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㉙ **Automatic device for removing sundry articles, in particular capsules, tablets and comfits, from their related compartments in a blister pack strip.**

㉚ The device operates along a line for packing articles, along which the blister pack strip is made to move.

The line comprises means, for detecting the absence of articles (5) in the blister packs, means for applying a film to the blister pack strip (3), means for cutting the strip into portions and rejecting any blister pack which lack at least one of the articles.

The device operates between the detection means and the means for applying the film, and comprises a pipe (12) located above the strip and connected via a hose (15) to a suction plant, with an opening (17) facing the strip. The opening is arranged transverse to the strip and is closed off by a gate valve means (19).

A slot (18) is located in front of the pipe, close to the opening, enabling a continuous air flow along the pipe.

When at least one article is missing in a portion of the blister pack strip, the gate valve means opens, thus causing a suction effect in the opening, and removing the articles located in the strip below.

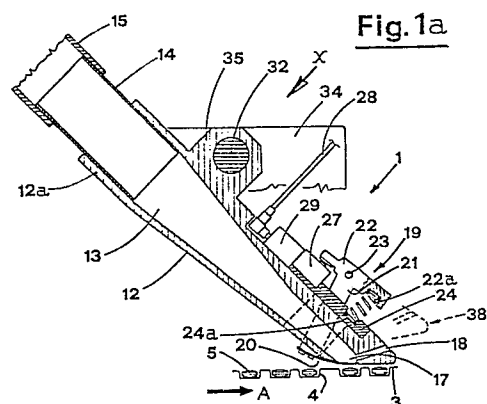


Fig. 1a

Description

AUTOMATIC DEVICE FOR REMOVING SUNDRY ARTICLES, IN PARTICULAR CAPSULES, TABLETS AND COMFITS, FROM THEIR RELATED COMPARTMENTS IN A BLISTER PACK STRIP.

The subject of the present invention is a device for removing articles such as capsules, tablets, comfits and the like from their related compartments formed in a strip made from a thermoformable material.

There are known automatic machines for filling compartments in a strip made from a thermoformable material with sundry articles.

The blister pack strip is subsequently covered, on the side where the compartments are open, with a film, after the articles have been placed in the latter, and then divided into a series of equal portions, commonly known as "blister packs".

In particular, the articles with which the compartments are filled are pharmaceutical products such as capsules, tablets or comfits.

The automatic machines for filling the compartments, which operate following different techniques, have achieved levels of perfection generally able to guarantee that all the compartments in a blister pack strip are filled.

Notwithstanding these high levels of perfection, however, it can sometimes happen that one of the compartments in the surface intended to form a blister pack remains empty, or is filled with an article that is not perfectly whole (with a part of it missing, for example).

The machines thus usually feature means which have the purpose of detecting whether any articles are missing from the compartments or whether those present have any imperfections.

If a missing or imperfect article is detected, the machine automatically rejects the corresponding blister pack in the operating stage that immediately precedes its being packaged in a box.

As an effect of operating in this way, a large number of articles are eliminated, in that even if an article is missing from a single compartment alone, the entire blister pack and its related contents are of necessity rejected.

If in some cases the particularly low cost of the articles concerned does not warrant solutions eliminating this effect, in other cases, the high cost of the articles makes it advisable to adopt devices for recovering these same articles, which would otherwise be irrecoverably lost.

A known device of this kind makes the blister pack strip pass through a brief section in an inverted position, (moving, for example, through an "S" shape).

A shaped plate is located in the section, temporarily closing off the compartments in the strip.

This plate features a transverse slit of the same width as the surface of the blister pack strip in which a transverse row of compartments is located.

The slit is closed off by means of a removable plate subjected to the action of actuator means.

When the above-mentioned means detect missing or imperfect articles, the actuator means are activated, in synchrony with the movement past the slit of the portion of blister pack strip where the fault

has been detected.

5 The slit is thus opened for the time required for the surface of the strip to pass that corresponds to the blister pack destined to be rejected later, which is thus totally emptied, and then closed again.

10 The recovered articles are then sent back to the feed device for filling subsequent compartments in the blister pack strip.

15 Another device adopted on the said automatic machines features a chamber which is connected to a suction plant by means of interceptor means, and has an opening which faces the belt in such a way that its edges skim the corresponding surface of the openings of the compartments.

20 Following the detection of missing or imperfect articles, the interceptor means are de-activated in synchrony with the passage, below the chamber opening, of the portion of the strip destined to form the blister pack which will later be rejected.

25 The suction air flow to the chamber also draws along the articles contained in the compartments below.

30 The dimensions of the opening (having a rectangular shape, for example) of the suction chamber are such that only the compartments in an area equal to the portion of the strip which is destined to form the blister pack are subjected to the action of the suction air flow, such that the portions of the blister pack strip which come before and follow on from that which is to have its compartments emptied are left unaffected.

