Aug. 17, 1948. B. A. PETERSON 2,447,274

HEDDLE RELEASE MECHANISM

Filed June 14, 1945 2 Sheets-Sheet 1

Fig. 1.

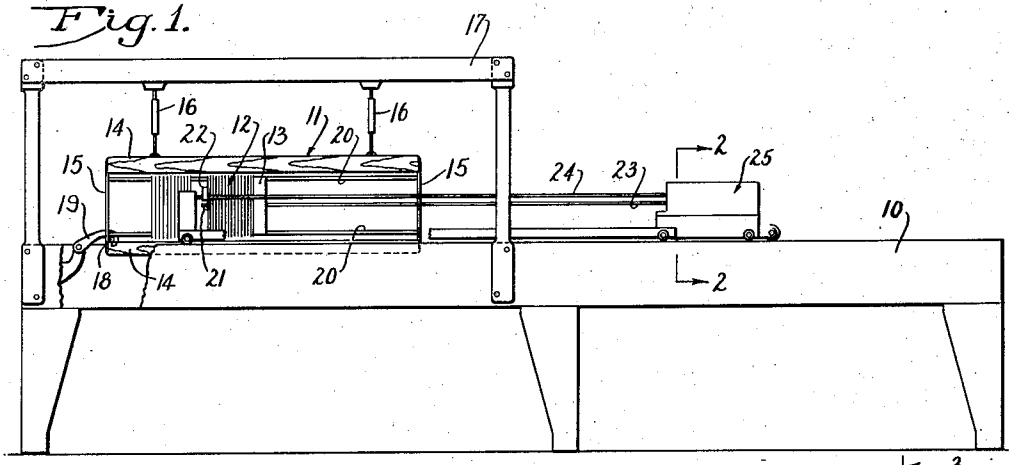


Fig. 2.

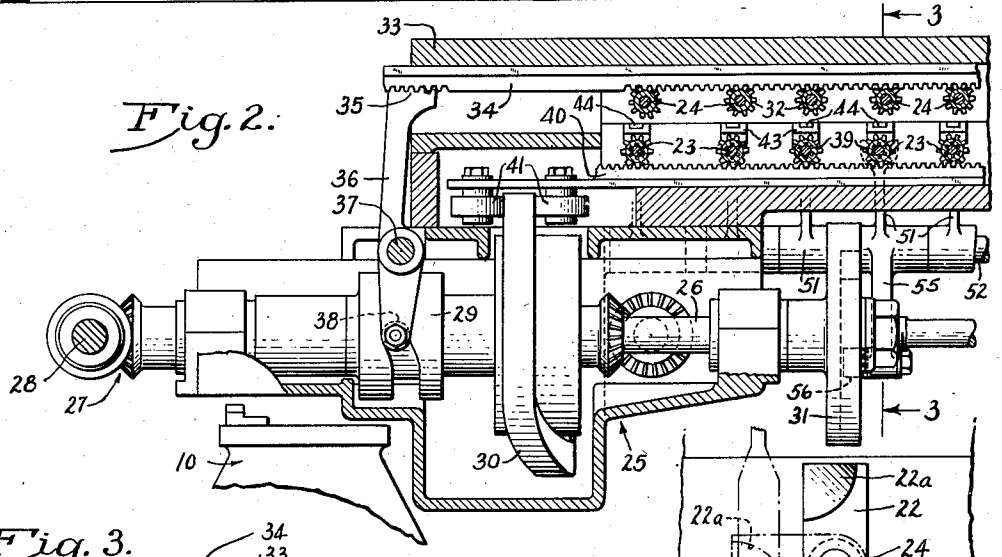


Fig. 3.

