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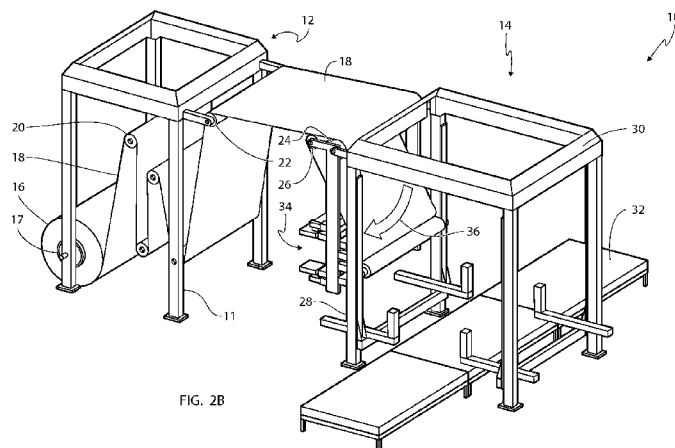


FIG. 2B

(57) Abstract: An apparatus for packing goods piled on a pallet, by drawing a deformed hood of a reformable foil material on to the goods and allowing the deformed hood to reform into or towards its original shape and fixating the goods relative to the pallet and relative to one another. The apparatus comprises a rack defining sets of vertical legs and a top part, a supply of the reformable foil material in the form of a collapsed hose, and a film feed, film welding and film cutting assembly for receiving the collapsed hose. The apparatus further comprises a vertically movable film stretching frame which is vertically movable relative to the film feed, film welding and film cutting assembly from a top position juxtaposed the assembly to a lowered position, in which the film stretching frame draws the hood in its slightly deformed shape around the goods or packages and eventually allows the hood to reform to or towards its original shape. The film feed, film welding and film cutting assembly is journaled at one side of the rack for allowing the film feed, film welding and film cutting assembly to be shifted from a horizontal working position at the top of the rack to a vertical service or maintenance position outside the rack by swinging the film feed, film welding and film cutting assembly from the horizontal working position to the vertical service position.



Apparatus for packing goods or packages and a method of repairing and servicing the apparatus

5 The present invention relates to an apparatus for packing goods or packages positioned on or piled on a support such as a pallet, i.e. an apparatus or a machine of the kind commonly known in the industry as a stretch hood pallet wrapping machine.

10 An apparatus or a machine of this kind is widely known in the industry and is described in numerous patent publications including among others EP 1 060 988, EP 2 069 206 and EP 2 336 034, to which reference is made for the understanding of the overall stretch hood wrapping technique itself.

15 In the prior art, stretch hood wrapping machines generally comprise a frame or rack defining vertical stands or legs such as a single pair of stands or legs or two pairs of stands or legs, on which a top part is supported. The stretch hood is produced from a reformable foil material which is supplied as a collapsed hose from a foil supply, such as a role of foil material.

20 For performing the stretch hood wrapping operation, the machine generally includes two further assemblies, namely firstly a film feed, film wrapping and film cutting assembly, into which the collapsed hose of the foil material is introduced, and secondly a vertically movable film stretching frame, which is vertically movable relative to the film feed, film welding and film cutting assembly. In a top position of
25 the vertical and movable film stretching frame juxtaposed the film feed, film welding and film cutting assembly, the film stretching frame receives the collapsed hose from the film feed, film welding and film cutting assembly and stretches the collapsed hose into a tubular form, whereupon the hose is welded into a sealed hood by the use of the film feed, film welding and film cutting assembly. Thereupon
30 the hood is separated from the reformable foil material by the film feed, film welding and film cutting assembly. Finally, the sealed hood is slightly deformed by the stretching of the hood, and the hood is vertically moved downwardly for the position of the sealed hood enclosing the goods or packages, whereupon the hood is

allowed to reform to or towards its original shape, which causes the goods or packages to be fixated as the foil material reforms and fixates the goods or packages relative to the support.

5 The machines of the above kind have, as said above, gained commercial success, still, the fairly complex film feed, film welding and film cutting assembly needs periodic service and repair, i.e. substitution of worn out components such as film feed rollers, the film welding bars and the film cutting tools of the assembly. In the basic stretch hood wrapping machine, the film feed, film welding and film cutting
10 assembly is stationary at the top of the frame or rack, which necessitates a person to service the machine to make the service and repair work while using a ladder or similar element to gain access to the upper side of the film feed, film welding and film cutting assembly and also to the lower side of the assembly. As is evident, this service and repair work is highly risky and non-acceptable from a worker's safety
15 point of view. In the above European patent specifications EP 2 069 206 and EP 2 336 034, a technique is described, according to which the film feed, film welding and film cutting assembly may be lowered from its position at the top of the frame or rack allowing a person to perform at least part of the service work while standing on the floor, on which the apparatus is resting.

20

It is an object of the present invention to improve the above described stretch hood wrapping technique and in particular the technique relating to service and repair for allowing easier access to the film feed, film welding and film cutting assembly of the apparatus or machine, while preserving the stability of the apparatus by preserving
25 a fixed and permanent connection between the film feed, film welding and film cutting assembly and the apparatus itself.

30

It is a particular advantage of the present invention that the apparatus according to the present invention allows a person performing service or repair work to the apparatus to easily gain access to both sides of the film feed, film welding and film cutting assembly, i.e. the upper side and the lower side of the assembly without the necessity of using ladders or similar elements for the service or repair work.

It is a further advantage of the present invention that the apparatus according to the present invention allows a person performing service or repair work to easily dismount the film feed, film welding and film cutting assembly for substituting the assembly or alternatively, for bringing the assembly to a workshop or repair shop for further service or repair work, without the necessity of using ladders or similar elements for the service for the demounting work.

The above object and the above advantage together with numerous other objects and advantages, which will be evident from the below detailed description of the present invention is according to a first aspect of the present invention obtained by an apparatus for packing goods or packages positioned on or piled on a support, such as a pallet, by drawing a slightly deformed hood of a reformable foil material on to the goods or packages and allowing the slightly deformed hood to reform into or towards its original shape and in doing so, fixating the goods or packages relative to the support and relative to one another,

the apparatus comprising:

a frame or rack defining sets of vertical stands or legs and a top part,

a supply of the reformable foil material for the supply of the reformable foil material in the form of the collapsed hose,

a film feed, film welding and film cutting assembly for receiving the collapsed hose,

and a vertically movable film stretching frame which is vertically movable relative to the film feed, film welding and film cutting assembly from a top position juxtaposed the assembly for receiving the collapsed hose from the film feed, film welding and film cutting assembly and stretching the collapsed hose into a tubular form prior to the assembly welding the hose into a sealed hood and separating the hood from the reformable foil material and to a lowered position, in which the vertically movable film stretching frame draws the hood in its slightly deformed shape around the goods or packages and eventually allows the hood to reform to or towards its original shape,

said film feed, film welding and film cutting assembly being journalled at one side of said frame or rack for allowing the film feed, film welding and film cutting assembly to be shifted from a horizontal working position at the top of the frame or

rack to a vertical service or maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from the horizontal working position to the vertical service position, and for allowing the film feed, film welding and film cutting assembly to be returned to the horizontal working position from the vertical service position.

In the present context, the term 'capacitor bank' is to be construed encompassing any electronic or electrical component or entity capable of storing electrical energy, such as conventional capacitors or chargeable batteries or alternatively, semiconductor based capacitors. The expression is further to be construed defining an entity or component serving as a power reservoir for a single motor or for a multiplicity of motors connected to the reservoir.

According to the basic teachings of the present invention, the film feed, film welding and film cutting assembly of the stretch hood wrapping apparatus or machine is shiftable from its horizontal working position to a vertical service or repair position, in which the assembly is located vertically outside the frame, which allows a service or repair worker to access both the top side and the lower side of the assembly in an easy and convenient manner. The returning of the apparatus into its operational mode is likewise established by simply swinging the film feed, film welding and film cutting assembly from its vertical service or repair/maintenance position to its horizontal working position at the top of the frame or rack of the apparatus.

In accordance with alternative embodiments of the apparatus according to the first aspect of the present invention, the supply of the reformable foil material, which is constituted by a roll of foil material may be supported on a second frame or rack or alternatively and preferably supported on the frame or rack of the apparatus or alternatively, by a movable rack or frame.

The film feed, film welding and film cutting assembly of the apparatus according to the first aspect of the present invention comprises individual components or elements serving the film feed, film welding and film cutting purposes and the assembly consequently, in the presently preferred embodiment of the apparatus

according to the first aspect of the present invention comprises film advancing rollers including a pair of drive rollers or alternatively, a drive roller and an idler roller for the advancing of the collapsed hose in the film feed, film welding and film cutting assembly to the vertically movable film stretching frame. The welding of the foil material into the sealed hood may advantageously be performed by the use of a set of heatable film welding tools and the separation of the sealed hood from the remaining of the foil material may be established by a reciprocating film cutter or alternatively, a heated wire cutter.

The introduction of the packages or goods into the apparatus according to the first aspect of the present invention may be carried out by any appropriate conveyer or transport means such as a conveyer belt or preferably conveyer rollers allowing fairly heavy weight piles of packages or goods supported on a pallet to be wrapped by the stretch hood machine according to the present invention. The conveyer, which is preferably constituted by conveyer rollers serving to introduce the support, on which the goods or packages are supported into the frame to a position below the film feed, film welding and film cutting assembly, defines a linear line of transportation through the apparatus, which line of transportation is orientated specifically perpendicular to the film feed, film welding and film cutting tools of the film feed, film welding and film cutting assembly of the apparatus.

The vertical service and repair position of the film feed, film welding and film cutting assembly of the apparatus according to the first aspect of the present invention may be oriented parallel with the line of transportation of the conveyer, or alternatively, perpendicular to the line of transportation of the conveyer dependent on the actual configuration of the apparatus and in particular, the space available for the apparatus itself.

For the conversion of the collapsed hose into the tubular form, which is further welded into the sealed hood, the vertical and movable film stretching frame of the apparatus according to the first aspect of the present invention preferably comprises sets of film separation elements, such as suction heads to be fixated from the outside to the collapsed hose.

Provided the apparatus itself is of a large height due to the necessity of packaging fairly large piles of goods of packages, the film feed, film welding and film cutting assembly of the apparatus according to the first aspect of the present invention may
5 further advantageously comprise extension arms allowing the film feed, film welding and film cutting assembly to be lowered from its vertical service position outside the frame or rack juxtaposed the supporting floor, on which the apparatus is resting.

The above object and the above advantage together with numerous other
10 advantages, which will be evident from the below detailed description of embodiments of the present invention is according to a further aspect of the present invention obtained by a method of repairing and servicing the apparatus according to the first aspect of the present invention, which method comprises shifting the film feed, film welding and film cutting assembly from its horizontal working position at
15 the top of the frame or rack to its vertical service or repair/maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from its horizontal work of position to its vertical service position.

In the apparatus for packing goods or packages positioned on or piled on a support,
20 such as a pallet, i.e. an apparatus or a machine commonly known in the industry as a stretch hood pallet wrapping machine, the operation of the supply for the reformable foil material, the film feed, film welding and film cutting assembly and further, the vertically movable film stretching frame are generally intermittent operations, which in addition as far as the vertically movable film stretching frame
25 involves raising and lowering an in the lowering, while pulling the reformable foil material downwardly, provides a braking operation in order to properly perform the operation of stretching and separating the hood while lowering the film stretching frame. Whereas in conventional apparatuses or machines of this kind, AC or DC motors have been employed, in which the braking operation is performed by
30 connecting short circuiting resistors across the motor, it has been realised that the energy consumption of the stretch hood pallet wrapping machine may be dramatically reduced by reusing the power while operating a motor in a braking

mode and charging a capacitor bank in order to allow the braking power to be used afterwards while energising the same motor or another motor.

Consequently, it is an object of the present invention to provide a stretch hood pallet
5 wrapping machine, which allows for the operation of the machine with a far less power consumption than conventional stretch hood pallet wrapping machines. The above object in accordance with a third aspect of the present invention is obtained by a an apparatus for packing goods or packages positioned on or piled on a support, such as a pallet, by drawing a slightly deformed hood of a reformable foil
10 material on to the goods or packages and allowing the slightly deformed hood to reform into or towards its original shape and in doing so, fixating the goods or packages relative to the support and relative to one another,

the apparatus comprising:

a frame or rack defining sets of vertical stands or legs and a top part,

15 a supply of the reformable foil material including a first motor for the supply of the reformable foil material in the form of the collapsed hose,

a film feed, film welding and film cutting assembly for receiving the collapsed hose, said film feed, film welding and film cutting assembly being
journalled in relation to said frame or rack

20 a vertically movable film stretching frame which is vertically movable relative to the film feed, film welding and film cutting assembly driven by a second motor included in said film feed, film welding and film cutting assembly or alternatively included in said film stretching frame from a top position juxtaposed the film feed, film welding and film cutting assembly for receiving the collapsed hose
25 from the film feed, film welding and film cutting assembly and stretching the collapsed hose into a tubular form prior to the assembly welding the hose into a sealed hood and separating the hood from the reformable foil material and to a lowered position, in which the vertically movable film stretching frame draws the hood in its slightly deformed shape around the goods or packages and eventually
30 allows the hood to reform to or towards its original shape,

said first and second motors being thyristor controlled DC, or AC single or three phase motors,

a power supply including a rectifying unit connected to the main supply and including a capacitor bank and a first thyristor controller and a second thyristor controller connected to said capacitor bank and connected to said first and second motor, respectively, and

5 a central controlling computer connected to said rectifying unit and to said first and second thyristor controllers for controlling the operation of the apparatus and in doing so, operating said first and second thyristor controllers in two alternative operational modes, a first operational mode, in which the thyristor controller in question receives DC power from said capacitor bank for the supply of
10 electrical power via the thyristor controller in question to the motor in question, or in the alternative, a second operational mode, in which the thyristor controller in question, while its motor is performing a braking operation and generates electrical power, supplies the electrical power from the electric motor in question to the capacitor bank.

15 In the apparatus for packing goods and packages according to the third aspect of the present invention, the operation of the motors serving to supply the reformable foil material to the machine and the motor serving to move the film stretching frame vertically are operated by a central controlling computer so as to regenerate any
20 power generated by the motor in question while performing a braking operation and in doing so, also controlling the operation of the overall apparatus due to the presence of the central controlling computer, which due to the thyristor controllers connected to the motors allow for the proper controlling of the speed of the motor, either in the first operational mode or the second operational mode.

25 The apparatus according to the third aspect of the present invention may in accordance with a presently preferred embodiment be implemented in accordance with the teachings of the first aspect, as the apparatus may advantageously be journalled at one side of said frame or rack and including a third motor for shifting
30 the film feed, film welding and film cutting assembly from a horizontal working position at the top of the frame or rack to a vertical service or maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from the horizontal working position to the vertical service position and

returning the film feed, film welding and film cutting assembly to the horizontal position from the vertical service position, the third motor being a thyristor controlled DC or AC, single or three phase motor controlled by a separate third thyristor controller connected to said central controlling computer.

