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(54) Machine with multiple beating plates for softening and stretching industrial hides and the like.

(57) A machine with multiple beating plates for softening and stretching industrial hides and the like including conveyor belts (3,4) for advancing the hides between a plurality of upper beating plates (6, 6'') which face an equal number of lower beating plates (7', 7'') adapted to form adjacent pairs in the hide advancement direction. Each plate is provided with protrusions (10', 10'') adapted to cooperate with complementary recesses (11', 11'') defined on the opposite plate. Each pair of facing plates includes a movable plate and a fixed plate. Motors (M', M'') alternatively move each movable plate toward and away from the respective fixed plate. Synchronization pulleys (21', 21'') are provided which act on the motors in order to equalize the oscillation frequencies of the adjacent movable plates.

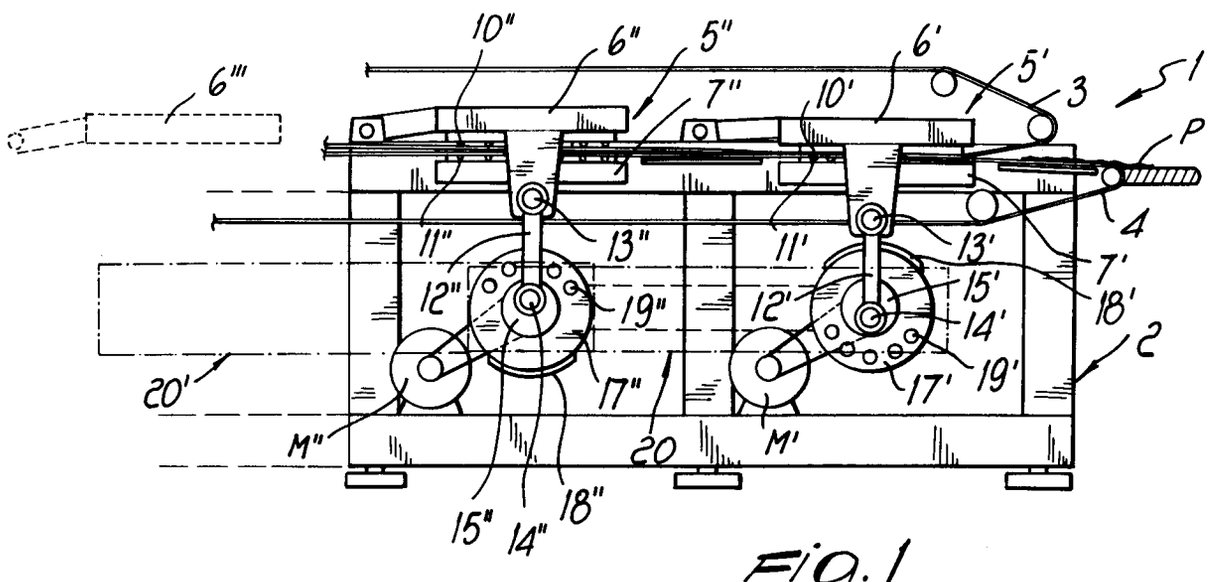

Fig. 1

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The present invention relates to a machine with multiple beating plates for softening and stretching industrial hides and the like, of the type which comprises hide advancement means interposed between a plurality of upper beating plates which face an equal number of lower beating plates so as to form adjacent pairs of plates in the hide advancement direction. In each pair of facing plates, one of the plates is fixed and the other one is movable; the movable plate moves alternatively toward and away from the facing fixed plate by virtue of adapted motor means. In a per se known manner, each plate is provided with protrusions which are adapted to cooperate with complementary recesses defined on the opposite plate.

These machines produce the stretching of the fibers of the hides, a process known as perching, which is used to restore the softness and flexibility of the hides after drying them.

