

- [54] **SHUTTLE BOX FOR LOOMS**
- [75] Inventors: **Charles E. Benedict**, Tallahassee;
Calvin C. Oliver, Gainesville, both
of Fla.
- [73] Assignees: **Wayne H. Coloney Co., Inc.**,
Tallahassee; **Controlled Acoustics,
Inc.**, Gainesville, both of Fla.
- [22] Filed: **Feb. 11, 1974**
- [21] Appl. No.: **441,706**
- [52] U.S. Cl. **139/185; 139/183**
- [51] Int. Cl.² **D03D 49/54**
- [58] Field of Search **139/183, 185**

3,258,036 6/1966 Butler 139/185
3,698,445 10/1972 Travis 139/185
3,807,461 4/1974 Moren 139/185

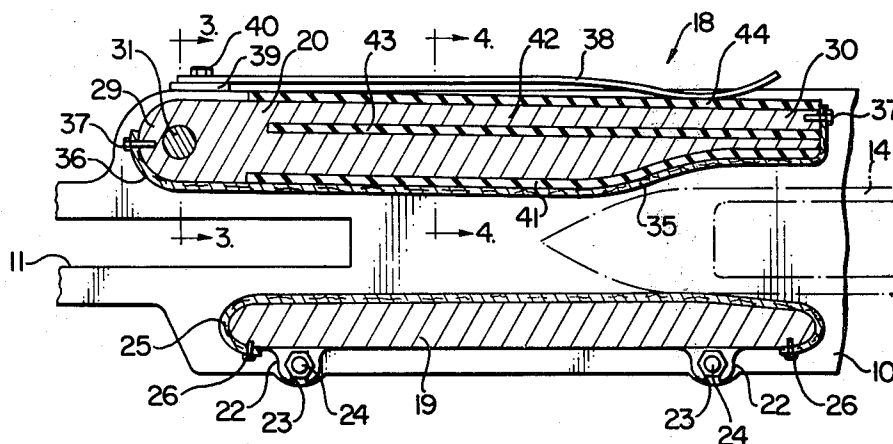
Primary Examiner—Mervin Stein
Assistant Examiner—Steven Hawkins
Attorney, Agent, or Firm—A. Yates Dowell, Jr.

[57] **ABSTRACT**

Shuttle box apparatus for decelerating the shuttle of a fly-shuttle loom and for reducing impact related noise emanating from such box. The shuttle box includes a shuttle binder and box front wherein at least the binder has internal acoustic damping material providing an impedance mismatch or elastic discontinuity to reduce the transmission of acoustic vibrations through the same and both the binder and the box front have external acoustic damping material on the surfaces which normally are in contact with air for suppressing noise vibrations therefrom.

1 Claim, 5 Drawing Figures

- [56] **References Cited**
- UNITED STATES PATENTS**
- | | | | |
|-----------|---------|---------------|---------|
| 550,596 | 12/1895 | Cowgill | 139/185 |
| 2,082,918 | 6/1937 | Turner | 139/183 |
| 2,120,144 | 6/1938 | Emmons | 139/185 |



