June 7, 1955 E. W. SHERTZ ET AL 2,710,029

PILE WIRE LOOM MECHANISM

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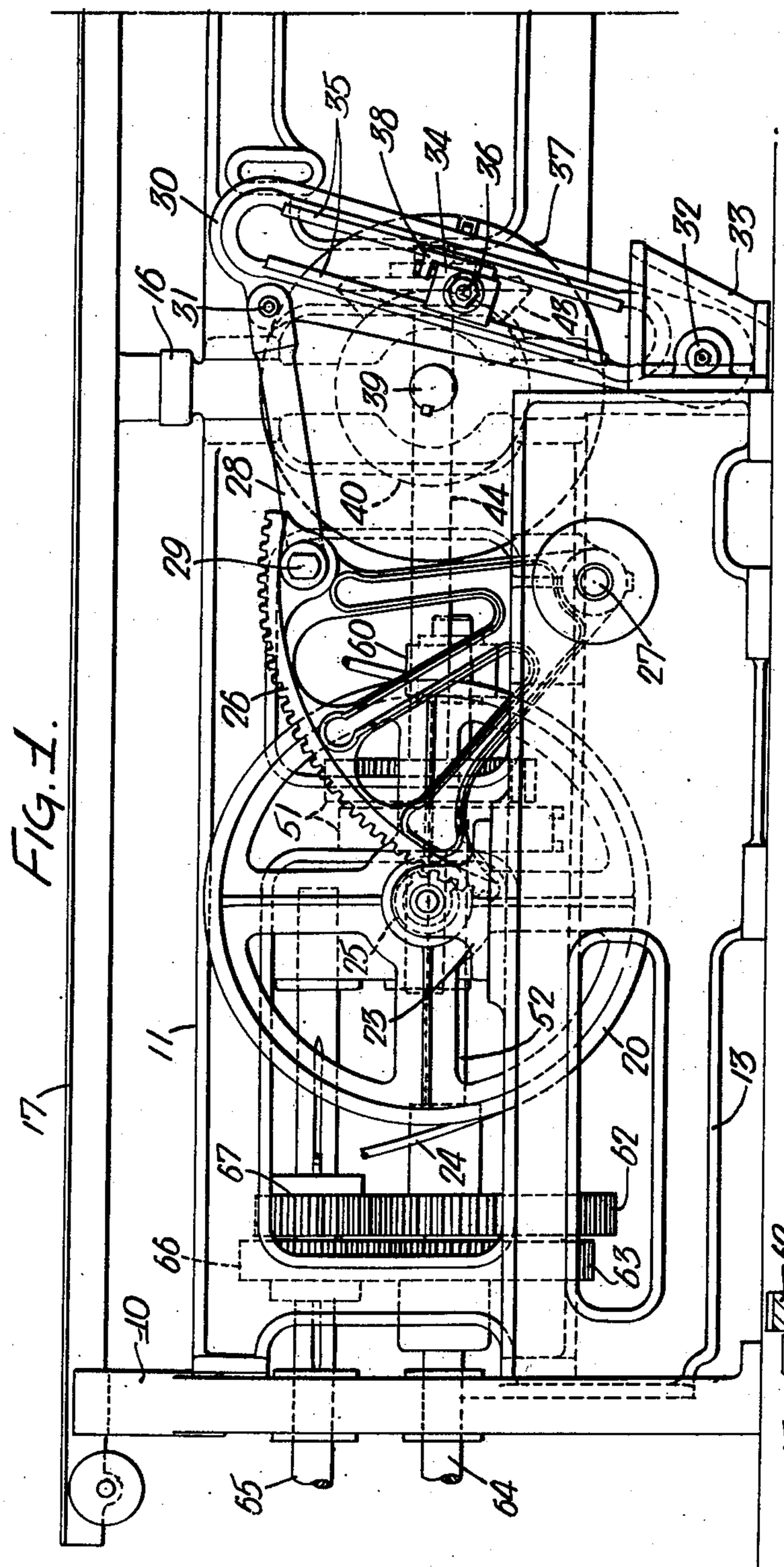


FIG. 1.