35 The quantity of the suction air flow is however difficult to determine with an end to obtaining optimum results.

40 The object of the present invention is to produce a device for removing articles already located in the related compartments of a blister pack strip, that is able to operate on single articles without acting on the blister pack strip or causing it to jam.

45 A further object of the present invention is to propose a device as stated which is produced following a simple technical solution that is completely functional and totally reliable, as well as being versatile in use.

50 The proposed device should enable the articles to be removed from their related compartments in a simple and totally reliable manner, without affecting the possibility of adjusting the device according to one's needs, so that it can operate with different sizes of blister packs.

55 The above objects are achieved, following the invention, by the present device for removing sundry articles, in particular capsules, tablets and comfits from their related compartments in a blister pack strip.

60 The proposed device is designed to operate along a line for packing articles, along which the blister pack strip is made to move by the action of corresponding means.

The line comprises means, made to operate by a

control unit, for detecting the absence of articles in the related compartments, in successive portions of the blister pack strip, means for applying a film to the blister pack strip in order to close off the compartments, and means for cutting the strip into portions as well as for rejecting any blister pack which lack at least one of the articles.

The device operates between the detection means and the means for applying the film, at a point corresponding with the line, and is characterised by the fact that it comprises a pipe located above the blister pack strip and that forms at least one duct, one end of which is connected via a hose to a suction plant, whilst the opposite end features an opening, located facing the blister pack strip.

The development of the opening is prevalently transverse to the strip, such that it covers a zone of the belt occupied by a transverse row of the compartments, and is closed off during the non-operative stage of the device by a gate valve means.

A slot is located in front of the pipe, close to the opening, enabling a continuous air flow along the duct.

The control unit is able, following detection by the detection means that at least one article is missing in a portion of the blister pack strip, to command, in synchrony with the passage of the portion through a point corresponding to the device, the gate valve means to open, thus causing a suction effect in the opening, and consequently removing the articles located in the compartments below.

The characteristics of the invention emerge in greater detail in the description of a preferred form of the device as illustrated in the enclosed tables of drawings, in which:

- Figures 1a and 1b illustrate a longitudinal section of the device which is the subject of the present invention, respectively in a non-operating stage and in the stage of removing the articles;
- Figure 2 is a plan of the present device, partially cut away, and partially in cross-section;
- Figure 3 is a block diagram of the line for packaging the said articles, in which the device which is the subject of the present invention has been incorporated;
- Figure 4 is an illustration, on an enlarged scale in relation to Figures 1 and 2, of section I-I in Figure 3.

With specific reference to these figures, shown at 1, in its entirety, is the device which is the subject of the present invention, situated so that it runs along a line 2 for the automatic packaging of articles such as tablets, capsules, and comfits, such as pharmaceutical products, for example.

A blister pack strip 3, featuring compartments 4, is drawn longitudinally along the said line 2 (by known means and/or techniques), in a forward feed direction A, with the openings of the compartments facing upwards.

Feed means of known type, not illustrated in the drawing, are located near the beginning of the line 2, for placing an article 5, which may have a disc-like shape, for example, as illustrated in Figures 1a and 1b, in each compartment 4.

Means 6 for detecting empty compartments or imperfect articles with a part missing, are located downstream of the feed means.

The means 6, which may comprise one or more sensors of known type, are electrically connected to a control unit 7.

These detection means 6 are located close to the blister pack strip 3 in order to function effectively.

The device 1 which is the object of the present invention, is located and operates downstream of the means 6, being actuated by control signals sent by the control unit 7 following detection of one or missing or imperfect articles, and removing all the articles from their related compartments 4 in the portion 8 of the strip 3, corresponding to a blister pack, in which the lack of an article or an imperfect article has been detected.

Means 9 for fitting a film 10 to the blister pack strip 3 to close off the compartments 4, and means 11 for cutting the strip 3 in to a series of portions (blister packs), and for rejecting those blister packs 8a which do not contain articles are, finally, located downstream of the device 1.

The device 1 comprises a pipe 12 located above the blister pack strip 3 connected to a suction plant of known type. More specifically, the pipe 12 forms at least one duct 13, whose shape is divergent in the vertical plane, the wider end of which is connected, by means of a union sleeve 14, to a hose 15 connected to the suction plant 16; the union sleeve 14 is inserted in a connector sleeve 12a formed in the pipe 12 at the said wider end of the duct 13.

The pipe 12 lies on a plane that is inclined downwards in the direction of travel A of the blister pack strip 3. The narrow end of the duct 13 thus faces downwards and forwards in relation to this direction of travel A of the blister pack strip.

