a path P; and a chain conveyor **16** for feeding group **2** and sheet **4** of packing material along tunnel **15** and path P. Tunnel **15** comprises a bottom wall **17** fixed to frame **9**, extending in direction D2, and defining a slideway for groups **2**; and a top wall **18** located over wall **17**, movable in direction D1, and connected to frame **9** by an adjusting device **19** for adjusting the distance D between top wall **18** and bottom wall **17**.

Chain conveyor **16** is fitted to frame **9** in a manner not shown, and comprises a chain **20** in turn comprising a work branch **21** over wall **18** and parallel to direction D2, and pairs of partitions **22**, which define a seat sized to house a group **2** of articles **3**, and penetrate inside tunnel **15** through openings (not shown) formed in wall **18**.

Machine **1** also comprises folding devices **23**, **24**, **25**, **26**, **27** for folding sheet **4** about group **2** along tunnel **15**; and a sealing device **28** for sealing sheet **4** about group **1**. In actual fact, folding devices **23**, **24**, **25**, **26**, **27** and sealing device **28** form part of tunnel **15**.

Folding device **23** comprises two blades **29** and **30** parallel to and substantially coplanar with bottom wall **17**; and two actuators **31** and **32** for moving respective blades **29** and **30** between a rest position shown by the dash line, and a work position shown by the continuous line in FIG. **1**.

Folding device **24** comprises a guide **33** integral with frame **9** and parallel to direction D2; a carriage **34** running along guide **33**; a drive **35** for driving carriage **34**; and two facing, specularly symmetrical folding members **36** fixed to carriage **34**.

With reference to FIG. **2**, each folding member **36** comprises two parallel bars **37***a* and **37***b*; a screw fastener **38** for connecting bar **37***a* to carriage **34**; an adjusting device **39** for adjusting the distance between bars **37***a* and **37***b* in direction D1; and a portion **40***a* extensible in direction D1 and connected to bars **37***a* and **37***b*. Portion **40***a* is referred to as active by being the portion of folding member **36** which comes into direct contact with sheet **4** of packing material during the folding operations. Adjusting device **39** comprises two levers **41** connected to each other in articulated manner to form an X, and fixed at the ends to bars **37***a* and **37***b* by means of pins **42** engaging holes **43** formed along bars **37***a* and **37***b*.

Bars **37***a* and **37***b* have a number of adjacent holes **43** engageable selectively by pins **42** to alter the configuration

of the two levers **41** and to adjust the distance between bars **37***a* and **37***b* and the extension of active portion **40***a* in direction D1.

Active portion **40***a* comprises a series of parallel, side by side coil springs **44**, each of which is fixed at the ends to bars **37***a* and **37***b* and is coiled in the same direction as the adjacent springs **44**. The coil direction of springs **44** is selected to exploit the thrust of the coil on sheet **4** as sheet **4** moves with respect to portion **40***a*, and, more specifically, is selected to produce an upward thrust as sheet **4** moves with respect to portion **40***a* in direction D2. Springs **44** are connected to bars **37***a* and **37***b* at points aligned along two respective straight lines, or along two curved paths to form a diverging portion **40***a*.

With reference to FIG. **1**, folding device **25** is fixed with respect to tunnel **15**, and comprises two facing, parallel folding members **36** fixed to frame **9** by respective fasteners **38**.

With reference to FIG. **6**, folding device **26** comprises two facing folding members **45** (only one shown in FIG. **6**), each of which comprises a triangular screw **46** having a first end pivoting on frame **9**, at bottom wall **17**, about an axis **47** parallel to a direction D3 perpendicular to directions D1 and D2, and a second end pivoting on top wall **18**, which has a pin **48** parallel to axis **47** and engaging a slot **49** in screw **46**. When top wall **18** is lowered by adjusting device **19** towards bottom wall **17** in direction D1 (position shown by the dash line in FIG. **6**), folding member **45** is oriented about axis **47** so that screw **46** has a portion **46***a* beneath wall **18**, and a portion **46***b* above wall **18**. That is, adjustment of top wall **18** rotates screw **46** about axis **47** and adjusts the extension of screw **46**. In other words, screw **46** has an active portion **46***a* which varies alongside a variation in the position of top wall **18**, and assumes the full extension of screw **46** when wall **18** is in the top limit position. Regardless of the extension adjustment of screw **46**, rotation of screw **46** about axis **47** adjusts the extension of active portion **46***a* in direction D1.

Folding device **27** comprises two facing, specularly symmetrical folding members **50**, only one of which is shown in FIG. **6**. Each folding member **50** comprises a screw **51** integral with wall **17**; an appendix **52** hinged to screw **51** about a pin **53**, which is parallel to axis **47**, is integral with screw **50**, and engages a slot **54** in appendix **52**; and an adjusting device **55** having a screw-nut screw mechanism for adjusting the orientation of appendix **52** about pin **53**.