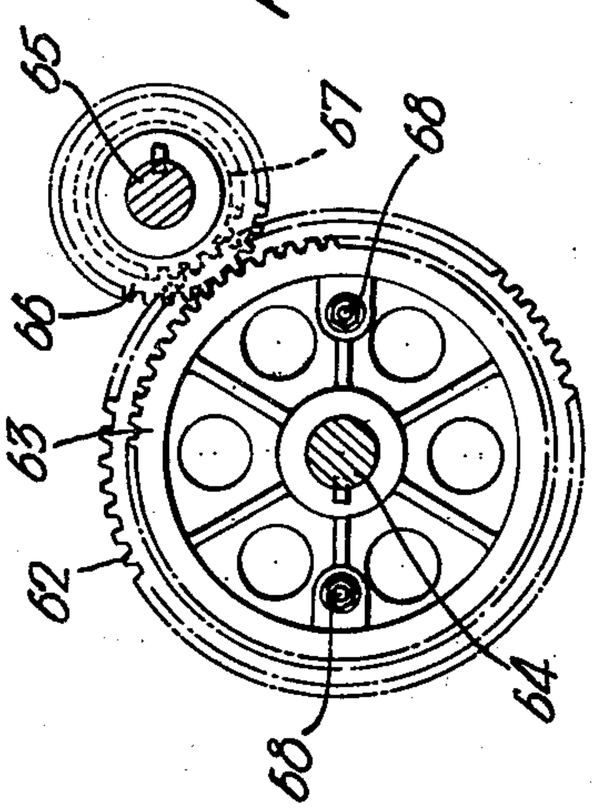


FIG. 3.

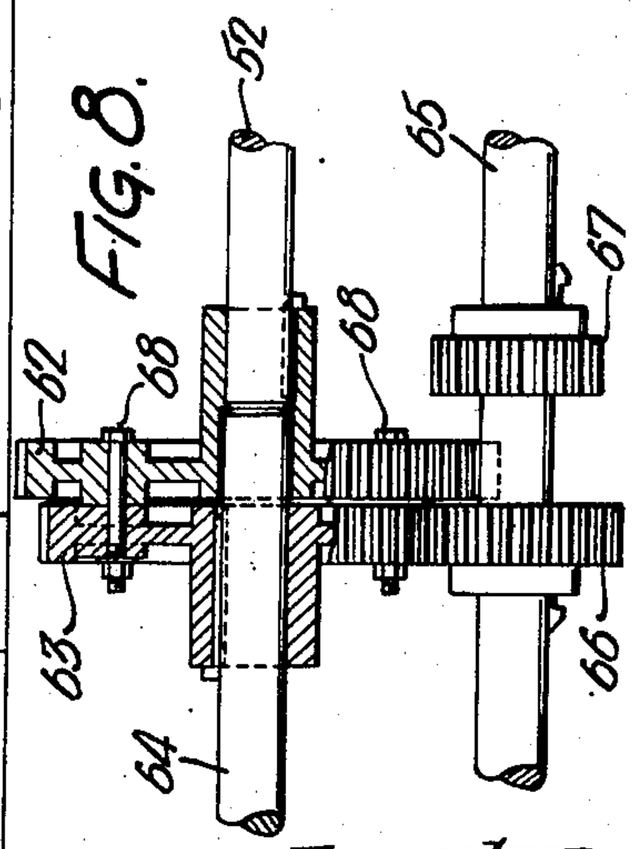


FIG. 8.

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