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Device and method for wrapping the ends of rolls

This invention relates to a wrapping device and more particularly to a device for wrapping rolls to cover their ends as well as their sides.

There have hitherto been known several methods for wrapping the ends of rolls. In one method a wrapping paper is wound with its ends slightly projected from the ends of the rolls and this projected cylindrical portion of the wrapping paper is tucked gradually towards the centre of the ends of the roll as the roll is rotated and a separate circular piece of wrapping paper is pasted thereon (U.S. Patent No. 2,368,213). In another method a wrapping paper is wound with its ends projected by at least a length equal to the radius of the roll, then the projected wrapping paper is twisted by rotating the roll and pushed into the hole at the centre of the roll.

The former method produces a good appearance because the ends of the roll are covered with a circular piece of wrapping paper. However, it has a fault in that the process of pasting on the circular piece of wrapping paper is troublesome and that it closes up the centre hole of the roll, making it inconvenient to transport.

The latter method is simpler in its process than the former. However, it may impair the quality and appearance of the roll by the formation of irregular wrinkles on the wrapped ends. Therefore, it is used mainly for rolls of small diameter.

As methods for overcoming the defect of the latter method, the inventor previously proposed a first method of wrapping about a roll a paper pre-processed to have folds in the portions destined to extend cylindrically from the ends of the roll and then winding the folded portion and tucking it into the centre of the roll (Japanese Patent Disclosure No. 13984/77), and a second method wherein tucking members are positioned at equal spaces on the periphery at the ends of the rolls, the cylindrical portions of wrapped paper extending from the ends of the rolls are depressed towards the centre of the roll so that ridge portions are formed, whereafter the centre portion of the wrapping paper is pushed into the centre of the rolls and the ridge portions are laid in a fixed direction (Japanese Patent Disclosure No. 70691/77).

These methods proposed by the inventor have some defects in that the pitch of the folds on the wrapping paper have to be changed as the diameter of the roll to be wrapped is altered, or that the projected cylindrical portion of the wrapping paper cannot always be folded evenly with the tucking members because the projected portion does not always maintain a perfectly circular shape.

In a further disclosure U.S. Patent No. 2,066,414 provides a device for wrapping cylindrical containers or articles in which folds

are formed in a cylindrical extension of wrapping material which extends beyond the ends of the article. This device includes at a single station a plurality of circumferentially spaced tucking members (153) and a plurality of internal projecting members (164), which co-operate with each other to provide alternate grooves and ridges in the extension. By means of relative rotation between the roll and the tucking members the ridges are caused to overlie the grooves and the ridges are pressed against the roll end by the tucking members.

According to one aspect of the invention there is provided a device for wrapping an end of a roll having an axial bore (1') in a wrapping material (2) which material has been wrapped about the roll to form a cylindrical extension of a length approximating to the radius of the roll of said material extending from the end of said roll; which comprises a combination at a single station of:

a) a plurality of circumferentially spaced tucking members (4), said tucking members being co-operable to provide alternate grooves and ridges in said extension,

b) means (3) for providing a partial rotation of said roll to cause said ridges to overlie said grooves while said tucking members (4) press the ridged and grooved extension against the roll end, and

c) plug means (14) for causing a portion of said extension to enter and be retained in said axial bore; characterised in that a plurality of radially movable internal projecting members (13) are provided in association with said tucking members (4) to assure correct ridge and groove formation, and said projecting members and said plug means are disposed on a common axial shaft (11), said shaft being movable axially from a first operational position in which said projecting members contact the inner surface of the extension, to a second operational position in which said projecting members and said plug are clear of said extension and subsequently to a third operational position wherein said plug causes said portion of said extension to enter the axial bore.

According to a second aspect of the invention there is provided a method for wrapping an end of a roll having an axial bore (1') in a wrapping material (2) which material has been wrapped about the roll to form a cylindrical extension of a length approximating to the radius of the roll of said material extending from the end of said roll; which comprises effecting the following steps at a single station:

a) causing a plurality of circumferentially spaced tucking members (4) to provide alternate ridges and grooves in said extension,

b) partially rotating said roll against said tucking members (4) to cause said ridges to overlie said grooves, and

c) forcing a plug means (14) into the axial bore of the roll thereby folding a portion of said extension into the axial bore thereby to retain the same,

characterized in that a plurality of radially movable internal projecting members (13) are provided in association with said tucking members (4) to assure correct ridge and groove formation and in that said projecting members and said plug means are disposed on a common axial shaft (11), said shaft being moved axially from a first operational position in which said projecting members contact the inner surface of the extension, to a second operational position in which said projecting members and said plug are clear of said extension and subsequently to a third operational position wherein said plug causes said portion of said extension to enter the axial bore.

Since the cylindrically extending wrapping paper is tucked on the ends of the roll in a state wherein the inner and outer peripheral surfaces thereof are strainedly supported, the device according to the present invention can wrap the ends of the roll neatly by producing even folds and prevent the central hole of the roll from being blocked. Accordingly, the present device is suitable particularly for a roll of large diameter.

Various ways of carrying out the invention are described in detail below with reference to drawings, in which:—

Figure 1 is a front view, partially in cross section, of a device for wrapping the ends of rolls according to this invention,

Figure 2 is a sectional view of the device in Figure 1 along a line II—II thereof.

Figures 3(A)—3(D) are the illustrations of the device according to this invention showing the state of the wrapping paper as it is tucked in the ends of the rolls.

Figure 4 illustrates the state of the wrapping paper tucked in the ends of the rolls.

Figure 5 is the enlarged front view showing another example of tucking members of the device for wrapping the ends of rolls according to this invention.

