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

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**EP-A- 0 368 233**  
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## Description

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.

EP-A-0 368 233 discloses a perching method and machine wherein the smoothing action is obtained by translation of the pegs within the stretching holes in the plane of the leather, with the purpose of improving the final softness thereof. In this known machine no physical interconnection is provided between each pair of perching unit and the adjacent ones with the aim of synchronizing their alternate motion.

From FR-A-2 325 718 a perching machine is known wherein the leather is periodically stretched by plates moving alternatively with a component in the plane of the leather. In one embodiment the motor is connected by chains to eccentric cams driving synchronously the ends of a single plate to impose thereto a circular movement parallel to itself. In another embodiment the chains serve to drive the eccentric cams of adjacent plates forcing them to oscillate in the plane of the leather with an anti-symmetric synchronous circular motion at the same distance from each other in the sense of advancement. Also in this case the machine is not provided with means for compensating the vibrational inertial forces acting on the movable plates.

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 in accordance with the independent claim 1.

Further embodiments of the invention are set out in claims 2-7.

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 trans-

mission 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, means (3, 4) for the advancement of the hides mounted on said supporting frame (2), a plurality of upper beating plates (6', 6'') and lower beating plates (7', 7'') facing each other so as to form adjacent pairs (5', 5'') of plates in the hide advancement direction, each said plate being provided with protrusions (10', 10'') adapted to cooperate with complementary recesses (11', 11'') formed on a respective opposite plate, each pair of beating plates (5', 5'') having a movable plate (6, 6'') and a fixed plate (7', 7''), motor means being provided for acting on said movable plates (6', 6'') so as to move them alternatively toward and away from the fixed plates (7', 7''), said motor means comprising at least one electric motor coupled to elements for converting the rotary motion of the motor into oscillating motion of said movable plates, which elements comprise, for each movable plate, a main shaft (15', 15''), a connecting rod (12', 12'') and a crank (14', 14''), characterized in that said motor means are provided with synchronization means (20) adapted to equalize the oscillation frequencies of the movable plates (6', 6''), said synchronization means (20) comprising transmission elements interposed between the main shaft (15') of each pair of beating plates and the main shaft (15'') of the adjacent pair and adapted to maintain the alternating movement of each movable plate constantly in opposition of phase.
2. Perching machine according to claim 1, characterized in that said transmission element

have a transmission ratio 1:1.

3. Perching machine according to claim 1, characterized in that said transmission elements are adapted to maintain the angular offset between the cranks (14', 14'') of all the adjacent shafts equal to 180°.
4. Perching machine according to claim 1, characterized in that said transmission elements comprise pairs of toothed pulleys (21', 21'') which are keyed on adjacent main shafts (15', 15'') and are connected by an appropriate toothed belt (23).
5. Perching machine according to claim 1, characterized in that said motion transmission elements are chosen among rigid transmission shafts provided with bevel gear pairs, Cardanic or the like transmission shafts, electronic speed regulators and similar devices.
6. Perching machine according to claim 1, characterized in that each movable plate (7', 7'') is actuated by a respective independent motor (M', M'').
7. Perching machine according to claim 1, characterized in that all the movable plates (7', 7'') are actuated by a single common motor.

### Patentansprüche

1. Stollmaschine mit vielfachen Hammerplatten für industrielle Felle und dergleichen, enthaltend ein Traggestell, auf dem Traggestell (2) angebrachte Mittel (3,4) zum Vorschub der Felle, eine Vielzahl von oberen Hammerplatten (6',6'') und unteren Hammerplatten (7',7''), die einander gegenüber liegen, um in Vorschubrichtung der Felle benachbarte Paare von Platten (5',5'') zu bilden, wobei jede Platte mit Vorsprüngen (10',10'') versehen ist, die mit komplementären Ausnehmungen (11',11'') in entsprechenden gegenüberliegenden Platten zusammenwirken, und wobei jedes Paar von Hammerplatten (5',5'') eine bewegliche Platte (6',6'') und eine feste Platte (7',7'') hat, Motormittel zur Einwirkung auf die beweglichen Platten (6',6'') derart, daß sie sich abwechselnd zu den festen Platten (7',7'') hin und von diesen weg bewegen, wobei diese Motormittel mindestens einen Elektromotor umfassen, der mit Elementen zur Umwandlung der Drehbewegung des Motors in eine hin- und hergehende Bewegung der beweglichen Platten gekoppelt ist, und wobei diese Elemente für jede bewegliche Platte eine Hauptwelle (15',15''), eine