The pipe 12 features an opening 17 at this narrow end of the duct 13, this opening 17 facing the blister pack strip 3.

The development of the said opening 17 is prevalently transverse to the blister pack strip 3, in such a way that it covers an area of the strip occupied by one single transverse row of compartments 4. More specifically, the longitudinal dimensions of the opening 17 slightly exceed those of a single article 5; and the transverse dimensions are substantially the same as the width of the blister pack strip. The duct 13 features a corresponding transversely widened zone 13a, adjacent to the opening 17.

The front part of the pipe 12 features a slot 18 close to the opening 17. The slot 18 is of the same width as the opening 17 itself, and its size is proportional to longitudinal dimension of the latter.

The opening 17 is closed off, during the non-operative stages of the device, by a gate valve means 19 comprising a reed 20 that is mounted so that it can swing upon an arm 21 of a rocker 22.

The rocker 22 pivots upon a pin 23, which is mounted on a support 24 with its horizontal axis transverse to the blister pack strip 3; this support is housed in an upper cavity 25 in the pipe 12.

One end of the rocker 22 is designed to be acted upon by the piston 26 of a pneumatic actuator

means 27. The actuator 27 is operated by the flow of compressed air delivered via a hose 28, connected to known compressor means. The hose 28 features interceptor means 29, in the form of, for example, a solenoid valve, connected to the control unit 7.

A helical spring 30 acts on the opposite end of the rocker 22, opposing the action of the piston 26; this spring is housed in facing seats 22a, 24a in the rocker 22 and support 24 respectively.

The arm 21 of the rocker 22 is located so that it passes through a slot 31 in the pipe 12 in a plane vertically longitudinal to the blister pack strip 3. The slot is located in a full portion of the pipe 12b, shaped in the median plane by the widened zone 13a of the said duct 13; the front part of this full portion features acute edges in order to minimise the resistance it opposes to the flow of air along the duct 13.

Increasing the usefulness of the device, the pipe 12 has also been envisaged in a form in which it features a series of ducts, thus being able to operate simultaneously on a corresponding series of blister pack strips, conveyed coplanar to and alongside one another along the line 2. Figure 2 is an illustration of one example of a pipe featuring a pair of lateral ducts 13b which are symmetrical in relation to the central duct and which branch out from a connector sleeve 12a; each of these ducts is obviously fitted with a related gate valve means 19 for closing off their related openings 17.

The pipe 12 is supported so that it is able to swing upon a shaft 32, horizontally transverse to the said belt 3, to which it is locked by means of lock rings 33. The shaft 32 is supported by a pair of walls 34, located on either side of the blister pack strip 3, and passes through laterally located bushes 35 formed in the upper surface of the pipe 12.

A pin 36, which is inserted as a free fit in a hole in a lever 37 which pivots on the shaft 32 (Fig. 4) protrudes outwards from one bush 35.

The weight of the pipe 12 forces the latter to swing downwards around the shaft 32 until striking the lever 37 against a stop 40 (e.g. a grub screw engaging with a related seat in a body 41 that is an integral part of one of the aforementioned walls 34); by operating on the said grub screw 40 it is possible to adjust the bottom end-of-stroke position of the pipe 12, which is to the distance between lower end of the latter and the blister pack strip 3 below it.

A proximity sensor 48, fixed to the body 41, detects this bottom end-of-stroke position.

The raising movement of the pipe is elastically opposed by a spring 42, located between the lever 37 and a body 43 fixed to a related wall 34.

It is easy to understand the operation of the device described herein. When the detection means 6 detect that there are one or more missing or imperfect articles in a portion 8 of the strip 3 that is destined to subsequently form a blister pack, they send a corresponding electric signal to the control unit 7.

The latter in its turn sends a signal to the solenoid valve 29, in synchrony with the passage of the previously mentioned portion 8 below the device 1, commanding the opening of the gate valve means 19

which normally close off the opening 17, as can be seen in Figure 1a.

The compressed air delivered via the hose 28 causes the piston 26 to be moved, this in turn causing the angular rotation of the rocker 22; the reed 20 moves backwards, opening the opening 17 (Fig. 1b).

At this point the duct 13 is brought into communication with the portion of the blister pack strip 3 below it. There is a constant air flow along the duct 13, entering through the corresponding front slot 18 of the pipe, and generated by suction means connected to the pipe 12 by means of the hose 15. There is thus a depression in the opening 17.

The suction action created in this way upon the portion of the blister pack strip passing beneath the opening 17 removes the articles 5 located in the compartments 4 forming a related transverse row of the blister pack strip itself.

These articles are sucked up inside the duct 13 and returned to the feed unit by means of the hose 15.