Figure 6 is a plan view of the tucking members shown in Figure 5.

Figure 7 is a side view of the tucking members shown in Figure 5.

Figures 8(A)—8(C) the state of tucking when the tucking members in Figure 5 are used.

Figure 9 is an explanatory view showing another example of the device for wrapping the ends of rolls by this invention.

Figure 1 shows one embodiment of the device for wrapping the ends of rolls according to this invention.

At first, a roll 1 to be wrapped is rotated by rollers 3 (rotation and support mechanisms not shown) to have several wrappings of a wrapping paper 2 wound thereon so as to project from the ends of the roll 1. Consequently, the end portion 2' of the wrapping paper projects cylindrically

from both ends of the roll 1. The length of the projected wrapping paper 2' should be slightly larger than the radius of the roll.

At either end of the roll 1, there is provided a device for wrapping that end of the roll. As the devices are identical only one of them will be described. The device is mounted on a frame 9 and is adjusted to a prescribed distance from the end of the roll by moving the frame 9 supported by wheels 22 along a rail 23. A cylindrical frame 21 having a slightly larger diameter than that of the roll to be wrapped is provided on the frame 9. The cylindrical frame 21 has a number of tucking members 4 for tucking in the projected portion of the wrapping paper 2' placed at equal intervals about the circumference thereof. A fulcrum supporting shaft 6 for each tucking member 4 is supported by a bearing 5 fixed on the side of the cylindrical frame 21. The fulcrum supporting shafts 6 of the tucking members are connected by flexible joints 7 in a generally circular pattern (Figure 2).

An arm 10 is projected from the fulcrum supporting shaft of the topmost fulcrum supporting shaft 6, and a fluid pressure cylinder 8 is connected to the arm 10. Therefore, the operation of the fluid pressure cylinder 8 causes the tips of the tucking members 4 to turn simultaneously towards the center of the cylindrical frame round the fulcrum supporting shaft 6.

At the position corresponding to the center hole of the roll 1, a plug 14 having substantially the same diameter as that of the hole 1' projects from the frame 9, and the plug 14 is given an axial movement and slow rotational motion through a shaft 11. The shaft 11 of the plug 14 has a sliding base 12 and a fixed ring 19 fitted thereon. The sliding base 12 has pivotally attached thereto a number of radially extending main arms 16 equal to the number of tucking members 4.

The tip of each main arm 16 is provided with a rotary piece 17 having welded thereon a projecting member 13 and the main arm 16, the rotary piece 17, an arm 18 and an arm 20 form a parallelogram. The lower end of the arm 20 is pivotally attached to the fixed ring 19. Therefore, when the sliding base 12 is caused to advance on the shaft 11 by rotation of driving screws 24', the link mechanism of the projecting members 13 all expand radially at one time and the tips 13' of the projecting members are placed between the tucking members 4. Then if the sliding base 12 is caused to retract by reverse rotation of the driving screws 24', the main arm 16 and the projecting members 13 are brought more parallel to the shaft 11, that is they are brought into a folded state. The driving screw 24' is rotated by a motor (not shown) in a box 24.

In the device for wrapping the ends of rolls, the frame 9 is moved so as to position the fulcrum supporting shafts 6 of tucking members 4 near the end of the roll 1 which has been wound on its periphery with wrapping paper 2

by the roller 3 (Figure 3(A)).

When the fulcrum supporting shafts 6 are positioned near the end of the roll 1, the cylinder 8 is operated to turn all the tucking members 4 inward at the same time and the sliding base 12 is advanced to cause the projecting members 13 to rise and bring the tips 13' into contact with the inside of the cylinder of wrapping paper 2' projecting from the end of the roll 1.

Therefore, the tucking members 4 contact the periphery of the cylinder of wrapping paper 2' projecting from the end of the roll 1 from the outside to produce groove portions, while the projecting members 13 contact the cylinder of wrapping paper from the inside at points lying between the tucking members to produce ridge portions (Figure 3(B)).

Once the cylinder of wrapping paper 2' has been contacted from both the outside and inside, the tucking members 4 are caused to turn inward by further operation of the cylinder 8. Then, the sliding base 12 is caused to draw back so as to pucker up the projecting members 13. The operation of the projecting members is slightly delayed so that the cylinder of wrapping paper is always formed into grooves by the tucking members and into ridges by the projecting members.

Just before, the tucking members 4 contact the end of the roll (Figure 3(C)), a cylinder 15 for drawing back the shaft 11 together with the sliding base 12 is put into operation and the projecting members 13 and the plug 14 are withdrawn from the cylinder of wrapping paper 2' (Figure 3(D)). Therefore, only the tucking members 4 remain in pressing contact with the end of the roll and the ridges are maintained in the wrapping paper (see the right end of Figure 1). The roll 1 is then rotated slightly so that the tucking members fold over the ridges and cause them to lie flat in one direction (Figure 4). Then the cylinder 15 is operated to cause the part of the folded wrapping paper which faces the hole 1' to be pushed into the hole by the plug 14 and thus complete the wrapping of the roll. The tucking members can be of rod or plate shape and can be made of plastic, wood or metal. They are of a length equal to, or somewhat less than, the thickness of the paper on the roll (from the surface to the center hole). When the structure shown in Figure 5—Figure 7 is used, the folds will be finished more neatly on the ends of the roll.

Referring to Figures 5 to 7, projecting rails 26 are provided on the both sides of a bar member 25 having a fin, and triangular plates 27 are slidably inserted into the projecting rails 26. For controlling the sliding motion of the triangular plates 27, a cylinder 29 is fixed on the bar member 25 and connected with triangular plates 27 through a bracket 28.