5

The operations to be performed in the apparatus according to the third aspect of the present invention involves the use of further motors, such as a fourth motor for stretching the collapsed hose into a tubular form and a fifth motor for the motion of a separating knife for separating the hood from the reformable foil material, said fourth and fifth motors being thyristor controlled DC or AC, single or three phase motors, the power supply including a fourth and fifth thyristor controlled controller controlling the fourth and fifth mode, respectively, and being connected to said central controlling computer.

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The apparatus according to the third aspect of the present invention may further advantageously comprise any of the features of the apparatus according to the first aspect of the present invention as described in the above points described in the invention.

20

The present invention is now to be further described with reference to the drawings, in which:

25

Fig. 1A is a schematic, side elevational view of a first embodiment of an apparatus according to the present invention constituting a stretch hood pallet wrapping machine illustrating a central film feed, film welding and film cutting assembly in a central operational mode,

Fig. 1B is a schematic, side elevational view of a first embodiment of the apparatus according to the present invention constituting a stretch hood pallet wrapping machine,

30

Fig. 2A is a schematic and perspective view of the first embodiment of the apparatus according to the present invention shown in Fig. 1A of the first embodiment of the stretch hood pallet wrapping machine according to the present invention illustrating the central film feed, film welding and film cutting assembly in a service mode,

Fig. 2B is a schematic and perspective view similar to the view of Fig. 2A illustrating the first embodiment of the stretch hood pallet wrapping machine according to the present invention, also shown in Fig. 1B in the service mode,

Fig. 3A is a schematic, side elevational view of a modified embodiment of the first embodiment of the apparatus shown in Fig. 1A having an increased height,

Fig. 3B is a schematic side elevational view similar to the view of Fig. 3A illustrating the modified embodiment in a service mode similar to the view of Fig. 1B,

Fig. 3C is a schematic and side elevational view of the modified embodiment of the apparatus according to the present invention shown in Figs. 3A and 3B illustrating a final stage of shifting the frame to the service mode,

Fig. 4 is a second and presently preferred embodiment of an apparatus according to the present invention constituting a stretch hood pallet wrapping machine similar to the first embodiment shown in Figs. 1A, 1B, 2A and 2B and the modified embodiments shown in Figs. 3A, 3B and 3C, however, differing from the above first and modified embodiments in that the foil support is integrated into a central frame of the machine,

Fig 5A is a detailed illustration of the essential elements of the film feed, film welding and film cutting assembly presented in an enlarged scale detail view,

Fig. 5B is a schematic and side elevational view similar to the view of Fig. 1B illustrating the frame in a service mode,

Figs. 6A – 6M are schematic views illustrating individual steps of the process of operating the machine shown in Figs. 4 and 5,

Fig. 7 is a detailed illustration of the positions of the essential motor elements of the second and presently preferred embodiment of the apparatus according to the present invention,

Fig. 8 is a diagrammatic and schematic view of a first implementation of an electronic control diagram of the controlling system of the apparatus according to the present invention,

Fig. 9 is a diagrammatic and schematic view of a second implementation of the electronic controlling system of the apparatus according to the present invention.

In Figs. 1A and 1B is shown a first embodiment of an apparatus according to the present invention constituting a stretch hood pallet wrapping machine implementing

the teachings of the present invention. The apparatus or machine is in its entirety designated the reference numeral 10 and comprises two racks designated the reference numerals 12 and 14. The first rack 12 has four stands or legs 11 and serves to support a supply of foil designated the reference numeral 16, which foil constitutes a tubular foil, which is intended to be separated into a tubular configuration and to be stretched for allowing the foil to be pulled over a product such as a number of individual packages or similarly products supported on a pallet. The foil supply 16 is rotated by a central motor 17 rotating the foil supply 16 at a constant speed and delivers the foil 18 through a set of rollers, which serve to take up the difference in speed between a constant rotational motion of the foil supply 16 and the intermittent supply of the foil into the wrapping part of the machine, which wrapping part is included in the second rack 14. One of these rollers is designated the reference numeral 20.

At the right hand side of the first rack 12, a roller 22 guides the foil in a horizontal orientation to input rollers 24 and 26 of the second rack 14, which rack comprises a total of four stands or legs 28, which support a top part constituting an open frame, which top part is designated the reference numeral 30. At the bottom of the second rack 14, a conveyer 32 is arranged centrally below the top part 30 of the second rack 14, which conveyer serves to introduce the above-mentioned pallet, on which individual goods or packages are received into the space delimited between the stands or legs 28 of the second rack 14.

Within the top part 30, a film feed, film welding and film cutting assembly is received, the function of which is in itself well-known in the art and described in several prior art documents including European patents EP 2 069 206 and EP 2 336 034, to which reference is made. The film feed, film welding and film cutting assembly 34 is further to be described in greater details below with reference to the drawing's Figs. 5 and 6A-6K.

The film feed, film welding and film cutting assembly 34 serves to pull the tubular foil 18 into the inner space of the second rack 14 and to separate the flat tubular foil into a tubular configuration by the cooperation with a foil stretching frame to be

described below for allowing the tubular configured foil to be mounted on to the goods or packages mounted on the pallets supported by the conveyer 32. From time to time, the film feed, film welding and film cutting assembly, which include feed elements, suction elements, welding and cutting elements are to be serviced or repaired to substitute any malfunctioning elements, and in order to allow the film feed, film welding and film cutting assembly to be easily serviced, the assembly 34 is hinged at the left hand stand 28 of the second rack 14 for allowing the assembly as a unit to be turned from its horizontal position shown in Fig. 1A into a vertical orientation shown in Fig. 1B, in which the film feed, film welding and film cutting assembly 34 is positioned outside the second rack 14 for allowing a person who has to repair or service the assembly to gain access easily from both sides of the vertically orientated assembly, i.e. access to the upper side of the film feed, film welding and film cutting assembly 34, and also obtain easy access to the lower side of the assembly, which lower side is located at the left hand side shown in Fig. 1B. The turning of the film feed, film welding and film cutting assembly 34 from its operational position shown in Fig. 1A to its service position shown in Fig. 1B outside the second rack 14 is accomplished by swinging the assembly as indicated by an arrow 36. By the swinging of the film feed, film welding and film cutting assembly 34 to its service position shown in Fig. 1B outside the second rack 14, the person performing a service work may, apart from obtaining easy access to both sides of the assembly, easily demount the assembly 34 provided more extensive service or repair work is needed, which work is most conveniently made on a remote workshop or repair shop location rather than at the location of the machine or apparatus 10. The swinging of the film feed, film welding and film cutting assembly 34 to the service position shown in Fig. 1B also allows a person performing service or repair work to easily demount the assembly 34 and substitute it by a new or fully repaired assembly, which has been repaired or serviced at a remote workshop or repair shop location.

Figs. 2A and 2B illustrate in perspective views the first embodiment of the apparatus or machine according to the present invention shown in Figs. 1A and 1B, respectively, illustrating the horizontal operational position of the film feed, film

welding and film cutting assembly 34 in Fig. 2A and illustrating in Fig. 2B the vertical service position of the assembly.

In Figs. 3A, 3B and 3C, a slightly modified embodiment of the first embodiment of the apparatus according to the present invention is shown, which apparatus differs from the above described first embodiment in that the first rack 12¹ and the second rack 14¹ are somewhat higher as compared to the racks of Figs. 1A and 1B, and in Figs. 3A-3C, the racks corresponding to the racks 12 and 14 shown in Figs. 1A, 1B, 2A and 2B are designated the reference numerals 12¹ and 14¹ simply to indicate the difference in configuration or geometry, still indicating the correspondence as to functionality and operation of the elements. Throughout the drawing's figures, components or elements, which have been described previously with reference to a previous drawing's figure is identically numbered and no detailed discussion of these components or elements is given, except for the understanding of specific functions or operations of the embodiment in question. Components or elements corresponding to previously described components or elements, however differing from the previously described components or elements in their geometrical configuration, still serving the same function, are designated the same integer, however added a marking for identifying the difference. In Figs. 3A-3C, the stands or legs 11 of the first rack are designated the reference numeral 11¹ and similarly, in relation to the second rack 12, the stands or legs are designated the reference numeral 28¹.

Fig. 3A illustrates, similar to Fig. 1A, the operation mode position of the film feed, film welding and film cutting assembly 34¹ and Fig. 3B illustrates the positioning of the film feed, film welding and film cutting assembly 34¹ in the vertical orientation outside the second rack 14¹, in which position the vertically orientated film feed, film welding and film cutting assembly 34¹ is positioned raised above the supporting floor of the location in which the apparatus 10¹ is located. In order to allow easy access to the upper and lower sides of the film feed, film welding and film cutting assembly 34¹ in the modified embodiment 10¹ shown in Figs. 3A-3C, the assembly 34¹ is provided with two telescopic arms, which allow the assembly 34¹ to be lowered from the position shown in Fig. 3B to the position shown in Fig. 3C, in which the opposite

upper and lower sides of the film feed, film welding and film cutting assembly 34^I is readily accessible from a position at floor level. The reference numeral 38 designates the shifting of the film feed, film welding and film cutting assembly 34^I downwardly by use of the telescopic arms of the assembly.

5

In Figs. 4A and 4B, a presently preferred second embodiment of the apparatus or machine according to the present invention is shown, which includes a single rack similar to the rack 14 described above and in addition, and a wheeled stand supporting two foil supplies 16^I and 16^{II} which are rotated by a central motor 17^I and 17^{II}, respectively. The foil assembly supporting stand is designated the reference numeral 40.

10

Like the above described first embodiment 10 of the apparatus or machine according to the present invention, the second and presently preferred embodiment shown in Fig. 4A includes the rack 14, in which the film feed, film welding and film cutting assembly 34^I is mounted so as to allow the assembly to be turned or swung from the horizontal operational position shown in Fig. 4A to the vertical service position shown in Fig. 4B. The second and presently preferred embodiment of the apparatus 10^{II} shown in Figs. 4A and 4B further differs slightly from the above described in Figs. 1A, 1B, 2A and 2B in that the guiding rollers 24 serve to receive the tubular foil from a respective foil supply 16^I and 16^{II} as the second embodiment of the apparatus 10^{II} shown in Fig. 4A and 4B allows, as will be described below, the utilisation of two differently sized tubular foils.

15

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In Fig. 5 is shown the film feed, film welding and film cutting assembly 34 as Fig. 5 includes a larger scale partial view of the central elements of the film feed, film welding and film cutting assembly 34.

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In Fig. 5, the four stands or legs 28 are shown and on top of the front and rear stands or legs, transversal bars 42 are provided. In Fig. 5, the frame of the film feed, film welding and film cutting assembly 34 is indicated in dotted line and in the enlarged view at the top of Fig. 5, the two foils 18^I and 18^{II} are shown guided round a respective roller 44 and 46. The foils 18^I and 18^{II} are guided from the rollers 44

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and 46, respectively, down through two sets of propeller rollers 48, 50 and 52, 54, respectively, as one of the rollers of each of the roller sets 48, 50 and 52, 54 constitute a drive roller, whereas the other roller is an idler roller.

5 Below the two sets of rollers 52, 54, a set of welding bars 56 and 58 are provided, which are movable relative to one another and heatable for allowing the foil material positioned between the two welding bars to be welded together for closing off the tubular hood, which is to be pulled down on to the packages or goods positioned below the foil feed, foil welding and foil cutting assembly 34. In addition, the
10 assembly 34 comprises a cutting knife 60, which is reciprocally movable from a left hand position to a right hand position above the welding bars 56 and 58 for separating the finalised hood, which will be described below, from the foil 18^I. A similar set of welding bars and a cutting knife is provided for the foil 18^I. In the embodiment shown, the welding bars 56 and 58 and the cutting knife 60 are used in
15 combination with both foils 18^I and 18^{II} as the foil presently being processed is caused to move downwards between the welding bars 56 and 58. Alternatively, two sets of welding bars and cutting knives may be provided, one for each of the two foils 18^I and 18^{II}. In the enlarged view at the top of Fig. 5, further four section heads 62 are shown positioned on supporting bars.

20

With reference to Figs. 6A-6M, a short description of the function of the foil feed, foil welding and foil cutting assembly 34 and the above described components is now to be presented.

25 In a first step shown in Fig. 6A, the rollers 52 and 54 are operated for pulling a short length of the foil 18^{II} from the foil supply 16^{II} shown in Fig. 4A. The motion of the length of the foil is indicated by two arrows 64 and 66.

In Fig. 6B, the length of the foil material produced in the step of Fig. 6A is contacted
30 by the suction heads 62, which are moved towards one another in pairs for contacting the outer side of the foil material 18^{II}. The motion of the suction heads 62 is indicated by arrows 68.

In Fig. 6C, the suction heads are moved from one another as indicated by arrows 69, and in doing so, the tubular foil is separated or converted in an open hose like configuration or form.

5 In Fig. 6D, four vertical pins 70 of a foil stretching frame are shown, which are supported on vertically and sidewise positionable bars 72, also shown in Fig. 5, and which are raised and positioned inside the hose like configuration of the foil and juxtaposed and without contacting the suction heads 62.

10 In Fig. 6E, the foil stretching frame is lowered as indicated by arrows 76 and the separated hose of the film 18^l is now maintained in the position shown in Figs. 6E by the pins 70 exclusively.

15 In Fig. 6F, four motor driven rollers 78 are in contact with the outer surface of the hood shaped or tubular shaped foil as the motion of the motor driven rollers 78 are indicated by arrows 80.

The motor driven rollers 78 are energised in Fig. 6G causing the foil material to be pulled on to the pins or bars 70 for the collection of a specific length or foil material on to the pins 70. The energising of the motor driven roller 78 is indicated in Fig. 6G by arrows 82.

25 After a pre-set and specific length of foil material has been pulled on to the pins 70, the welding bars 56 and 58 are in contact with one another as shown in Figs. 6H indicated by arrows 84 and the welding bars are heated for welding the foil material into a sealed-off hood.

30 In Fig. 6I, the cutting knife 60 is moved from left to right as indicated by an arrow 86 for separating the sealed-off hood from the web of the foil material 18^l. The motion of the cutting knife is indicated by an arrow 86.

In Fig. 6J, the foil stretching frame including the bars 72 is lowered as indicated by arrows 88, and at the same time, the motor driven rollers 78 are kept in contact with

the foil causing a longitudinal stretching of the foil as the bars 72 are lowered. Finally, the motor driven rollers 78 are disengaged from the vertical pins 70 as indicated by arrows 90.