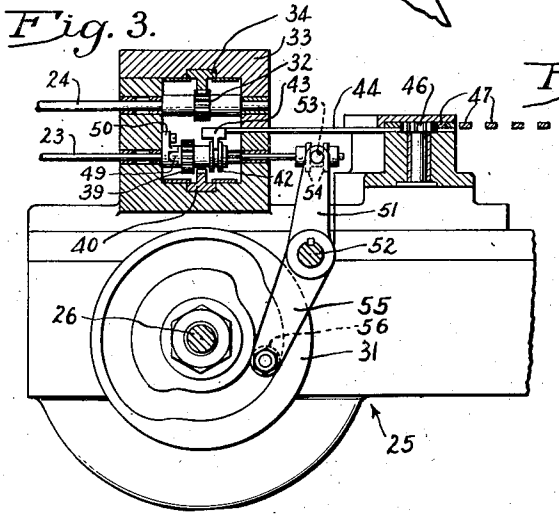
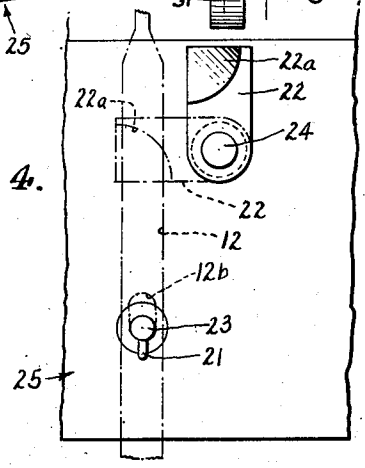


Fig. 4.



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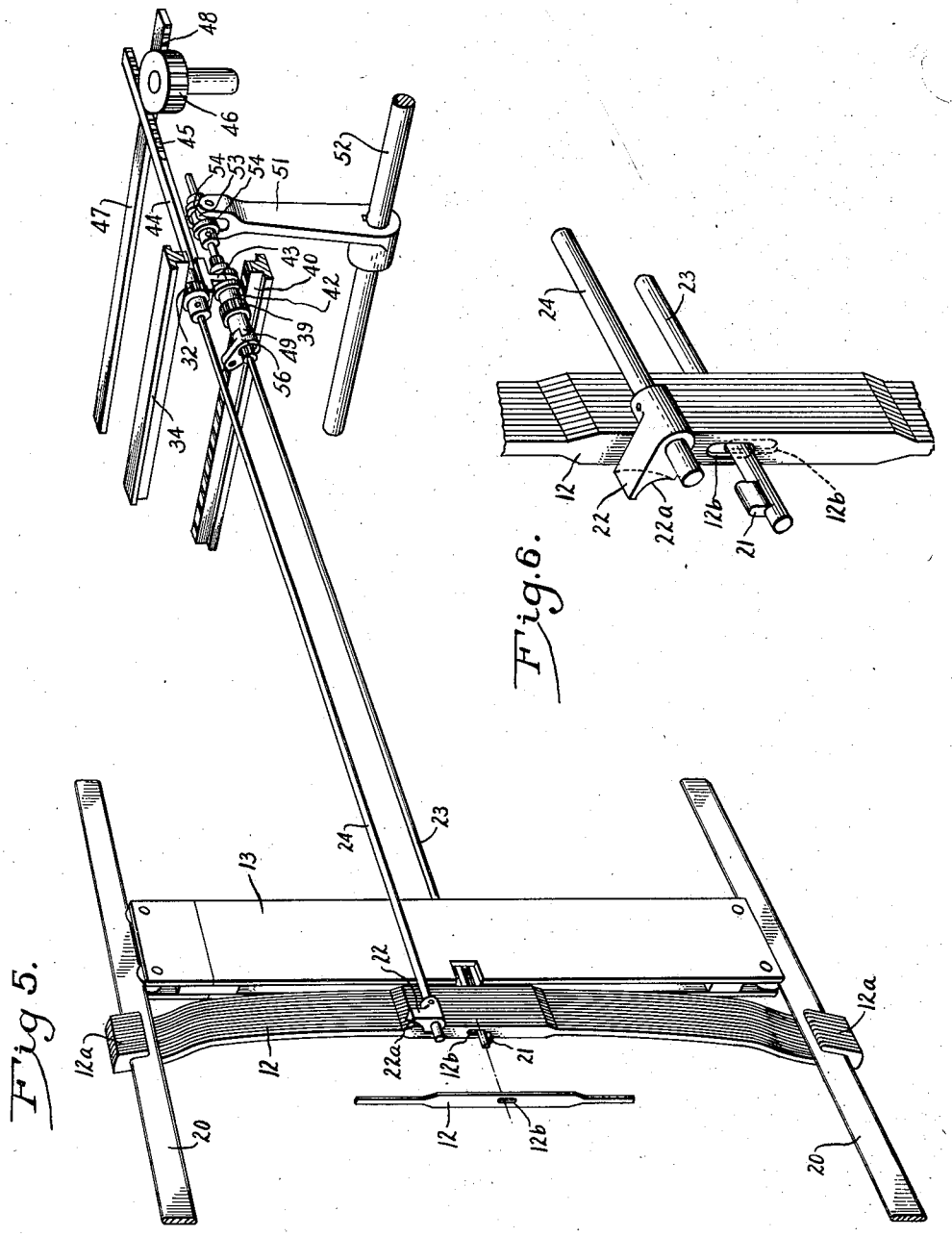