Wall **17** has an opening **56**, through which sealing device **28** is brought into contact with sheet **4** of packing material, and at which each screw **51** has a recess **57** extending the full length of opening **56** in direction D1.In other words, each screw **51** is in the form of an upside down U to bridge opening **56**. Recess **57** is defined by a top edge **58** and two lateral edges **59**, and is partly occupied by coil springs **60** fixed to the top edge **58** of screw **51** and coiled in the same direction so as to lift sheet **4** of packing material as group **2** moves with respect to screw **51**.

In other words, folding member **50** has an active portion **50** defined by screw **51**, appendix **52**, and springs **60**, and the extension of which in direction D1 is adjusted by rotating appendix **52** about pin **53**.

Device **28** comprises a guide **61** parallel to direction D1; a carriage **62** running along guide **61**; and an actuator **63**. Carriage **62** supports a wall **64** contacting wall **17** to close opening **56**; and a sealing member **65** having a sealing head **66** and an actuator **67** for moving head **66** back and forth in direction D1. Wall **64** has an opening **68** for the passage of sealing head **66** and smaller than opening **56**; and the movement of carriage **62** in direction D1 provides for setting sealing head **66** and opening **68** to the best position for sealing various types of groups **2**.

In actual use, machine **1** is set to pack groups **2** according to the size of groups **2**. That is, the height H of group **2** determines the distance D between walls **17** and **18**, and the extension of active portions **40***a*, **46***a* and **50***a* of respective folding members **36**, **45** and **50**; and the size of group **2** parallel to direction D2 determines the setting of sealing head **66** in direction D2 by means of carriage **62**.

Once machine **1** is set to pack a given type of group **2**, the packing cycle is started, and which provides for lifting a group **2** on platform **14** in direction D1 so as to intercept a sheet **4** held in a horizontal position by known devices (not shown), and bring the sheet **4** into contact with wall **18** and between partitions **22**. As group **2** and sheet **4** are raised, sheet **4** contacts the free edge of blades **29** and **30** positioned as shown by the dash lines in FIG. **1**, and is folded into a U about group **2** as shown in FIG. **7**, in which the U-folded sheet **4** of packing material has two flaps **69** and **70** projecting downwards. With reference to FIG. **1**, blades **29** and **30** are then moved into the closed position (shown by the continuous lines in FIG. **1**) between platform **14** and group **2**, so as to fold flaps **69** and **70** on to the bottom main face **6** of group **2** and form the tubular wrapping shown in FIG. **8**. The tubular wrapping has two tubular portions **71** projecting from opposite end faces **8** of group **2**; each tubular portion **71** has two lateral flaps **72** parallel to direction D1, and two main flaps **73** parallel to direction D2; and the tubular wrapping as a whole has a portion **74** defined by superimposing end portions of flaps **69** and **70**.

Once the tubular wrapping is formed, folding device **24** moves folding members **36** into a work position in which to fold the lateral flaps **72** located upstream in the traveling direction of group **2** (from left to right in FIG. **1**). Chain conveyor **16** then feeds group **2** in direction D2 to bring the downstream lateral flaps **72** into contact with folding members **36** of fixed folding device **25** and fold the downstream lateral flaps **73** on to group **2** as shown in FIG. **9**. As group **2** and relative sheet **4**, partly folded about group **2**, are fed forward further, the bottom main flaps **73** are folded squarely by folding device **27** as shown in FIG. **10**. At a stop in the operation of conveyor **16**, sealing head **66** is inserted through opening **68** into contact with portion **74**, is heated to melt sheet **4** of packing material along portion **74**, and is pushed against group **2**, which is deformed so that sealing head **66** penetrates inside tunnel **15** and deforms coil springs **60** contacting sealing head **66**.

Once the seal is made, sealing head **66** is withdrawn, and group **2** is fed from right to left in direction D2 so that folding device **26** folds the top main flaps **73** squarely to form the pack **5** shown in FIG. **11**.

With reference to the FIG. **3** variation, folding member **36** comprises two bars **75***a* and **75***b*, between which the active portion **40***a* defined by springs **44** extends; and an adjusting device **76**. Each bar **75***a*, **75***b* differs from bars **37***a*, **37***b* by having one hole **43** and a slot **77** in place of the number of holes **43**. Adjusting device **76** comprises two levers **41**, each pivoting at one end on a pin **42** at hole **43**, and at the other end on a pin **78** engaging slot **77**; and a screw-nut screw mechanism **79** located along bar **75***b* to determine the position of pin **78** along slot **77** and, consequently, the extension of active portion **40***a* in direction D1. Bar **75***a* is connected to carriage **34** by screw fastener **38**.

The above variation of folding member **36** provides for accurate, as well as faster, adjustment of the extension of

portion **40***a* in direction D1 by virtue of screw-nut screw mechanism **79**.