PILE WIRE LOOM MECHANISM

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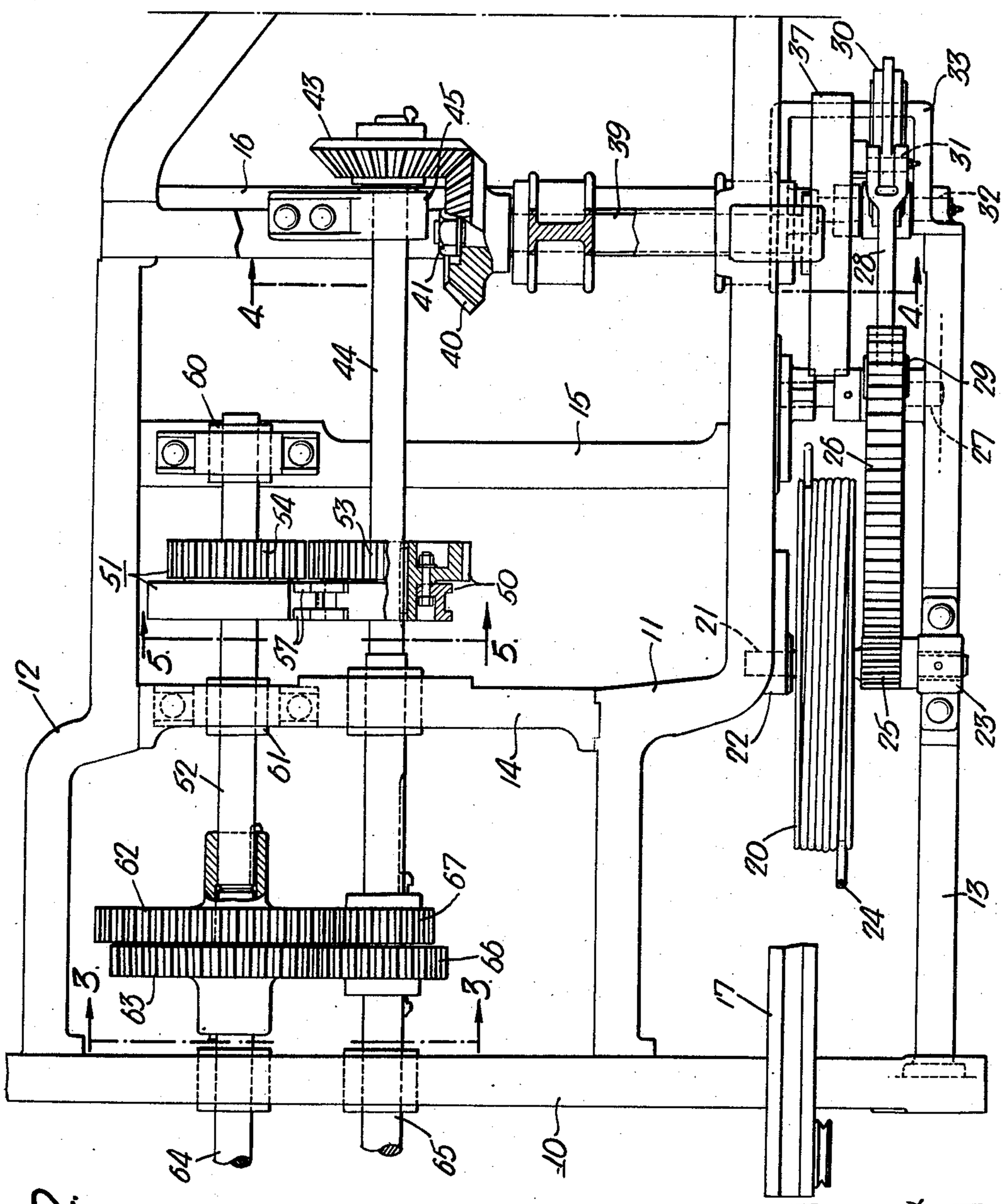