At the top of the bar member 25, an elastic wire 30 is supported by a shaft 33 and rotated

by a cylinder 31 placed at the tip of the bar member 25.

When using tucking members as mentioned above, a lever 32 is rotated by cylinder 31 about shaft 33 and a supporting shaft 6 is rotated by a cylinder (not shown) after the tip of the wire 30 contacts with the end of the roll 1. At the same time, the projecting members 13 in contact with the inside of the cylinder of wrapping paper 2' are puckered up gradually by drawing back the sliding base 12. Thus, at the end of the cylinder of wrapping paper, ridge and groove portions are formed as shown in Figure 8(A). When the tucking members are further turned and the projecting members 13 are withdrawn from the wrapping paper, the tucking members remain in close contact with the end of the roll with the ridge portions maintained as shown in Figure 8(B). At this time, the wire 30 is drawn into a groove provided at the bottom of the bar member 25. Appropriate gaps are left between the tucking members in close contact with end of the roll. Therefore, when the cylinder 29 is operated, the triangular plates 27 on both sides of the bar member 25 are caused to slide towards the center along the projecting rail 26 to eliminate the gaps between triangular plates 27 and raise the ridges (Figure 8(C)). In such a state, the roll 1 is rotated and the ridges are laid towards the periphery. Thereafter, the end of the wrapping paper is pushed into the hole 1' by the plug 14.

Further, a flexible piece 34 is provided on the tip of the tucking members as shown in Figure 9. This piece 34 is normally held in extended state by means of a spring 35, and when the wrapping paper is pushed in by the plug 14, it is caused to bend into the hollow hole under the force of the plug 14. Through this action the piece 34 protects the edge of the hole and also makes the folds neat.

The projecting members 13 are made of a highly flexible wire material because the wrapping paper may be broken if the motions of the tucking members and the projecting members 13 are not smoothly coordinated. The material of these pieces can be metal, plastic, wood, bamboo, etc.

In case of an actual operation, the most appropriate relationship between the motions of the tucking and projecting members can be obtained by experiments and calculations, and it is preferable to control the hydraulic cylinder-actuating motor so that the tucking and projecting members can work in accordance with such relationship.

The device for wrapping the ends of rolls according to this invention, as explained above, folds the cylinder of wrapping paper projecting from the ends of the roll by supporting the cylinder from both the inside and the outside and thus is able to wrap the ends in neat folds. It is especially suitable for wrapping rolls having a larger diameter.

Claims

1. A device for wrapping an end of a roll having an axial bore (1') in a wrapping material (2) which material has been wrapped about the roll to form a cylindrical extension of a length approximating to the radius of the roll of said material extending from the end of said roll; which comprises a combination at a single station of:

a) a plurality of circumferentially spaced tucking members (4) said tucking members being co-operable to provide alternate grooves and ridges in said extension,

b) means (3) for providing a partial rotation of said roll to cause said ridges to overlie said grooves while said tucking members (4) press the ridged and grooved extension against the roll end, and

c) plug means (14) for causing a portion of said extension to enter and be retained in said axial bore; characterised in that a plurality of radially movable internal projecting members (13) are provided in association with said tucking members (4) to assure correct ridge and groove formation, and said projecting members and said plug means are disposed on a common axial shaft (11), said shaft being movable axially from a first operational position in which said projecting members contact the inner surface of the extension, to a second operational position in which said projecting members and said plug are clear of said extension, and subsequently to a third operational position wherein said plug causes said portion of said extension to enter the axial bore.

2. A device according to claim 1 wherein each of said tucking members (4) is provided with a pair of wings (27) capable of moving toward the centre of the end of said roll after said tucking members come into contact with the end of said roll.

3. A device according to either one of claims 1 or 2 wherein each tucking member (4) has a pivoted portion (34) toward its free end, adapted to be forced into the axial bore by the plug means.

4. A method for wrapping an end of a roll having an axial bore (1') in a wrapping material (2) which material has been wrapped about the roll to form a cylindrical extension of a length approximating to the radius of the roll of said material extending from the end of said roll; which comprises effecting the following steps at a single station:

a) causing a plurality of circumferentially spaced tucking members (4) to provide alternate ridges and grooves in said extension,

b) partially rotating said roll against said tucking members (4) to cause said ridges to overlie said grooves, and

c) forcing a plug means (14) into the axial bore of the roll thereby folding a portion of said extension into the axial bore thereby to retain the same, characterized in that a plurality of

radially movable internal projecting members (13) are provided in association with said tucking members (4) to assure correct ridge and groove formation and in that said projecting members and said plug means are disposed on a common axial shaft (11), said shaft being moved axially from a first operational position in which said projecting members contact the inner surface of the extension, to a second operational position in which said projecting members and said plug are clear of said extension and subsequently to a third operational position wherein said plug causes said portion of said extension to enter the axial bore.