Fig 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

2,447,274

HEDDLE RELEASE MECHANISM

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Application June 14, 1945, Serial No. 599,442

22 Claims. (Cl. 28—46)

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The present invention relates to mechanisms for releasing, one by one, a series of heddles from a pack, such mechanisms being suited for use in warp drawing machines, heddle counting machines, or any other machine where such successive release of heddles is required.

The general aim of the present invention is to afford a heddle release mechanism which does not require a special keyhole in the heddles to accommodate them for release. On the contrary, release mechanisms of the present invention are adapted for use with heddles having only a simple slot or thread eye in them and no additional keyhole.

For an example of a release mechanism of the type heretofore available in the art and requiring a special release keyhole in the heddle in addition to the thread eye, see my Patent No. 2,175,910, issued October 10, 1939.

A more specific object is to provide in a heddle release mechanism having a release key operative upon the foremost heddle of a pack to hold it releasably against separation therefrom, means for relieving such heddle of wear incident to the movement of the release key from holding to releasing position.

Further objects and advantages of the invention will become apparent as the following description proceeds, taken in connection with the accompanying drawings in which:

Figure 1 is a front view of a warp drawing machine equipped with a heddle release mechanism embodying the present invention, the portions of the machine not directly related to the release mechanism being omitted for the sake of clarity and simplicity of illustration.

Fig. 2 is an enlarged fragmentary detail sectional view taken substantially along the line 2—2 in Fig. 1 and illustrating a portion of the actuating system for the heddle release mechanism.

Fig. 3 is a sectional view taken substantially along the line 3—3 in Fig. 2.

Fig. 4 is an enlarged front end view of the release key and cooperating detent finger included in the release mechanism, an associated heddle being shown in broken lines.

Fig. 5 is a fragmentary perspective view of the release mechanism shown as incorporated in the machine of Fig. 1, and illustrating its location in reference to the heddle pack upon which it operates.

Fig. 6 is an enlarged fragmentary perspective view showing the release key and detent finger of

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the release mechanism in a different position from that which they occupy in Fig. 5.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the invention has been illustrated therein as embodied in a heddle release mechanism, shown (Fig. 1) in this instance as applied to a warp drawing machine. Such machine need not be considered in its entirety for an understanding of the present invention and has therefore only been partially illustrated. For the present suffice it to note that the machine includes a base or bed 10 above which are supported a series of heddle frames in side-by-side relation, only one of which appears and is designated generally as 11. On each of these frames is carried a group of heddles 12. The general function of the release mechanism is to retain the heddles 12 compacted in a pack or bunch against a backer 13 on the heddle frame, and to release the heddles one by one from the pack in accordance with the operation of a pattern control mechanism. Thereafter they are picked up by some other mechanism, such as a leader worm (not shown) and threads inserted through the eyes of the heddles.

The heddle frames 11 are in the present instance rectangular, each comprising top and bottom bars 14 joined by end bars 15. The heddle frames are suspended by supports 16 from an elevated frame 17 rising from the base 10. A bar 18 is inserted transversely through the lower front corners of the series of heddle frames and restrains them against movement to the right (as viewed in Fig. 1). The frames are urged to move in the latter direction by the action of the release mechanism in compacting the heddles, as will hereinafter appear. A latch 19 carried by the bed 10 releasably engages the rod 18.

The heddles 12 (see Fig. 5) are resilient sheet metal stampings, being made, for example, of steel. They have hooked ends 12a which slidably engage rails 20 fixed to the heddle frames 11. The backer 13 may take various forms such, for example, as that illustrated in detail in my Patent No. 2,175,910 referred to above. In general it constitutes an abutment positionally ad-

justable along the rails 20 and against which the heddles are compacted in a bundle.