Fig. 2.

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PILE WIRE LOOM MECHANISM

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FIG. 5.

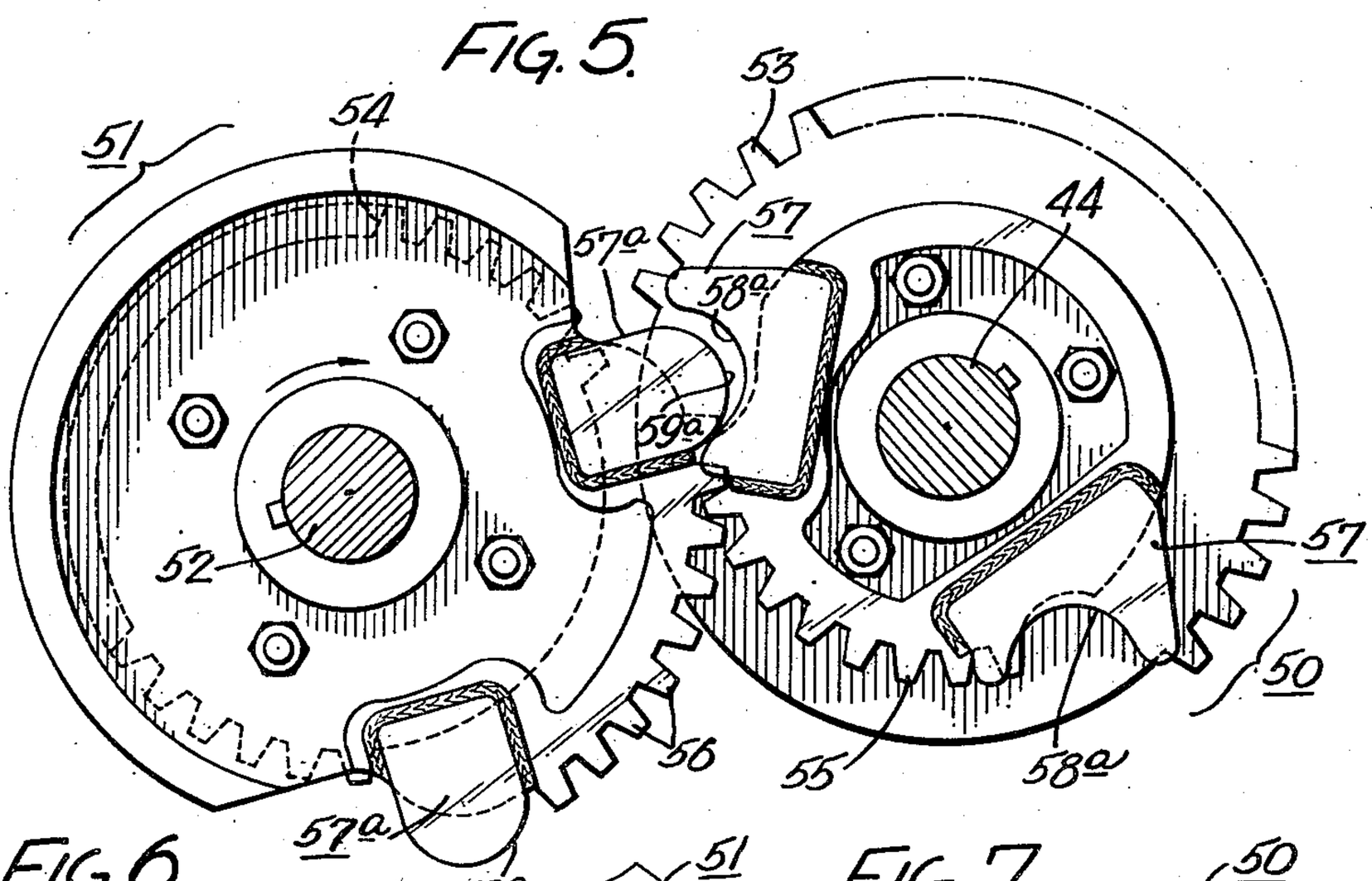



FIG. 6.

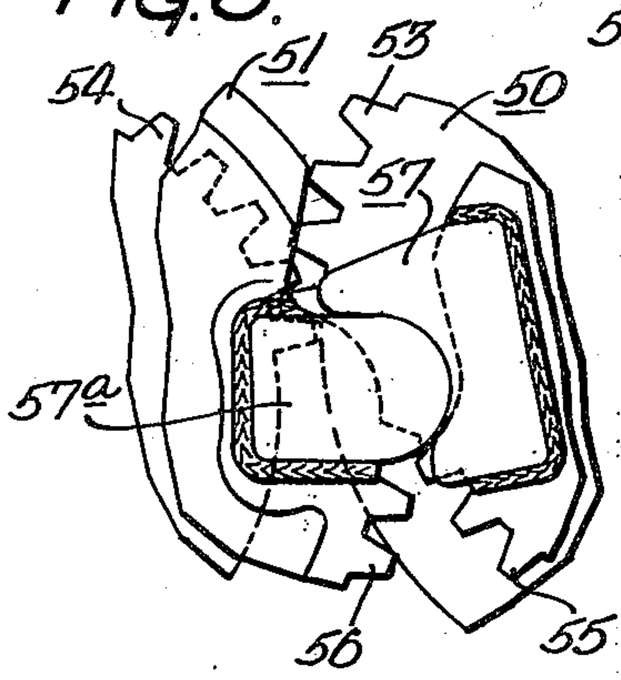



FIG. 7.

