No. 842,274.

PATENTED JAN. 29, 1907.

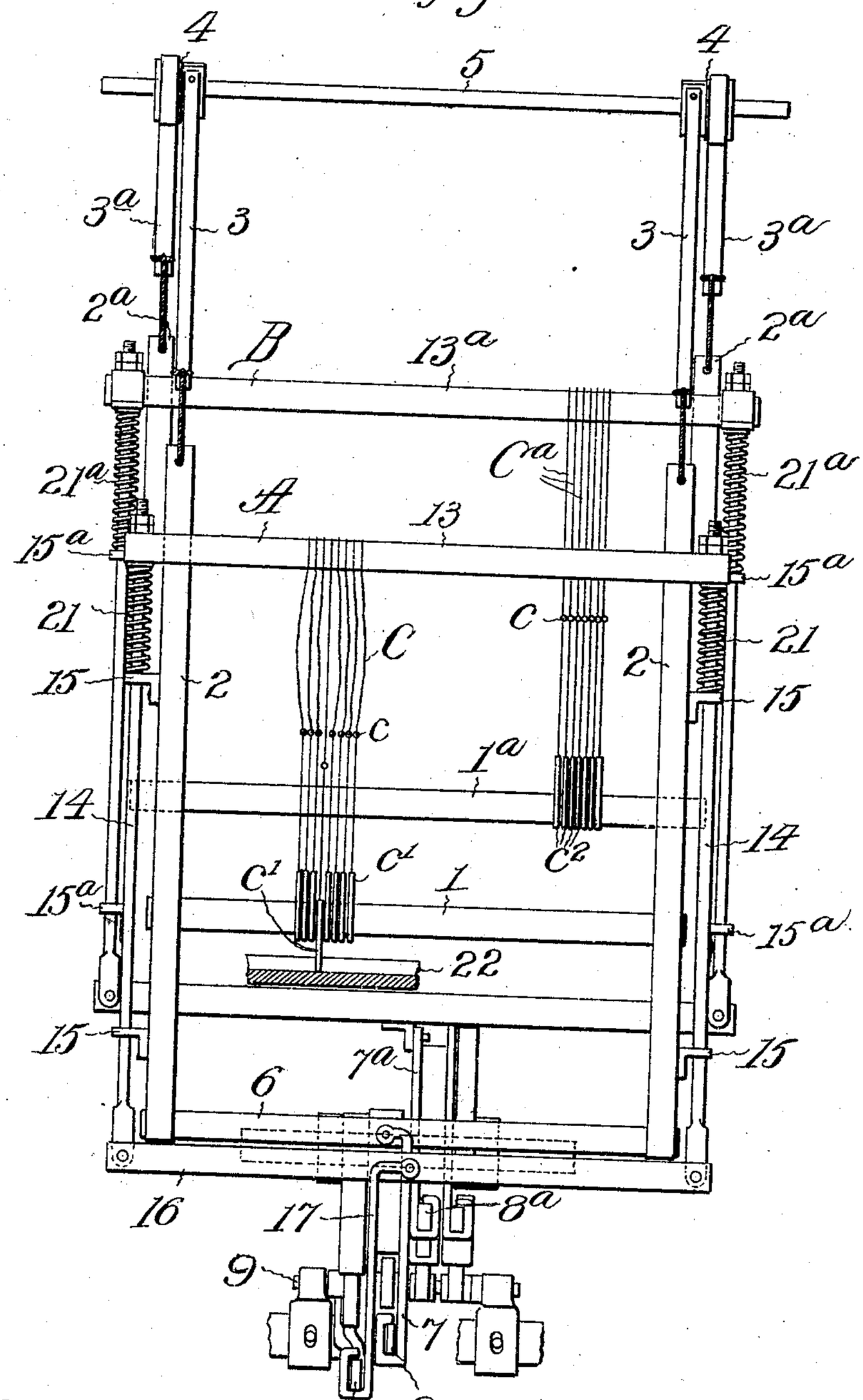
S. TOYODA.

WEAVING MACHINE.