Revendications

1. Dispositif pour envelopper dans un matériau d'emballage (2) une extrémité d'un rouleau ayant un trou axial (1'), ce matériau ayant été enroulé autour du rouleau de façon à former une rallonge cylindrique de longueur voisine du rayon du rouleau de matériau d'emballage dépassant de l'extrémité du rouleau, comprenant à un seul poste la combinaison suivante:

a) une série d'éléments replieurs (4) espacés circonférentiellement qui coopèrent pour former dans la rallonge des gorges et des crêtes alternées,

b) des moyens (3) destinés à produire une rotation partielle du rouleau pour appliquer les crêtes sur les gorges pendant que les éléments replieurs (4) serrent la rallonge pourvue de crêtes et de gorges contre l'extrémité du rouleau, et

c) des moyens du genre tampon (14), destinés à faire entrer et maintenir une partie de la rallonge dans le trou axial, caractérisé en ce qu'il comporte une série d'éléments intérieurs saillants (13) mobiles radialement destinés en association avec les éléments replieurs (4), à assurer la formation correcte des crêtes et des gorges, et en ce que les éléments saillants et les moyens du genre tampon sont montés sur un arbre axial commun (11) mobile axialement depuis une première position dans laquelle les éléments saillants sont en contact avec la face intérieure de la rallonge jusqu'à une deuxième position dans laquelle les éléments saillants et le tampon sont dégagés de la rallonge, et ensuite jusqu'à une troisième position dans laquelle le tampon fait entrer ladite partie de la rallonge dans le trou axial.

2. Dispositif selon la revendication 1, caractérisé en ce que chacun des éléments replieurs (4) est pourvu de deux ailes (27) qui peuvent se déplacer vers le centre de l'extrémité du rouleau après que les éléments replieurs sont venus en contact avec l'extrémité du rouleau.

3. Dispositif selon l'une des revendications 1 ou 2, caractérisé en ce que chaque élément replieur (4) comporte vers son extrémité une partie articulée (34) faite pour être enfoncée dans le trou axial par le tampon.

4. Procédé pour envelopper dans un matériau d'emballage (2) une extrémité d'un rouleau ayant un trou axial (1'), ce matériau ayant été enroulé autour du rouleau de façon à former une rallonge cylindrique de longueur voisine du rayon du rouleau de matériau d'emballage qui dépasse de l'extrémité du rouleau, comprenant l'exécution au même poste des opérations suivantes:

a) on forme dans la rallonge des crêtes et des gorges alternées au moyen d'une série d'éléments replieurs (4) espacés circonférentiellement,

b) on fait subir au rouleau une rotation partielle relativement aux éléments replieurs (4) pour faire en sorte que les crêtes recouvrent les gorges, et

c) on enfonce des moyens du genre tampon (14) dans le trou axial du rouleau pour replier une partie de la rallonge dans ces trous et l'y maintenir, caractérisé en ce qu'il est prévu une série d'éléments intérieurs saillants (13) mobiles radialement destinés, en association avec les éléments replieurs (4) à assurer la formation correcte des crêtes et des gorges, et en ce que les éléments saillants et les moyens du genre tampon sont montés sur un arbre axial commun (11) mobile axialement depuis une position dans laquelle les éléments saillants sont en contact avec la surface intérieure de la rallonge, jusqu'à une deuxième position dans laquelle les éléments saillants et le tampon sont dégagés de la rallonge, et ensuite jusqu'à une troisième position dans laquelle le tampon fait entrer ladite partie de la rallonge dans le trou axial.

Patentansprüche

1. Vorrichtung zum Verpacken eines Endes einer mit einer axialen Bohrung (1') versehenen Rolle (1) in ein Umhüllungsmaterial (2), welches um die Rolle gewickelt worden ist und einen zylindrischen Umhüllungsfortsatz bildet, dessen Länge dem Radius der Rolle des Materials gleichkommt, welches vom Ende der Rolle wegsteht, mit folgender Merkmalskombination an einer einzelnen Station:

a) mehrere Falt-Umschlag-Glieder (4) sind in Umfangsrichtung in gleichem Abstand voneinander angeordnet und arbeiten zur Bildung abwechselnder Faltenkämme und Faltenknice am Umhüllungsfortsatz zusammen;

b) eine Dreheinrichtung (3) ist zu einer teilweisen Drehung der Rolle vorgesehen, so daß die Faltenkämme über den Faltenknicken zu liegen kommen, während die Falt-Umschlag-Glieder (4) den gefalteten Umhüllungsfortsatz gegen das Rollenende pressen;

c) eine stopfenartige Einrichtung (14) dient zum Einführen und Festhalten eines Teils des Umhüllungsfortsatzes des Umhüllungsmaterials in der axialen Bohrung; dadurch gekennzeichnet, daß eine Mehrzahl von radial bewegbaren, nach innen vorstehenden Gliedern

(13) in Zuordnung zu den Falt-Umschlag-Gliedern (4) vorgesehen ist und zur korrekten Bildung der Faltenkämme und Faltenknice dient, daß die vorstehenden Glieder (13) und die stopfenartige Einrichtung (14) auf einer gemeinsamen Achse (11) angeordnet sind, die aus einer ersten Betriebslage, in welcher die vorstehenden Glieder (13) die Innenoberfläche des Umhüllungsfortsatzes berühren, in eine zweite Betriebslage bewegbar sind, in welcher die vorstehenden Glieder (13) und die stopfenartige Einrichtung (14) frei von dem Umhüllungsfortsatz sind und daß nachfolgend die Achse (11) in eine dritte Betriebslage verschiebbar ist, bei welcher die stopfenartige Einrichtung (14) einen Teil des Umhüllungsfortsatzes in die axiale Bohrung (1') einschiebt.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß jedes Falt-Umschlag-Glied (4) mit zwei Flügeln (27) versehen ist, die zur Mitte des Endes der Rolle (1) bewegbar sind, nachdem die Falt-Umschlag-Glieder (4) in Kontakt mit dem Ende der Rolle (1) kommen.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jedes Falt-Umschlag-Glied (4) an seinem freien Ende ein schwenkbares Teil (34) aufweist, welches durch die stopfenartige Einrichtung (14) in die axiale Bohrung (1') gedrängt werden kann.