It should be noted that the removed articles 5 are turned over in the entrance to the duct 13 as a result of the thrust of the compressed air entering through the slot 18, this causing them to be orientated edgewise along the duct itself.

The forward movement of the blister pack strip 3 causes a successive row of compartments 4 in the strip to be emptied. When the entire above-mentioned portion 8 has passed beneath the device 1 and has consequently been emptied, the control unit 7 sends a new signal to solenoid valve 29, causing the piston 26 to return; the gate valve means 19 close due to the action of the spring 30.

It is clear that the device described here operates without acting on the blister pack strip 3 itself, the articles being removed by suction and conveyed away along the duct 13. The generously wide section of this duct 13 and the continuous air flow along it prevents any jamming of the blister pack strip or of the device, since the articles or fragments of them do not block up the duct itself.

This is helped by the fact that the pipe 12 is located in a forward and downward-facing plane, such that the suction air flow along the duct 13 flows in practically the opposite direction to the forward feed direction A of the blister pack strip 3.

Even if the strip is loaded with articles located in such a way as to exceed the dimensions normally allocated them, there is no risk of jamming due to the swing mounting of the pipe 12. The pipe 12 is in fact able to rotate on the shaft 32, as partially indicated by the broken line 38 in Figure 1a, moving upwards, opposed by the elastic action of the spring 42, from the related bottom end-of-stroke position.

The distance between the lower end of the pipe and the blister pack strip 3 beneath can thus vary; this is detected by the sensor 48 which, as a consequence, stops the means (not illustrated) for drawing along the blister pack strip, enabling the mode in which the latter is filled to be returned to normal.

Emphasis should be placed on the fact that the

pipe 12 may easily be changed over, according to one's needs. More specifically, different sizes of openings 17 can be provided for different sizes of blister packs.

Changing over one pipe 12 for another one of the same type does not necessitate effecting any operations on the grub screw 40, or concerning the axial position of sensor 48; the latter, indeed, works in conjunction with the lever 37, which is not removed when changing over the pipe.

Changing over one pipe for another of a different type (e.g.: when changing the size of the articles 5) may demand that one adjust the aforementioned bottom end-of-stroke position; this may be rapidly and easily effected by operating on the grub screw 40, and adjusting the axial position of the sensor 48.

The gate valve 20 also may, for example, be operated in a horizontal plane instead of in a vertical plane as shown in the drawings.

Claims

1) Device for removing sundry articles, in particular capsules, tablets and comfits, from their related compartments in a blister pack strip, of the type designed to operate along a line (2) for packing said articles (5), along which said blister pack strip (3) is made to move by the action of corresponding means, the line comprising means (6), made to operate by a control unit (7), for detecting the absence of articles (5) in the related compartments (4), in successive portions (8) of said blister pack strip (3), means (9) for applying a film (10) to the blister pack strip (3), closing off the compartments (4), and means (11) for cutting the strip (3) into portions (8) as well as for rejecting any blister pack (8a) which lack at least one of said articles (5); said device (1) operating between said detection means (6) and means (9) for applying the film, at a point corresponding with said line (2), and being characterised in that it comprises a pipe (12) located above said blister pack strip (3) and forming at least one duct (13), one end of which is connected via a first hose (15) to a suction plant (16), whilst the opposite end features an opening (17), located facing the blister pack strip (3), and whose development is prevalently transverse to the strip (3), such that it covers a zone of the belt occupied by a transverse row of said compartments (4), and is closed off during the non-operative stage of the device by a gate valve means (19), a slot (18) being located in front of said pipe (12), close to said opening (17), enabling a continuous air flow along said duct (13), said control unit being able to command said gate valve means (19) to open following detection by said detection means (6) that at least one article (5) is missing in a portion (8) of the blister pack strip (3) and in synchrony with the passage of said portion (8) through a point corresponding to said device (1), thus causing a suction effect in said opening (17), and consequently removing the

articles (5) located in the compartments (4) below.

2) Device as in claim 1, characterised in that said pipe (12) lies on a downwards-inclined plane in relation to direction A in which said blister pack strip (3) is moved forwards, such that said end of said duct (13) featuring said opening (17) faces downwards and forwards.

3) Device as in claim 1, characterised in that said gate valve means (19) comprise a metal reed (20) mounted so that it can swing upon an arm (21) of a rocker (22), the fulcrum for which is a pin (23) whose horizontal axis is located transversely to said blister pack strip (3), and able to be operated at one end, opposed by the force of a spring (30), by the piston (26) of pneumatic actuator means (27), operated by the flow of compressed air delivered via a second hose (28), connected to compressor means, due to the intervening action of interception means (29).

4) Device as in claim 3, characterised in that said arm (21) of said rocker (22) is located so that it passes through a slot (31), in a plane vertically longitudinal to said strip (3), in a full portion (12b) of said pipe, shaped in the median plane by said duct (13).