APPLICATION FILED MAY 13, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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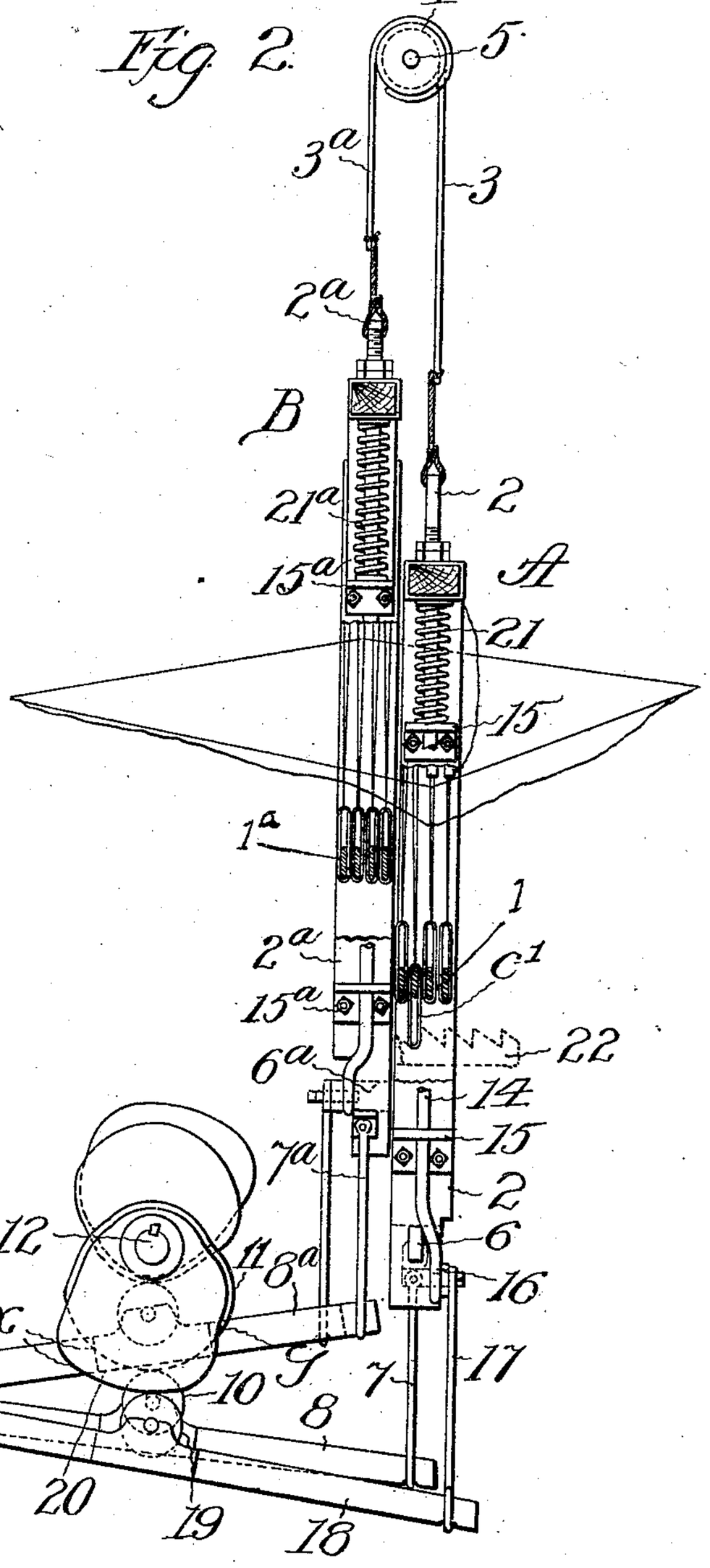
2 SHEETS—SHEET 2.

Fig 2.



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SASUKE TOYODA, OF NAGOYA, JAPAN.

WEAVING-MACHINE.

No. 842,274. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed May 13, 1905. Serial No. 260,349.

To all whom it may concern:

Be it known that I, SASUKE TOYODA, a subject of the Emperor of Japan, residing at No. 15 Nishi-Shinmachi, Nagoya, Empire of Japan, have invented certain new and useful Improvements in Weaving-Machines, of which the following is a full, clear, and exact specification.