5 In Fig. 6K, the pins 70 are moved away from one another as indicated by arrows 92 for stretching the hood into an enlarged configuration as compared to the assembly 94 positioned below the foil feed, foil welding and foil cutting assembly 34 and as is shown in Fig. 6L, the closed off hood is pulled down on to the package assembly 94 by means of the foil stretching frame including the bars 72 supporting the pins 70.
10 The downward pulling of the hood is indicated by arrows 96. As the hood is disengaged from the catching pins 70, as shown in Fig. 6M by the further downward motion of the bars 72 indicated by the arrows 96, the hood reforms to or towards its original shape and provides a tight fit around the package assembly 94, as is shown in Fig. 6M, whereupon the wrapped package assembly 94 is removed from the
15 machine.

Fig. 7 illustrates the position of the different motors serving for performing the above described functions of the apparatus or machine according to the present invention. The apparatus or machine according to the present invention basically performs two
20 major movements, which do not necessitate the generation of power, namely the swinging of the film feed, film welding and film cutting assembly 34 to the service position as indicated by the arrow 36 shown in Fig. 4B and further, the lowering of the film stretching frame while performing the hood wrapping operation described above. The swinging of the film feed, film welding and film cutting assembly 34 is
25 performed by a motor 116, which during the downwards swinging serves as a brake and consequently generates power. Similarly, while lowering the film stretching frame as indicated by arrows 100, two motors connected to the film stretching frame by wires like the swinging motor 116, are indicated by reference numerals 128.

30 For feeding the packages to be wrapped by the stretch hood wrapping apparatus or machine, a conveyer 31 feeds the packaging into the machine powered by a motor 104 and similarly, a discharge conveyer 33 is provided, which is powered by a further motor 108. The internal conveyer 32 of the machine is powered by a motor

106. For centring the conveyer 32 within the apparatus or machine 14^{II}, a centring conveyer motor 110 is provided.

5 The bars 172 of the film stretching frame described above with reference to the drawings' Figs. 6D-6J are powered by sets of motors 112 and 114 serving to position the bars horizontally and vertically, respectively. The two rollers 44 and 46 are powered by respective motors designated the reference numerals 118 and 120, respectively. Furthermore, the knife 60 is moved by a motor 122 and the suction heads 62 are moved transversally and horizontally by the operation of motors
10 designated the reference numerals 124 and 126, respectively.

Since the major motors of the apparatus or machine 14^{II} perform operations which are causing braking of the motor rather than powering the motor, the motors are constituted by thyristor powered DC and AC motors, which are capable of
15 regenerating electrical power when operated in braking mode.

In Fig. 8, a first embodiment of an electronic control circuitry of the stretch hood wrapping apparatus or machine according to the present invention is shown. At the right-hand side of Fig. 8, three motors 130, 132 and 134 are shown, which motors
20 may constitute any of the above described motors shown in Fig. 7 and described with reference to the previous figures, each of which motors is connected to a load 131, 133 and 135, respectively. The motors 130, 132 and 134 are three phase AC motors, which are powered by thyristor convertors 136, 138 and 140, respectively, serving in power generating mode to supply alternating three phase electrical power
25 to the respective motors and in the regenerating mode serving to convert the current generated by the motor in question to DC, which is charged to a DC capacitor bank 142, 144 and 146, respectively. For the supply of energy to the motors 130, 132 and 134, three rectifying circuits 148, 150 and 152, respectively, are provided, which are connected to a three phase power supply indicated by the reference numerals R, S
30 and T. The above described power supply and power regenerating circuitry of each of the motors 130, 132 and 134 is included in a respective block designated the reference numerals 154, 156 and 158, respectively, which further include a control

circuitry 160, 162 and 164, respectively serving to control the rectifier 148, 150 and 152, respectively, and the thyristor converter 136, 138 and 140, respectively.

5 The control circuitry blocks 160, 162 and 164 are connected to a main CPU 166 through wired or wireless connections 161, 163 and 165, respectively, which CPU is further connected to an operator's display 168 and keyboard 170.

10 In Fig. 9, an alternative embodiment of the electronic control circuitry is shown, in which the capacitor banks 142, 144 and 146 are substituted by a single capacitor bank 142¹ and similarly, the rectifiers 148, 150 and 152 are substituted by a single three phase power rectifier 148¹. In addition, the three individual control circuit blocks 160, 162 and 164 are substituted by a single control circuit block 160¹ communicating through a single wired or wireless connection with the CPU 166.

15 Although the present invention has been described above with reference to specific and presently preferred embodiments, it is evident to a person having ordinary skill in the art that numerous modification may be made within the protective scope as defined in the appending claims without deviating from the spirit of the invention.

CLAIMS

1. An apparatus for packing goods or packages positioned on or piled on a support, such as a pallet, by drawing a slightly deformed hood of a reformable foil material on
5 to the goods or packages and allowing the slightly deformed hood to reform into or towards its original shape and in doing so, fixating the goods or packages relative to the support and relative to one another,

the apparatus comprising:

a frame or rack defining sets of vertical stands or legs and a top part,

10 a supply of the reformable foil material for the supply of the reformable foil material in the form of the collapsed hose,

a film feed, film welding and film cutting assembly for receiving the collapsed hose,

15 and a vertically movable film stretching frame which is vertically movable relative to the film feed, film welding and film cutting assembly from a top position juxtaposed the assembly for receiving the collapsed hose from the film feed, film welding and film cutting assembly and stretching the collapsed hose into a tubular form prior to the assembly welding the hose into a sealed hood and separating the hood from the reformable foil material and to a lowered position, in
20 which the vertically movable film stretching frame draws the hood in its slightly deformed shape around the goods or packages and eventually allows the hood to reform to or towards its original shape,

said film feed, film welding and film cutting assembly being journalled at one side of said frame or rack for allowing the film feed, film welding and film cutting
25 assembly to be shifted from a horizontal working position at the top of the frame or rack to a vertical service or maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from the horizontal working position to the vertical service position, and for allowing the film feed, film welding and film cutting assembly to be returned to the horizontal working position
30 from the vertical service position.

2. The apparatus according to point 1, the supply of the reformable foil material being constituted by a roll of foil material supported on a separate frame or rack or alternatively supported on the frame or rack of the apparatus.

5 3. The apparatus according to any of the points 1 or 2, the film feed, film welding and film cutting assembly comprising a set of film advancing rollers for the advancing of the collapsed hose of the reformable foil material to the vertically movable film stretching frame.

10 4. The apparatus according to any of the points 1 - 3, the film feed, film welding and film cutting assembly comprising a set of heatable film welding tools and a reciprocally movable film cutter.

15 5. The apparatus according to any of the points 1 – 4, the apparatus further comprising a conveyer for the introduction of the support into a position within the frame or rack below the film feed, film welding and film cutting assembly, the conveyer defining a linear line of transportation through the apparatus.

20 6. The apparatus according to point 5, the vertical service position of the film feed, film welding and film cutting assembly being parallel with the line of transportation of the conveyer, or alternatively perpendicular to the line of transportation of the conveyer.

25 7. The apparatus according to any of the points 1 – 6, the vertical and movable film stretching frame comprising sets of film separation elements serving to separate the collapsed hose into the tubular form.

30 8. The apparatus according to any of the points 1 - 7, the film feed, film welding and film cutting assembly further comprising extension arms allowing the film feed, film welding and film cutting assembly to be lowered from its vertical service position outside the frame or rack to a position juxtaposed the supporting floor on which the apparatus is resting

9. A method of repairing and servicing the apparatus according to any of the claims 1 – 8, the method comprising:

shifting the film feed, film welding and film cutting assembly from its horizontal working position at the top of the frame or rack to its vertical service or maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from its horizontal work of position to its vertical service position.

10. An apparatus for packing goods or packages positioned on or piled on a support, such as a pallet, by drawing a slightly deformed hood of a reformable foil material on to the goods or packages and allowing the slightly deformed hood to reform into or towards its original shape and in doing so, fixating the goods or packages relative to the support and relative to one another,

the apparatus comprising:

a frame or rack defining sets of vertical stands or legs and a top part, a supply of the reformable foil material including a first motor for the supply of the reformable foil material in the form of the collapsed hose,

a film feed, film welding and film cutting assembly for receiving the collapsed hose, said film feed, film welding and film cutting assembly being journaled in relation to said frame or rack

a vertically movable film stretching frame which is vertically movable relative to the film feed, film welding and film cutting assembly driven by a second motor included in said film feed, film welding and film cutting assembly or alternatively included in said film stretching frame from a top position juxtaposed the film feed, film welding and film cutting assembly for receiving the collapsed hose from the film feed, film welding and film cutting assembly and stretching the collapsed hose into a tubular form prior to the assembly welding the hose into a sealed hood and separating the hood from the reformable foil material and to a lowered position, in which the vertically movable film stretching frame draws the hood in its slightly deformed shape around the goods or packages and eventually allows the hood to reform to or towards its original shape,

said first and second motors being thyristor controlled DC, or AC single or three phase motors,

a power supply including a rectifying unit connected to the main supply and including a capacitor bank and a first thyristor controller and a second thyristor controller connected to said capacitor bank and connected to said first and second motor, respectively, and

5 a central controlling computer connected to said rectifying unit and to said first and second thyristor controllers for controlling the operation of the apparatus and in doing so, operating said first and second thyristor controllers in two alternative operational modes, a first operational mode, in which the thyristor controller in question receives DC power from said capacitor bank for the supply of
10 electrical power via the thyristor controller in question to the motor in question, or in the alternative, a second operational mode, in which the thyristor controller in question, while its motor is performing a braking operation and generates electrical power, supplies the electrical power from the electric motor in question to the capacitor bank.

15 11. The apparatus according to claim 10, said film feed, film welding and film cutting assembly being journaled at one side of said frame or rack and including a third motor for shifting the film feed, film welding and film cutting assembly from a horizontal working position at the top of the frame or rack to a vertical service or
20 maintenance position outside the frame or rack by swinging the film feed, film welding and film cutting assembly from the horizontal working position to the vertical service position and returning the film feed, film welding and film cutting assembly to the horizontal position from the vertical service position, the third motor being a thyristor controlled DC or AC, single or three phase motor controlled by a separate
25 third thyristor controller connected to said central controlling computer.

12. The apparatus according to claims 10 or 11 having a fourth motor for stretching the collapsed hose into a tubular form and a fifth motor for the motion of a separating knife for separating the hood from the reformable foil material, said fourth
30 and fifth motors being thyristor controlled DC or AC single or three phase motors, the power supply including a fourth and fifth thyristor controlled controller controlling the fourth and fifth motor, respectively, and being connected to said central controlling computer.

13. The apparatus according to claims 10 – 12, further having any of the features of the points 1-9 describing the invention.