4. Verfahren zum Verpacken einer mit einer axialen Bohrung (1') versehenen Rolle (1) in ein Umhüllungsmaterial (2), welches um die Rolle zur Bildung eines zylindrischen Umhüllungsfortsatzes gewickelt ist, dessen Länge dem Radius der Rolle des Materials gleichkommt, welches vom Ende der Rolle wegsteht, mit folgenden Schritten an einer einzelnen Station:

a) mehrere in Umfangsrichtung in Abstand voneinander angeordnete Falt-Umschlag-Glieder (4) werden dazu gebracht, abwechselnde Faltenkämme und Faltenknice in dem Umhüllungsfortsatz zu erzeugen;

b) die Rolle (1) wird partiell gegenüber den Falt-Umschlag-Gliedern (4) gedreht, um die Faltenkämme zum Bedecken der Faltenknice zu bringen;

c) eine stopfenartige Einrichtung (14) wird in die axiale Bohrung (1') der Rolle (1) gepreßt, wobei ein Teil des Umhüllungsfortsatzes in die axiale Bohrung gepreßt und dort gehalten wird; dadurch gekennzeichnet, daß eine Mehrzahl von radial beweglichen, nach innen vorstehenden Gliedern (13) in Zuordnung zu dem Falt-Umschlag-Gliedern (4) vorgesehen ist, um die korrekte Faltenkamm- und Faltenknickbildung sicherzustellen, daß die vorspringenden Glieder (13) und die stopfenartigen Einrichtungen (14) auf einer gemeinsamen Achse (11) angeordnet sind, die in Axialrichtung von einer ersten Betriebslage, in welcher die vorstehenden Glieder (13) die Innenoberfläche des Umhüllungsfortsatzes berühren, in eine zweite Betriebslage verschoben wird, in welcher die vorstehenden Glieder (13) und die stopfenartige Einrichtung (14) frei von dem Umhüll-

lungsfortsatz sind, und daß nachfolgend eine dritte Betriebslage eingenommen wird, wobei die stopfenartige Einrichtung (14) das innere

Ende des Umhüllungsfortsatzes in die axiale Bohrung (1') hineindrängt.

