

[72] Inventor **William Eger Nyboe Lauritsen**
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 [31] **13391/67**

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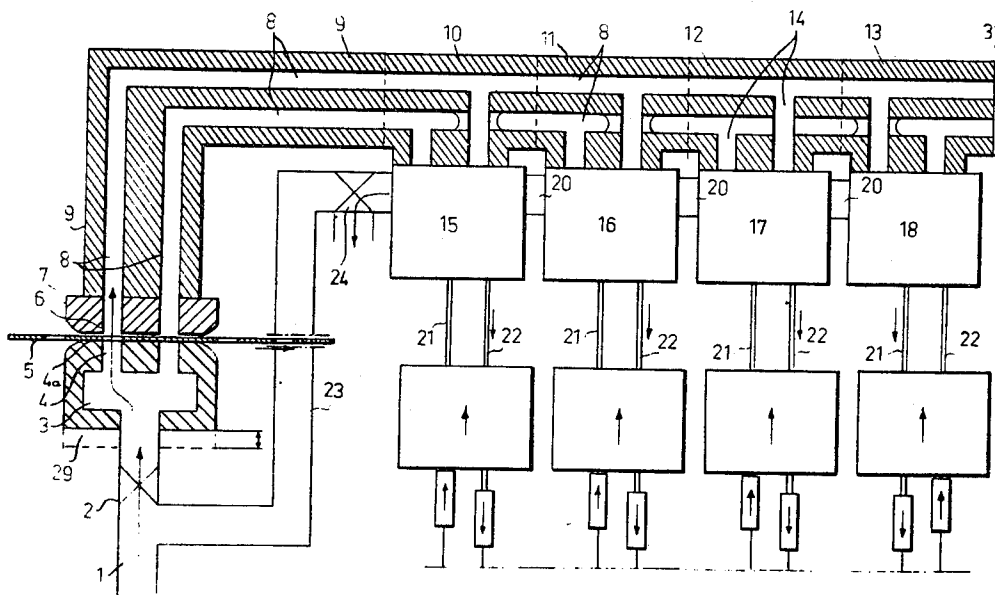
Primary Examiner—James Kee Chi
 Attorney—Beveridge & De Grandi

