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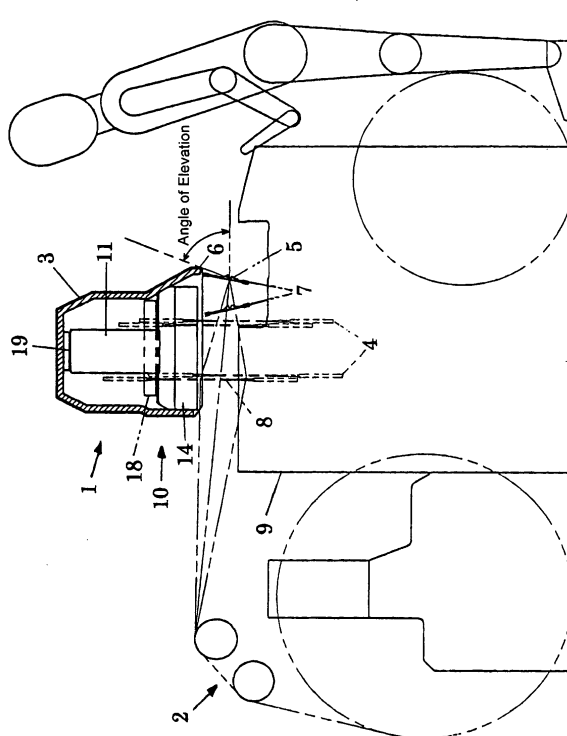
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(54) Sound-deadening device for loom

(57) A sound-deadening device (1) for a loom includes a sound-deadening cover (3) which has front, back, right, left, and top sides, which is open at the bottom, and which is moveable between a sound-deadening position and an open position above the sound-deaden-

ing position. When the sound-deadening cover (3) is at the sound-deadening position, the sound-deadening cover (3) covers an upper portion of a group of heald frames (4), and the angle of elevation of a lower edge (6) of the front side of the sound-deadening cover (3) from a cloth fell (5) is 45° or more.

FIG.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a loom, and more specifically to a device for deadening the noise from the loom by covering a group of healds.

2. Description of the Related Art

[0002] Japanese Unexamined Patent Application Publication No. 56-58035 discloses a sound-deadening cover for healds. The sound-deadening cover includes an upper cover portion and a lower cover portion disposed across a warp line. The upper cover section is moveable between a sound-deadening position and an open position above the sound-deadening position. When the upper cover section is at the sound-deadening position, the lower edge of the front side of the sound-deadening cover is near a cloth fell.

[0003] In this structure, the upper cover portion of the sound-deadening cover must be moved to the open position to view the cloth fell. Accordingly, it is difficult to observe weaving states, such as states of weft insertion and a weft bar immediately after the occurrence thereof, without moving the upper cover portion to the open position.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to reduce the noise of a loom without degrading the operability and to thereby improve the work environment.

[0005] In order to achieve the above-described object, according to an aspect of the present invention, a sound-deadening device for a loom includes a sound-deadening cover which has front, back, right, left, and top sides, which is open at the bottom, and which is moveable between a sound-deadening position and an open position above the sound-deadening position. When the sound-deadening cover is at the sound-deadening position, the sound-deadening cover covers an upper portion of a group of heald frames, and the angle of elevation of a lower edge of the front side of the sound-deadening cover from a cloth fell is 45° or more.

[0006] According to this structure, the sound-deadening cover covers the upper portion of the group of heald frames when the sound-deadening cover is at the sound-deadening position. Therefore, the noise generated from the upper portion of the group of heald frames including collision sounds between healds and an upper heald rod which supports the healds at the top ends thereof is absorbed by the sound-deadening cover, and accordingly the work environment is improved. In addition, when the loom stops, a yarn repair can be performed without being obstructed by the sound-deadening cover

by moving the sound-deadening cover to the open position. In addition, the cloth fell and an area near the cloth fell can be clearly viewed without moving the sound-deadening cover from the sound-deadening position to the open position. Therefore, weaving states, such as the states of weft insertion and a weft bar immediately after the occurrence thereof, can be observed and the weave quality can be maintained.

[0007] The sound-deadening device may further include a moving unit for pushing a bottom surface of the sound-deadening cover upward, the sound-deadening cover being linearly moved upward and downward by the moving unit.

[0008] According to this structure, the overall body of the sound-deadening cover moves so that both the front side and the back side move upward together to the open position. Therefore, the yarn repair can be performed from either the front side or the back side depending on the region where repair is required, and operability is thus maintained.

[0009] Preferably, the moving unit becomes engaged with the sound-deadening cover to maintain the sound-deadening cover at the open position, and the sound-deadening cover becomes disengaged from the moving unit by being placed on a loom frame at the sound-deadening position.

[0010] This structure provides the following advantages. That is, since the sound-deadening position is set irrespective of the position at which the moving unit stops, the sound-deadening cover is accurately positioned in the vertical position and reliably covers the upper portion of the group of heald frames. In addition, interference with a movable member (reed) does not occur. In addition, when the sound-deadening cover is at the sound-deadening position, that is, when the loom is operating, the moving unit do not receive the weight of the sound-deadening cover, and therefore the durability of the moving unit is increased. In addition, in this structure, the sound-deadening cover is not fixed to the moving unit with bolts or the like. Therefore, the sound-deadening cover can be easily removed by lifting the sound-deadening cover manually or with a crane or the like when the group of heald frames are to be removed for looming or the like.