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Fig-1

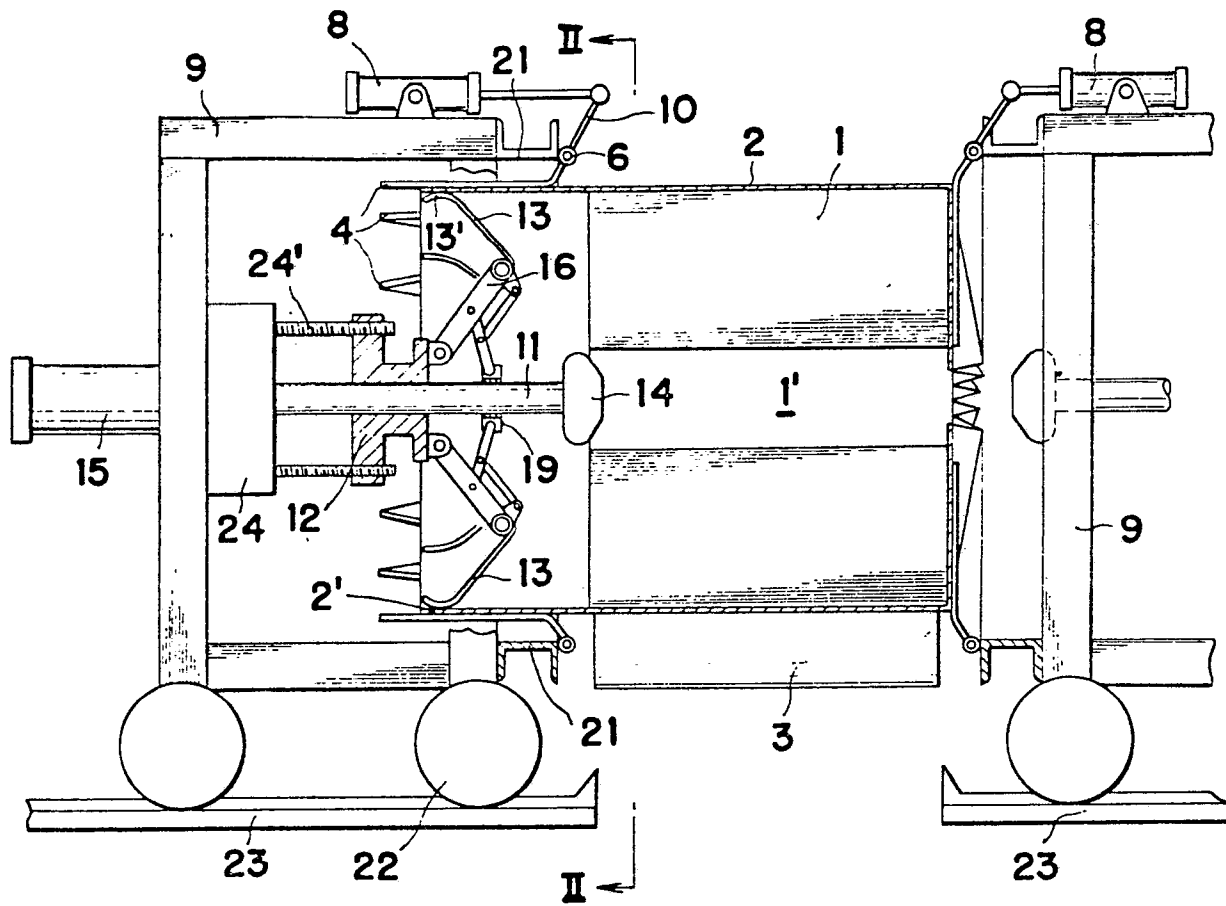
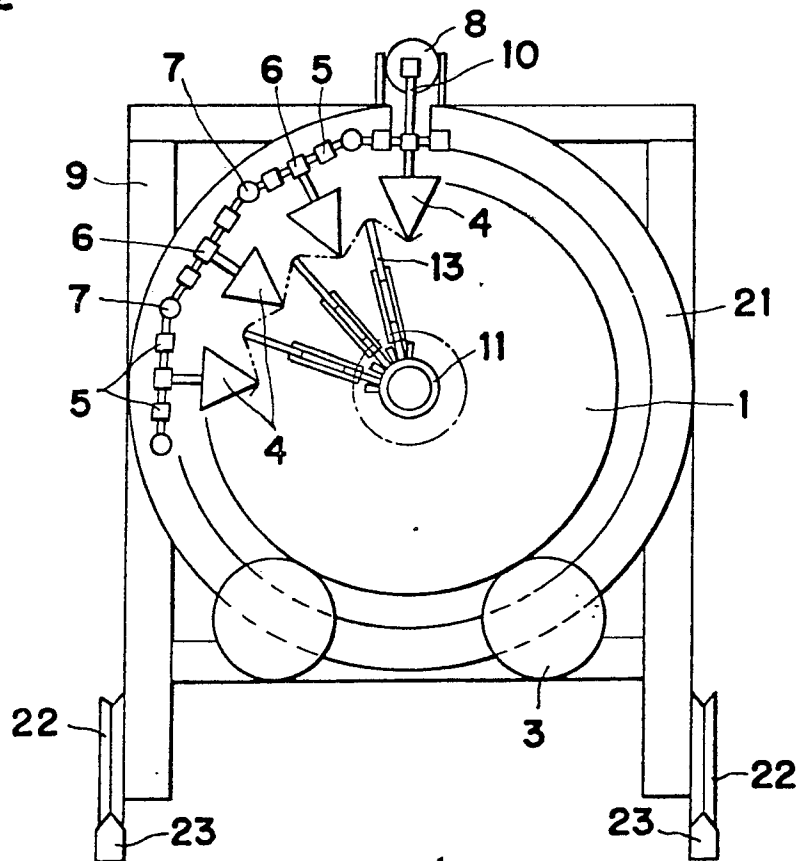
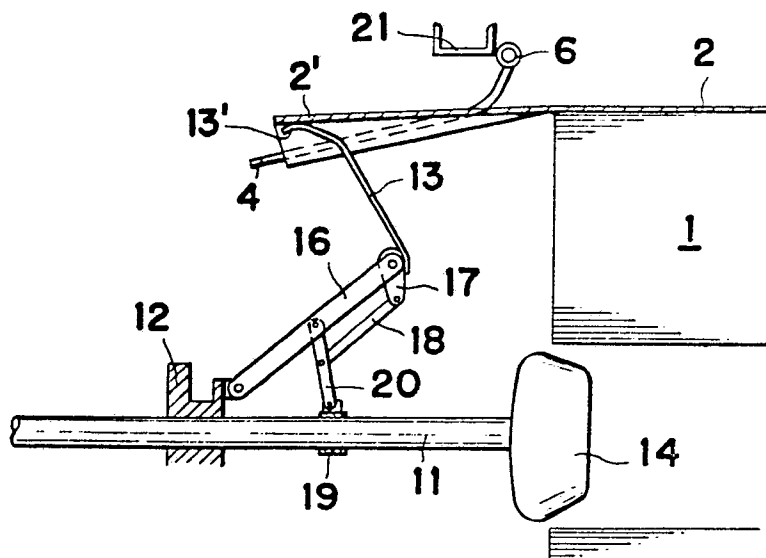


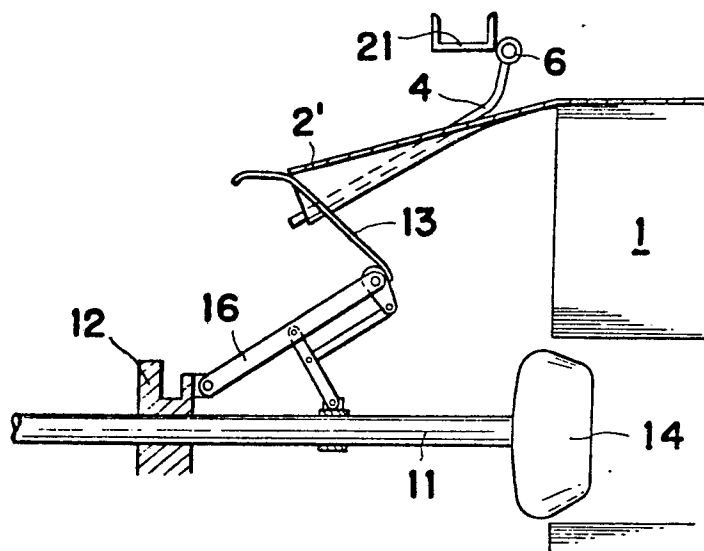
Fig-2



Fig_3(A)



Fig_3(B)



Fig_3(C)