With reference to the FIG. **4** variation, folding member **36** comprises three parallel bars **80***a*, **80***b*, **80***c*; an adjusting device **81** cooperating with and for adjusting the distance between bars **80***a*, **80***b*, **80***c*; and two active portions **40***a*, each extending between two adjacent bars **80***a*, **80***b*, **80***c*.

Bar **80***b* is located between bars **80***a* and **80***c*, and is fixed to carriage **34** by screw fastener **38**; each bar **80***a*, **80***b*, **80***c* has a hole **43** and a slot **77**; adjusting device **81** comprises two levers **41** pivoting in the form of an X between bars **80***a* and **80***b*, and two levers **41** pivoting in the form of an X between bars **80***b* and **80***c*; each lever **41** engages a hole **43** and a slot **77** as shown and described in the FIG. **3** variation; and adjusting device **81** comprises a screw-nut screw mechanism **82** located on bar **80***b* and for adjusting the extension of both active portions **40***a* in direction D1.

Folding member **36** in the FIG. **4** variation has the advantage of adjusting extension upwards and downwards by the same amount.

With reference to the FIG. **5** variation, folding member **36** comprises two bars **83***a* and **83***b*, between which the active portion **40***a* defined by springs **44** extends; and an adjusting device **84** which also provides for supporting bars **83***a*, **83***b*. Adjusting device **84** comprises a support **85**; and two electrically operated screw-nut screw mechanisms **86***a*, **86***b* fixed to support **85** and connected to respective bars **83***a*, **83***b* to adjust the extension of active portion **40***a*.

Folding member **36** in the FIG. **5** variation has the advantage of providing for accurate remote adjustment of both the extension and position of portion **40***a*. Support **85** may be fitted to carriage **34** to form folding device **24**, and to frame **9** to form fixed folding device **25**.

What is claimed is:

**1**. A machine for packing groups of articles in respective sheets of packing material, the machine comprising at least one folding member having at least one active portion which is brought into contact with a flap of a sheet of packing material; said folding member comprising an adjusting device for adjusting the extension of said active portion at least in a first direction, wherein said active portion is extensible in said first direction and comprises springs.

**2**. A machine as claimed in claim **1** wherein said springs are coil springs arranged side by side and parallel to the first direction.

**3**. A machine as claimed in claim **2** wherein said springs have respective coils coiled in the same direction.

**4**. A machine as claimed in claim **1** wherein said active portion extends, in said first direction, between two rigid supports.

**5**. A machine as claimed in claim **4** wherein said adjusting device adjusts the relative position of said rigid supports.

**6**. A machine as claimed in claim **5** wherein said adjusting device keeps one rigid support fixed.

**7**. A machine as claimed in claim **6** wherein said folding member comprises three rigid supports and two adjacent active portions.

**8**. A machine as claimed in claim **5** wherein said adjusting device comprises two adjusting mechanisms connected respectively to two rigid supports to adjust the position of each rigid support independently of the other.

**9**. A machine as claimed in claim **8** wherein said adjusting mechanisms are operated by respective remote controlled actuators.

**10**. A machine as claimed in claim **1**, and comprising a fixed frame and a carriage movable with respect to said fixed frame in a second direction and supporting two specularly symmetrical folding members.

**11**. A machine as claimed in claim **1**, and comprising a fixed frame supporting two specularly symmetrical folding members.

**12**. A machine as claimed in claim **1**, and comprising a tunnel, along which a group of articles and a relative sheet of packing material are fed along a path (P); the tunnel comprising a number of said folding members and varying in size as a function of the size of said group in said first direction.

**13**. A machine as claimed in claim **12**, wherein said tunnel comprises a bottom wall; a top wall; and an adjusting device for adjusting the distance between the bottom wall and the top wall.

**14**. A machine for packing groups of articles in respective sheets of packing material, the machine comprising at least one folding member having at least one active portion which is brought into contact with a flap of a sheet of packing material; and wherein the said folding member comprises a screw and an adjusting device for adjusting the extension of said active portion at least in a first direction pivoting at least partly about an axis perpendicular to the first direction, so that the orientation of the folding member about said axis varies the extension of said active portion in the first direction.

**15**. A machine for packing groups of articles in respective sheets of packing material, the machine comprising a frame and at least one folding member having at least one active portion which is brought into contact with a flap of a sheet of packing material; said folding member comprising an adjusting device for adjusting the extension of said active portion at least in a first direction, the folding member pivoting at least partly about an axis perpendicular to the first direction so that the orientation of the folding member about said axis varies the extension of said active portion in the first direction; said folding member further comprising a screw integral with the frame, and an appendix pivoting on said screw.

**16**. A machine as claimed in claim **14**, characterized in that said screw comprises a recess partly occupied by deformable elements.

**17**. A machine as claimed in claim **16**, characterized by a sealing device located at said screw; said recess preventing interference between said sealing device and said screw.

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