[0011] The moving unit may include a drive controller which moves the sound-deadening cover to the open position in response to a loom stop signal.

[0012] According to this structure, the sound-deadening cover moves to the open position when the loom stops. Therefore, the cause of stoppage can be checked or the yarn repair can be performed immediately after the stoppage of the loom.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a side view of a sound-deadening device

for a loom according to the present invention (sectional view of a sound-deadening cover at a sound-deadening position);

Fig. 2 is a front view of the sound-deadening device for the loom according to the present invention (sectional view of the sound-deadening cover at the sound-deadening position);

Fig. 3 is an enlarged view of a part of Fig. 1;

Fig. 4 is an enlarged view of a part of Fig. 2;

Fig. 5 is a side view of the sound-deadening device for the loom according to the present invention (sectional view of the sound-deadening cover at an open position);

Fig. 6 is an enlarged front view of a part of Fig. 5;

Fig. 7 is a diagram showing a manner in which healds are attached to heald frames; and

Fig. 8 is a block diagram of a moving unit including a drive controller.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Figs. 1 to 7 show a sound-deadening device 1 for a loom 2 according to the present invention. With reference to these figures, the sound-deadening device 1 includes a sound-deadening cover 3 provided on the loom 2. The sound-deadening cover 3 includes a cover body 28 composed of a metal plate, such as an iron plate, or a plastic plate and a sound absorber 29 provided on the inner surface of the cover body 28. The sound-deadening cover 3 has front, back, left, right, and top sides and is open at the bottom. The loom 2 is, for example, an air jet loom.

[0015] In a preferred embodiment, the sound-deadening cover 3 is structured such that the cover body 28 is composed of a damping steel plate and the sound absorber 29 is composed of urethane foam or a honeycomb structural body, the sound absorber 29 being adhered to the inner surface of the cover body 28. When the cover body 28 of the sound-deadening cover 3 is composed of a transparent plastic plate, a region free from the sound absorber 29 is provided near a cloth fell 5, so that an operator can see through the plate in this region. However, this region simply functions as a safety cover, and does not function as a part of the sound-deadening cover 3. Similarly, although not shown in the figures, a transparent plastic plate is attached to the front side of the metal or plastic cover body 28 in a region near the cloth fell 5 with bolts or the like. This plate also functions simply as a safety cover.

[0016] The sound-deadening cover 3 can be linearly moved upward and downward between a sound-deadening position shown in Fig. 1 and an open position above the sound-deadening position shown in Fig. 5 by moving units 10. As shown in Figs. 1 to 6, each moving unit 10 has a linear actuator 11 composed of a fluid pressure cylinder, such as an air cylinder. In the case in which the loom 2 is an air jet loom, the air cylinder is used since a drive source (pressurized air source) of the loom can be

used in common.

[0017] The linear actuators 11 are respectively attached to left and right loom frames 9 with brackets 12 at positions where the sound-deadening cover 3 moves upward and downward. Each linear actuator 11 drives an actuator rod 13 which pushes the bottom surface (the bottom surface of an upper plate portion) of the sound-deadening cover 3. Accordingly, the sound-deadening cover 3 linearly moves upward and downward between the sound-deadening position shown in Fig. 1 and the open position shown in Fig. 5. An end portion of each actuator rod 13 may also be structured so as to push a bottom surface of a connection member provided on a side wall of the sound-deadening cover 3 instead of pushing the bottom surface of the upper plate portion of the sound-deadening cover 3.

[0018] The end portion of each actuator rod 13 is in contact (or is engaged) with the inner surface of the sound-deadening cover 3 with a plate-shaped receiver 19 provided therebetween. Accordingly, the sound-deadening cover 3 is simply placed on the receivers 19 of the actuator rods 13, and can be removed by lifting it up. However, the sound-deadening cover 3 may also be fixed by means of bolts or the like.

[0019] Thus, the overall body of the sound-deadening cover 3 moves upward and downward, and the front and back sides of the sound-deadening cover 3 move upward together when the sound-deadening cover 3 moves to the open position. Therefore, a yarn repair may be done from either the front side or the back side of the sound-deadening cover 3 depending on the region where repair is required. Accordingly, the yarn repair can be easily performed.

[0020] The upward and downward movement of the sound-deadening cover 3 is limited to a substantially vertical direction, that is, within a range of $90^\circ \pm 5^\circ$ with respect to the horizontal direction. When the movement is limited to this range, the moving unit 10 does not receive a bending moment caused by the weight of the sound-deadening cover 3. Therefore, it is not necessary that the moving unit 10 have a high rigidity, and accordingly this structure is advantageous in view of manufacturing.