The Italian patent No. 883012, in the name of the same Applicant describes a perching machine having a single pair of beating plates. In order to increase the capacity and productivity of this known machine, multiple beating plates, arranged one after another in the hide advancement direction, have subsequently been used. An electric motor for each individual beating plate has also been used in order to limit the power and bulk of the installed motors.

Machines of this type offer the advantage of considerable functionality and high productivity, but are not free from some acknowledged problems. In fact, although the electric motors used to actuate each beating plate are identical, they differ in rotation rate and maximum delivered power, and therefore it is not possible to ensure strictly identical oscillation frequencies for the various beating plates. Furthermore, due to the oscillating motion of the plates, the supporting frame of the machine as a whole is subjected to considerable vibrations which are only partially damped by eccentric masses and vibration-damping supports. Because of the difference in oscillation frequency, the plates tend to progressively lose their synchronization until they are periodically in the same phase even if they are initially set in phase opposition. The machine is thus periodically subjected to a resonance peak accompanied by a sharp jolt and by a certain noise.

This resonance can cause damage to the machine's supporting structure after sometime, especially at the welded joints, with a consequent reduction in the average life and sometimes with the need for repairs and interruptions of the machine's operation.

A further negative consequence of this resonance is constituted by the limitation of the maximum frequency of the oscillation of the beating plates around values of approximately 550-570 beats per minute, in order to prevent dangerous vibrations in the structure of the machine.

The aim of the present invention is to eliminate the problems described above by providing a perching machine with multiple beating plates which has high characteristics of reliability and productivity, as well as of maximum quietness and uniformity in operation.

Within the scope of the above aim, a particular object of the invention is to provide a perching machine with multiple beating plates which prevents resonance during the oscillation of the beating plates.

A further object of the present invention is to provide a perching machine with multiple beating plates which can use higher oscillation frequencies than previous ones without thereby causing resonance.

This aim, these objects and others which will become apparent hereinafter are achieved by a perching machine with multiple beating plates for industrial hides and the like, comprising a supporting frame, said supporting frame supporting means for the advancement of the hides, a plurality of upper beating plates, said upper beating plates facing respective lower beating plates so as to form adjacent pairs of plates in the hide advancement direction, each of said plates being provided with protrusions adapted to cooperate with complementary recesses, said recesses being formed on an opposite of said plates, each pair of facing plates having a movable plate and a fixed plate, motor means being provided for acting on said movable plates in order to move said movable plates alternatively toward and away from the fixed plates, characterized in that it is provided with synchronisation means which act on said motor means in order to equalize the oscillation frequencies of the adjacent movable plates.

In a second aspect of the invention, the synchronization means are selected so as to keep the alternating movement of the adjacent plates constantly in phase opposition.

Further characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of the machine with multiple beating plates according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a partially sectional side view of a perching machine according to the invention;

Figure 2 is a view of a detail of the machine of Figure 1 located in the region delimited by the discontinuous line II;

Figure 3 is a view of a second embodiment of the detail of Figure 2.

With particular reference to Figure 1, a perching machine according to the invention, generally designated by the reference numeral 1, comprises a supporting frame 2 which is formed by strong steel beams and supports hide advancement means constituted by a pair of conveyor belts 3 and 4 which have adjacent portions in mutual contact in order to entrain hides P to be treated.

Pairs of beating plates, generally designated by the reference numeral 5, are arranged on opposite sides with respect to the adjacent portions of the belts 3 and 4. In the illustrated embodiment there are two pairs 5' and 5'', but their number can be increased according to the requirements in order to increase the productivity of the machine. In particular, each pair is constituted by an upper plate 6 and by a lower plate 7 which are arranged respectively on opposite sides with respect to the hides to be treated. The first pair of plates 5' is formed by an upper plate 6' which is arranged opposite to a lower plate 7', whereas the second pair 5'' is constituted by an upper plate 6'' which faces a lower plate 7''.