My invention relates to improvements in weaving-machines, and has to do more particularly with an improved construction of the heddle-frames and means for operating the same.

In constructions now in use where the heddle-cords are slack throughout the entire reciprocation of the frame the entire weight of the loops and rings are carried by the warp-threads and the constant vibration and oscillation of the rings during the reciprocating movement creates an inertia which combined with the weight of the cords causes a sufficient degree of friction upon the weaker warp-threads to break the same. This defect is especially troublesome in weaving fabrics of cheaper grades when the speed of operation of the machine is increased. Furthermore, the strain upon the warp-threads is greater when the sheds are being opened and during vertical movement of the frames than it is when the frames have reached either limit of movement.

By my improved construction the weight of the cords is entirely sustained by the heddle-frame substantially throughout the travel thereof, or, in other words, until the respective sheds are completely opened, whereupon each warp-thread sustains merely the weight of its respective cord, the inertia of the cords being completely neutralized by stoppage of the frame before the weight of said cords has been thrust upon the warp-threads. By means of my improved construction the very highest practical speed may be attained in weaving the cheapest fabric without proportionately increasing the liability of breaking the warp-threads. This result is attained by momentarily slackening the tension of the heddle-cords at a prescribed point in the reciprocation of the frames, which point is preferably at the time the shed is completely open, causing the weight of the heddle-cords from the heddle-rings downwardly to be thrust upon the warp-threads which are intact, the broken or weaker warp-threads permitting their respective ends to sag.

My invention will be more fully set forth in the accompanying drawings and will be more particularly pointed out in the appended claims.

In the drawings, Figure 1 shows in front elevation two coöperating heddle-frames and actuating devices therefor, the same being shown detached from the frame of the machine. Fig. 2 is a view in side elevation of the device shown in Fig. 1 with parts broken away.

There is shown in Figs. 1 and 2 a single pair of reciprocating heddle-frames A and B. Each of said frames is provided with heddle-cord-engaging members which are independently movable. The said independently-movable members are each provided with independent actuating means for moving them throughout the major portion of their reciprocation in unison and momentarily producing a further movement of the upper members when movement of the lower members has been concluded to slacken the cords. The independently-movable members of each frame are also yieldingly connected with each other in a manner to uniformly stretch all of the cords of the frames and to normally permit slackening of the cords at prescribed points. Each of the coöperating frames A and B, as shown, are similar in all respects, and similar ordinals for like parts thereof will be used, those applied to the frame B being distinguished by exponent "a."

One specific embodiment of the invention consists in the provision of a rectangular frame having a lower U-shaped structure provided with a heddle loop-bar 1 and side suspending bars 2 2. Said suspending bars are secured by supporting-leathers 3 3 to pulleys 4 4, rigidly secured on an oscillating shaft 5. As will be seen by reference to Fig. 2, the leathers 3 and 3^a are trained about the pulleys 4 in opposite directions. The suspending bars 2 2 extend below the loop-bar 1 and are connected by a link-bar 6. A connecting-link 7, secured to said bar 6 at one end, is connected at its other end with the outer end of a cam-lever 8, the latter being

pivoted at 9 upon any suitable stationary part of the frame structure. The lever 8 is provided with a cam-roller 10, engaging a cam 11, rigidly mounted on a main actuating cam-shaft 12. The upper heddle-bar 13, between which and bar 1 heddle-cords C are hung, is connected at its opposite ends with spring-actuated rods 14, extending downwardly through guides 15 on bars 2 and being connected at their lower ends by a link-bar 16. Said bar 16 is connected by a link 17 with a cam-lever 18, pivoted at 9. Said cam-lever 18 is provided between its ends with a roller 19, which engages a cam 20, rigidly secured to the cam-shaft 12. The cams 11 and 20 at points farthest remote from the shaft 12 are of unequal radii, cam 20 projecting a greater radial distance from the shaft 12 than cam 11 at points *x*, at which time the frame A will have reached a downward limit of its travel. It will be obvious that as the cam-levers of the frames A and B are below their respective actuating-cams the latter may be turned with the pulleys 4 on the oscillating shaft 5, so that frame A will be forced to descend at the same time that frame B ascends.