[0021] As described above, the sound-deadening cover 3 moves substantially vertically. As shown in Figs. 1 to 4, when the sound-deadening cover 3 is at the sound-deadening position, the sound-deadening cover 3 is in contact with restricting members 14 attached to the loom frames 9 with the brackets 12, and is thereby positioned in the front-back direction. In order to position the sound-deadening cover 3, the restricting members 14 have shapes corresponding to the inner shape of the sound-deadening cover 3. For example, each restricting member 14 is trapezoidal when viewed from the side, and has an inclined restricting surface 15 and a vertical back restricting surface 16 which come into contact with the inner surface of the sound-deadening cover 3. The restricting surfaces 15 and 16 may, of course, also have

other suitable shapes depending on the inner shape of the sound-deadening cover 3.

[0022] When the sound-deadening cover 3 is at the open position, the moving units 10, more specifically, the actuator rods 13 are in contact (or are engaged) with the sound-deadening cover 3 so as to stably maintain the sound-deadening cover 3 at the open position. In this example, as shown in Fig. 3, the end portion of each actuator rod 13 is engaged with the sound absorber 29 of the sound-deadening cover 3 with the receiver 19 interposed therebetween.

[0023] When the actuator rods 13 of the moving units 10 move downward, the sound-deadening cover 3 comes into contact with the inclined front restricting surface 15 and the vertical back restricting surface 16 of each restricting member 14, and is thereby positioned in the front-back direction. At the same time, a top restricting surface 17 of each restricting member 14 comes into contact with a stopper 18 which is fixed to the cover body 28 by spot welding. Therefore, the sound-deadening cover 3 is also positioned in the vertical direction by the engagement between the stopper 18 and the restricting surface 17 of each restricting member 14. When the sound-deadening cover 3 is moved to the sound-deadening position, the top restricting surface 17 of each restricting member 14 comes into contact with the stopper 18 of the sound-deadening cover 3, and accordingly the end portion (the receiver 19) of the actuator rod 13 of each moving unit 10 becomes disengaged from the inner surface (sound absorber 29) of the sound-deadening cover 3. Accordingly, each moving unit 10 (actuator rod 13) becomes separated from the sound-deadening cover 3. As shown in Fig. 4, a portion of the sound absorber 29 becomes deformed when it comes into contact with the outer surface of the restricting member 14.

[0024] Accordingly, the sound-deadening position of the sound-deadening cover 3 is set by the restricting members 14 irrespective of the positions at which the moving units 10 stop. Therefore, the sound-deadening cover 3 is accurately positioned in the vertical position, and reliably covers an upper portion of the group of heald frames 4. In addition, interference with movable members including a reed 7 does not occur. In addition, when the sound-deadening cover 3 is at the sound-deadening position, that is, when the loom is operating, the moving units 10 do not receive the weight of the sound-deadening cover 3. Therefore, the durability of the moving units 10 is increased. In addition, in the structure of this example, the sound-deadening cover 3 is not fixed to the moving units 10 with bolts or the like. Therefore, the sound-deadening cover 3 can be easily removed by lifting the sound-deadening cover 3 manually or with a crane or the like when the group of heald frames 4 are to be removed for looming or the like.

[0025] Although the above-described effects cannot be provided, the moving units 10 may also be detachably fixed to the sound-deadening cover 3 and be moved between the open position and the sound-deadening posi-

tion. In such a case, the moving units 10 may be fixed by means of bolts, a simple clamp, etc.

[0026] As shown in Figs. 1 and 3, the sound-deadening cover 3 covers the upper portion of the group of heald frames 4 while it is at the sound-deadening position. As shown in Fig. 7, each heald frame 4 holds multiple healds 8 with upper and lower heald rods 21 which are fixed to the heald frame 4. Each heald 8 has through holes 30 for allowing the upper and lower heald rods 21 to extend therethrough at the top and bottom ends thereof. In addition, each heald 8 is supported by the heald frame 4 in such a manner that vertical play (movement) is allowed at the through holes 30. Collision sounds within a range of 5,000 Hz to 10,000 Hz are generated by the healds 8 and the heald rods 21 due to the shedding motion (vertical motion) of the heald frames 4, and these sounds serve as a source of a very unpleasant noise. Therefore, at least the front surface of the sound-deadening cover 3 covers the top ends of the healds 8 near the ears of the operator.

[0027] In this example, at least the lower edge of the front side of the sound-deadening cover 3 is positioned below the lowermost position of the top end portions of the healds 8 in the front row, and constantly covers the top end portions of the healds 8. Thus, at least the lower edge of the front side of the sound-deadening cover 3 must deaden the sounds from the top end portions of the healds 8 in the front row at the lowermost position, and the sound-deadening effect increases as the position of the lower edge of the sound-deadening cover 3 becomes lower. In addition, the lower edge of the back side of the sound-deadening cover 3 is positioned as low as possible within a range that interference with warp 20 does not occur. Accordingly, when the operator faces the front of the loom 2 during the operation of the loom 2, the collision sounds generated between the healds 8 and the heald rods 21 at the upper region thereof are absorbed and are prevented from directly reaching the ears of the operator. Therefore, the operator's fatigue caused by the noise is reduced.