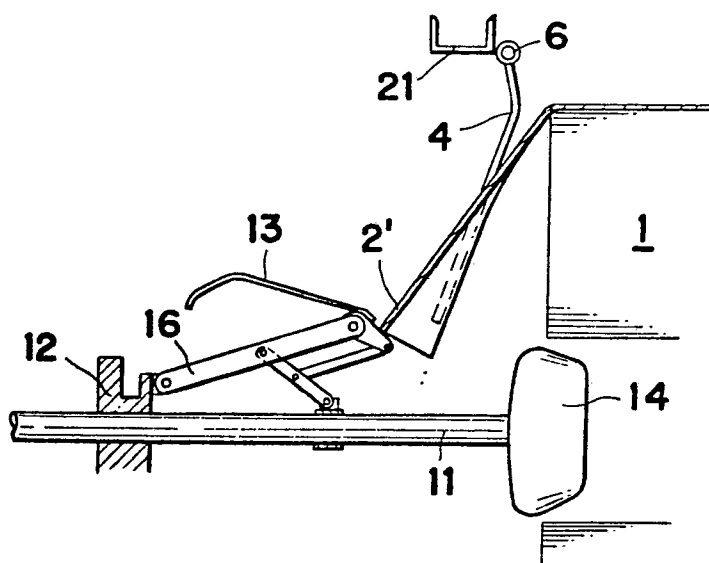


Fig-3(D)