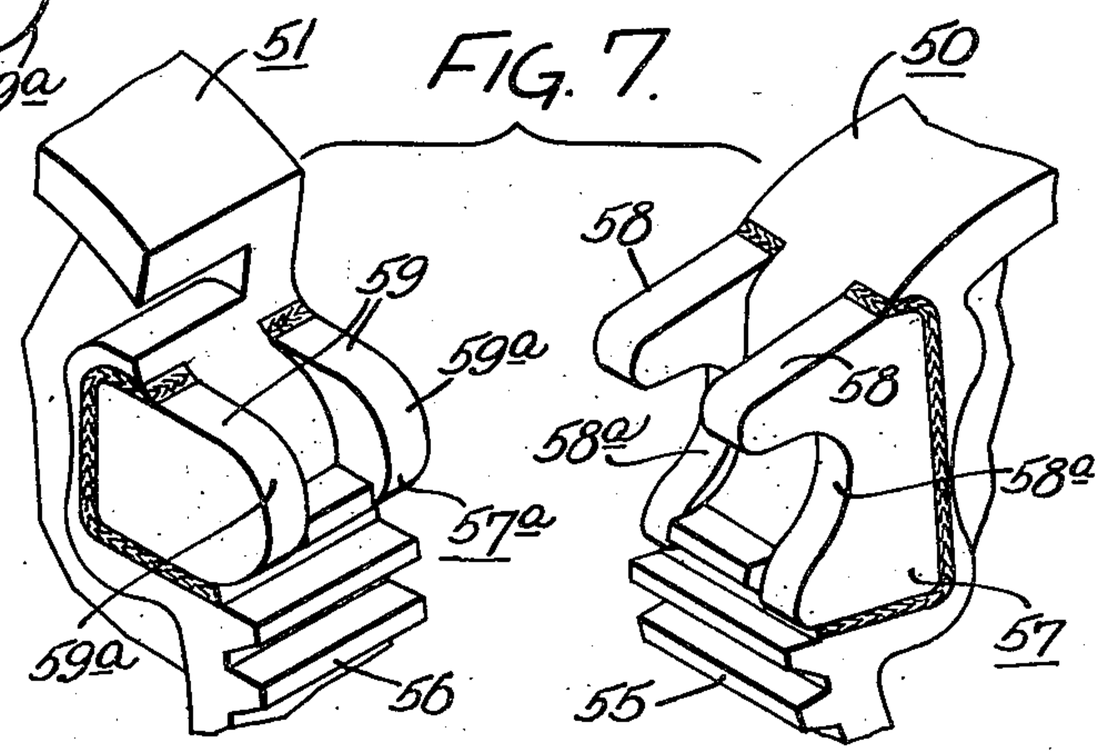
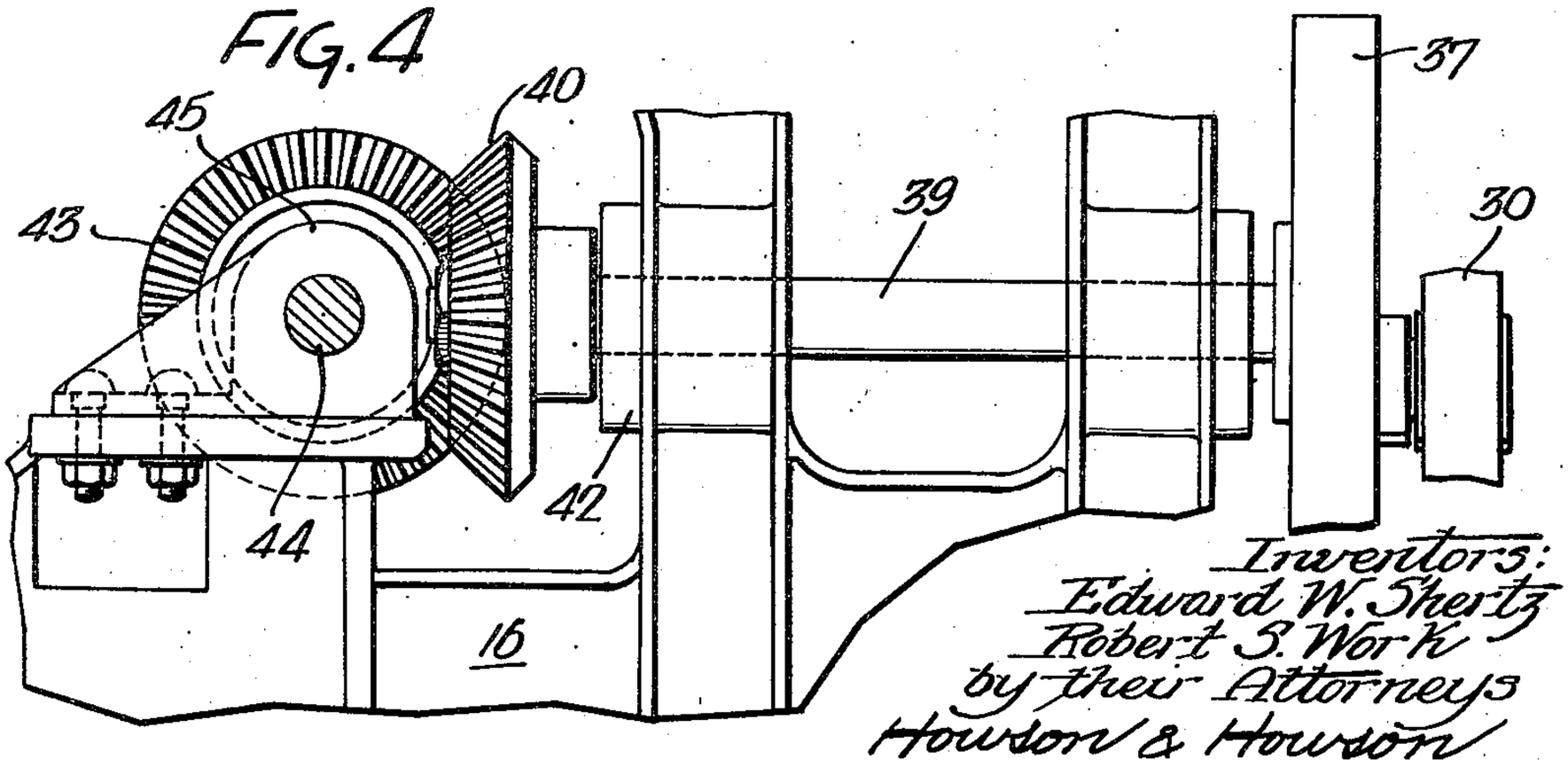



FIG. 4

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# PILE WIRE LOOM MECHANISM

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Application October 24, 1951, Serial No. 252,872

6 Claims. (Cl. 139—42)

This invention relates to fabric looms and has to do more particularly with improved mechanism permitting three-shot operation in a pile wire loom equipped with a rope pull wire motion.

Our present modification is especially suited for what are currently known as Wilton type looms, in which the weft shots are inserted by means of a shuttle. However, the invention is not limited to looms of this sort because it may be applied to other types of pile wire looms such as, for example, plush looms.