[0028] As described above, vertical play is generally provided between the healds 8 and the heald rods 21 at the through holes 30, and accordingly the healds 8 have a freedom in the direction along the width of a woven cloth. Therefore, even when the healds 8 tilt to the left or right, they immediately return to the original positions by being pushed by the adjacent healds 8, and thus the warp 20 is prevented from being damaged during the beating-up motion. This play causes large collision sounds. The frequency of a sound of the beating-up motion is about 500 Hz, and this sound does not cause an unpleasant noise. In addition, it has been experimentally confirmed that the this sound easily travels below the sound-deadening cover 3 instead of being absorbed because of the low frequency, and is difficult to deaden with the sound-deadening cover 3. Accordingly, in this embodiment, the lower edge of the front side of the sound-deadening cover 3 is positioned above the reed

7, and does not positively cover the reed 7. Since the sound caused by the beating-up motion has a frequency of about 500 Hz and does not cause an unpleasant noise, no problem occurs even when the reed 7 is not covered by the sound-deadening cover 3. On the contrary, degradation of visibility of the cloth fell 5 due to the sound-deadening cover 3 is prevented.

[0029] When the sound-deadening cover 3 is at the sound-deadening position, the lower edge 6 of the front side of the sound-deadening cover 3 is positioned such that the angle of elevation of the lower edge 6 from the cloth fell 5 is set to 45° or more. This condition is required to prevent degradation of visibility due to the sound-deadening cover 3. More specifically, as shown in Fig. 3, the area in which the lower edge 6 of the front side of the sound-deadening cover 3 can be placed is defined as a hatching area surrounded by an inclined line corresponding to an angle of elevation of 45°, an L-shaped line for preventing the interference with the beating-up motion of the reed 7, the L-shaped line including a substantially horizontal arc line corresponding to the rocking movement of the reed 7 and a vertical line, a vertical line for preventing the interference with the vertical motion of the healds 8 supported by the heald frames 4, and a horizontal line for covering at least the top end portions of the healds 8 to obtain the sound-deadening effect.

[0030] In addition, the lower edge 6 of the front side of the sound-deadening cover 3 satisfies the following conditions depending on the situation:

(1) When the front side of the sound-deadening cover 3 is in front of the foremost position (beating-up position) of the reed 7, the front side of the sound-deadening cover 3 is outside the moving area of the reed 7 and does not interfere with the reed 7, the lower edge 6 of the front side may be positioned below the top edge of the reed 7.

(2) When the front side of the sound-deadening cover 3 is behind the foremost position (beating-up position) of the reed 7, the lower edge 6 of the front side must also be positioned above the reed 7 in order to avoid the interference with the reed 7. In this case, since the reed 7 tilts frontward at an angle of 80° or more with respect to the horizontal plane when it performs the beating-up motion, the condition that the angle of elevation of the lower edge 6 of the front side must be 45° or more is always satisfied. The angle of elevation is set to, for example, 110°.

[0031] Fig. 8 is a block diagram showing the structure of each moving unit 10 for moving the sound-deadening cover 3. Fig. 8 shows connections between a drive controller 22, a main controller 23, a solenoid valve 26, and manual switches 24 and 25. The drive controller 22 drives the solenoid valve 26 during the operation of the loom 2 in response to a loom stop signal output in the case of weft stop, warp stop, or manual stop. Accordingly, the sound-deadening cover 3 is automatically moved from

the sound-deadening position to the open position.

[0032] More specifically, when the main controller 23 of the loom 2 outputs the loom stop signal to the drive controller 22 while the loom 2 is being operated, the drive controller 22 switches the solenoid valve 26 so that a pressurized air source 27 supplies pressurized air to the actuator (air cylinder) 11 to move the actuator rod 13 upward. Accordingly, the sound-deadening cover 3 is moved to the open position, so that the yarn repair can be performed when the loom 2 stops.

[0033] After the loom 2 stops, the yarn repair is performed. Then, the operator manually operates the manual switch 24 before or after restarting the loom 2, so that the solenoid valve 26 is switched and the pressurized air source 27 supplies pressurized air to the actuator (air cylinder) 11 to move the actuator rod 13 downward. Accordingly, the sound-deadening cover 3 returns to the sound-deadening position. Instead of the operation of the manual switch 24, the sound-deadening cover 3 may also be moved to the sound-deadening position in response to a loom operation signal output from the main controller 23 when the operation of the loom 2 starts.

[0034] In this example, the manual switch 25 is provided to move the sound-deadening cover 3 upward to an arbitrary position or to the open position during the operation of the loom 2 as necessary. After the sound-deadening cover 3 is moved upward to the arbitrary position or the open position, it is moved downward back to the sound-deadening position by the operation of the manual switch 24.

[0035] The moving unit 10 may also include an electric motor as the actuator 11 instead of the air cylinder. In such a case, rotation of the electric motor is converted into a vertical linear movement using a rack and a pinion, and the sound-deadening cover 3 is moved vertically while being guided by a guiding member together with the rack. Alternatively, the moving unit 10 may also include a fixed or detachably attached manual handle for rotating a pinion and the sound-deadening cover 3 may be moved vertically while being guided by a guiding member together with a rack which meshes with the pinion. In addition, the sound-deadening cover 3 may also swing upward and downward instead of moving linearly. Also in this case, the front side or the back side of the sound-deadening cover 3, which obstructs the repair process, must be moveable to the open position. In addition, a complex mechanism including two swing centers is required, one of the swing centers being selected depending on the region where repair is required while the other is canceled. However, this structure is advantageous in the case in which interference with an auxiliary device of the loom 2 occurs.