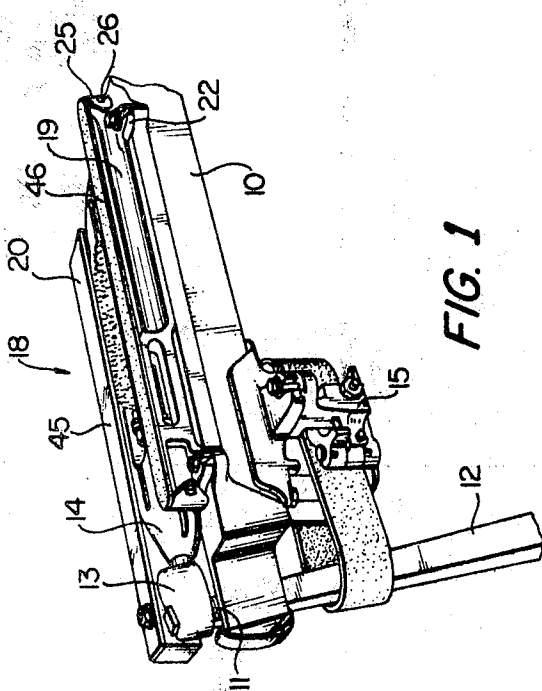


FIG. 1

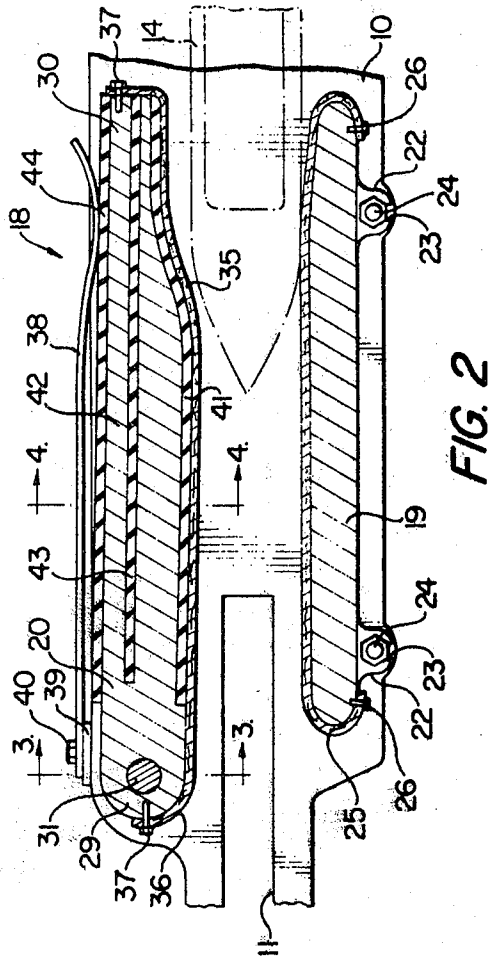


FIG. 2

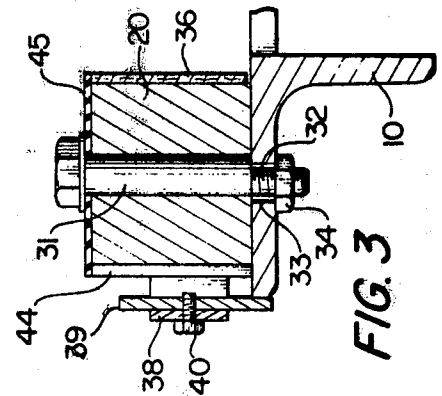


FIG. 3

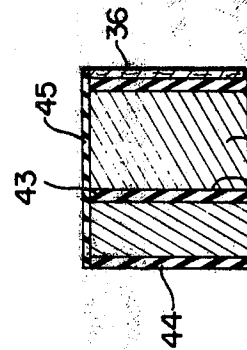


FIG. 4

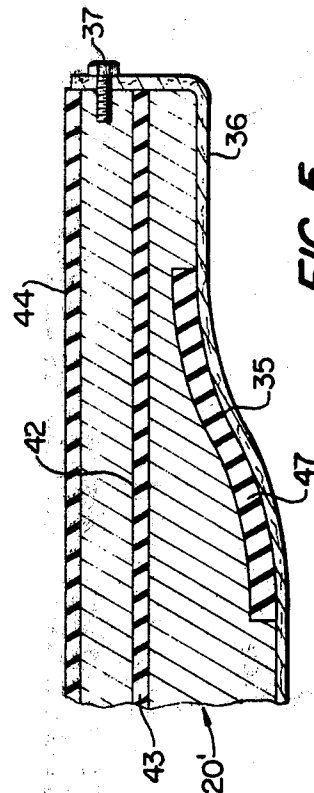


FIG. 5

SHUTTLE BOX FOR LOOMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to weaving looms of various kinds and relates particularly to fly-shuttle looms having a lay with a shuttle box mechanism at each end which catches and decelerates a shuttle after the shuttle has been thrown from one end of the lay to the other.