It is current practice in this country to weave floor coverings such as pile fabrics using what is commonly referred to as a "two-shot" construction, which means that there are two weft shots per wire or in a double chain fabric there are two weft shots laid before the binder warp shed and heddles change. In a three shot weave, there are three weft shots per wire or in a double chain fabric three weft shots before the binder warp shed and heddles change. In current Wilton practice, nearly always a double chain fabric, two-shot carpets use wool yarn in the pile, whereas three-shot carpets are generally made with worsted pile yarn.

Heretofore, looms of the type known in the trade as "Wilton" looms have employed a chain pull motion. When a three shot fabric is woven in a loom thus equipped it has been possible to convert from two to three-shot operation and vice versa in a comparatively short time. However a chain pull loom operates at only about 40 per cent to 50 per cent of the efficiency of the more widely used rope pull wire motion loom. The modern tendency is to increase loom speeds and efficiency wherever possible so that it is highly desirable to use the rope pull wire motion loom in all installations.

As noted above, however, it was necessary to convert a rope pull wire motion loom to the slow and less efficient chain pull wire motion when it was desired to weave a three-shot fabric.

The present invention therefore permits the retention of the increased production and efficiency of the rope pull loom together with the ability to weave a three-shot fabric thereon.

Furthermore, on Wilton type looms it has been found highly desirable to employ as many of the same parts as possible and there has lately been an increased demand for relatively quick conversion of the loom from two to three-shot and vice versa. Heretofore, such conversion necessitated substantial "down time" due to changing of gears in the wire rope drive, etc. The present invention contemplates drive mechanism in a rope pull wire motion loom which enables the conversion from two to three-shot weave to be made with a minimum of effort and loss of time.

A primary object of the invention, therefore, is to provide mechanism whereby a rope pull wire motion loom can be operated to weave a three-shot fabric.

A further object of the invention is to provide in a loom of the type described a suitable quick return motion for the rope driveshaft.



A further object of the invention is to provide a set of compound interrupted gears for varying the drive ratio of the crank drum shaft with respect to the crankshaft during one revolution of the rope driveshaft.

Further objects will be apparent from the specification and drawings in which:

Fig. 1 is a front view of the wire rope drive mechanism of a pile wire loom;

Fig. 2 is a top view of the structure shown in Fig. 1;

Fig. 3 is a sectional detail as seen at **3—3** of Fig. 2;

Fig. 4 is a sectional detail as seen at **4—4** of Fig. 2;

Fig. 5 is a sectional detail as seen at **5—5** of Fig. 2;

Fig. 6 is an enlarged fragmentary detail showing the gears of Fig. 5 in a moved position;

Fig. 7 is a perspective of the structure of Fig. 6; and

Fig. 8 shows a part of the mechanism of Fig. 2 arranged for two-shot operation.

The invention comprises essentially the provision of a pair of compact interrupted gears connected between the bottom extension driveshaft and the rope driveshaft so that it is unnecessary to modify or replace any part of the rope pull wire motion when the loom is converted from two to three shot operation and vice versa.

Referring now more particularly to the drawings, the portion of a pile wire loom associated with the present construction comprises a conventional frame member **10** to which there is connected a front extension girt **11**, a rear extension girt **12**, and a rope drum journal support **13**. The front and rear extension girts are suitably connected by means of an extension cross girt **14**, a gearing support tie **15**, and the crank drum shaft supporting member **16**. The hopper guide girt **17** is mounted on members **10** and **16** (as shown in Fig. 1.) The wire rope drum **20** is keyed to wire rope drum shaft **21** which is in turn journaled at **22** and **23** on the front extension girt **11** and the drum journal support **13** respectively.

The drum is provided with the conventional rope **24** which simultaneously winds and unwinds from the drum in accordance with standard practice. Shaft **21** carries a pinion gear **25** which meshes with the teeth on quadrant **26** which is in turn pivoted at **27**. Quadrant **26** is oscillated on its pinion through a connecting arm **28** secured to the quadrant by means of quadrant pin **29** and to the crank lever **30** by means of crank lever pin **31**. Lever **30** is journaled on the crank fulcrum shaft **32** mounted in crank lever fulcrum bracket **33**. A slide block **34** reciprocates on guides **35**, **35** of lever **30** and the slide block is controlled through a crank pin **36** mounted in crank drum **37**. Slide block **34** may be conveniently adjusted in lever **30** by means of slide block adjusting shoe **38**. The crank drum **37** is keyed to the crank drum shaft **39** which is in turn journaled in drum shaft support member **16** and the opposite end of shaft **39** carries a driven bevel gear **40** retained thereon by means of a nut **41**. A suitable thrust washer **42** may be used on shaft **39** (as shown in Fig. 4).

Gear **40** meshes with the driving bevel gear **43** keyed to rope driveshaft **44** which is journaled at one end in bearing **45** and at the other end in extension cross girt **14**. The above-described drive mechanism is well known in the art and forms no part of the present invention. It will be understood, however, that upon rotation of shafts **44** and **39**, the drum **20** makes a predetermined number of revolutions in a clockwise direction, to pull the wires (not shown) and a predetermined number of revolutions in a counterclockwise direction at a higher rate, to insert the wires.