[0036] The loom 2 is not limited to the air jet loom, and the present invention may also be applied to water jet looms and other kinds of looms.

Claims

1. A sound-deadening device (1) for a loom, the sound-deadening device (1) comprising a sound-deadening cover (3) which has front, back, right, left, and top sides, which is open at the bottom, and which is moveable between a sound-deadening position and an open position above the sound-deadening position, wherein the sound-deadening device (1) is **characterized in that** when the sound-deadening cover (3) is at the sound-deadening position, the sound-deadening cover (3) covers an upper portion of a group of heald frames (4), and the angle of elevation of a lower edge (6) of the front side of the sound-deadening cover (3) from a cloth fell (5) is 45° or more.
2. The sound-deadening device (1) for the loom according to Claim 1, further comprising a moving unit (10) for pushing a bottom surface of the sound-deadening cover (3) upward, the sound-deadening cover (3) being linearly moved upward and downward by the moving unit (10).
3. The sound-deadening device (1) for the loom according to Claim 2, wherein the moving unit (10) becomes engaged with the sound-deadening cover (3) to maintain the sound-deadening cover (3) at the open position, and the sound-deadening cover (3) becomes disengaged from the moving unit (10) by being placed on a loom frame (9) at the sound-deadening position.
4. The sound-deadening device (1) for the loom according to one of Claims 2 and 3, wherein the moving unit (10) includes a drive controller (22) which moves the sound-deadening cover (3) to the open position in response to a loom stop signal.