- Pleuelstange (12',12'') und eine Kurbel (14',14'') enthalten, dadurch gekennzeichnet, daß die Motormittel mit Synchronisierungsmitteln (20) versehen sind, die dazu geeignet sind, die Schwingungsfrequenzen der beweglichen Platten (6',6'') einander anzugleichen, wobei diese Synchronisierungsmittel (20) Transmissionselemente zwischen der Hauptwelle (15') eines jeden Paares von Hammerplatten und der Hauptwelle (15'') des benachbarten Paares aufweisen und geeignet sind, die hin- und hergehende Bewegung jeder beweglichen Platte konstant in Gegenphase zu halten.
2. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Transmissionselemente ein Übersetzungsverhältnis von 1 : 1 haben.
  3. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Transmissionselemente dazu geeignet sind, den Winkelversatz zwischen den Kurbeln (14',14'') aller benachbarten Wellen gleich 180° zu halten.
  4. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Transmissionselemente Paare von Zahnscheiben (21',21'') aufweisen, die auf benachbarten Hauptwellen (15',15'') verkeilt und durch einen passenden Zahnriemen (23) verbunden sind.
  5. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Bewegungstransmissionselemente unter starren Transmissionswellen mit Kegelradpaaren, kardanischen oder ähnlichen Transmissionswellen, elektronischen Drehzahlreglern und ähnlichen Einrichtungen ausgewählt sind.
  6. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß jede bewegliche Platte (7',7'') durch einen entsprechenden unabhängigen Motor (M',M'') betätigt wird.
  7. Stollmaschine nach Anspruch 1, dadurch gekennzeichnet, daß alle beweglichen Platten (7',7'') durch einen einzigen gemeinsamen Motor betätigt werden.
- Revendications**
1. Machine à étirer pourvue de plaques de battage multiples, pour peaux industrielles et analogues, comprenant un cadre porteur, des moyens (3, 4) servant à faire avancer les peaux montées sur ledit cadre porteur (2), une pluralité de plaques de battage supérieures (6', 6'') et de plaques de battage inférieures (7', 7'') qui se font face de manière à former des paires (5', 5'') de plaques adjacentes dans la direction de l'avance des peaux, chacune desdites plaques étant munie de protubérances (10', 10'') adaptées pour coopérer avec des évidements complémentaires (11', 11'') formés sur une plaque opposée respective, chaque paire de plaques de battage (5', 5'') comprenant une plaque mobile (6', 6'') et une plaque fixe (7', 7''), des moyens moteurs étant prévus pour agir sur lesdites plaques mobiles (6', 6'') de manière à les rapprocher et à les éloigner alternativement des plaques fixes (7', 7''), lesdits moyens moteurs comprenant au moins un moteur électrique couplé à des éléments servant à transformer le mouvement rotatif du moteur en un mouvement oscillant desdites plaques mobiles, lesquels éléments comprennent, pour chaque plaque mobile, un arbre principal (15', 15''), une bielle (12', 12'') et une manivelle (14', 14''), caractérisée en ce que lesdits moyens moteurs sont munis de moyens de synchronisation (20) adaptés pour égaliser les fréquences d'oscillation des plaques mobiles (6', 6''), lesdits moyens de synchronisation (20) comprenant des éléments de transmission interposés entre l'arbre principal (15') de chaque paire de plaques de battage et l'arbre principal (15'') de la paire adjacente, et propres à maintenir constamment les mouvements alternatifs des plaques mobiles en opposition de phase.
  2. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que lesdits éléments de transmission ont un rapport de transmission de 1:1.
  3. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que lesdits éléments de transmission sont adaptés pour maintenir le décalage angulaire entre les manivelles (14', 14'') de tous les arbres adjacents égal à 180°.
  4. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que lesdits éléments de transmission comprennent des paires de poulies dentées (21', 21'') qui sont clavetées sur des arbres principaux adjacents (15', 15'') et qui sont accouplées par une courroie crantée appropriée (23).
  5. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que lesdits éléments de transmission du mouvement sont choisis parmi les arbres de transmission rigides munis de couples de pignons coniques, les arbres de transmission à cardans ou analogues, les régu-

lateurs de vitesse électroniques et les dispositifs similaires.

6. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que chaque plaque mobile (7', 7'') est actionnée par un moteur indépendant respectif (M', M''). 5
7. Machine à étirer les peaux selon la revendication 1, caractérisée en ce que toutes les plaques mobiles (7', 7'') sont actionnées par un moteur commun unique. 10