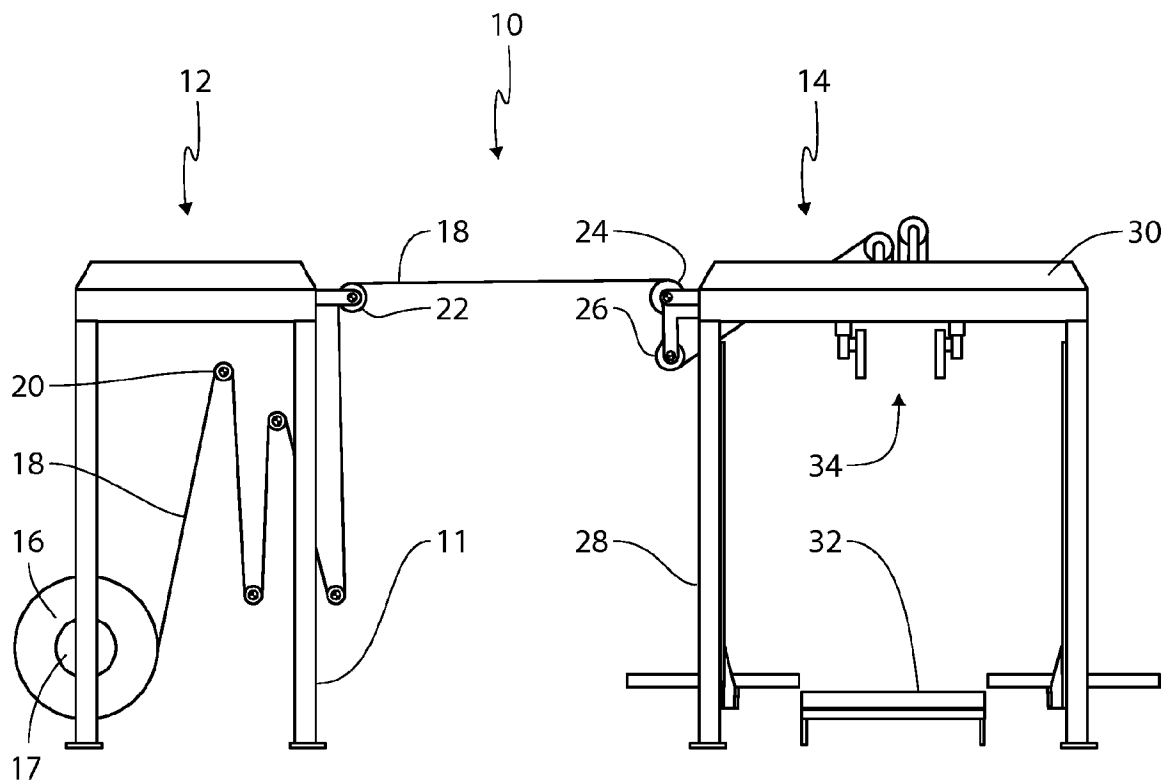


FIG. 1A

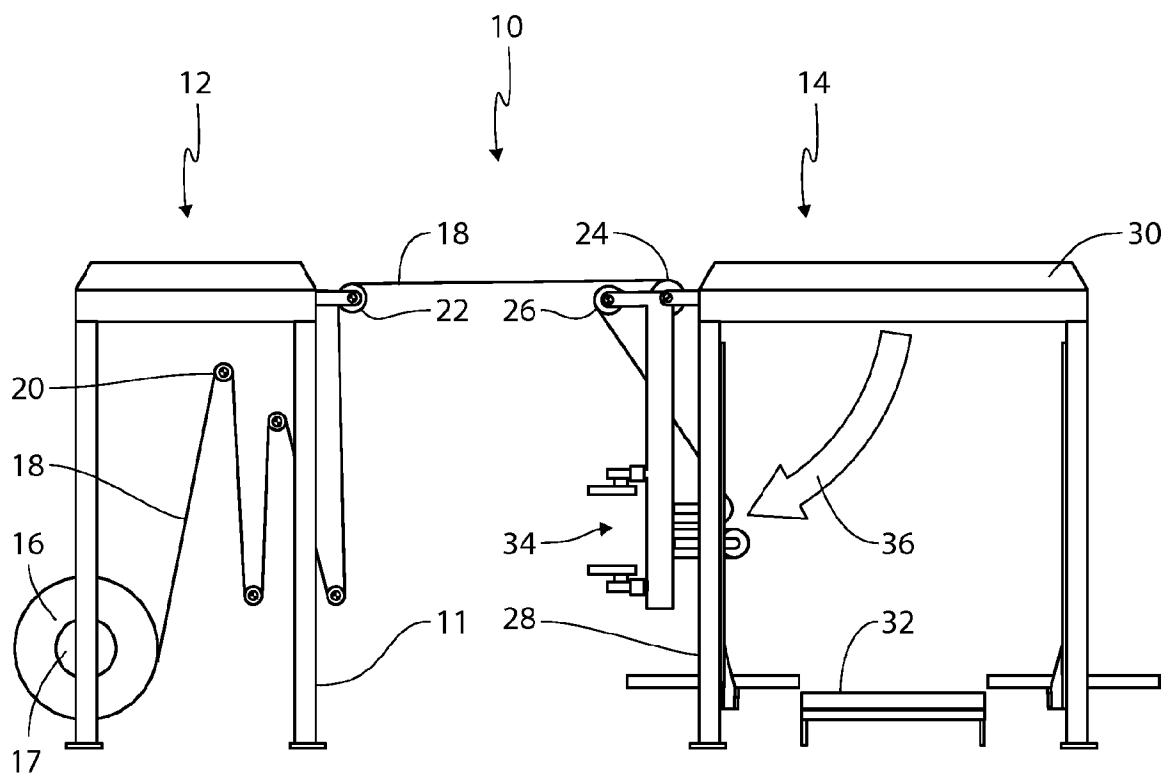


FIG. 1B

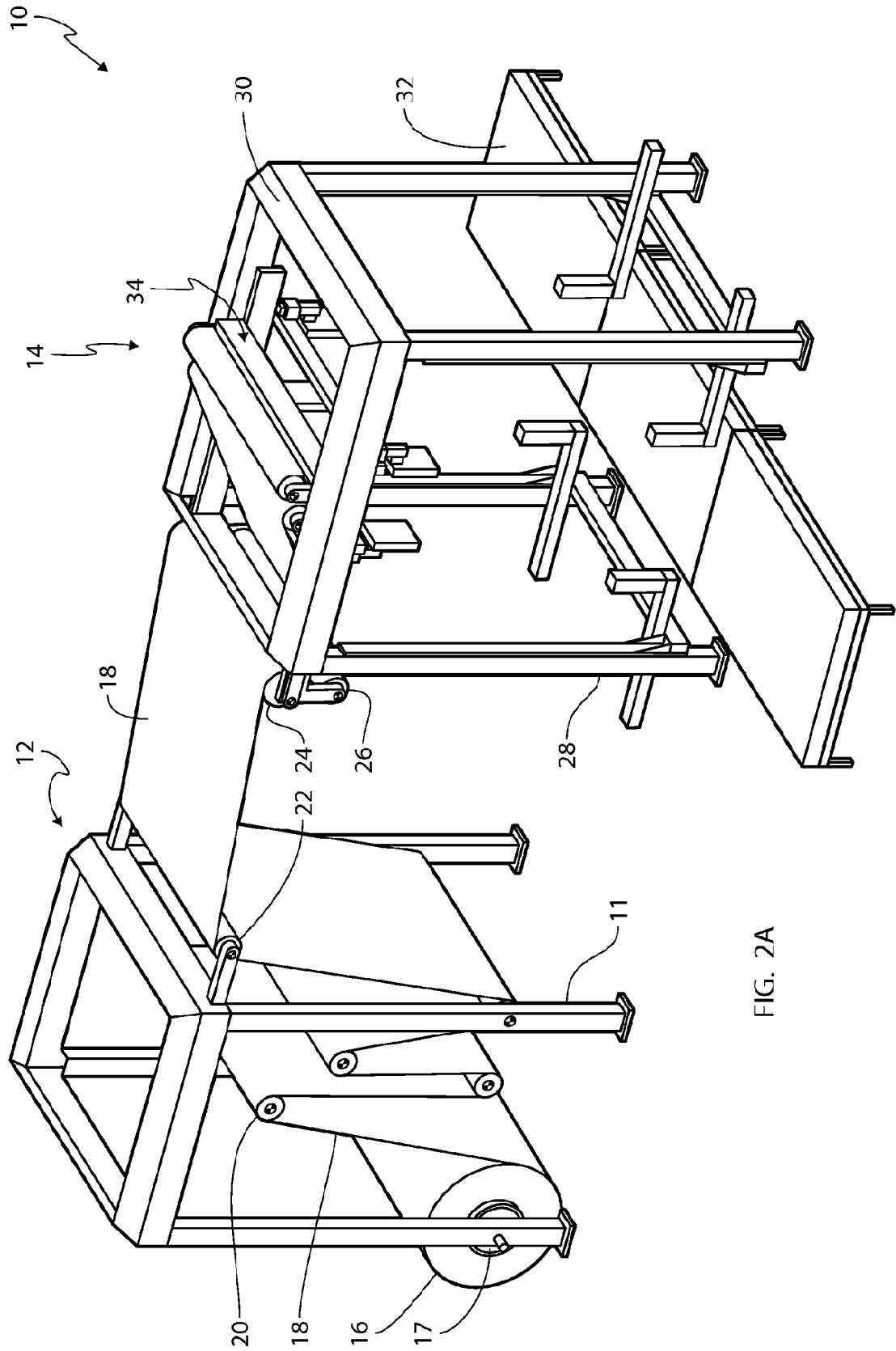


FIG. 2A

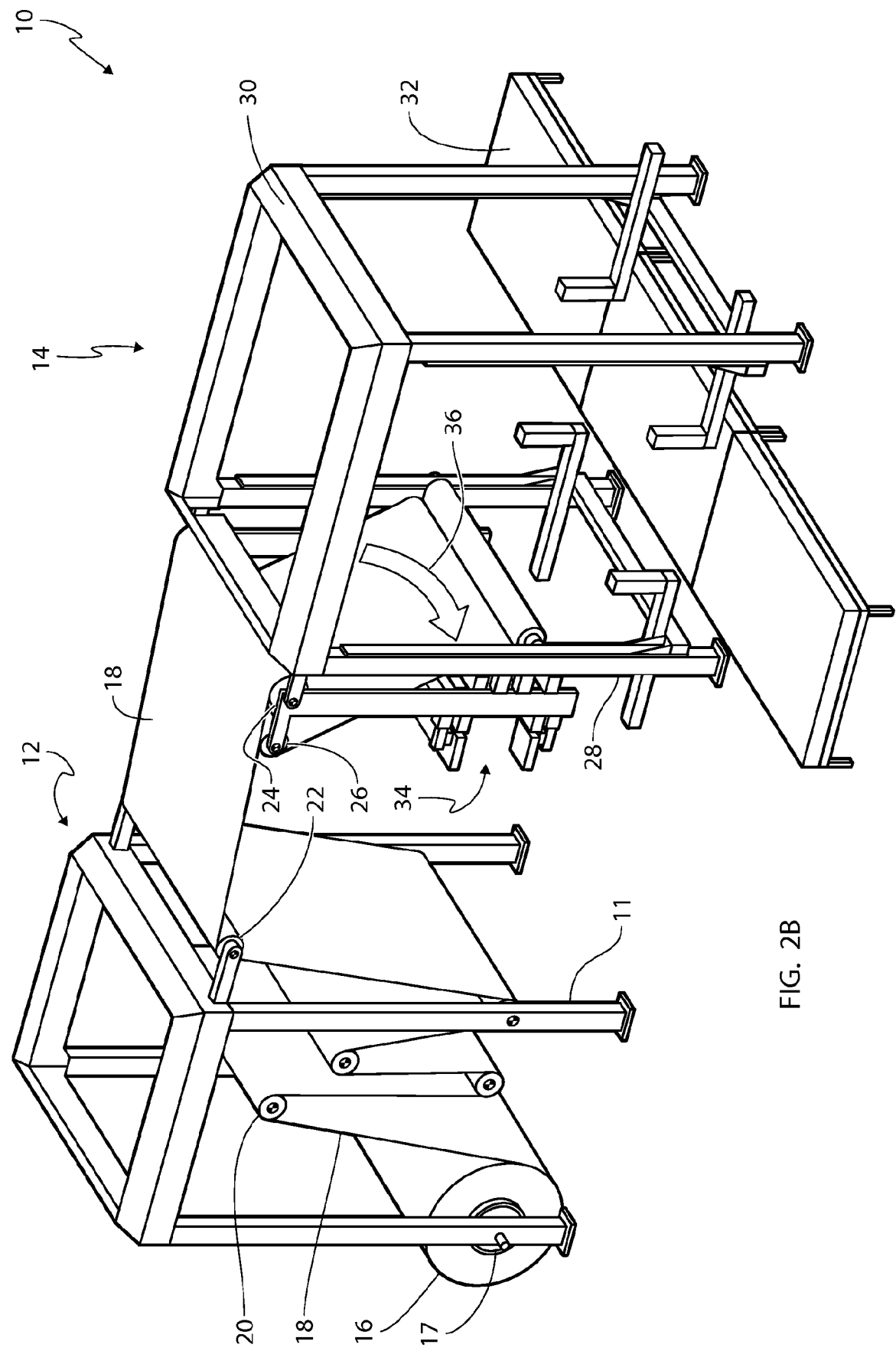
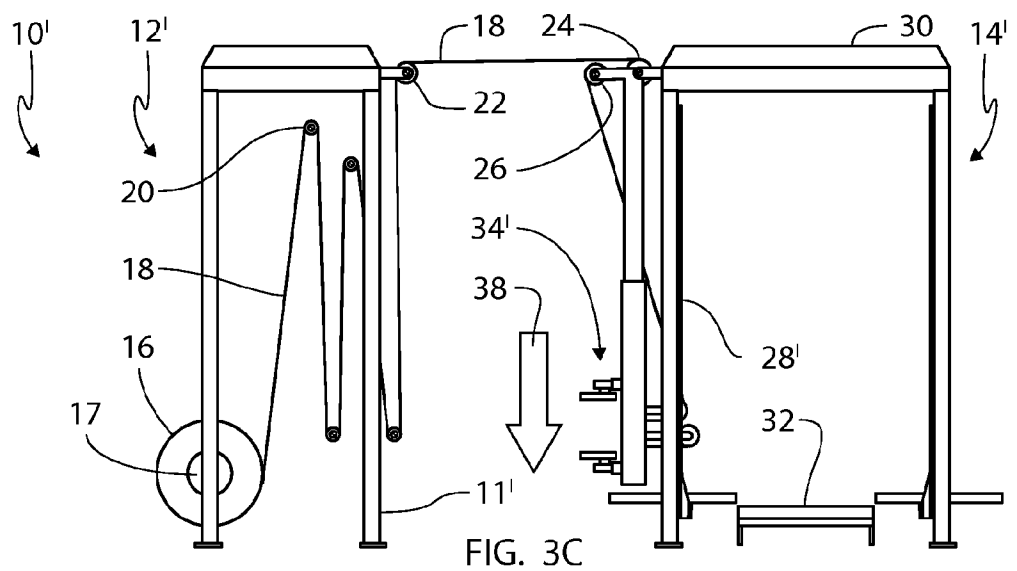
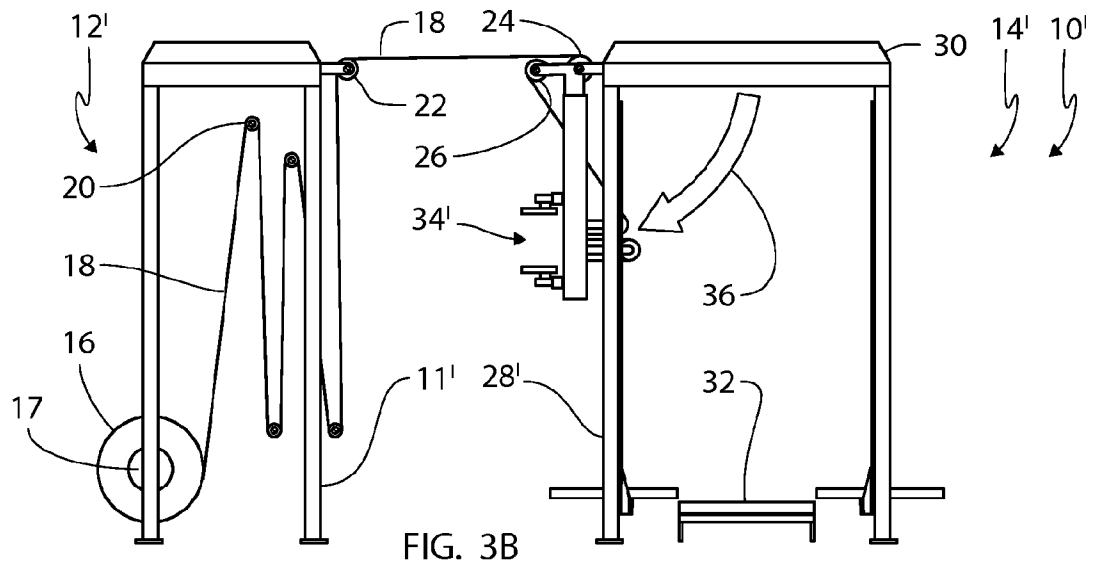
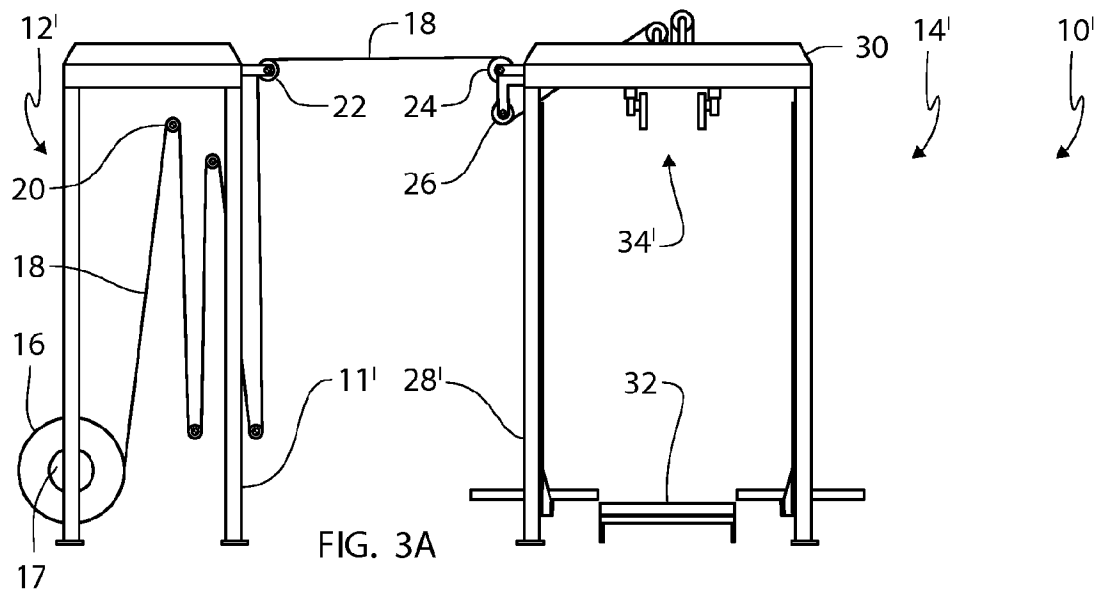