In each of the heddles 12 is a thread eye 12b in the form of a longitudinally extending slot. These eyes are formed in laterally enlarged central portions of the heddles and the eyes in successive heddles overlap each other. However, the eyes in alternate heddles are offset longitudinally with respect to each other (see Fig. 6) so that the overlap or registry of the eyes in successive heddles making up the pack is only partial. This offset of the eyes in successive heddles is utilized by the release mechanism which will next be described.

The release mechanism includes, in the illustrated embodiment of the invention, a key 21 and a cooperating detent finger 22 (Figs. 5 and 6) carried by respective shafts 23 and 24. The key shaft 23 extends through an opening in the central portion of the backer 13 and through the registering portions of the thread eyes 12b in the heddles, having a radially extending lug on its forward end which constitutes the key 21. The detent shaft 24, on the other hand, extends alongside the heddle pack rather than through it, being in parallelism with the key shaft 23. To the forward end of the detent shaft 24 is fixed the radially projecting detent finger 22 engageable with the front face of the pack of heddles when swung into the position of Fig. 6.

A pair of such key and detent shafts 23, 24 for each of the several heddle frames 11 is carried by and projects forwardly from a car 25 (Fig. 1) which is wheel-mounted on the machine bed 10 to roll toward and from the heddle frames. In the normal operation of the machine the car 25 is urged to move to the right (as viewed in Fig. 1). Accordingly, when the release keys 21 are positioned as shown in Fig. 5 they engage with the foremost ones of the heddles 12 in their respective packs, the pull exerted by the car 25 on the key shafts 23 causing the keys to compress or compact the respective bundles of heddles against their backers 13. Since the hooked ends 12a of the heddles frictionally engage the rails 20 there is a bowing of the packs toward their backers.

Having compacted and bowed the several heddle packs against the backers in the manner described above, the dent shafts 24 are turned to rock the detent fingers 22 in front of the heddle packs (see Fig. 6) to retain them in place. With the heddles thus temporarily restrained by the detent fingers, the key shafts 23 may be moved axially to free their respective keys 21 from contact with the heddles. The freed keys may then each be revolved, without frictional engagement with the foremost heddle, through a half revolution to aline the keys 21 with the thread eyes 12b in the foremost heddles. Thereafter the key shafts 23 are moved axially back toward their initial positions, the keys 21 moving through the slots in the first heddles into contact with the next heddles and bowing the same back toward the backer with a small clearance of the detent 22. With the keys thus abutted against the second heddles, rocking of the detent fingers 22 out of engagement with the forward heddles permits the latter to spring forward free of the keys. The bowing imparted to the heddles places them under tension and such tension is thus utilized in separating them from the pack. Moreover, the noses of the detent fingers 22 are relieved or cut away at 22a as best shown in Fig. 5 so that when turned into pack-engaging position they will

each cam the last freed heddle along the rails away from the pack. In Fig. 6 the extent of forward axial movement of the release key shaft has been shown somewhat exaggerated for clarity of illustration. In practice, the extent of such axial shifting movement is merely sufficient to carry the key out of frictional engagement with the pack and not far enough to interfere with the previously released heddle.

Having in mind the foregoing general mode of operation of the release mechanism, attention may now be given to the disclosed arrangement for actuating the key and detent shafts 23, 24 in timed relation with each other for selectively releasing successive heddles. The drive for that purpose is derived from a cam shaft 26 (Figs. 2 and 3) journaled transversely within the car 25 and driven through bevel gears 27 from a main drive shaft 28. Rigid with the cam shaft 26 are a barrel cam 29 utilized in oscillating the detent shafts 24, a two-roller cylinder cam 30 utilized in oscillating the key shafts 23, and an open-faced cam 31 utilized in shifting the key shafts 23 axially.

As to the oscillator for the detent shafts 24, it will be observed upon reference to Figs. 2 and 3 (see also Fig. 5) that pinions 32 are pinned to these detent shafts, being located within a housing 33 atop the car 25 and in which the detent shafts are journaled. These pinions 32 mesh with a rack 34 slidable endwise within the housing 33. The rack 34 is in turn meshed with a sector 35 on the upper end of a follower lever 36 pivoted intermediate its ends at 37 and having a cam follower roller 38 on its lower end received in the peripheral groove of the barrel cam 29. The cam shape and tooth ratios are so chosen that for each rotation of the cam shaft 26 the detent shafts 24 are oscillated or turned forward and back about their longitudinal axes through a quarter turn, thereby shifting the detent fingers 22 between the two alternate positions therefor indicated in full and broken lines in Fig. 4.