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FIG.1

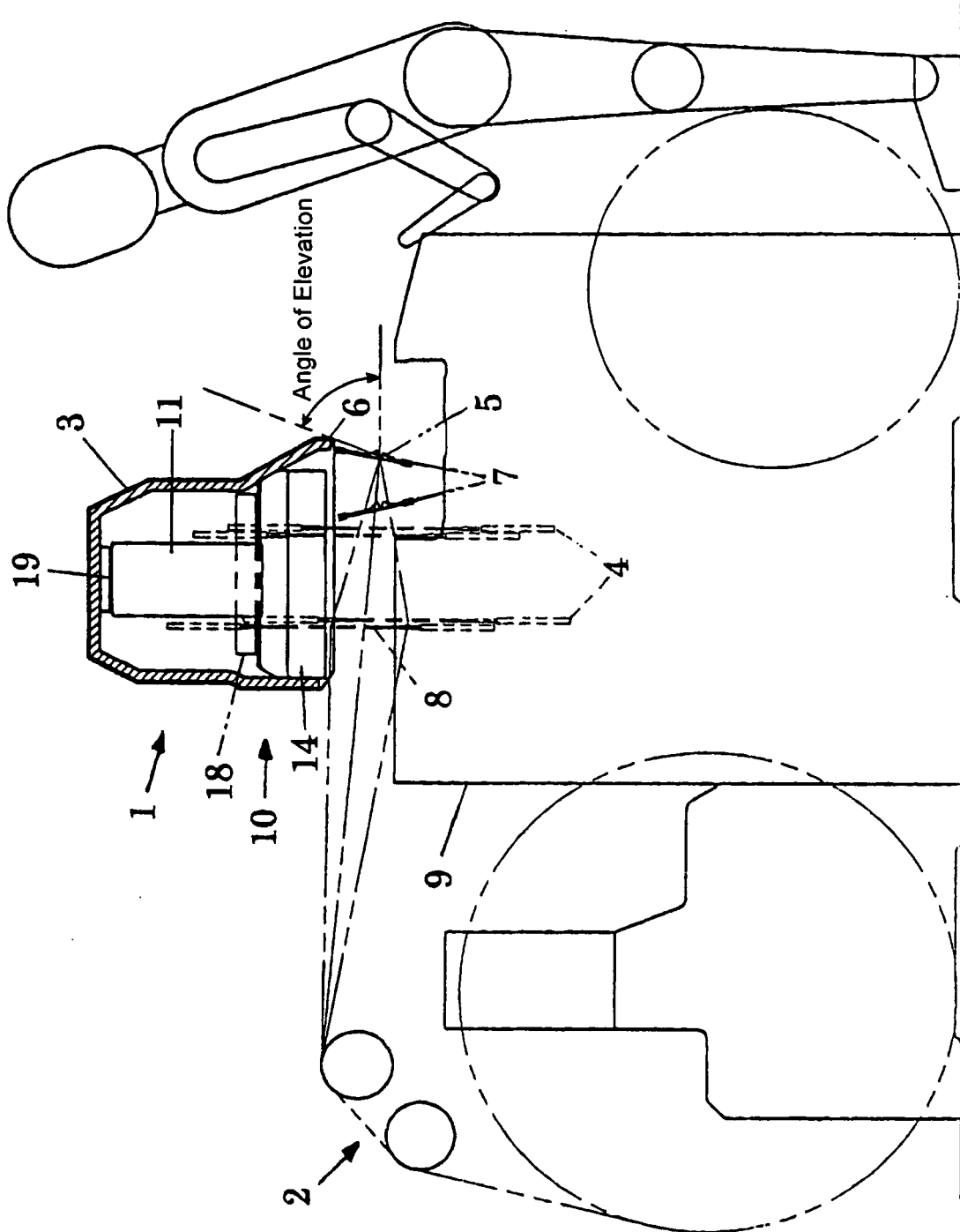


FIG.2

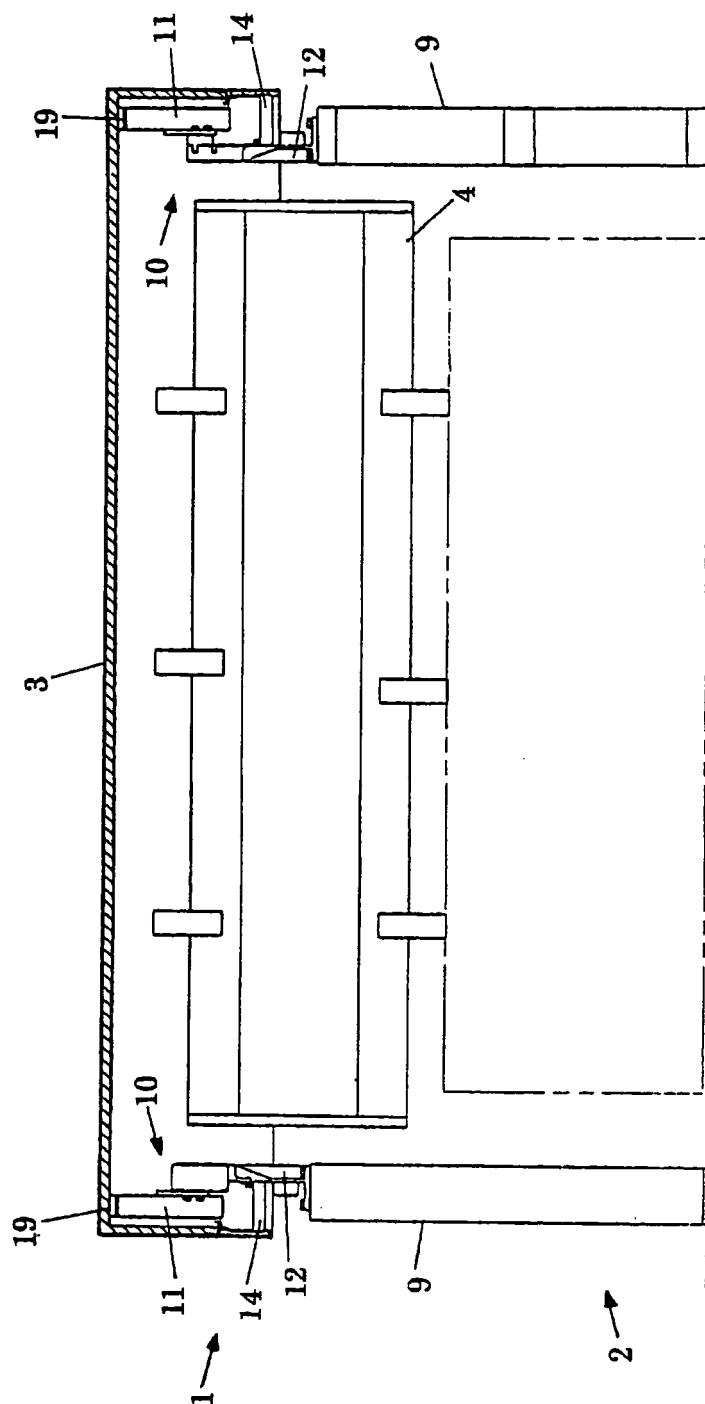