FIG. 2B



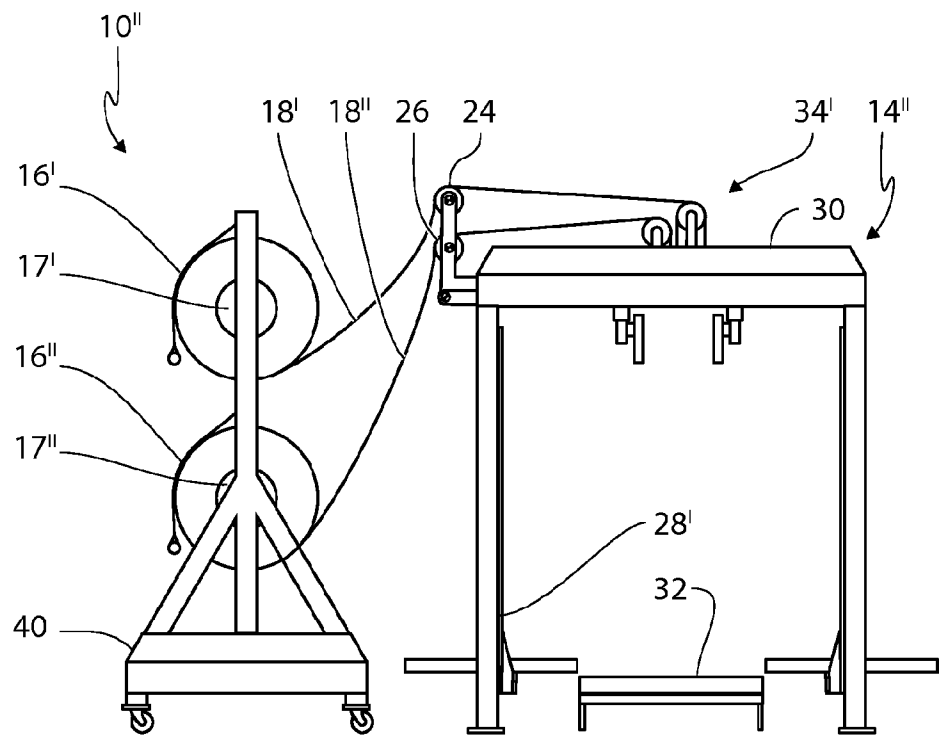


FIG. 4A

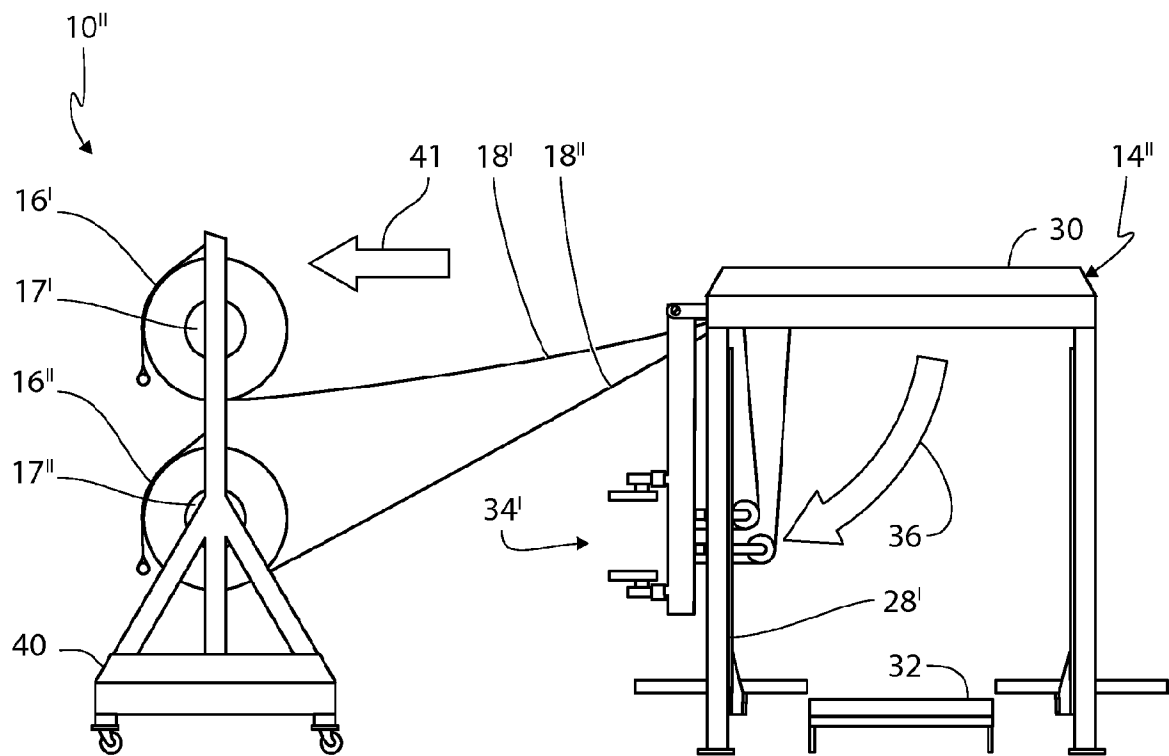


FIG. 4B

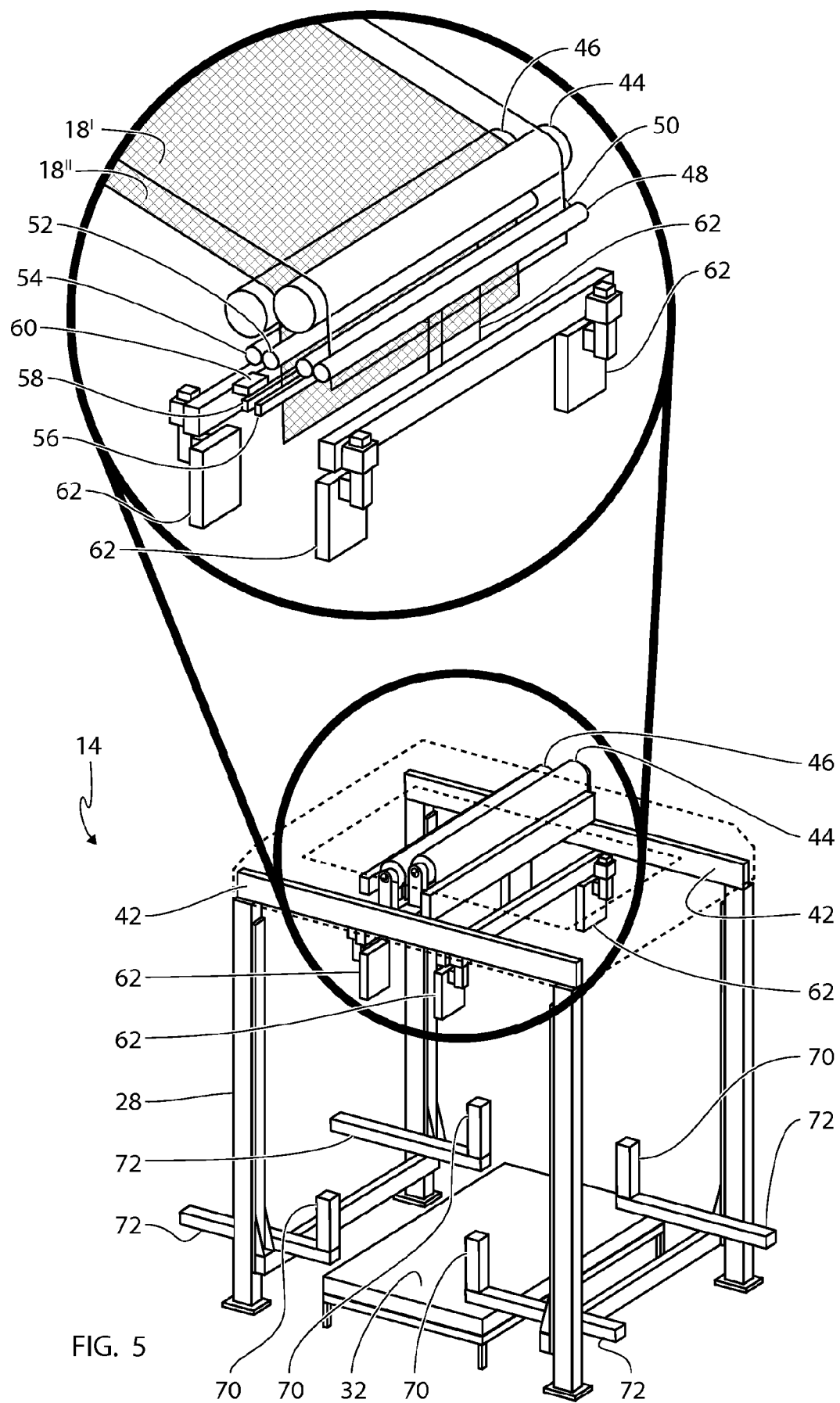


FIG. 5

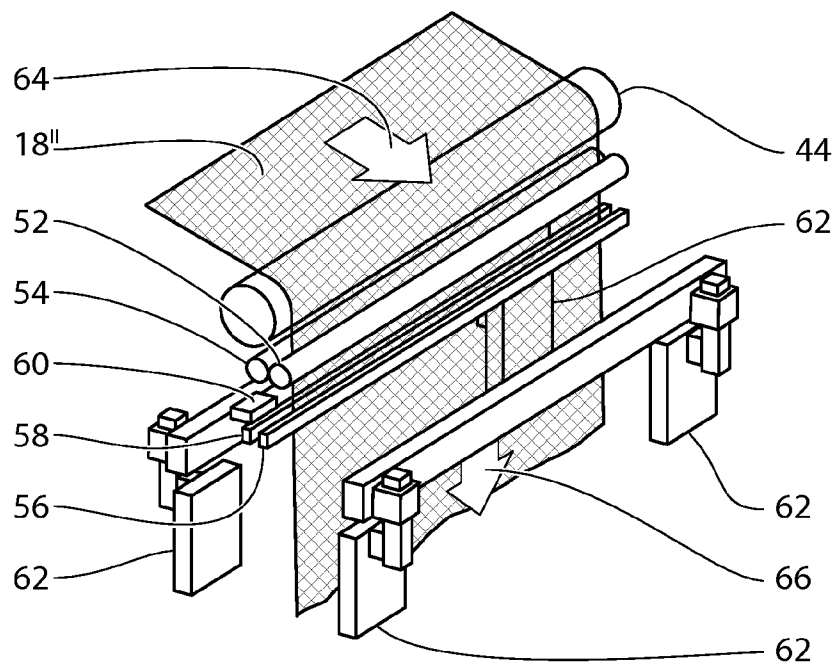


FIG. 6A

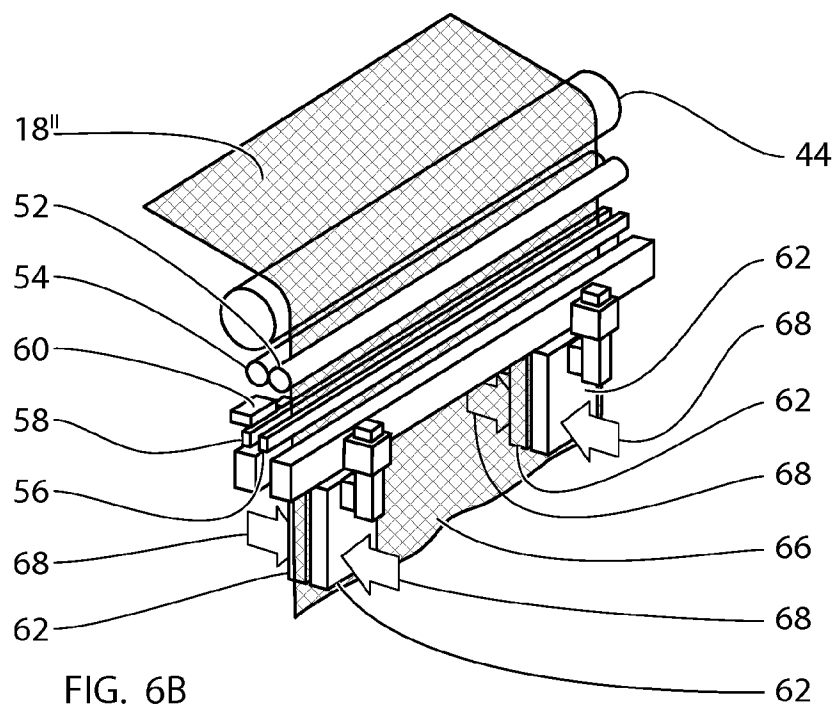


FIG. 6B