The oscillator for the key shafts 23 may be somewhat similar to that for the detent shafts 24 described above. Thus in the present instance pinions 39 for the several key shafts are adapted to be meshed with a rack bar 40 slidable endwise within the housing 33. A pair of follower rollers 41 journaled on the outer end of this bar 40 engage the cylinder cam 30, the parts being so proportioned that the key shafts 23 are oscillated through a half revolution and back to starting position for each full revolution of the cam shaft 26, in the event that the pinions 39 are meshed with the rack bar 40.

Provision is made for shifting individual ones of the pinions 39 into or out of meshing engagement with the rack 40 so that by thus establishing or disestablishing the drive from the cam shaft 26 to selected ones of the release keys, the selection of heddles may be correspondingly controlled. To accomplish such selective connection of the pinions 39 to the rack 40 the pinions are splined on the respective key shafts 23 for axial movement relative thereto. Each pinion 39 is rigid with a spool 42 (Figs. 3 and 5) presenting an annular groove in which is received a lug 43 on the forward end of a corresponding shifter bar 44. The shifter bars have rack teeth 45 (Fig. 5) on their outer ends meshed with idler pinions 46 and are moved endwise by a suitable pattern controlled mechanism such, for example, as that disclosed in Russell P. Drake application Serial No. 533,160, filed April 28, 1944, now Patent

No. 2,400,342, May 14, 1946. The pattern controlled mechanism, as such, forms no part of the present invention. For the present, suffice it to say that when the pattern calls for release of a heddle 12 from a particular one of the series of heddle frames, a corresponding pattern control bar 47 having its rack teeth 48 meshed with the companion pinion 46 moves to the right (as viewed in Fig. 5). This causes the corresponding shifter bar 44 to move to the right (as also viewed in Fig. 5), drawing the corresponding pinion 39 bodily to the right into mesh with the rack bar 40 so that the companion release key 21 can be oscillated by such rack bar. Conversely, when the pattern does not call for release of a heddle from a particular frame, no movement is imparted to the corresponding pattern control bar 47 and shifter bar 44, so that the appropriate pinion 39 remains in disengaged relation with respect to the rack bar 40. In such disengaged position, the pinion and its release key are held positively against rotation by a lug 49 on the pinion engaging with a notched stop member 50 fixed to the housing 33.

For shifting the release keys 21 endwise a corresponding series of arms 51 keyed to a rock shaft 52 (Figs. 2, 3 and 5) are operatively connected with the key shafts 23. Thus the bifurcated upper ends of the arms carry rollers 53 received between a pair of spaced flanges 54 fixed to the respective release key shafts 23. A depending follower arm 55, also keyed to the rock shaft 52, carries on its lower end a follower roller 56 received in the groove of the open-faced cam 31. For each rotation of the cam shaft 26 the release key shafts 23 are thus thrust forward by the rocker arms 51 and then pulled back to their initial positions.

The operation of the disclosed apparatus will in general be clear from the foregoing. By way of brief recapitulation, it may be observed that the series of heddle frames such as 11 are initially set up on the machine and the release keys 21 positioned as shown in Fig. 5 for compacting the corresponding bunches of heddles against the backers. The machine is set in operation and for each revolution of the cam shaft 26 a heddle 12 is released from each pack selected by the pattern controlled mechanism. Thus, as the cam shaft 26 revolves the cam controlled rack bar 34 is thrust to the left (as viewed in Fig. 5), turning the detent shafts 24 from the position of Fig. 5 to that of Fig. 6 where the detents 22 are located to engage and hold their corresponding packs of heddles as the latter move forwardly slightly upon the subsequent axial advance of the release keys. While the detents 22 dwell in such position the rocker arms 51 thrust the release key shafts 23 axially forward, freeing their keys 21 from frictional engagement with the bunched heddles. Those of the release key shafts which have been selected for operation by the pattern controlled shifter rods 47 (through engagement of their pinions 39 with the rack bar 40) are turned through a half revolution. After having been thus turned, the release key shafts are shifted axially to return their keys for engagement with the heddles. Those keys which have been turned now engage the second heddle in the pack, passing through the eye in the first heddle. Thereafter the detent fingers are oscillated back to their freed or starting position, whereupon the front heddles of the selected packs spring forward out of the pack. In the non-selected packs the release keys, not having been turned, re-

engage the first heddle in the pack so that no heddle is released. These operations are repeated for each revolution of the cam shaft 26, freeing successive heddles from selected packs as the pattern may require.