2. Description of the Prior Art

Heretofore, fly-shuttle looms have included a movable lay with a multiplicity of warp threads thereover which extend from the front to the rear of the loom. The warp threads are independently raised and lowered by hettles in such a manner that certain of the hettles are in an upper position, while other hettles are in a lowered position. A shuttle carrying a bobbin of weft or filler thread is thrown by a picker stick from one end of the lay to the other where the shuttle enters a shuttle box and is brought to a halt in engagement with another picker stick. As soon as the shuttle is boxed, some or all of the raised hettles are lowered while some or all of the lowered hettles are raised and the shuttle is thrown back across the lay. This operation is relatively fast and normally operates at approximately three picks or shuttle traverses per second. In order to maintain this speed, the shuttle must attain a velocity in excess of 500 feet per second with the result that the shuttle contacts the shuttle box with substantial impact resulting in noise vibrating from the surfaces in contact with the air. In this sense, the term "noise" embraces those sounds which are audibly unpleasant by virtue of their loudness, pitch, or quality.

Some efforts have been made to provide a shuttle box which catches and decelerates the shuttle and which includes apparatus which inherently damps out at least some sound vibrations so that the noise level is reduced. Some examples of the prior art are the U.S. Pat. Nos. to Davis 446,113; Emmons 2,120,144; Pfarrwaller 2,271,205; Kronoff 2,528,150; Herard et al. 3,014,505; Kronoff 3,096,794; and Sundquist, Jr. 3,403,708.

SUMMARY OF THE INVENTION

The present invention is a shuttle box which is located at each end of the lay in a position to catch the shuttle of a fly-shuttle loom. Each shuttle box includes a shuttle binder and a box front having an inner facing of leather or the like which frictionally engages the opposite sides of a shuttle for causing the shuttle to be uniformly decelerated and stopped in a space which usually is no longer than the length of the shuttle. The box front normally is mounted in a fixed position to guide the shuttle into engagement with the picker stick and the binder is urged toward the box front by a resilient member so that the space between the binder and the box front is less than the width of the shuttle when the shuttle is not in the box. When the shuttle strikes the binder and box front, the binder is moved away from the box front and impact related noise vibrations are introduced into the binder and box front and such vibrations are transmitted to the surfaces in contact with air so that such surfaces are excited. Since the binder is located in the path of travel of the shuttle, such binder receives most of the impact force. In order to substantially reduce impact related noise vibrations,

the binder is provided with internal acoustic damping material providing an impedance mismatch or elastic discontinuity to interrupt and substantially reduce the transmission of vibrations through the same and both the binder and the box front are provided with external acoustic damping material along the surfaces which are in contact with the air to suppress noise vibrations which reach such surfaces, particularly vibrations in the frequency range of 1 KHZ to 5 KHZ.

It is an object of the invention to provide a shuttle box which decelerates and stops a shuttle and which reduces or eliminates impact related sound vibrations to reduce the overall noise level of a fly-shuttle loom.

Another object of the invention is to provide a shuttle box having a binder and box front each of which has external acoustic damping material to suppress sound vibrations which reach the surfaces thereof and at least the binder has internal acoustic damping material to interfere with or interrupt the transmission of sound vibrations therethrough.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective illustrating one application of the invention.

FIG. 2 is an enlarged horizontal section of the shuttle binder and box front per se mounted on one end of a lay.

FIG. 3 is an enlarged section on the line 3—3 of FIG. 2.

FIG. 4 is an enlarged section on the line 4—4 of FIG. 2.

FIG. 5 is an enlarged vertical section of one end of another embodiment of the binder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With continued reference to the drawing, a fly-shuttle loom includes a lay 10 which is adapted to be reciprocated back and forth toward the front and rear of the loom and such lay has a slot 11 at each end in which a picker 12 is movably mounted. A picker head 13 is fixed to the upper end of each picker stick 12 and such pick head is adapted to engage one end of a shuttle 14. A conventional check strap mechanism 15 may be mounted beneath each end of the lay 10 to assist in the operation of the picker stick as is conventional in the art. The picker stick 12 has a drive mechanism (not shown) which forces the upper end of the picker stick and the pick head from the outer end of the slot 11 toward the inner end thereof and causes rapid acceleration of the shuttle 14 so that the shuttle is thrown from one end of the lay 10 to the other.