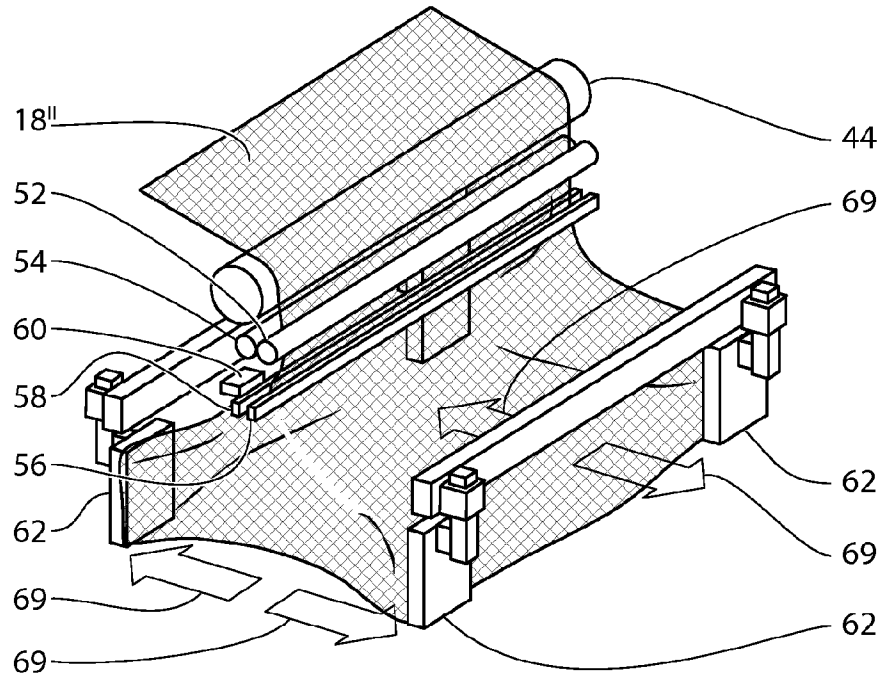


FIG. 6C

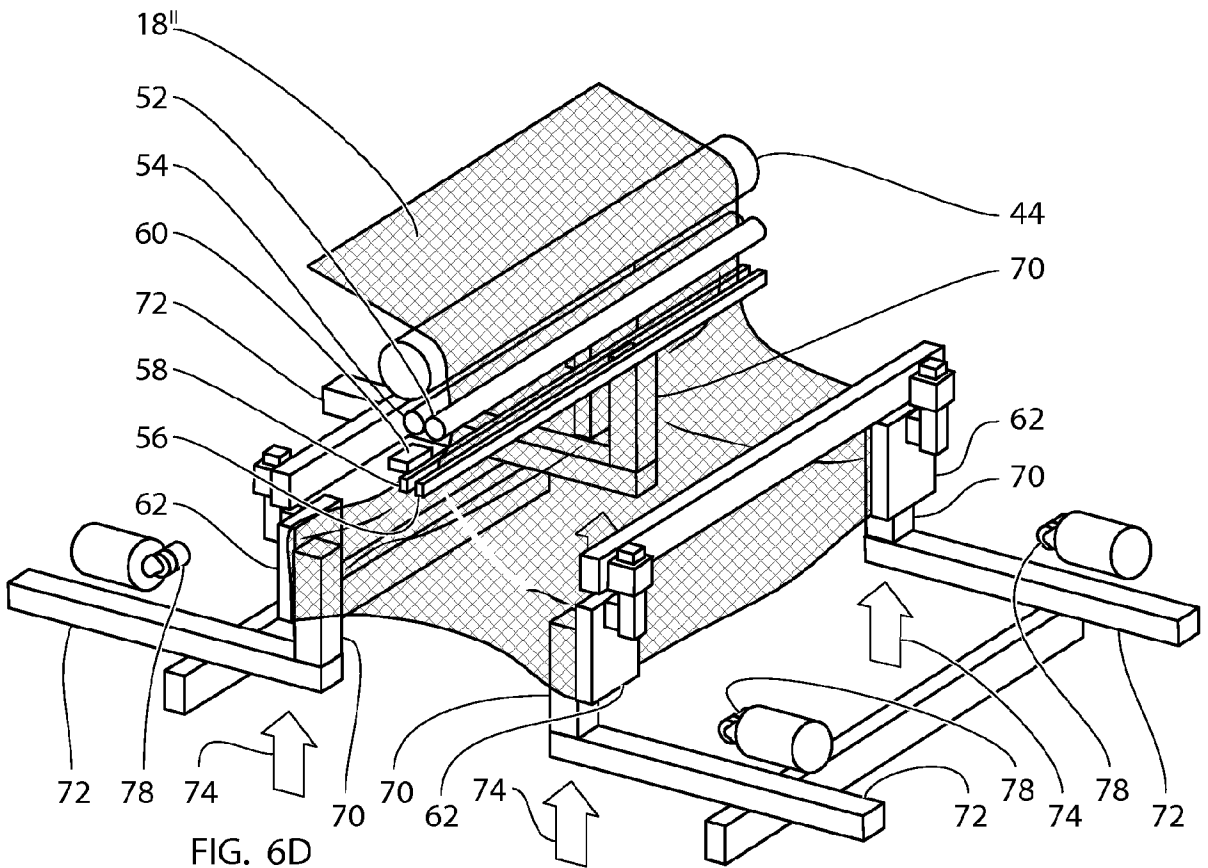


FIG. 6D

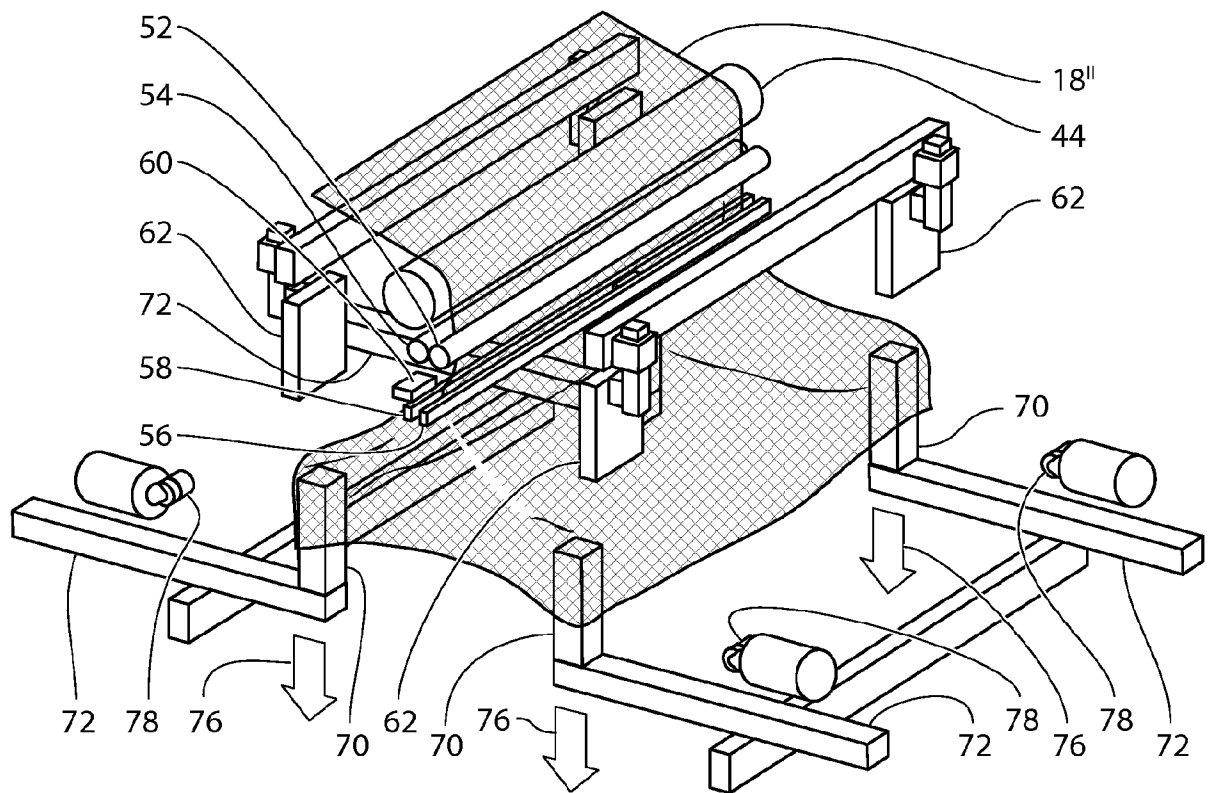


FIG. 6E

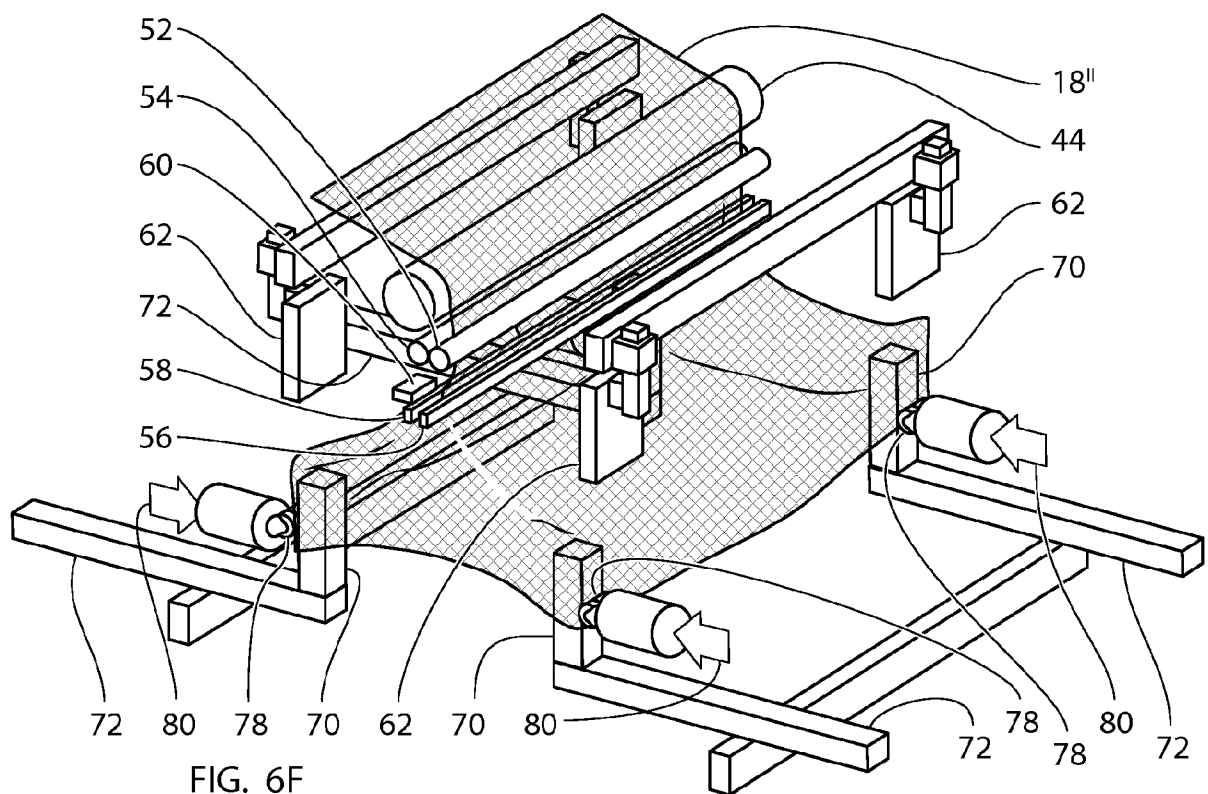


FIG. 6F

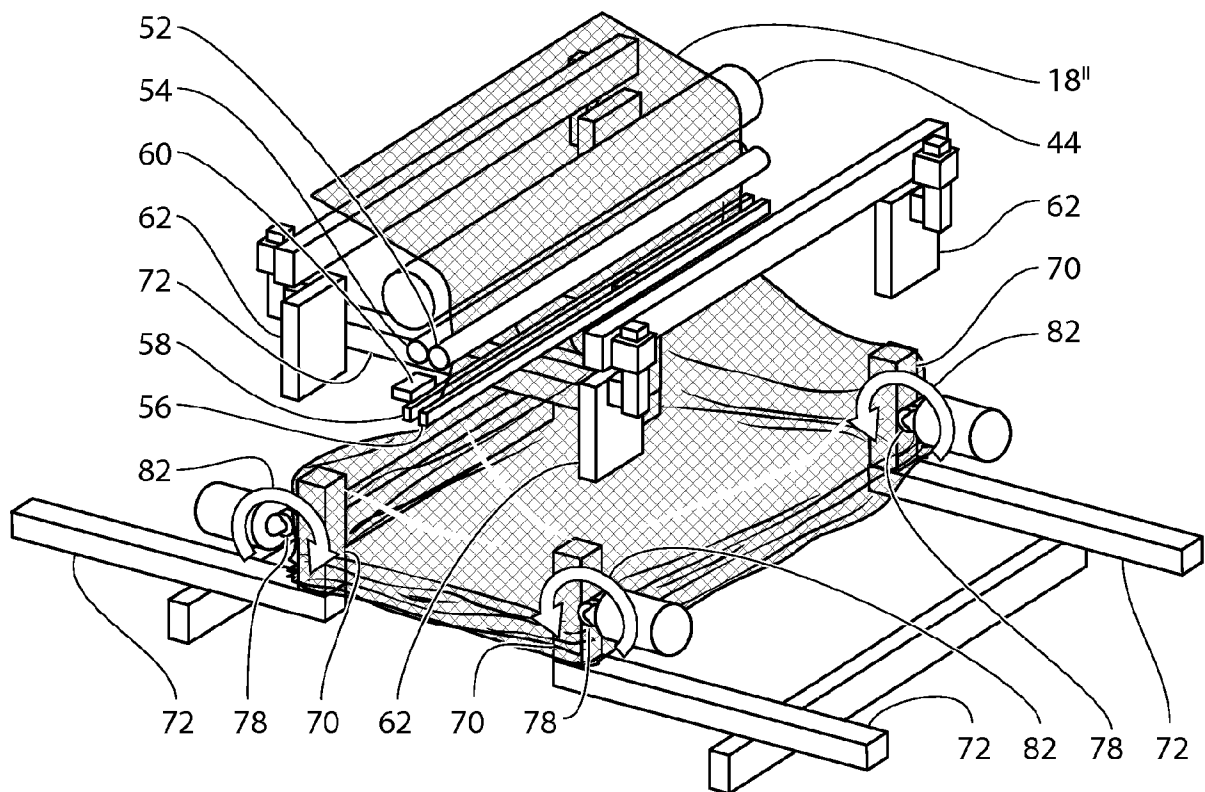


FIG. 6G