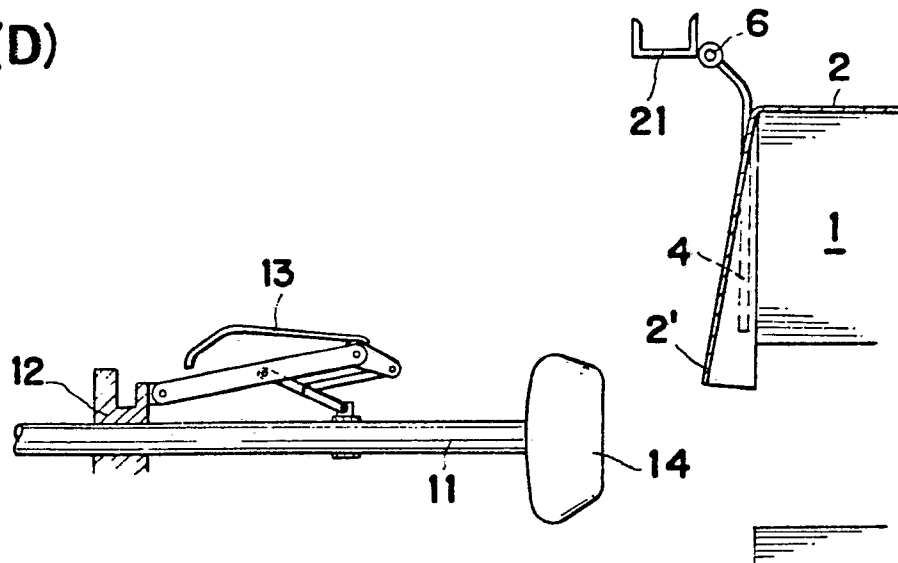


Fig-4

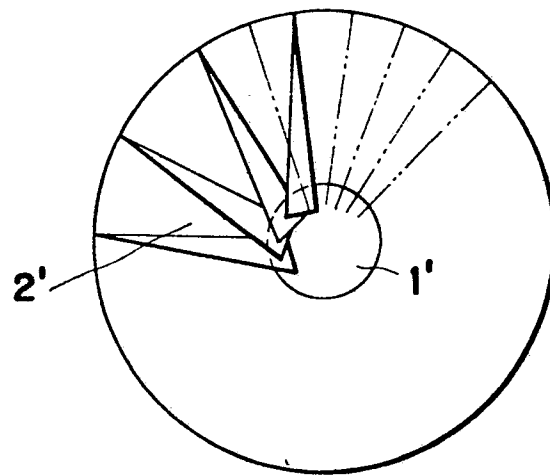


Fig-6

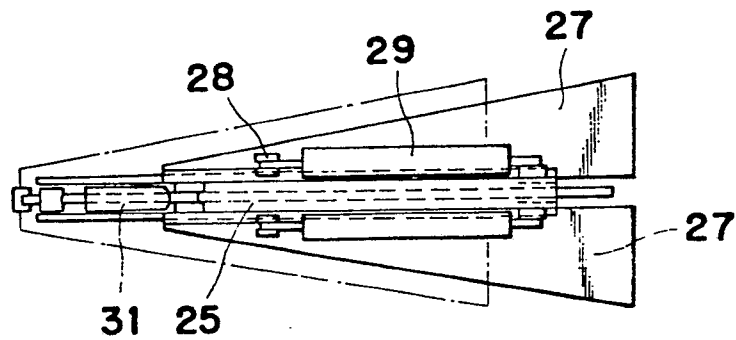


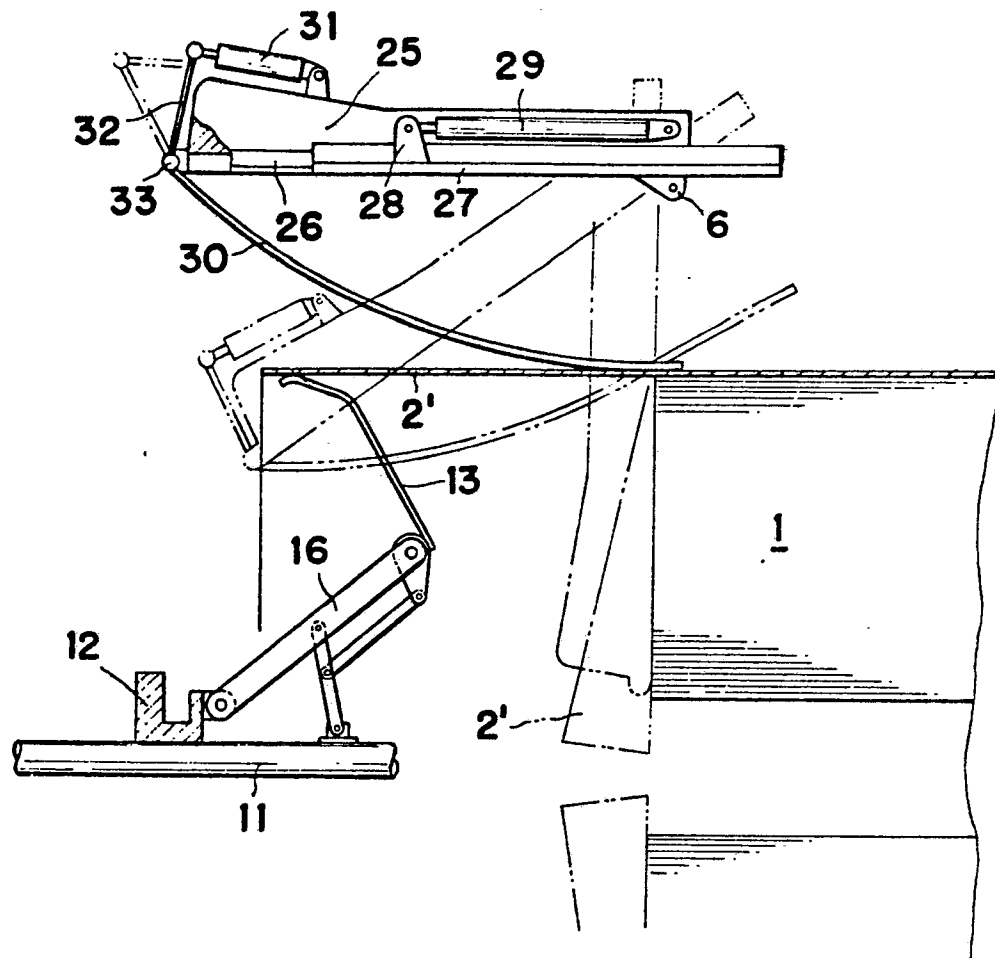
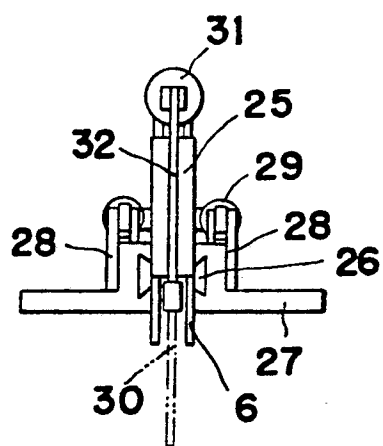
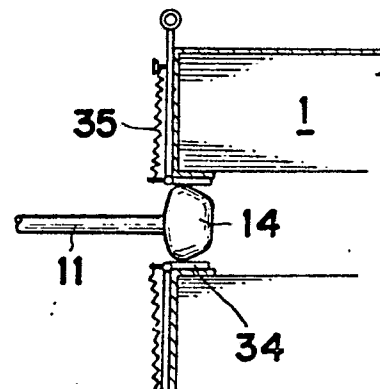
Fig-5**Fig-7****Fig-9**

Fig-8(A)

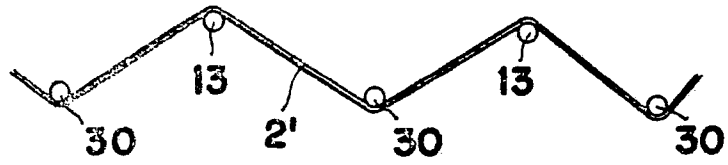


Fig-8(B)

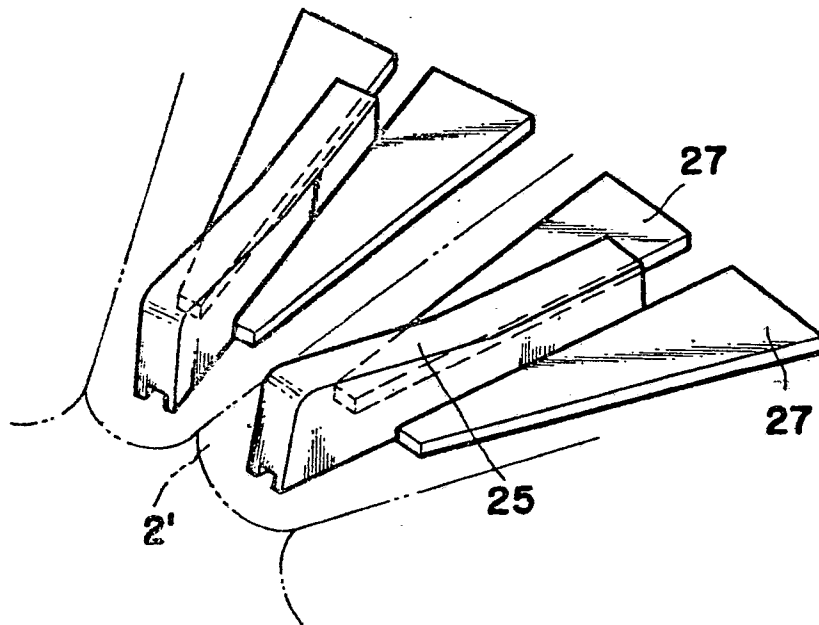


Fig-8(C)