In a per se known manner, the upper plates 6' and 6'' are hinged by means of arms 8'and 8'' to supports 9' and 9'' which are mounted on the supporting frame 2. The upper plates 6' and 6'' are furthermore provided with protrusions 10' and 10'' which cooperate with complementary recesses 11' and 11'' defined in the lower plates 7' and 7''.

Motor means are provided for oscillating the movable plates 6' and 6'', for a selected extent and frequency, about the fulcrums 9 and 9'', so as to cause alternating approach and spacing with respect to the fixed plates 7' and 7'' in order to cause the mutual engagement and disengagement of the protrusions 10' and 10'' and of the recesses 11' and 11''. The motor means can be constituted by connecting rods 12 and 12'' which connect pivots 13' and 13'' to cranks 14' and 14''. Pivots 13' and 13'' are rigidly associated with the plates 6' and 6''. Cranks 14' and 14'' are rigidly associated with respective main shafts 15' and 15''. The shafts are rotatably mounted on the supporting frame 2 and are rotated by respective motors M' and M'' by means of adapted transmission belts 16' and 16''.

Advantageously, in order to equalize the operation of the machine, respective flywheels 17' and 17'' are fixed to each main shaft 15' and 15'' and are provided with eccentric masses 18' and 18''. Flywheels 17', 17'' may optionally be provided with lightening holes 19' and 19'' which are arranged so as to balance the movements of the plates and at least partially reduce the vibrations of the machine.

According to a peculiar characteristic of the invention, synchronization means 20 are provided which act on the motor means in order to equalize the oscillation frequency of the adjacent beating plates 6' and 6''.

Figure 2 illustrates a first embodiment of said synchronization means 20, which comprises a pair of toothed pulleys 21' and 21'' which are respectively keyed on the shafts 15' and 15'' and are mutually coupled by an adapted toothed belt 22. It is possible to provide a tensioning roller 23 in order to keep the toothed belt 22 constantly under tension. The pulleys 21' and 21'' are chosen with an equal diameter and an equal number of teeth, so that the transmission ratio between the shafts 15' and 15'' is 1:1. It is furthermore noted that the pulleys are angularly keyed on the shafts 15' and 15'' so as to keep the cranks 14' and 14'' strictly in phase opposition.

In the second embodiment illustrated in Figure 3, the synchronization means are constituted by a transmission shaft 24 on which terminal gears 25' and 25'' are keyed; said gears mesh with gears 26' and 26'' which are rigidly associated with the shafts 15' and 15''. In this case also, the transmission ratio is chosen equal to 1:1, with the cranks 14' and 14'' in phase opposition.

It is obviously possible to provide further synchronization means 20', indicated in broken lines in the left part of Figure 1, which are intended to also equalize the rotation frequencies of a third beating plate 6''', which is also schematically illustrated in broken lines in Figure 1.

In use, the rotation frequencies of the shafts 15' and 15'' and of any other main shafts are strictly identical, whereas the cranks are orientated so as to keep the oscillations of the beating plates 6', 6'' and 6''' in phase opposition during the operation of the machine.

In practice it has been observed that the machine according to the invention fully achieves the intended aim and objects, and in particular that it eliminates the resonance phenomena typical of previous multiple-plate machines. It has furthermore been possible to determine that the machine can operate at higher rates, with frequencies around 650 beats per minute, increasing productivity by approximately 20% without producing resonance phenomena.

The machine thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept defined by the accompanying claims. Thus, the transmission elements comprised in the synchronization means can be replaced with equivalent systems, such as Cardanic shafts and universal joints, or hydraulic or electronic transmissions, which are assumed to be within the scope of the claimed inventive concept. Instead of a plurality of motors connected to respective main shafts, it is furthermore possible to provide a single motor connected