FIG.3

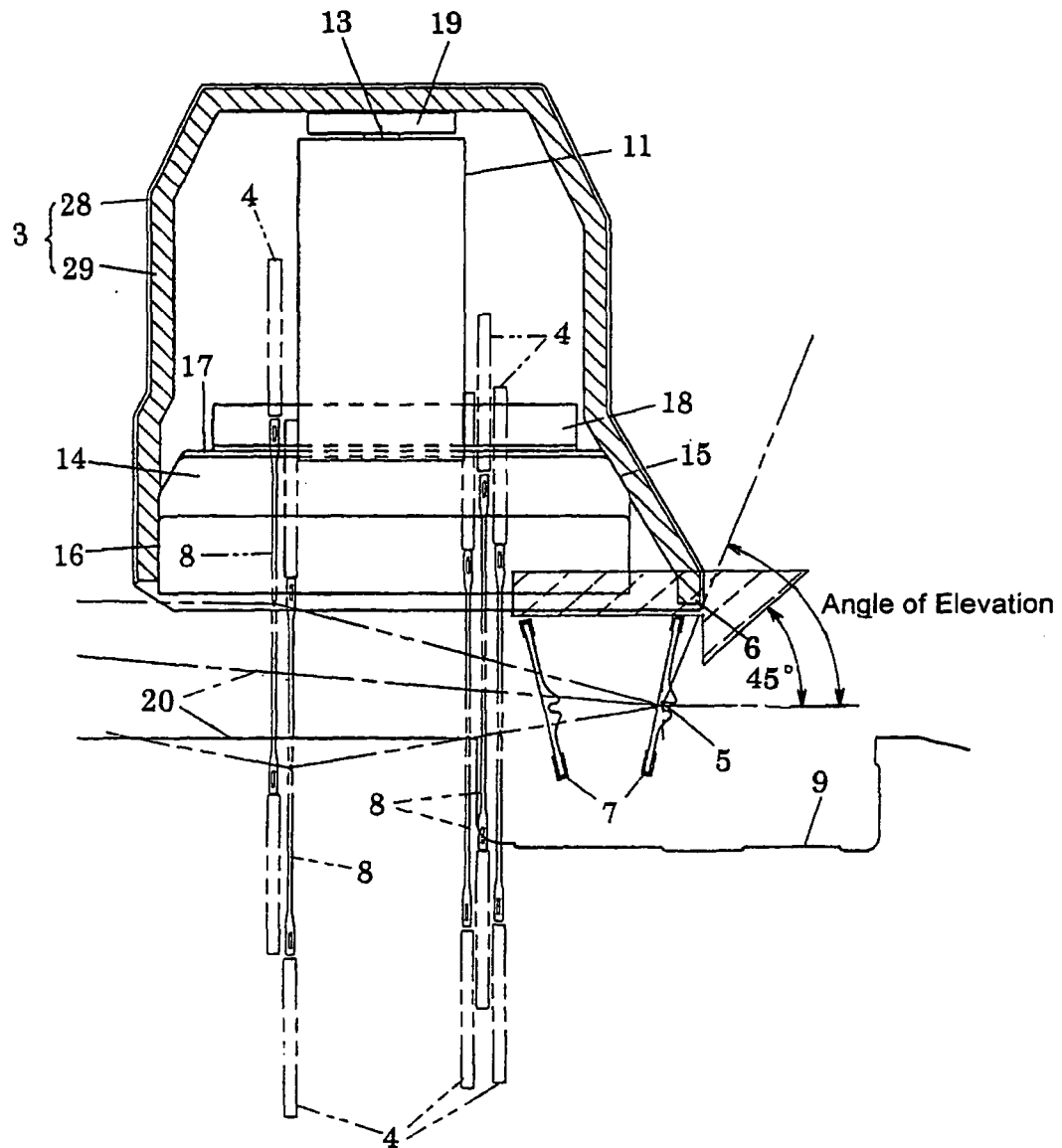


FIG.4

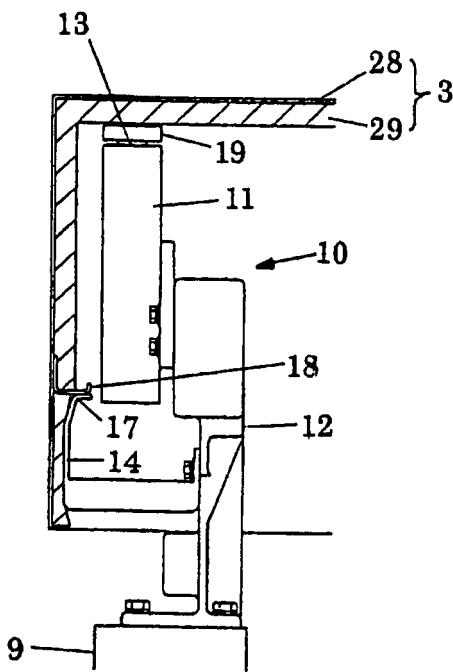


FIG.5