5) Device as in claim 1, characterised in that said pipe (12) is supported so that it is able to swing upon a shaft (32), horizontally transverse to said strip (3), this shaft (32) being supported by a pair of walls (34), located on either side of said blister pack strip (3), and passing through laterally located bushes (35) formed in the upper surface of the pipe (12), means being provided for imposing the bottom end of stroke position of said pipe at a preset value, and further means (48) for detecting said end of stroke position, with said further means being made to operate so that they deactivate said means for moving the blister pack strip (3) whenever the above-mentioned pipe is raised in relation to said end of stroke position.

6) Device as in claim 5, characterised in that said means for imposing the bottom end of stroke position comprise a lever (37), which turns on said shaft (32), connected to the pipe (12) by means of a pin (36) which is inserted as a free fit from one side into a hole made in said lever, and is on the other side locked to a related bush (35) of said bushes through which said shaft (32) passes, and a grub screw (40), which engages in a seat made in a body (41) that is an integral part of the related wall (34), and which intercepts said lever (37); said further means for detecting the above-mentioned bottom end of stroke position comprising a proximity sensor (48), locked to said body (41) and able to detect when said lever (37) strikes against said grub screw (40).

7) Device as in claim 1, characterised in that said pipe (12) features a large number of ducts (13) in order to be able to operate simultaneously on a corresponding number of blister pack strips (3), conveyed coplanar to and

alongside one another along said line (2).

8) Device as in claim 7, characterised in that said pipe (12) features a pair of lateral ducts (13b) which are symmetrical in relation to the central duct and which branch out from a connector sleeve (12a) and which in turn feature a related gate valve means (19) for closing their related openings (17).

9) Device as in claim 1, characterised in that the shape of said duct (13) is divergent in the longitudinal plane.

10) Device as in claim 1, characterised in that said duct (13) features a transversely enlarged zone (13a) which is adjacent to said opening

(17).

11) Device as in claim 1, characterised in that said slot (18) has the same width as that of said opening (17) of the duct (13).

12) Device as in claim 1, characterised in that the size of said slot (18) is proportional to the longitudinal dimension of said opening (17).

13) Device as in claim 6, characterised in that it comprises elastic means (42) located between said lever (37) and a body (43) locked to a related wall (34), with said elastic means operating so that they provide an elastic resistance to the raising of the pipe (12) from said bottom end of stroke position onwards.