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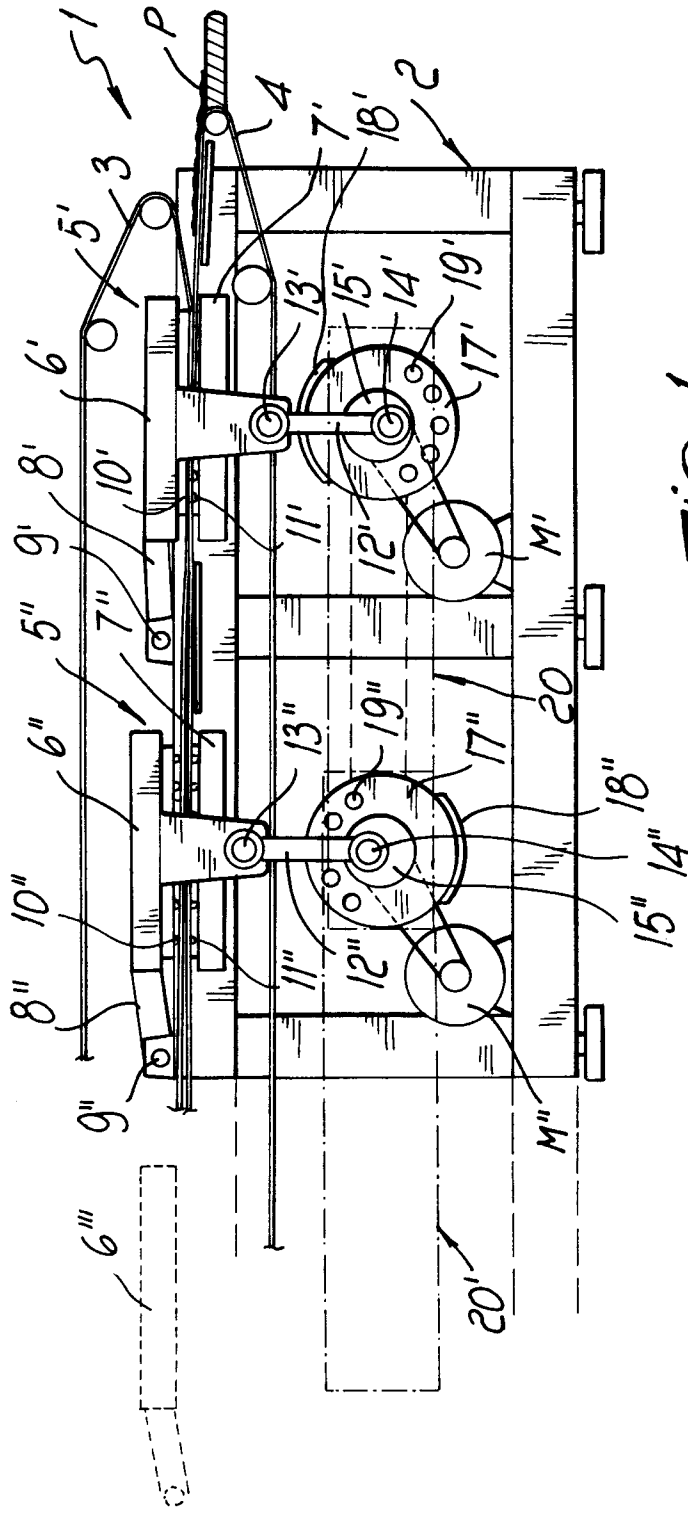


Fig. 1

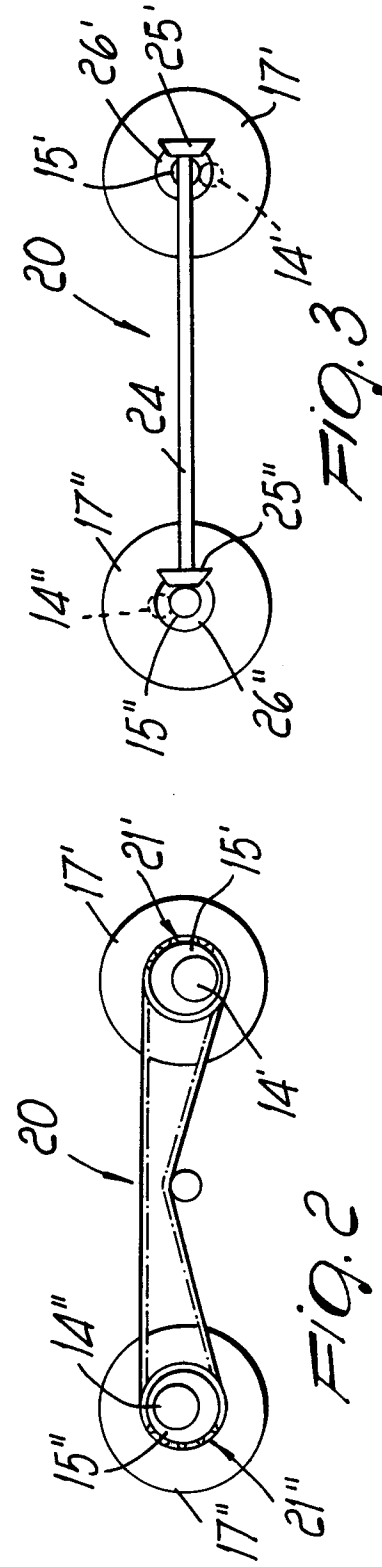


Fig. 2

Fig. 3