I claim as my invention:

1. In a warp drawing machine having means for supporting a heddle frame with a pack of heddles frictionally supported at opposite ends on said frame and slotted intermediate their ends to form eyes relatively offset in the case of adjacent heddles, the combination of a traveling carriage, and mechanism on said carriage for releasing heddles one at a time from said pack, said mechanism including a shaft threaded through the heddle eyes and having a key thereon actuated successively into two positions respectively alined with the eyes of adjacent heddles, and detent means engaging with the foremost heddle to hold the same against release from the pack during the movement of the release key from one position to the other, said detent means being operative into disassociated relation to the foremost heddle following movement of the release key into one of said positions.

2. In a warp drawing machine having means for supporting a heddle frame with heddles supported at opposite ends and arranged in a pack, a release mechanism comprising a release key movable successively from one releasing position to another and operative in each such position to release a heddle from the pack, and other means timed with respect to the release key and acting to restrain the foremost heddle against release from the pack during such movement of the release key, said release mechanism being operative to draw the heddles along the supporting frame so as to effect a bowing of the heddles as an incident to the engagement of the free ends thereof with the heddle supporting frame.

3. In a warp drawing machine having means for supporting a heddle frame with spaced parallel bars with which the opposite ends of the heddles frictionally engage, a release mechanism acting upon the heddles intermediate their ends so as to effect a bowing thereof whereby to place the heddles under tension, said release mechanism comprising a release key movable successively into two positions and operative in the respective positions to release successive ones of the heddles for separation from the stack, and other means coacting with the release key to temporarily restrain a separating movement of the foremost heddle during movement of the release key from one of said releasing positions to the other.

4. In a warp drawing machine having means for supporting a heddle frame with a pack of heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, said mechanism comprising selectively operable release means movable from a position in holding engagement with the foremost heddle into a releasing position with respect to such heddle, said release mechanism being operative to place the heddles in said pack under tension so as to cause the foremost heddle to separate from the pack as permitted by said release means, and other means for temporarily holding the foremost heddle against separation from the pack as permitted by said release means and timed with respect to the operation of the release means to move out of holding relation with respect to the

foremost heddle upon movement of the release means out of holding position.

5. In a warp drawing machine having means for supporting a heddle frame with a pack of heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, said mechanism comprising selectively operable release means movable from a position in holding engagement with the foremost heddle into a releasing position with respect to such heddle, said release mechanism being operative to place the heddles in said pack under tension so as to cause the foremost heddle to separate from the pack as permitted by said release means, other means movable into holding relation with the foremost heddle preliminary to the movement of the release means into its heddle releasing position, and means for shifting the release means into disassociated relation to the foremost heddle preliminary to the movement of the release means into its said releasing position.

6. In a warp drawing machine having means for supporting a heddle frame with a pack of heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, said mechanism comprising selectively operable release means movable from a position in holding engagement with the foremost heddle into a releasing position with respect to such heddle, said release mechanism being operative to place the heddles in said pack under tension so as to cause the foremost heddle to separate from the pack as permitted by said release means, and other means movable into holding position with respect to the foremost heddle to retain the same during movement of the release means into its said releasing position with respect to such heddle, said other means being operative in such movement to engage a previously released heddle with a positive action so as to insure separation thereof from the pack.

7. In a warp drawing machine having means for supporting a heddle frame with a pack of centrally apertured heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, said mechanism comprising a shaft threaded through alined apertures in the heddles and having a key thereon movable from a position in holding relation to the foremost heddle into a releasing position with respect thereto, said key being operative in each such position to release a heddle from the pack, and a detent movable into holding position with respect to the foremost heddle preliminary to the movement of the release key into releasing position with respect to such heddle.