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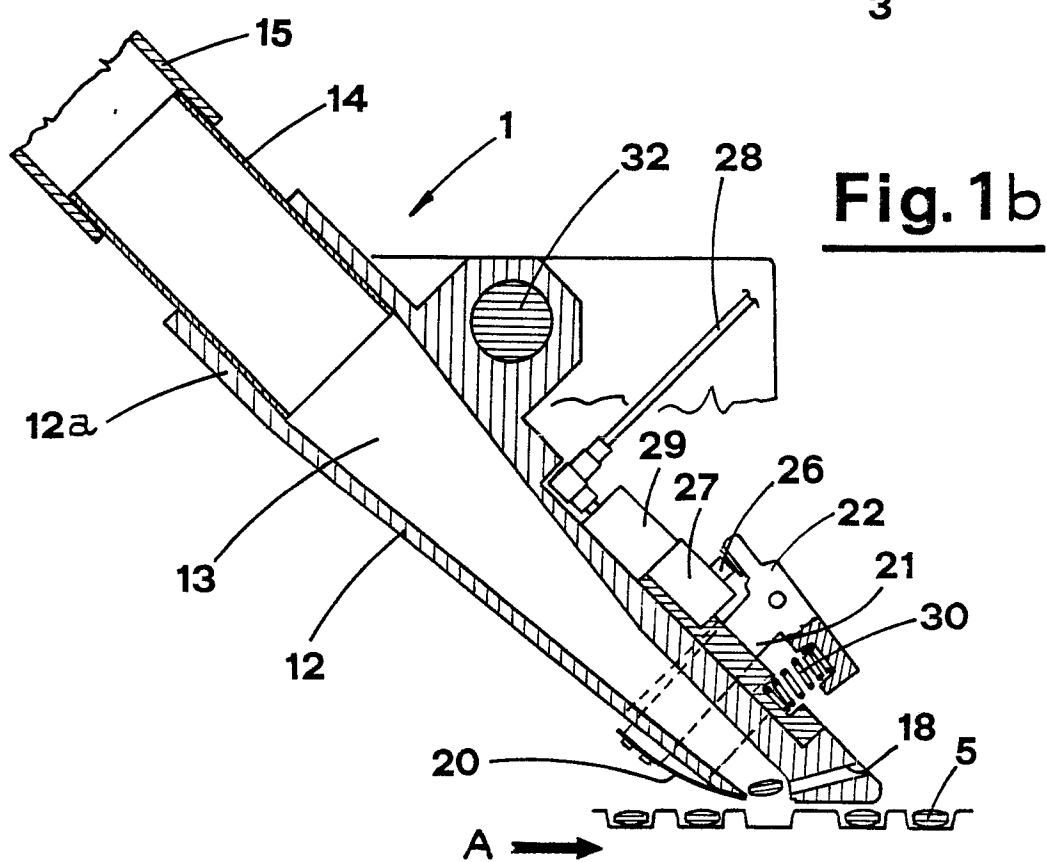
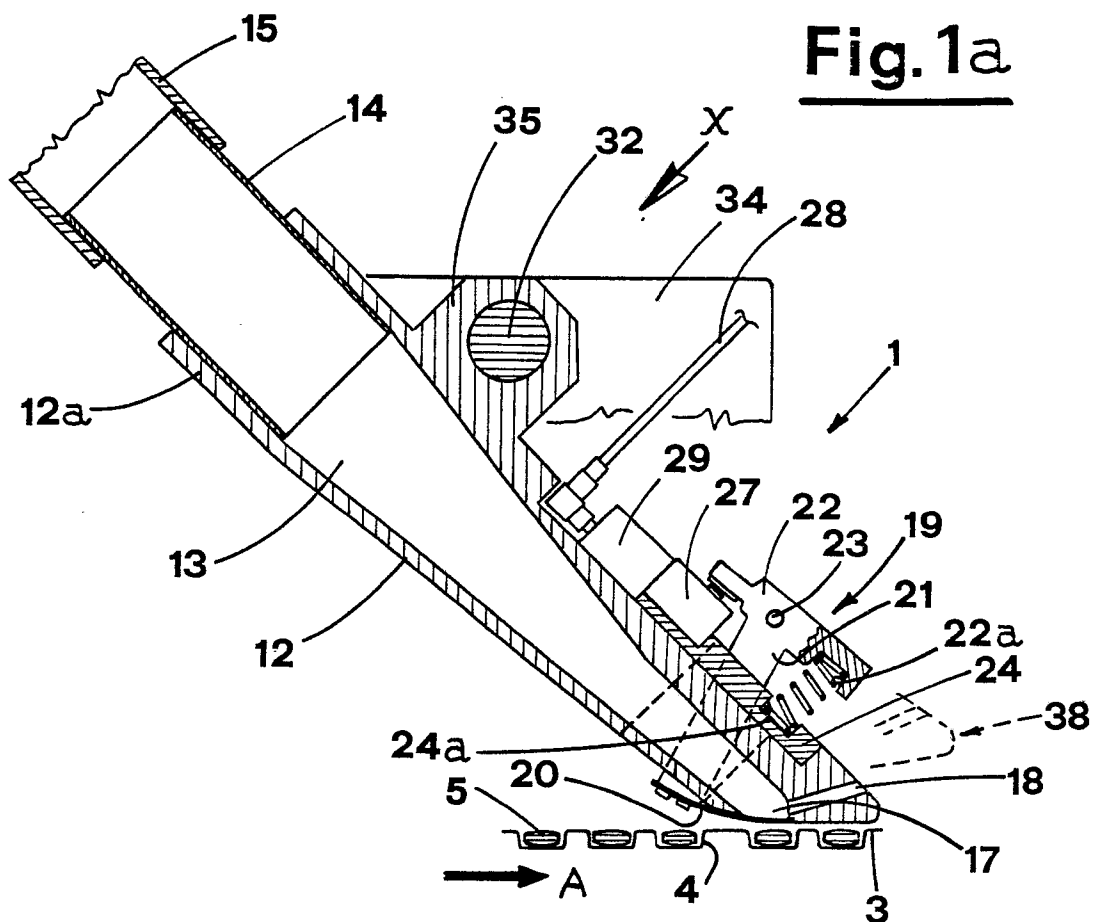
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