to all the main shafts by means of appropriate transmission elements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Perching machine with multiple beating plates for industrial hides and the like, comprising a supporting frame, said supporting frame (2) supporting means (3 and 4) for the advancement of the hides, a plurality of upper beating plates (6' and 6''), said upper beating plates facing respective lower beating plates (7'and 7'') so as to form adjacent pairs (5' and 5'') of plates in the hide advancement direction, each of said plates being provided with protrusions (10' and 10'') adapted to cooperate with complementary recesses (11' and 11''), said recesses being formed on an opposite of said plates, each pair of facing plates having a movable plate and a fixed plate, motor means being provided for acting on said movable plates in order to move said movable plates alternatively toward and away from the fixed plates, characterized in that it is provided with synchronization means (20) which act on said motor means in order to equalize the oscillation frequencies of the adjacent movable plates.

2. Perching machine according to claim 1, characterized in that said synchronization means (20) are adapted to keep the alternating movement of the adjacent plates (6' and 6'') constantly in phase opposition.

3. Perching machine according to claim 1, characterized in that said motor means comprise, for each movable plate (6' and 6''), at least one electric motor (M' and M'') which is coupled to appropriate elements for converting rotary motion into oscillating motion which comprise a main shaft (15' and 15''), a connecting rod (12' and 12'') and a crank (14'and 14'').

4. Perching machine according to claim 2, characterized in that said synchronization means (20) are interposed between the main shaft (15' and 15'') of each pair of beating plates and the main shaft of the adjacent pair.

5. Perching machine according to claim 4, characterized in that said synchronization means (20) comprise transmission elements with a 1:1 transmission ratio.

6. Perching machine according to claim 5, characterized in that said transmission elements are preset so that the offset between the cranks (14' and 14'') of said adjacent main shafts is equal to 180°.

7. Perching machine according to claim 6, characterized in that said motion transmission elements comprise pairs of toothed pulleys (21' and 21'') which are keyed on adjacent main shafts (15' and 15'') and are connected by an appropriate toothed belt (23).

8. Perching machine according to claim 5, characterized in that said motion transmission elements are chosen among elements of the type with transmission shafts provided with bevel gear pairs, Cardanic transmission shafts or the like, electronic speed regulators, and the like, with a 1:1 transmission ratio.

9. Perching machine according to claim 1, characterized in that each movable beating plate is actuated by a single electric motor (M and M').

10. Perching machine according to claim 1, characterized in that it has a single actuation motor for all the movable beating plates.