A shuttle box 18 is located at each end of the lay in a position to catch the shuttle and cause rapid substantially uniform deceleration thereof so that the shuttle strikes the pick head with only enough force to help cock the picker stick 12 while the shuttle and pick head remain in intimate engagement. In order to do this, the shuttle box 18 includes a box front 19 and a spaced generally parallel binder 20. A portion of the binder 20 normally is spaced from the box front 19 a distance less than the width of the shuttle when the shuttle is out of the box but such portion is movable outwardly to permit the shuttle to enter the box.

The box front 19 normally is constructed of hard wood or an aluminum alloy and has a pair of outwardly extending lugs 22 along its lower edge and adjacent op-

posite ends thereof. Such lugs have slots 23 which adjustably receive fasteners 24 by means of which the box front 19 is mounted in fixed adjusted position on the lay 10. The box front has a strip or coating of frictional material such as leather or the like 25 disposed along the shuttle engaging surface in a position to frictionally engage the shuttle 14 and decelerate the same. The strip 25 is removably mounted on the box front in any desired manner, as by screws 26; however, it is contemplated that such strip could be mounted in any other conventional manner as by adhesives, clamps, or the like. The box front 19 normally is mounted on the lay 10 in such a position that when the side of the shuttle 14 engages the leather strip 25, the longitudinal axis of the shuttle is substantially in alignment with the longitudinal axis of the pick head 13.

The binder 20 normally is constructed of hard wood or an aluminum alloy and such binder has an outer end 29 and a reduced inner end 30 or an inner end which is curved away from the path of travel of the shuttle 14. The outer end 29 of the binder is movably mounted on the lay 10 in any desired manner, as by a cam bolt 31. As illustrated best in FIG. 3, the bolt 31 has a reduced eccentric portion 32 rotatably mounted in an opening 33 extending through the lay 10. The outer end of the reduced portion 32 is threaded to receive a nut 34. By loosening the nut and rotating the bolt 31, the outer end of the binder can be moved toward and away from the box front 19 to adjust the space between the binder and the box front to frictionally bind the shuttle between the same.

The inner surface of the binder 20 which faces the box front 19 has an angularly disposed portion 35 connecting the main portion of the binder to the reduced inner end 30 in such a manner that the shuttle normally engages the angularly disposed portion as it enters the shuttle box, as illustrated in FIG. 2. The inner surface of the binder including the angularly disposed portion 35 and the reduced end 30 normally is covered by a strip or coating of frictional material such as leather or the like 36. The strip 36 is removably mounted on the inner surface of the binder in any desired manner, as by screws, clamps, adhesives or other attaching means 37.

In order to urge the inner free end of the binder 20 toward the box front 19, a spring or other resilient member 38 has one end mounted on a post 39 by a screw or other fastener 40 while the opposite end of such spring bears against the outer surface of the binder. If desired a stop (not shown) can be provided to limit the movement of the inner end toward the box front. As the shuttle 14 enters the shuttle box 18, such shuttle cams the inner end of the binder outwardly against the tension of the spring 38 so that opposite sides of the shuttle engage the leather strips 25 and 36 to frictionally decelerate the shuttle. Since the outer end 29 of the binder remains in fixed spaced relationship with the box front 19, the friction on the sides of the shuttle increases in a uniform manner as the shuttle proceeds through the shuttle box.

When the shuttle strikes the binder 20 with an impact force, impact related vibrations are induced in such binder which are transmitted to the surfaces in engagement with the air and cause noise, particularly in the frequencies between 1 KHZ and 5 KHZ. In order to interrupt the transmission of such vibrations, an inner layer 41 of acoustic absorbing material is mounted directly behind the leather strip 36 of the binder to ab-

sorb a substantial portion of the impact related vibrations and reduce the amount of vibrations transmitted to the binder.