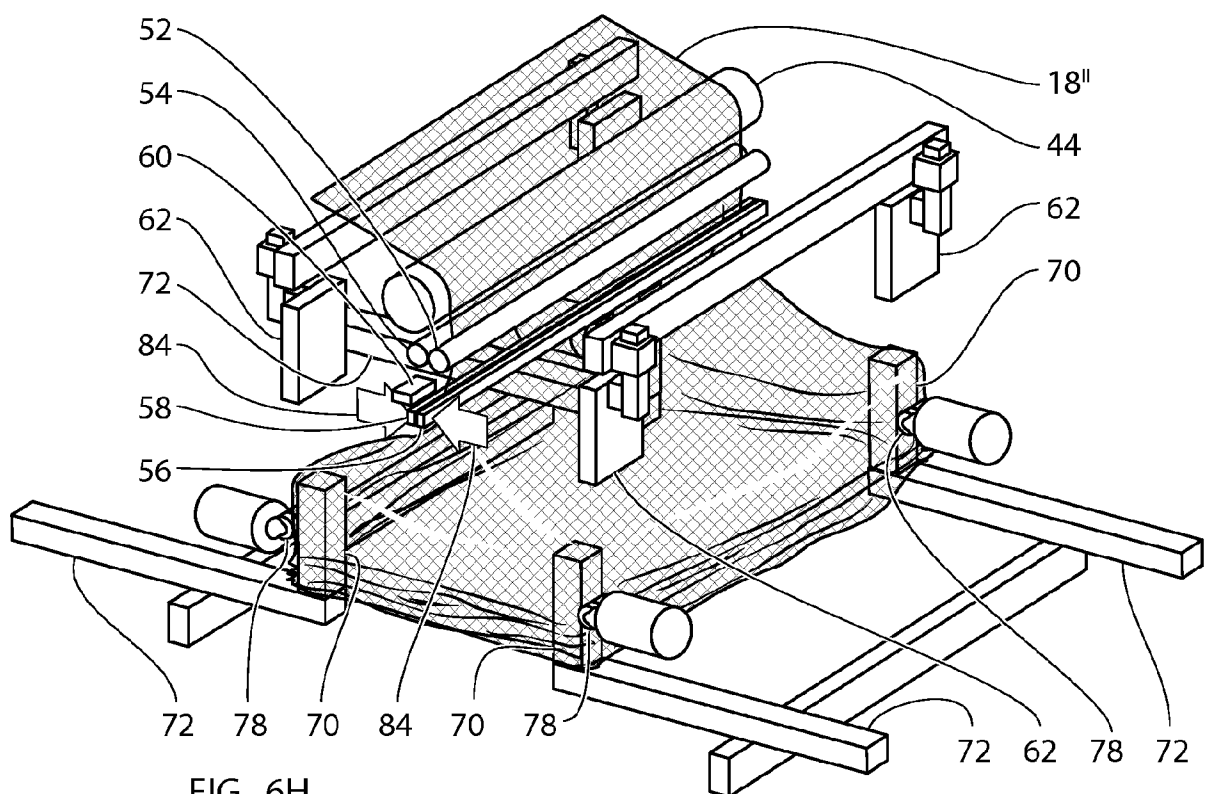
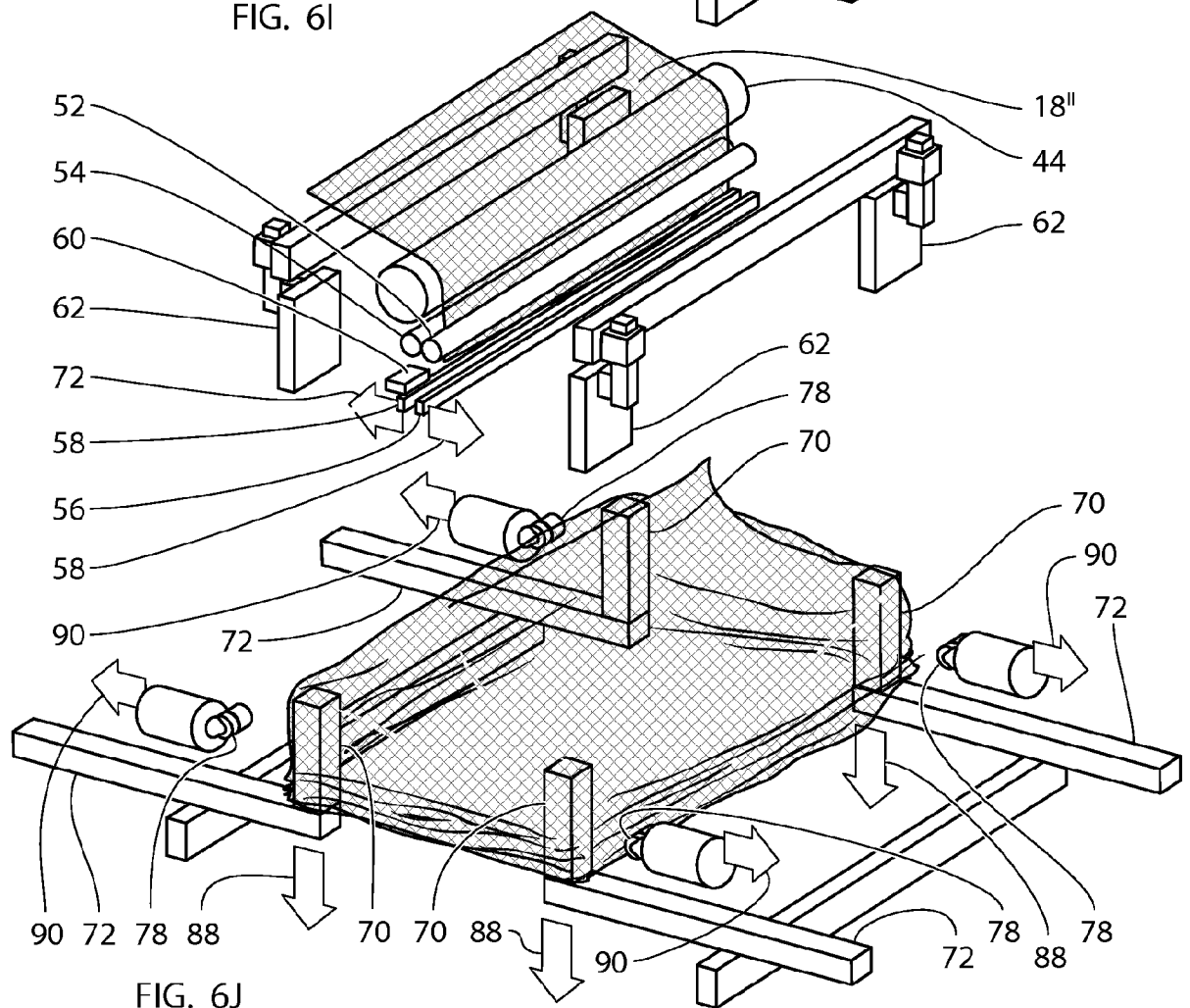
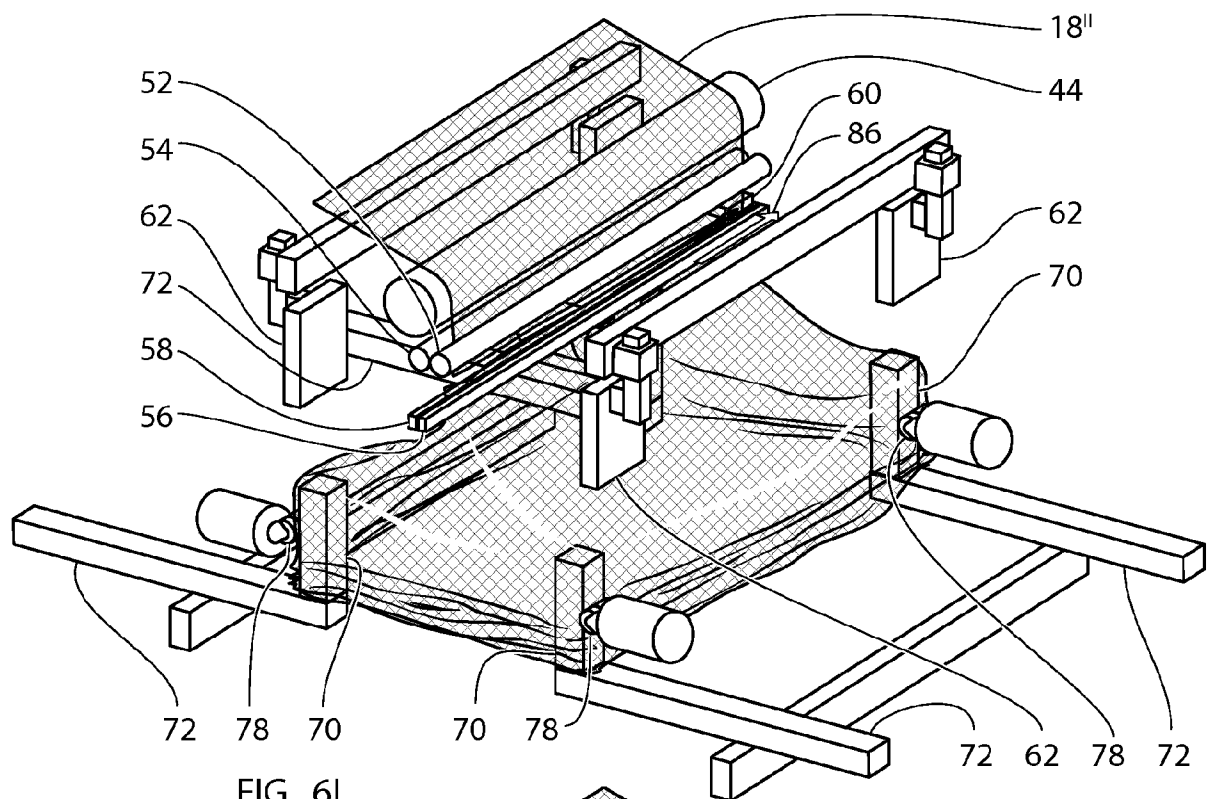


FIG. 6H



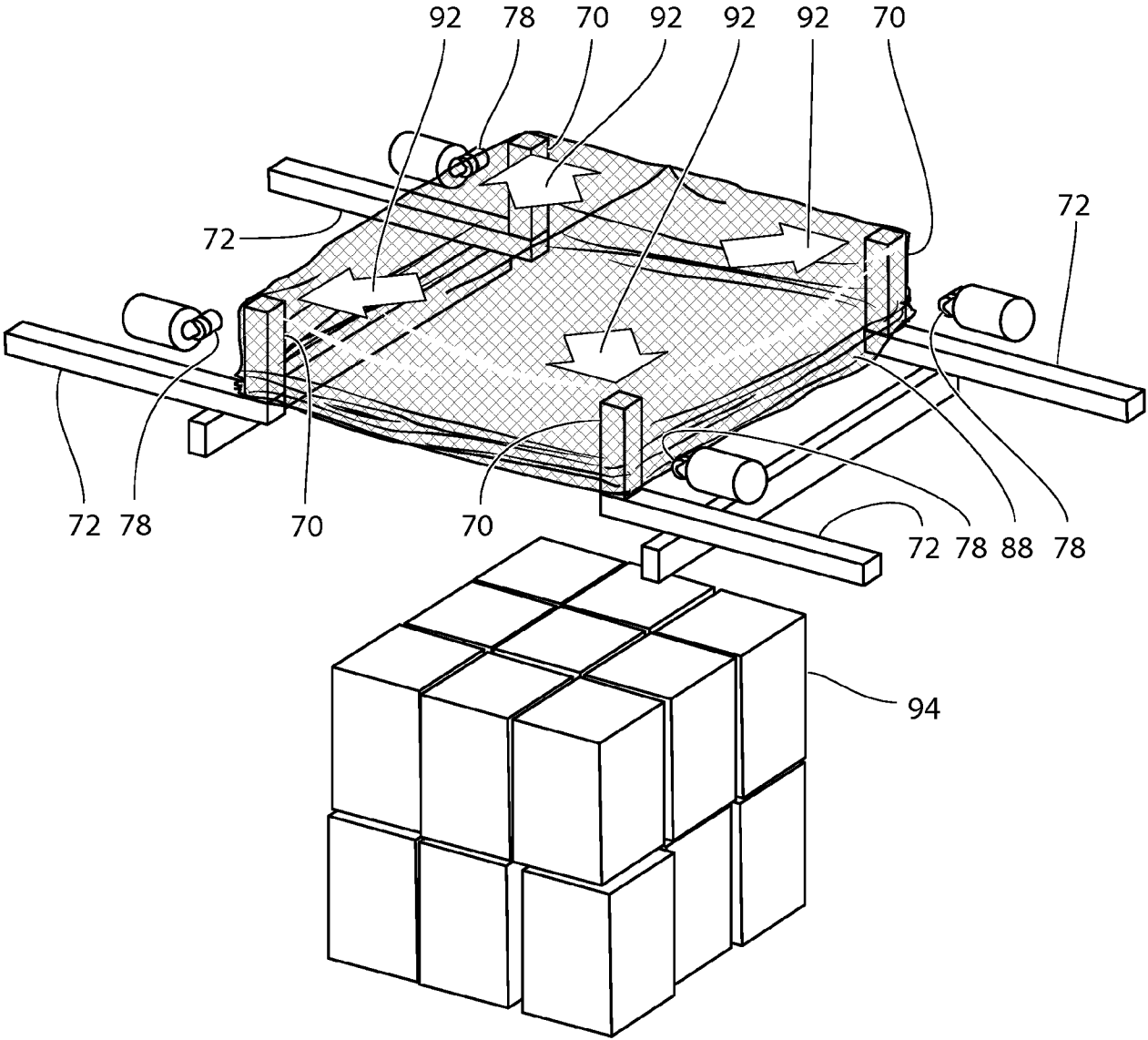


FIG. 6K

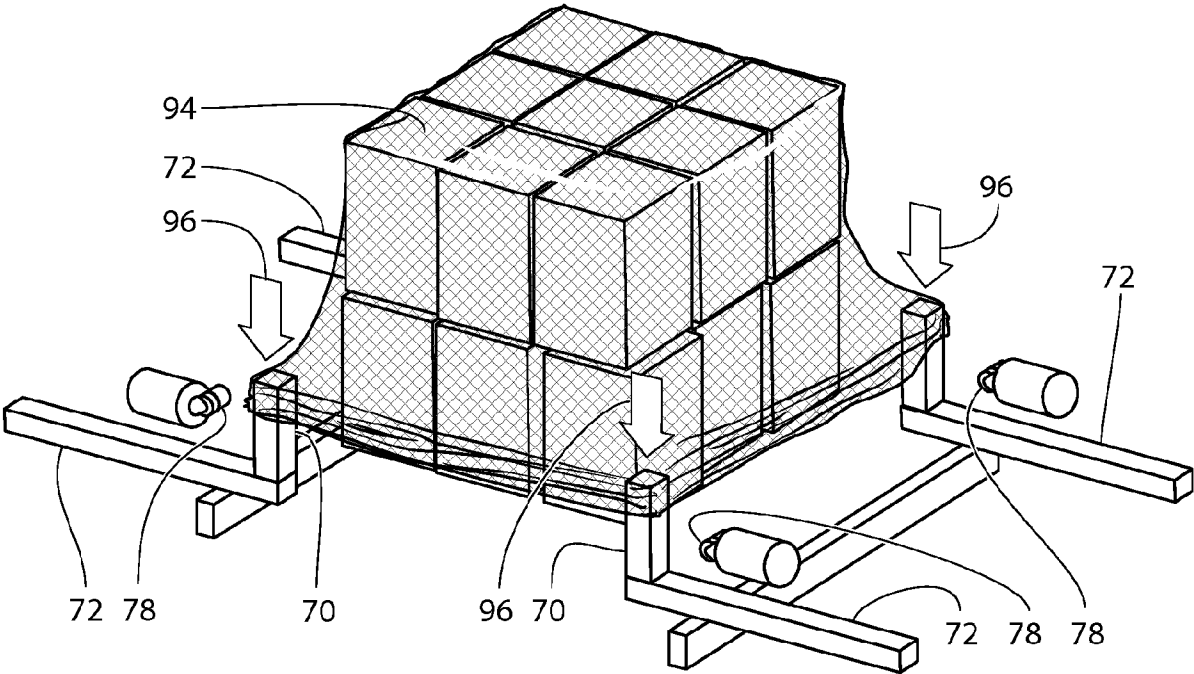
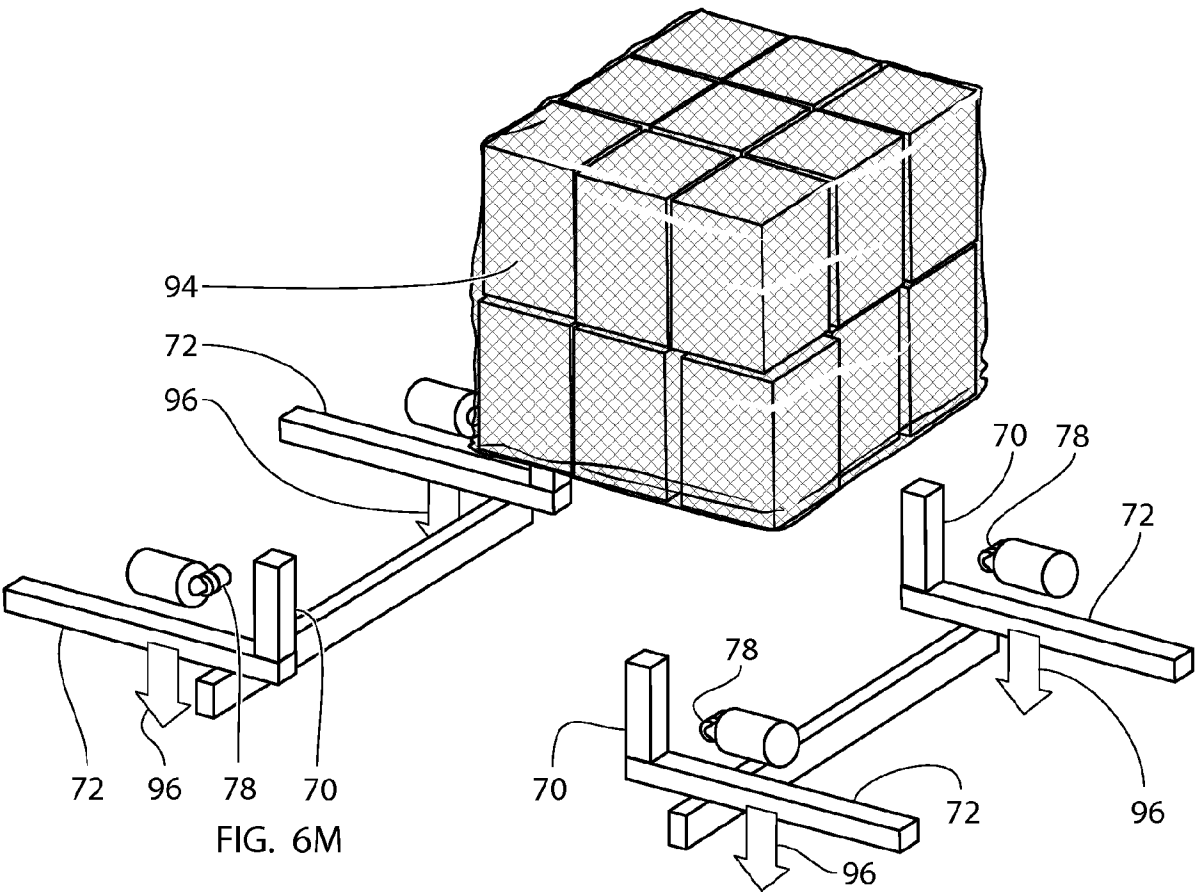