Shaft **44** carries a compound interrupted gear **50** which is keyed thereto. Gear **50** is driven from a meshing compound interrupted gear **51** in such a manner that the ratio with which shaft **44** turns with respect to the bottom

extension shaft 52 varies during one turn of the shaft.

Referring to Figs. 5–7, gear 50 has a set of gear teeth 53 which mesh with a set of teeth 54 on gear 51, and it will be apparent that the pitch diameter of the teeth 53 is greater than teeth 54 so that when these gear sets are meshed in driving relationship, shaft 52 turns relatively faster than shaft 44. In the conventional loom, the ratio of gear sets 53 and 54 is 1.2:1, respectively. The teeth of set 53 are interrupted around the periphery of gear 50 so that there is no driving relationship between the gears 50 and 51 during the interrupted portion of the gear travel except as provided through the teeth of sets 55 and 56 on gears 50 and 51, respectively. It will be apparent that the pitch diameter of gear tooth set 55 on gear 50 is substantially less than the pitch diameter of set 56 on gear 51 so that when shaft 44 is being driven with sets 55 and 56 in mesh, it turns relatively faster than shaft 52. By way of example, the ratio between sets 56 and 55 is 1.5:1.

In order to provide quiet and positive transfer between the teeth of different pitch sets on the same gear, we utilize special transfer teeth 57, 57*a* at the termini of the gear tooth sets 53 and 54 on each gear. The transfer tooth 57 comprises a pair of outer flanges 58, 58 which are welded to the gear (as shown in Fig. 7) and which have arcuate concave surfaces 58*a*, 58*a* so shaped to provide rolling contact with the convex surfaces 59*a*, 59*a* of cooperating flanges 59, 59 of transfer tooth 57*a* on gear 51. Figs. 5 and 6 clearly show the engagement and disengagement of the transition teeth 57 and 57*a* respectively.

Gear 51 is keyed to shaft 52 which is in turn journaled at 60 and 61 in bearing tie 15 and cross girt 14 respectively (Fig. 2). The opposite end of shaft 52 is keyed to lash cam gear 62 which is of larger pitch diameter and concentric with a spur gear 63 keyed to the treadle box driveshaft 64. Crankshaft 65 is keyed to the crankshaft pinion 66 which is in constant mesh with gear 63. The lash cam drive pinion 67 is slidably keyed to shaft 65 so that it may be selectively engaged with the lash cam gear 62. When the loom is set up for three-shot operation, the gears are meshed as shown in Fig. 2, so that treadle box driveshaft 64 is driven solely through gears 66 and 63 from shaft 65, whereas the lash cam gear 62 and shaft 52 are driven from gear 67 at different ratios. In this case, the ratio between gears 63 and 66 is preferably 2:1 and the ratio of gears 62 and 67 is 3:1.

Fig. 8 illustrates the alternate manner for connecting gears 62, 63 and 66 when the loom is operated for weaving a two-shot fabric. For this purpose it is necessary to slide the drive gear 67 axially on shaft 65 and then to bolt gears 62 and 63 together to form a compound gear which drives both shafts 64 and 52 at the same speed from gear 66. It will be understood that any suitable means for connecting gears 62 and 63 may be used, but we find it satisfactory to employ ordinary bolts 68, 68. For two-shot operation other alterations and changes to the loom are made but these changes do not require the replacement of the more efficient rope pull wire motion.

It will thus be understood that we have provided a satisfactory and, insofar as is known, the only loom which can be run to weave a three-shot pile fabric with a rope pull wire motion. Furthermore, this loom can be converted to the conventional two-shot weave with a minimum of lost time.

Having thus described our invention, we claim:

1. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile wires adapted to be inserted into and withdrawn from the fabric, an extension shaft for actuating the pile wires, means including a rope drive shaft driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including means engageable with said wires to alternately insert and withdraw the pile wires from the fabric, and driving connections between said rope drive shaft and said shaft comprising a compound interrupted gear on each extension shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the wire insertion means is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively, each of said gears having means intermediate said large and small diameter sets of teeth to effect transition therebetween.



2. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile wires adapted to be inserted into and withdrawn from the fabric, a driven crank shaft having a first pinion fixed thereto and a second pinion slidably keyed thereto for selective movement between a first and a second position, means including a treadle box gear meshed with said first pinion to actuate said yarn manipulating means, an extension shaft for actuating the pile wires, a lash cam gear fixed to said extension shaft coaxial with said treadle box gear and meshed with said second pinion in the first position thereof and disengaged therefrom in the second position thereof, means to engage said lash cam gear with said treadle box gear for rotation therewith when the former is disengaged from the second pinion, means including a rope drive shaft driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including means engageable with said wires to alternately insert and withdraw the pile wires from the fabric, and driving connections between said rope drive shaft and said extension shaft comprising a compound interrupted gear on each shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the wire insertion means is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively, each of said gears having means intermediate said large and small diameter sets of teeth to effect transition therebetween.

3. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile wires adapted to be inserted into and withdrawn from the fabric, a driven crank shaft having a first pinion fixed thereto and a second pinion slidably keyed thereto for selective movement between a first and second position, means including a treadle box gear meshed with said first pinion to actuate said yarn manipulating means, an extension shaft for actuating the pile wires, a lash cam gear fixed to said extension shaft coaxial with said treadle box gear and meshed with said second pinion in the first position thereof and disengaged therefrom in the second position thereof, means to engage said lash cam gear with said treadle box gear for rotation therewith when the former is disengaged from the second pinion, the drive ratios to said extension shaft afforded by said first and second pinions having a 3:2 relationship, means including a rope drive shaft driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including means engageable with said wires and operable upon uni-directional rotation of the extension shaft to alternately insert and withdraw the pile wires from the fabric, and driving connections between said rope drive shaft and said extension shaft comprising a compound interrupted gear on each shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the wire insertion means is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively.

4. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile

wires adapted to be inserted into and withdrawn from the fabric, a driven crank shaft having a first pinion fixed thereto and a second pinion slidably keyed thereto for selective movement between a first and second position, means including a treadle box gear meshed with said first pinion to actuate said yarn manipulating means, an extension shaft for actuating the pile wires, a lash cam gear fixed to said extension shaft coaxial with said treadle box gear and meshed with said second pinion in the first position theerof and disengaged therefrom in the second position thereof, means to engage said lash cam gear with said treadle box gear for rotation therewith when the former is disengaged from the second pinion, means driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including a rope means engageable with said wires, a rope drum to drive said rope means, a rope drive shaft mechanically connected to said rope drum and operable upon unidirectional rotation of the extension shaft to effect reciprocating rotary movement of said rope drum to thereby alternately insert and withdraw the pile wires from the fabric, and driving connections between said rope drive shaft and said extension shaft comprising a compound interrupted gear on each shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the rope drive shaft is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively, each of said gears having means intermediate said large and small diameter sets of teeth to effect transition therebetween.

5. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile wires adapted to be inserted into and withdrawn from the fabric, an extension shaft for actuating the pile wires, means driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including a rope means engageable with said wires, a rope drum to drive said rope means, a crank drum having a crank mechanically connected to said rope drum and operable upon uni-directional rotation of the crank drum to effect reciprocating rotary movement of said rope drum to thereby alternately insert and withdraw the pile wires from the fabric, a rope drive shaft connected to said crank drum to drive the same uni-directionally, and driving connections between said rope drive shaft and said extension shaft comprising a compound interrupted gear on each shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the rope drive shaft is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively.



6. In a pile wire loom comprising means for manipulating warp and weft yarns to weave a fabric, and pile wires adapted to be inserted into and withdrawn from the fabric, a driven crank shaft having a first pinion fixed thereto and a second pinion slidably keyed thereto for selective movement between a first and second position, means including a treadle box gear meshed with said first pinion to actuate said yarn manipulating means, an extension shaft for actuating the pile wires, a lash cam gear fixed to said extension shaft coaxial with said treadle box gear and meshed with said second pinion in the first position thereof and disengaged therefrom in the second position thereof, means to engage said lash cam gear with said treadle box gear for rotation therewith when the former is disengaged from the second pinion, the drive ratios to said extension shaft afforded by said first and second pinions having a 3:2 relationship, means driven by said extension shaft to insert and withdraw the pile wires into and from the fabric including a rope means engageable with said wires, a rope drum to drive said rope means, a crank drum having a crank mechanically connected to said rope drum and operable upon unidirectional rotation of the crank drum to effect reciprocating rotary movement of said rope drum to thereby alternately insert and withdraw the pile wires from the fabric, a rope drive shaft connected to said crank drum to drive the same uni-directionally, and driving connections between said rope drive shaft and said extension shaft comprising a compound interrupted gear on each shaft, each gear comprising two sets of teeth having respectively large and small pitch diameters, the set of large diameter of one gear being meshed with the set of small diameter of the other gear so that the rope drive shaft is driven alternately fast and slow to effect a different rate of insertion and withdrawal of the wires respectively, each of said gears having an enlarged transfer tooth intermediate said large and small diameter sets of teeth to effect transition therebetween.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 426,284 | Kothe | Apr. 22, 1890 |
| 769,062 | Dennis et al. | Aug. 30, 1904 |
| 776,375 | Beattie et al. | Nov. 29, 1904 |
| 1,209,837 | Harris | Dec. 26, 1916 |
| 1,771,662 | Stone | July 29, 1930 |
| 2,566,945 | Laze | Sept. 4, 1951 |