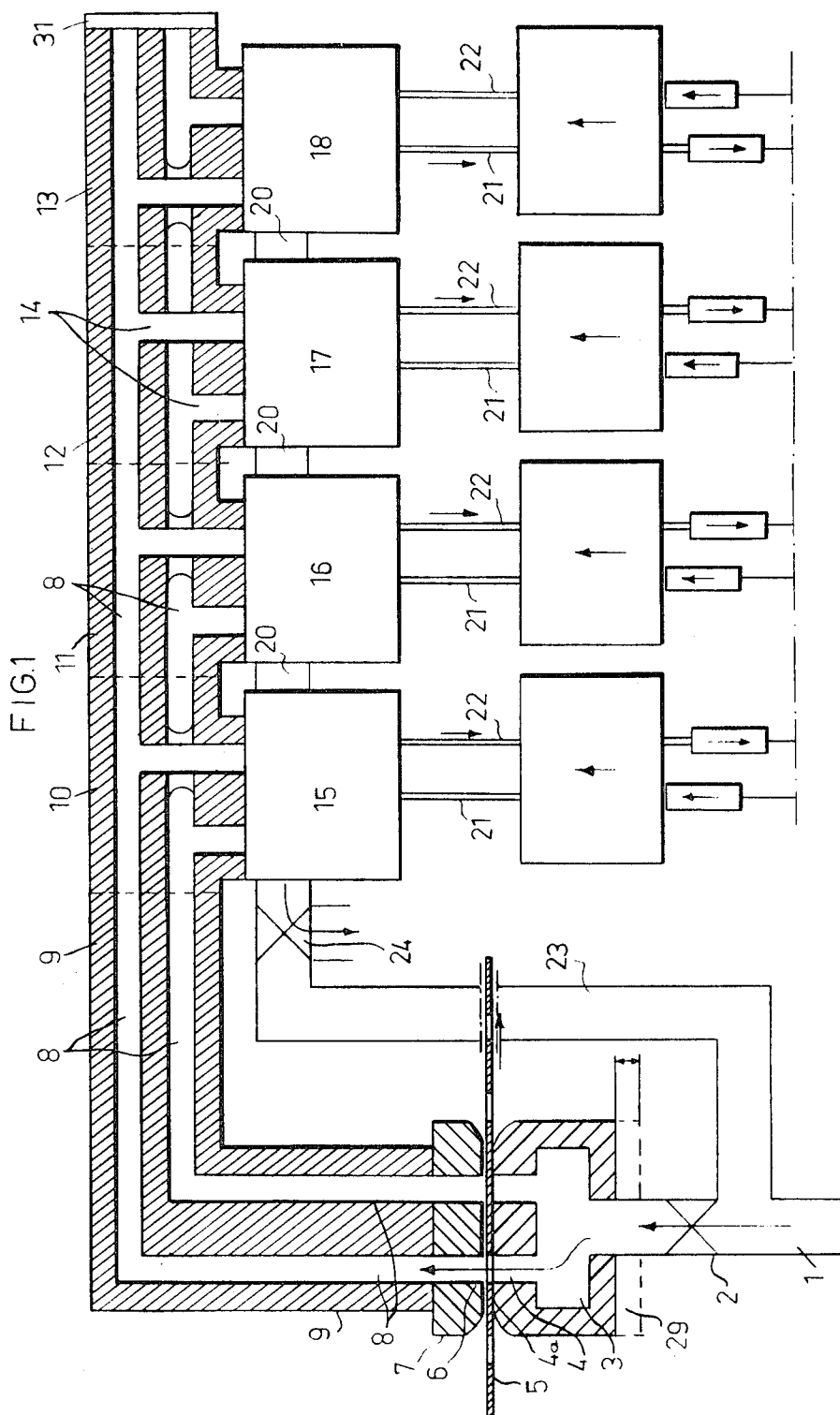
[54] **CONTROL AND SELECTIVE MECHANISM FOR
 SELECTIVE THREADING MEMBERS IN
 KNITTING MACHINES, LOOMS, PATTERN
 MAKING MACHINES AND THE LIKE**
 9 Claims, 13 Drawing Figs.

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139/317, 66/154, 137/608
 [51] Int. Cl..... **D03c 13/00,**
D03c 15/00, F16k 11/00
 [50] Field of Search..... **139/55,**
317; 66/154 A, 154; 137/608, 609

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ABSTRACT: A servo-controlled selection mechanism operating on pressure variations, for selecting one or more of a number of displaceable operating members preferably in the form of pins or rods and intended primarily for magnetic operation. The operating members are included in the shedding mechanisms of looms, in jacquard machines, knitting machines, card punching machines, or the like. The novel matter of the invention resides in that the actuators for each operating member comprises blocking means in the form of a body which is displaceable through pressure variations and which in one position prevents and in another position permits the operating member to be displaced, and in that a distributor including exchangeable channel blocks are provided between an impulse donor and a number of actuators, said channel blocks controlling the impulses from the impulse donor to the desired actuators mechanisms.





INVENTOR:

WILLIAM EGER NYBOE LAURITSEN

by

Brown, Schuyler + Beveridge,
Attorneys

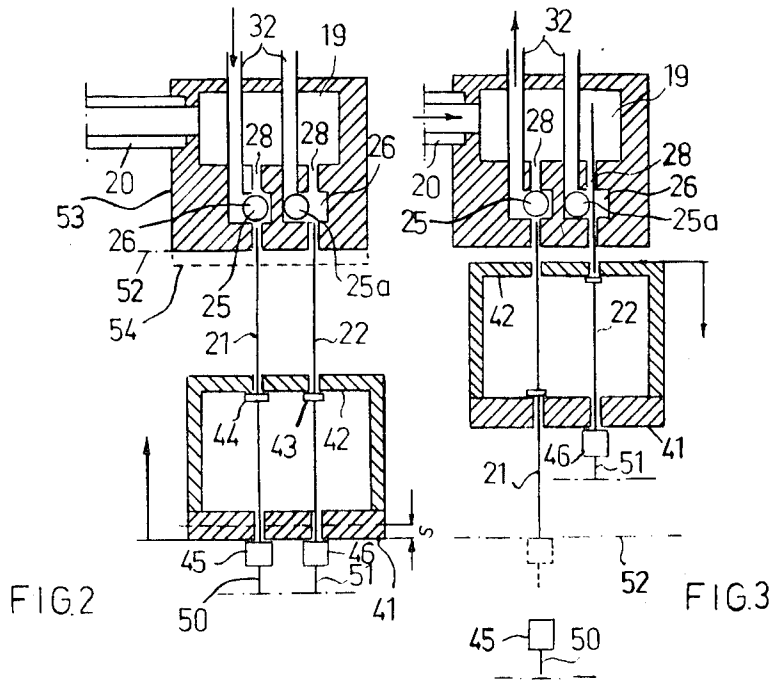


FIG. 4

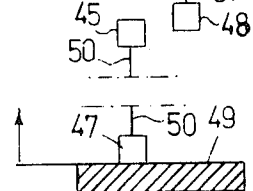
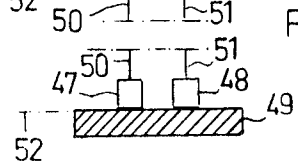


FIG. 5



INVENTOR:

WILLIAM EGER NYBOE LAURITSEN

by

Brown, Schuyler Beveridge
Attorneys

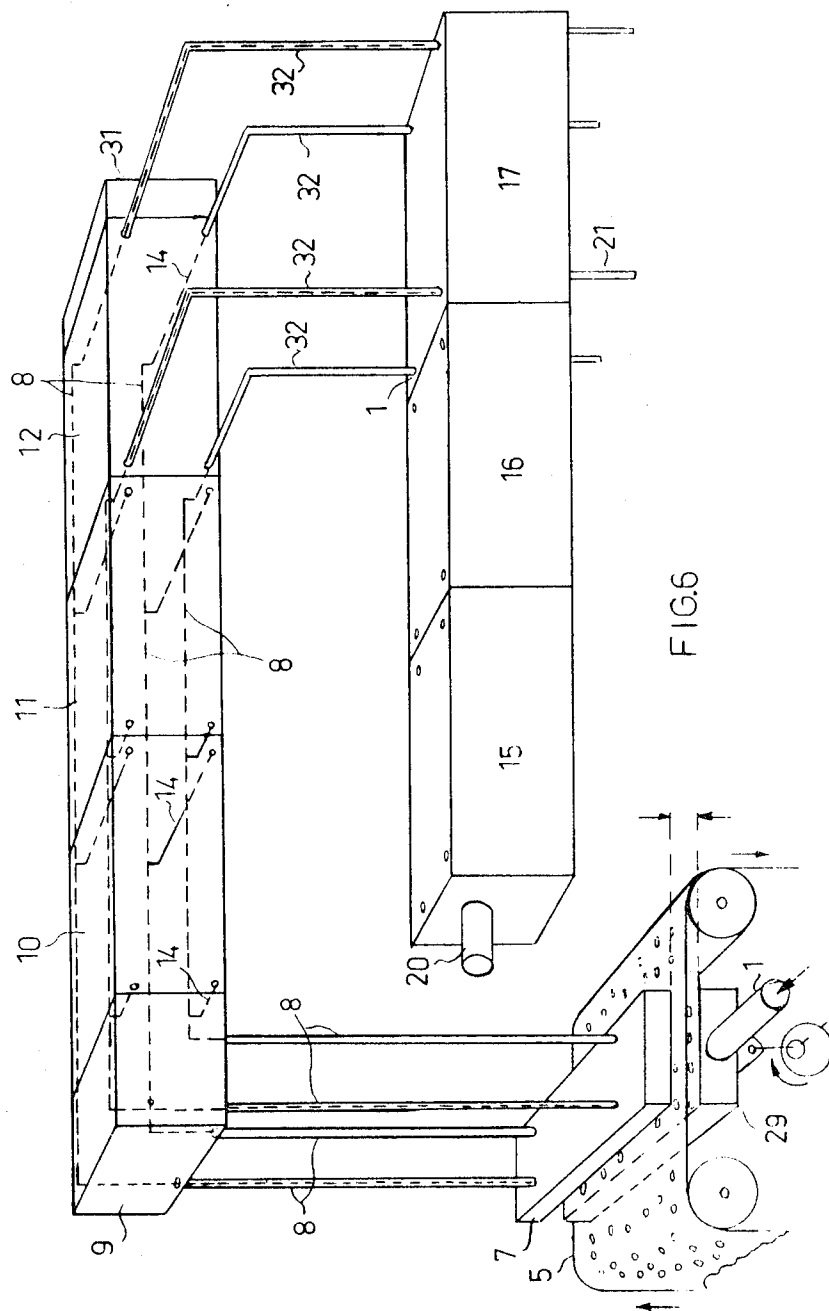
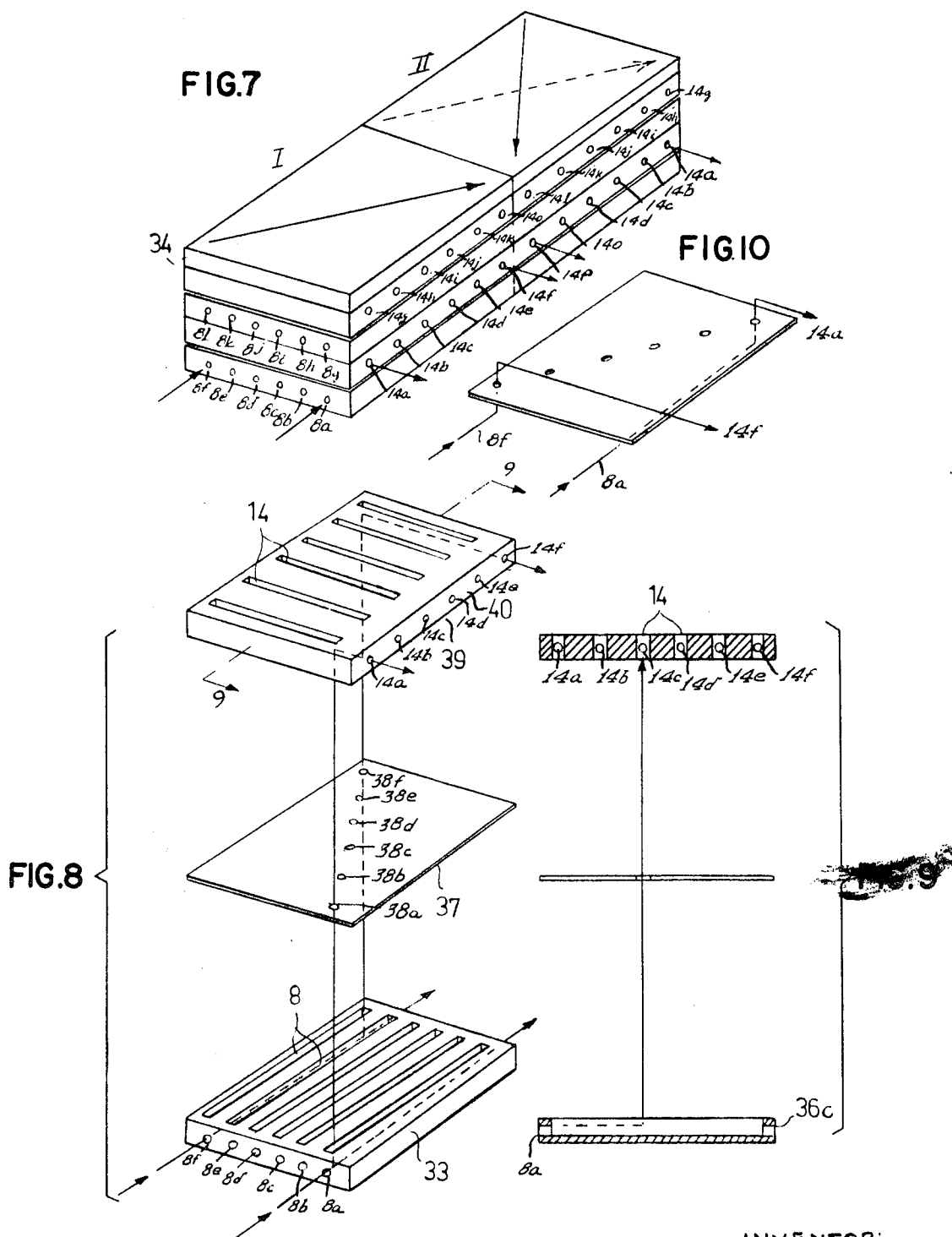