As illustrated best in FIGS. 2, 4 and 5, an intermediate slot 42 extends from the inner end 30 of the binder through most of the length thereof and such slot is completely filled with an intermediate layer 43 of vibration absorbing material so that the interfaces between the layer 43 and the binder 20 are in direct communication with each other. The inner layer 41 and the intermediate layer 43 provide an impedance mismatch which substantially reduces or prevents the transmission of acoustic vibrations through the binder. It is noted that the inner layer 41 and the intermediate layer 43 can be made of the same acoustic damping material or such layers could be made of different materials capable of damping out different frequencies of vibrations.

It is recognized that certain acoustic frequencies may not be entirely damped by the inner and intermediate layers 41 and 43 and that some frequencies may be transmitted to the surfaces of the binder which normally are in contact with air. In order to suppress the noise vibrations which reach the outer surfaces of the binder, an outer layer 44 of acoustic damping material is bonded or otherwise adhered to the surface of the binder remote from the box front and an upper layer 45 of acoustic damping material is bonded or otherwise adhered to the top of the binder.

Although the binder 20 receives most of the impact related noise vibrations, the box front 19 receives some secondary noise vibrations due to the movement of the shuttle along the leather strip 25. Normally an upper layer 46 of acoustic vibration absorbing material on the upper surface of the box front 19 is sufficient to suppress noise emanating from the box front; however, if desired an outer layer (not shown) of acoustic vibration absorbing material could be attached to the back or outer surface of the box front.

With particular reference to FIG. 5, a binder 20' is provided which includes an inner layer 47 of acoustic vibration damping material located only in the area of the angularly disposed portion 35 of the binder since this is the area of impact with the shuttle 14. It is contemplated that the inner layers 41 and 47, as well as the intermediate layer 43, may include a single layer of material as shown or may include a plurality of layers with each layer damping out certain ranges of acoustic frequencies.

In the operation of the device when the shuttle 14 is thrown from one end of the lay, the shuttle travels across the lay and enters the shuttle box at the opposite end. Upon entering the shuttle box, the shuttle strikes the binder with a substantial impact and causes the inner free end of the binder to move away from the path of travel of the shuttle against the tension of the spring 38. Continued inward movement of the shuttle into the shuttle box causes the sides of the shuttle to frictionally engage the leather strips 25 and 36 carried by the box front and the binder, respectively, to decelerate the shuttle. During the initial movement the frictional engagement is controlled by the tension of the spring 38. However, as the shuttle continues to move inwardly, frictional resistance is substantially increased since the outer end of the binder cannot move away from the box front. Impact related noise vibrations which occur when the shuttle strikes the binder and moves along the facing surfaces of the binder and the

box front, are damped by the inner and intermediate layers 41 and 43 of acoustic vibration damping material so that most of the impact related vibrations are not transmitted through the binder 20. Most of the remaining vibrations which are transmitted are suppressed by the outer layer 44 and the upper layers 45 and 46 so that few if any vibrations are transmitted to the air surrounding the shuttle box.

We claim:

1. In a shuttle box carried by the lay of a fly-shuttle loom and including a box front with frictional material mounted on one surface thereof, and means for mounting said box front in fixed adjusted position on said lay, the improvement comprising an elongated binder swingably mounted at one end in spaced relationship to said box front, resilient means urging the opposite end of said binder toward said box front, frictional material mounted on said binder on the side facing said box front, a first layer of acoustic vibration absorbing material carried by said binder behind and in engagement

with said frictional material, an elongated generally vertically disposed slot extending inwardly from the opposite end of said binder more than one-half the length thereof, a second layer of acoustic vibration absorbing material completely filling said slot so that the interfaces between said slot and said second layer are in direct engagement, a third layer of acoustic vibration absorbing material mounted on the side of said binder opposite said frictional material, said first, second and third layers extending the full height of said binder, and a fourth layer of acoustic vibration absorbing material fixed to the upper surface of said binder, whereby said first and second layers of acoustic vibration absorbing material provide an impedance mismatch to resist the transmission of impact related vibrations through said binder and said third and fourth layers of acoustic vibration absorbing material suppress acoustic vibrations which reach the rear and upper surfaces of said binder.

* * * * *

25

30

35

40

45

50

55

60

65