Next referring particularly to the construction whereby the heddle-cords C of each frame are held taut, the same is desirably as follows: Expansively-acting coil-springs 21 are interposed between the upper guides 15 and the outer ends of the heddle-bars 13. It will be seen from Fig. 1 that each of the springs 21 bear at their opposite ends against the independently-movable members of the frames, serving thereby to yieldingly hold the heddle-bars 13 and 1 a sufficient distance apart to tightly stretch the heddle-cords C. Said springs maintain the bars in this prescribed relation, excepting when the frames reach a lowermost position, whereupon the peculiar shape of the cam gives the bars 13 a slight increased downward movement after the travel of the bar 1 has been completed. This increased travel of the bars 13 is effected against the action of springs 21, said bars being immediately restored to their former position when the frame starts upon its upward travel. When the frames A and B reach the extreme limit of their travel and the sheds are parted for the passage of the bobbin, the lower frame A will momentarily cease its downward travel when the roller 19 reaches the point *y* in the cam 20. Each of the threads of the shed which are intact remain in the aforesaid position of their extreme travel. The slight cessation of travel of the frame completely neutralizes the inertia of the cords C, whereupon a further downward movement of the bar 13 will be effected. This further movement of the bar 13 is not accompanied by a corresponding downward movement of the warp-threads, the latter ceasing their downward movement when the bar 1 stops. Thus at this point each intact thread of the lower shed will support its respective cord from the warp-rings *c*, including the loops c' c^2, the upper portions of the cord being slackened by the further downward movement of the bar 13 and being supported thereby. Any of the warp-threads of the lower sheds which are not intact or which have been unduly stretched will permit its respective loop c' to sag, as shown in Figs. 1 and 2, this sagging of the loop being permitted by the fact that each of said loops are elongated with respect to the vertical width of the bar 1.

I claim—

1. In a weaving-machine the combination of a reciprocating heddle-frame comprising upper and lower independently-movable heddle-bars, heddle-cords connecting said bars, and mechanism reciprocating the bars in unison and serving at a predetermined point to momentarily move one of the bars toward the other to slacken said cords.

2. In a weaving-machine the combination of a reciprocating heddle-frame comprising upper and lower independently-movable heddle-bars, heddle-cords connecting said bars, cams operating said upper and lower bars in unison, said cams serving to bring one of said bars toward the other and slacken said cords at a predetermined point.

3. In a weaving-machine the combination of a reciprocating heddle-frame comprising upper and lower independently-movable heddle-bars, heddle-cords connecting said bars, yieldingly-acting mechanism for said bars normally holding the cords taut, and mechanism reciprocating the bars in unison and serving at a predetermined point to momentarily move one of said bars toward the other to slacken said cords.

4. In a weaving-machine the combination of a reciprocating heddle-frame comprising upper and lower independently-movable heddle-bars, heddle-cords connecting said bars, springs interposed between said bars serving to stretch said cords, cams operating said upper and lower bars in unison, said cams being formed to bring one of said bars toward the other and slacken the cords at a predetermined point.

5. In a weaving-machine the combination with a reciprocating heddle-frame comprising lower and upper heddle-bars, heddle-cords connecting said bars, a cam for operating said lower bar, a cam for operating said upper bar, springs normally holding said bars apart to tighten said cords, said cams being formed to reciprocate the bars in unison and cause the upper bar to move toward said lower bar at a predetermined point.

6. A weaving-machine provided with a reciprocating heddle-frame comprising independently-movable heddle-bars, heddle-cords connecting said bars and means for operating said bars in unison.

7. A weaving-machine provided with a reciprocating heddle-frame comprising independently-movable heddle-bars, and means for operating said bars in unison, said means serving at predetermined points to vary the operation of said bars.

In testimony whereof I affix my signature in presence of two witnesses.

SASUKE TOYODA.

Witnesses:
UHACHI ISHIWARA.
R. S. MILLER.