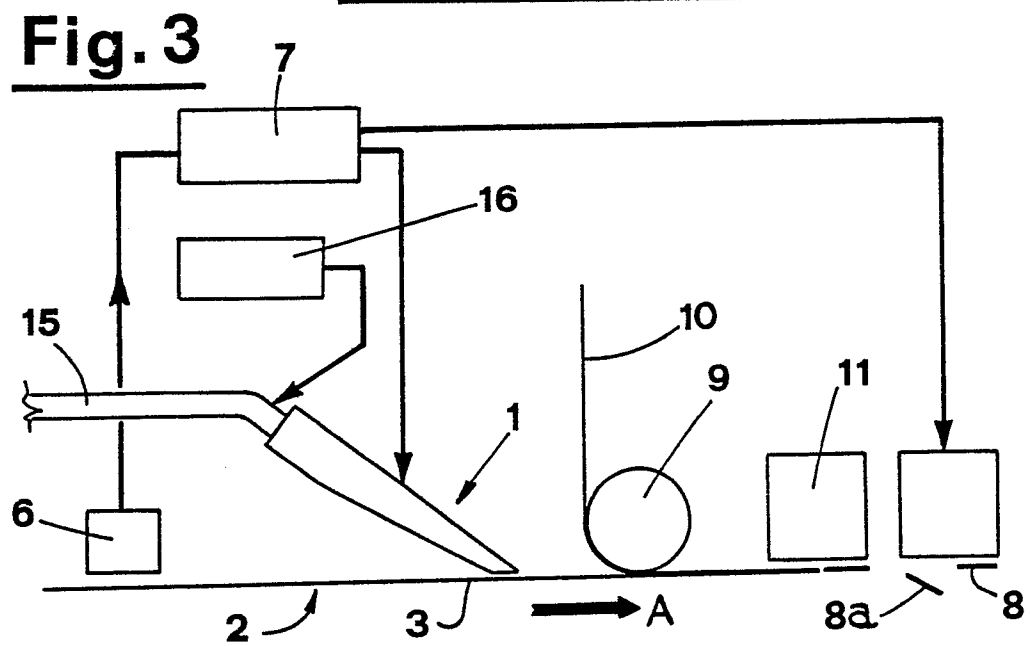
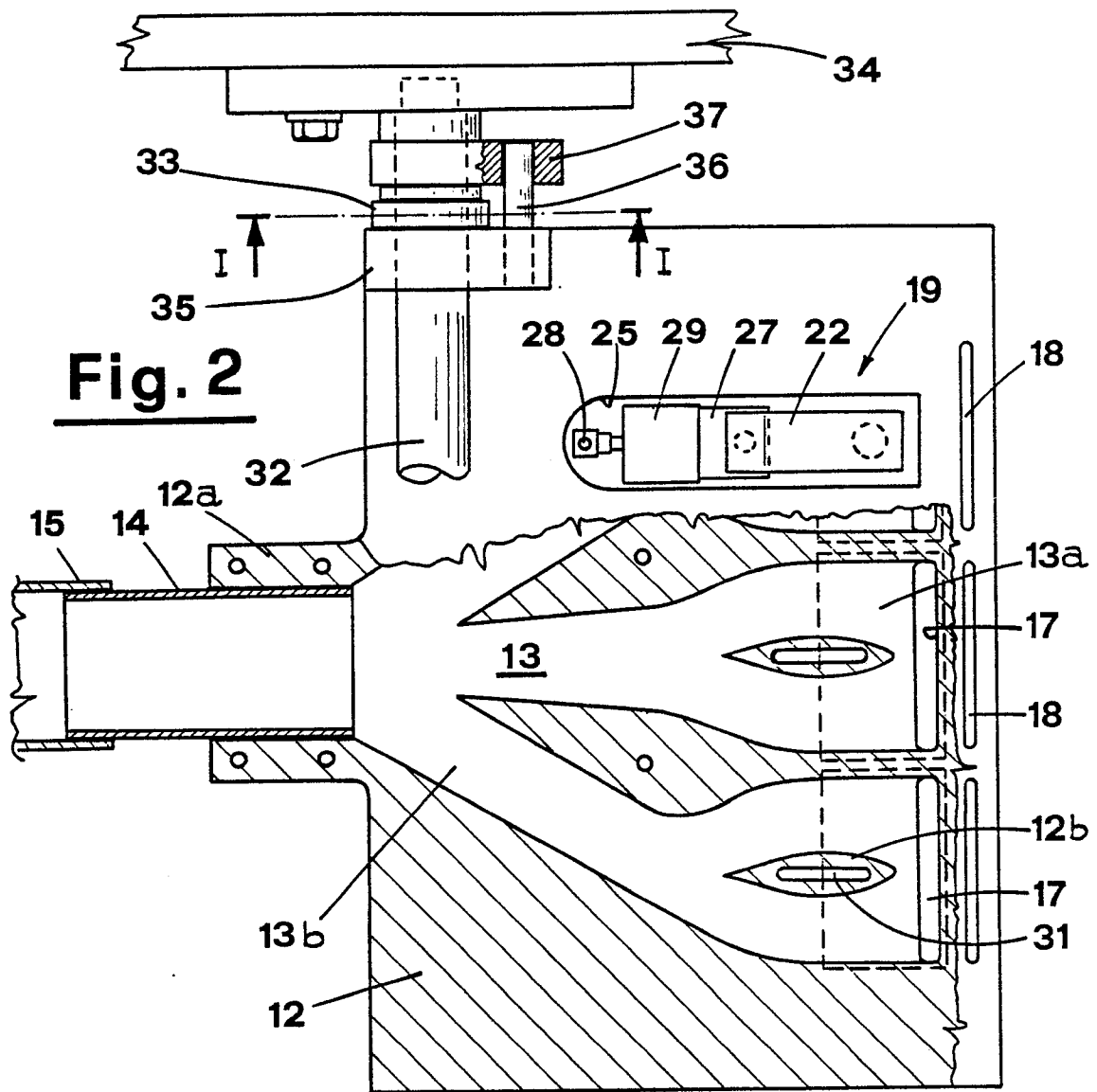
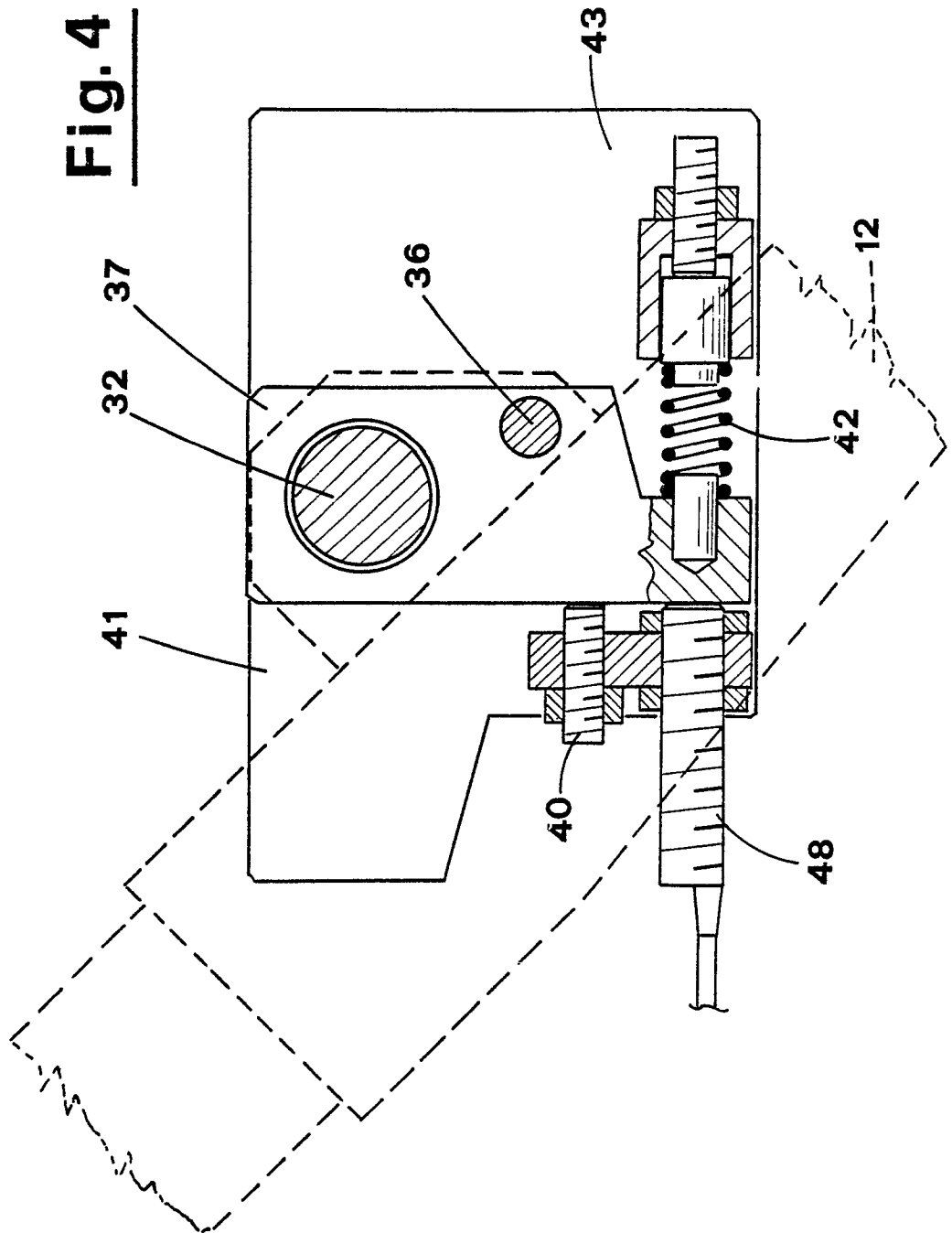


Fig. 4





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-1 955 359 (MASINO) * Whole document * -----	1	B 65 B 69/00 B 65 B 57/10
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27-09-1989	Examiner CLAEYS H.C.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			