FIG. 6L



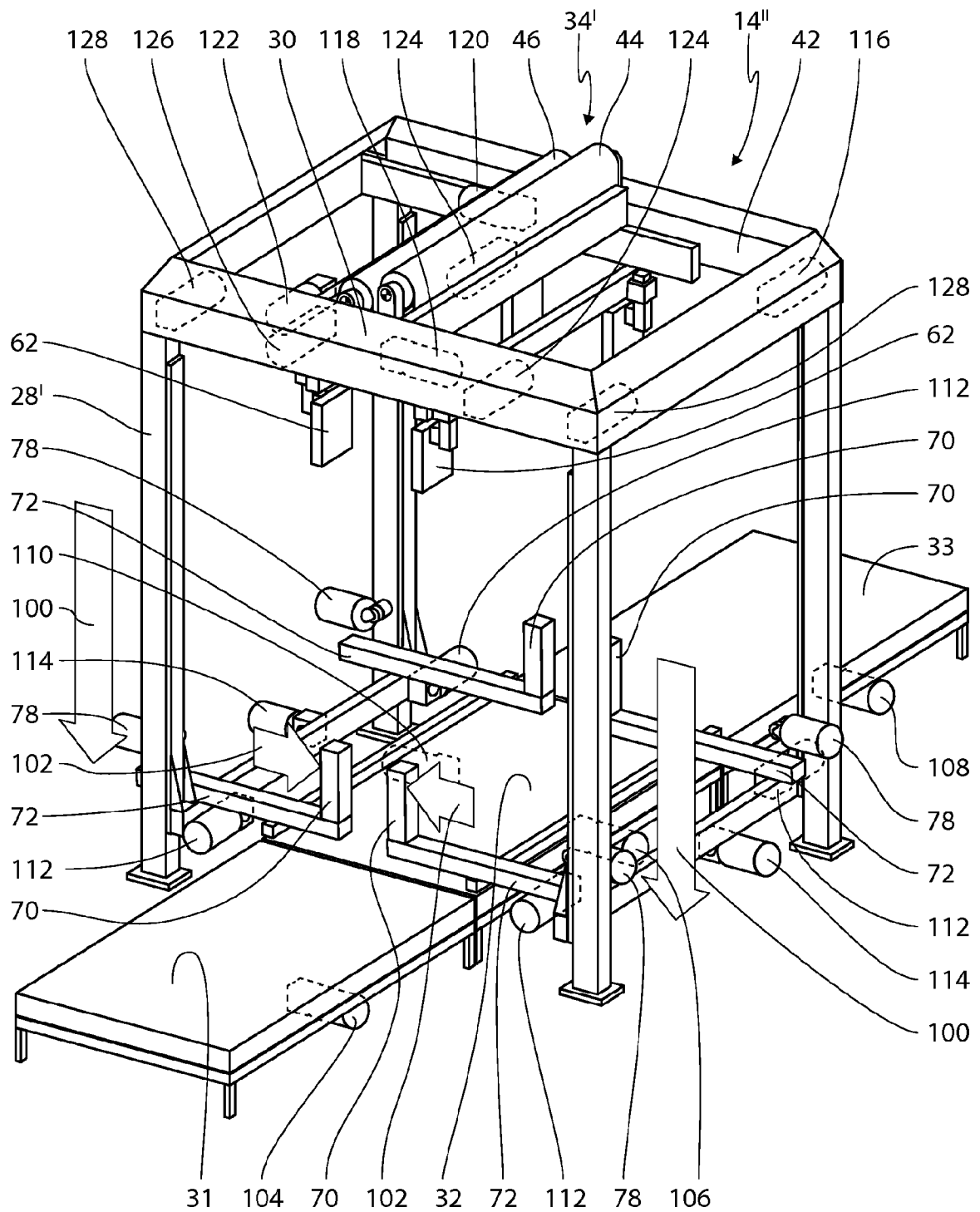


FIG. 7

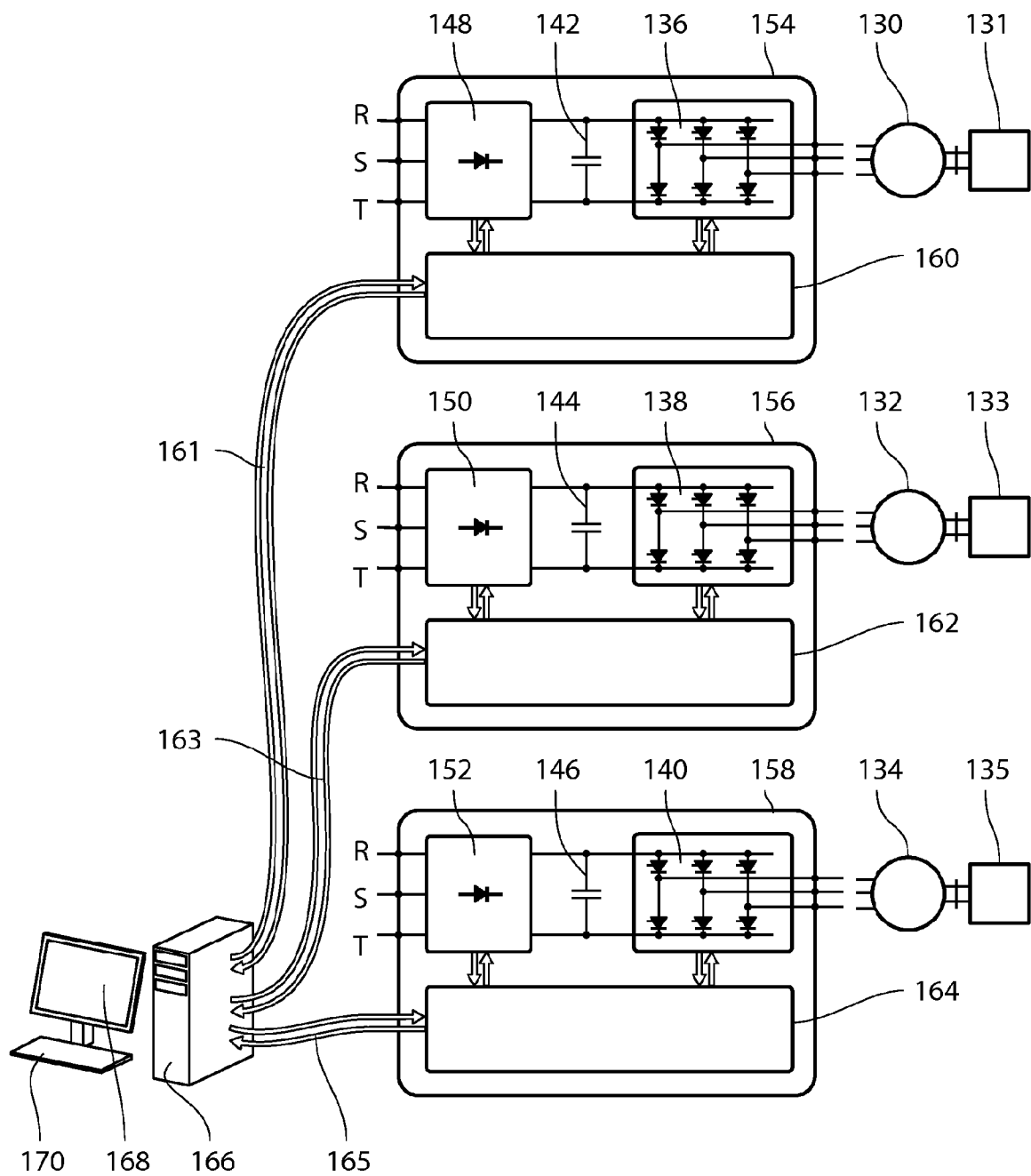


FIG. 8

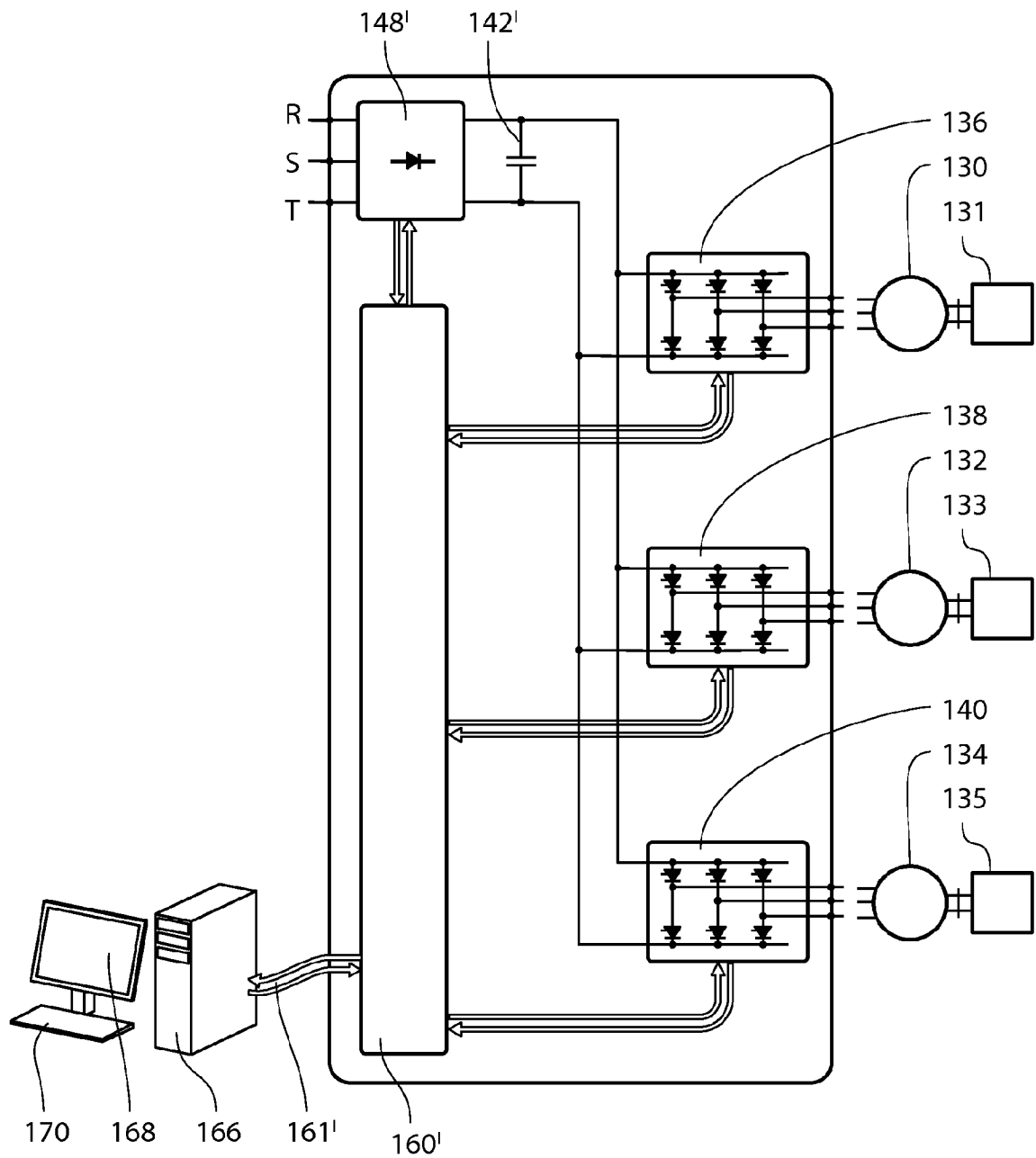


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/055965

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B59/04 B65B9/13
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y,P	EP 2 767 479 A1 (ERIN INTELLECTUAL PROPERTY LTD [IE]) 20 August 2014 (2014-08-20) the whole document ----- -/--	10-13



Further documents are listed in the continuation of Box C.



See patent family annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

14 April 2015

Date of mailing of the international search report

23/04/2015

Name and mailing address of the ISA/

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Authorized officer

Lawder, M

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/055965

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No

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