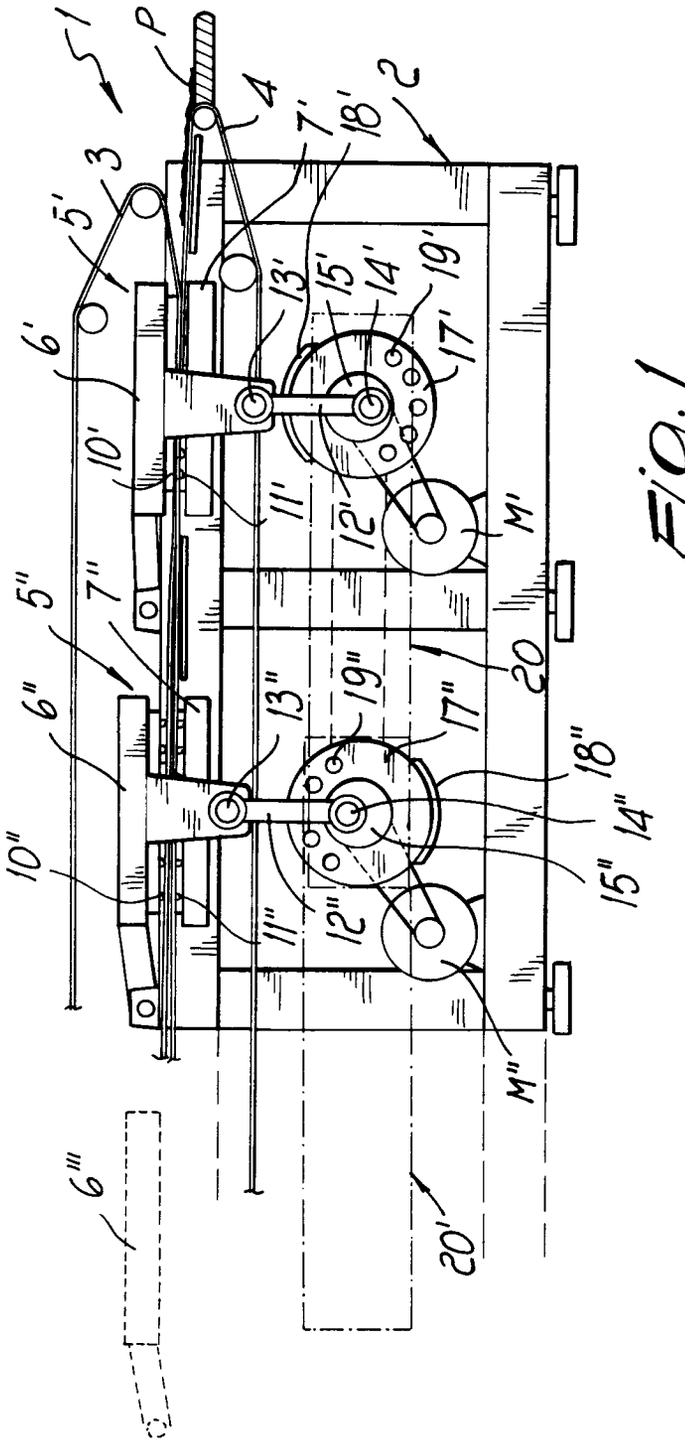

Fig. 1

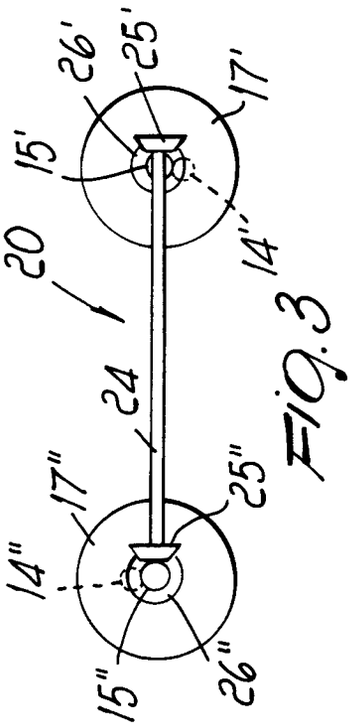

Fig. 3

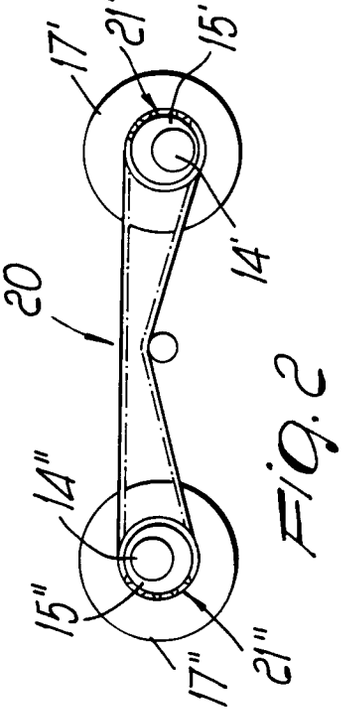

Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 2147

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 368 233 (BAGGIO) * the whole document *	1-3,6,9	C14B1/40
Y		4,5,7,8	

X	FR-A-2 325 718 (DOKOUPIL) * the whole document *	1,10	
Y		4,7	

Y	GB-A-809 179 (MASCHINENFABRIK MOENUS) * page 2, left column, line 35 - line 50; figure 1 *	5,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

C14B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 JUNE 1992	ELMEROS C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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E : earlier patent document, but published on, or after the filing date
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