8. In a warp drawing machine having means for supporting a heddle frame with a pack of centrally apertured heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, said mechanism comprising a shaft threaded through alined apertures in the heddles and having a key thereon movable from a position in holding relation to the foremost heddle into a releasing position with respect thereto, and a detent movable into holding position with respect to the foremost heddle preliminary to the movement of the release key into releasing position with respect to such heddle, said detent being reciprocable so as to move out of engagement with the foremost heddle and then into engagement with the next heddle, and being operative in the latter movement to effect a positive movement of separation of the first heddle from the pack by cam engagement with such heddle.

9. In a warp drawing machine having means for supporting a heddle frame with a pack of slotted heddles frictionally supported at opposite ends on said frame, a release mechanism for effecting the separation of said heddles one at a time from the pack, a shaft threaded through alined slots centrally of the heddles with the slots of adjacent heddles extending in opposite directions and including a laterally projecting portion movable successively from a position in blocking relation to the foremost heddle at one side of the slot therein into position in registry with said slot, said mechanism acting on the pack of heddles to place the same under tension while the release key is in its said blocking position, and means operative upon the heddles to relieve frictional engagement between the release key and the foremost heddle during movement of the key from said blocking position into its said releasing position.

10. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a slot therein overlapping the slot in the next adjacent heddle of the pack but with the slots in adjacent heddles offset in opposite directions, the combination with a release key shaft adapted to project through the overlapping portions of the slots and having a key on its forward end registerable with the slots in successive heddles in corresponding successive half turn positions of said shaft, of means including a detent movable into and out of engagement with the foremost heddle in the pack for temporarily holding the pack bunched out of contact with said key while the latter is rotating.

11. In a mechanism for releasing heddles from a pack, the combination with means including a rotatable release key for retaining the pack of heddles compressed and for releasing successive heddles from the pack in successive predetermined angular positions of said key, of means for shifting said release key longitudinally out of engagement with the pack preparatory to each successive rotational movement of said key, together with detent means for temporarily retaining the pack bunched while said key is out of engagement with the pack.

12. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a slot therein overlapping the slot in the next adjacent heddle of the pack but with the slots in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the slots and having a key on its forward end registerable with the slots in successive heddles in corresponding successive half turn positions of said shaft, a detent swingable into and out of a position in front of the pack, and means for actuating said release key and detent in timed relation to effect, first, movement of said detent into holding relation with the foremost heddle, second, separation of said release key from such foremost heddle, third, rotation of said release key to position the same in registry with the slot in said foremost heddle, fourth, movement of said release key through the last mentioned slot into holding engagement with the next adjacent heddle, and fifth, move-

ment of said detent out of holding engagement with said foremost heddle whereby to release it.

13. In a mechanism for releasing heddles from a pack supported in front of a backer on a pair of rails along which the heddles are slidable while in frictional engagement with the same, the combination with means including a rotatable release key for centrally bowing the pack of heddles in a compressed bunch against the backer while their ends remain frictionally engaged with the supporting rails and for releasing successive heddles to spring forward from the pack in successive predetermined angular positions of said key, of means for shifting said release key longitudinally out of engagement with the pack preparatory to each successive rotational movement of said key, together with detent means for temporarily retaining the pack bunched while said key is out of engagement with the pack.

14. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle of the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in successive heddles in corresponding half turn positions of said key shaft, a rock shaft extending in parallelism with said key shaft and laterally offset therefrom to lie alongside the pack of heddles, a detent finger on the forward end of said rock shaft shiftable by rocking of the latter into and out of position to engage the foremost heddle in the pack, and means for turning alternate ones of said rock and key shafts through quarter and half turns respectively in timed relation with each other.

15. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle of the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half turn positions of said key shaft, a rock shaft extending in parallelism with said key shaft and laterally offset therefrom to lie alongside the pack of heddles, a detent finger on the forward end of said rock shaft shiftable by rocking of the latter into and out of position to engage the foremost heddle in the pack, and cam actuated means for not only turning alternate ones of said shafts, with a half turn of said key shaft intervening between successive quarter turns of said rock shaft in opposite directions, but for also recpirocating said key shaft endwise away from the pack and back toward the same after each turn of said rock shaft to swing said detent finger toward the pack and prior to the succeeding half turn of said key shaft.

16. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle in the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half turn positions of said key shaft, to thereby release successive heddles in successive half turn positions of said key, means including a detent movable into and out of engagement with the foremost heddle in the pack for temporarily holding the pack bunched while in engagement with such heddle, and means for actuating said key shaft and detent in timed relation with each other to successively bring said detent into engaging position, shift said key away from the pack and back while rotating it through a half turn, and finally withdraw said detent from the pack.

17. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle in the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half turn positions of said key shaft, to thereby release successive heddles in successive half turn positions of said key, means including a detent movable into and out of engagement with the foremost heddle in the pack for temporarily holding the pack bunched while in engagement with such heddle, means for actuating said key shaft and detent in timed relation with each other to successively bring said detent into engaging position, shift said key away from the pack and back while rotating it through a half turn, and finally withdraw said detent from the pack, and means for disabling said last-named means against effecting rotation of said key shaft.

18. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle in the pack but with the eyes in the adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half-turn positions of said key shaft, to thereby release successive heddles in successive half-turn positions of said key, a rock shaft paralleling said key shaft and positioned relative to the latter to extend alongside the pack, said rock shaft carrying a detent on its forward end movable into and out of engagement with the foremost heddle in the pack of said rock shaft, pinions carried by each of said rock shafts, a pair of reciprocable racks meshed with respective ones of said pinions, and power operated means for reciprocating said racks in timed relation with each other.

19. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle in the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half-turn

positions of said key shaft, to thereby release successive heddles in successive half-turn positions of said key, a rock shaft paralleling said key shaft and positioned relative to the latter to extend alongside the pack, said rock shaft carrying a detent on its forward end movable into and out of engagement with the foremost heddle in the pack of said rock shaft, pinions carried by each of said rock shafts, a pair of reciprocable racks meshed with respective ones of said pinions, power operated means for reciprocating said racks in timed relation with each other, the one of said pinions carried by said key shaft having a splined connection with the latter, and means for shifting the last-mentioned pinion out of mesh with its associated rack to disable the latter against turning said key shaft while said rock shaft is turning.

20. In a mechanism for releasing, one at a time, successive heddles from a pack of the same in which the heddles each have a thread eye therein overlapping the eye in the next adjacent heddle in the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of the heddle eyes, a key on the forward end of said key shaft registerable with the eyes in adjacent heddles in corresponding successive half-turn positions of said key shaft, to thereby release successive heddles in successive half-turn positions of said key, a rock shaft paralleling said key shaft and positioned relative to the latter to extend alongside the pack, said rock shaft carrying a detent on its forward end movable into and out of engagement with the foremost heddle in the pack of said rock shaft, pinions carried by each of said rock shafts, a pair of reciprocable racks meshed with respective ones of said pinions, and power actuated means for not only reciprocating both of said racks in timed relation with each other but for also reciprocating said key shaft axially in timed relation with the reciprocation of said racks.

21. In a mechanism for releasing heddles from a pack supported in front of a backer on a pair of rails along which the heddles are slidable while in frictional engagement with the same, each heddle having a thread eye therein overlapping the thread eye in the next adjacent heddle of the pack but with the eyes in adjacent heddles offset in opposite directions, the combination of a release key shaft adapted to project through the overlapping portions of said eyes and having a key on its forward end registerable with the eyes

in adjacent heddles in corresponding successive half-turn positions of said shaft, the pressure of said key against said heddles serving to bow them centrally toward said backer, means for shifting said shaft endwise to free said key from the heddles during turning of said key, and means including a detent movable into and out of engagement with the foremost heddle in the pack for temporarily holding the pack bunched out of contact with said key while the latter is rotating, said detent being operative as an incident to its movement into engagement with the heddle next to be released from the pack to impart a movement of separation to the heddle last previously released.

22. In a warp drawing machine, the combination of a heddle frame having a pack of heddles frictionally supported at opposite ends and each having a thread eye intermediate its ends, and mechanism for releasing heddles one at a time from said pack, said mechanism including a traveling carriage, release means on said carriage shiftable selectively into and out of holding position with respect to successive heddles and also movable in a direction longitudinally of the heddle frame to bow the heddles and place them under tension, detent means also shiftable into and out of holding position with respect to the heddles, and means for actuating said release means and said detent means in timed relation to effect, first, movement of the release means longitudinally of the heddle frame and into engagement with the foremost heddle so as to place the heddles of the pack under tension, second, movement of the detent means into holding engagement with the foremost heddle to maintain the heddles under tension, third, movement of the release means into releasing position with respect to the foremost heddle and, fourth, movement of the detent means out of its holding position with respect to the foremost heddle.

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