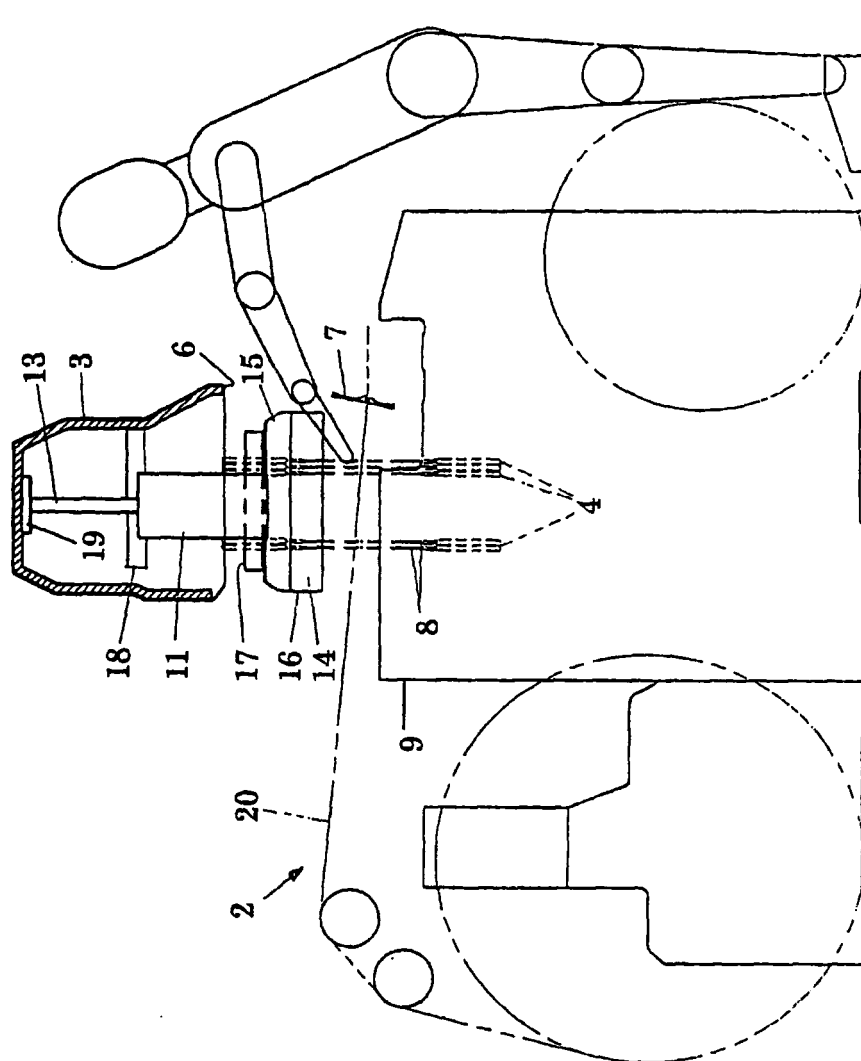


FIG.6

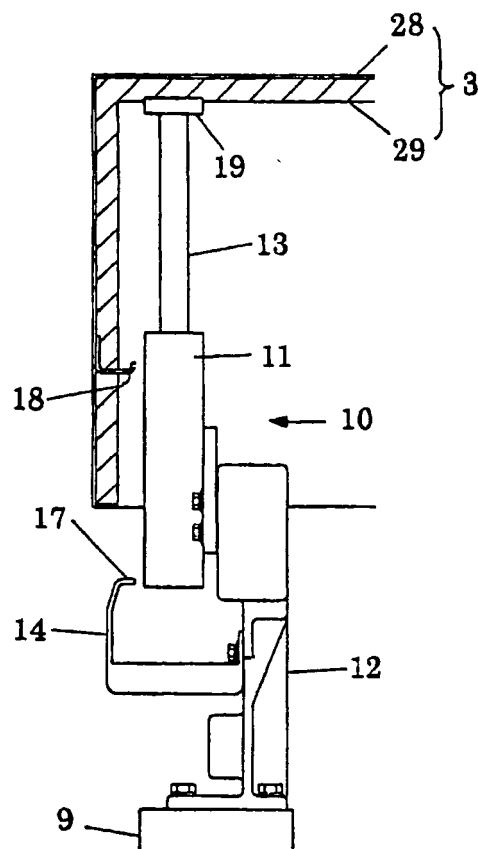


FIG.7

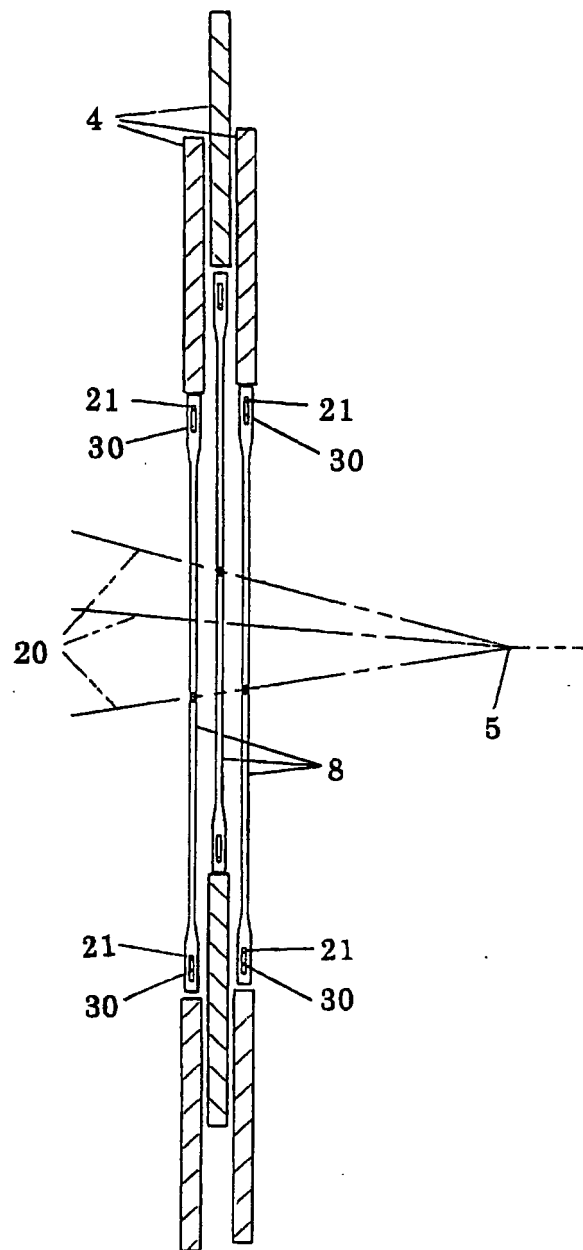


FIG.8