FIG. 6

INVENTOR:
 WILLIAM EGER NYBOE LAURITSEN
 by
 Browne, Schuyler & Beveridge,
 Attorneys



INVENTOR:

WILLIAM EGER NYBØE LAURITSEN

by
Browne, Schuyler & Beveridge
Attorneys

FIG. 12

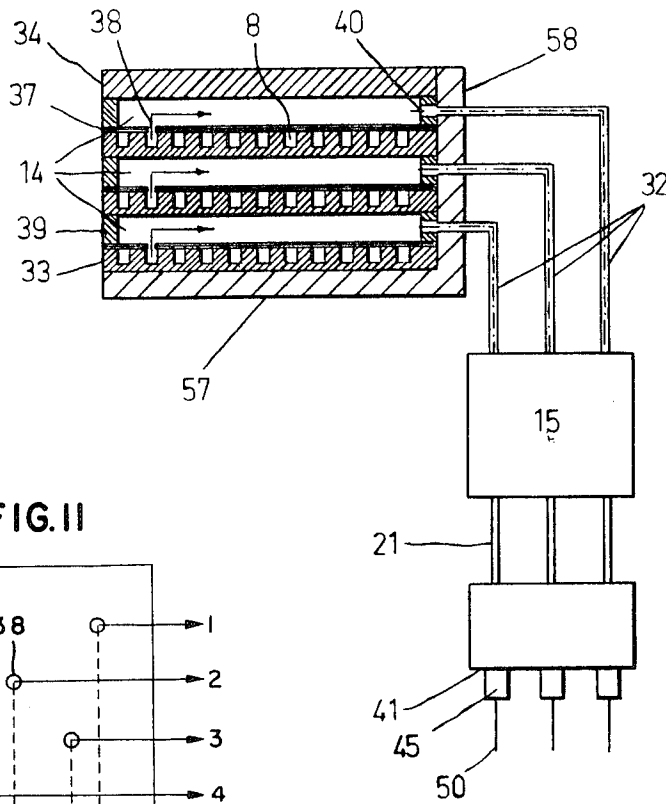
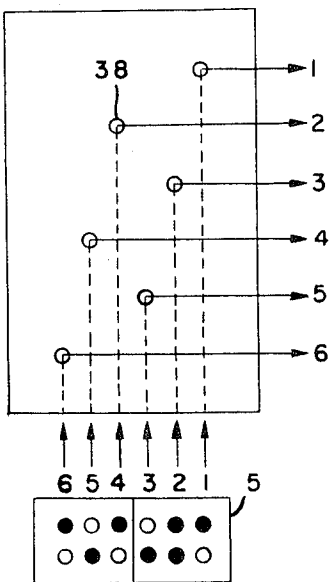


FIG. 11



INVENTOR:

WILLIAM EGER NYBOE LAURITSEN

by
Erwone, Schuyler + Beveridge,
 Attorneys

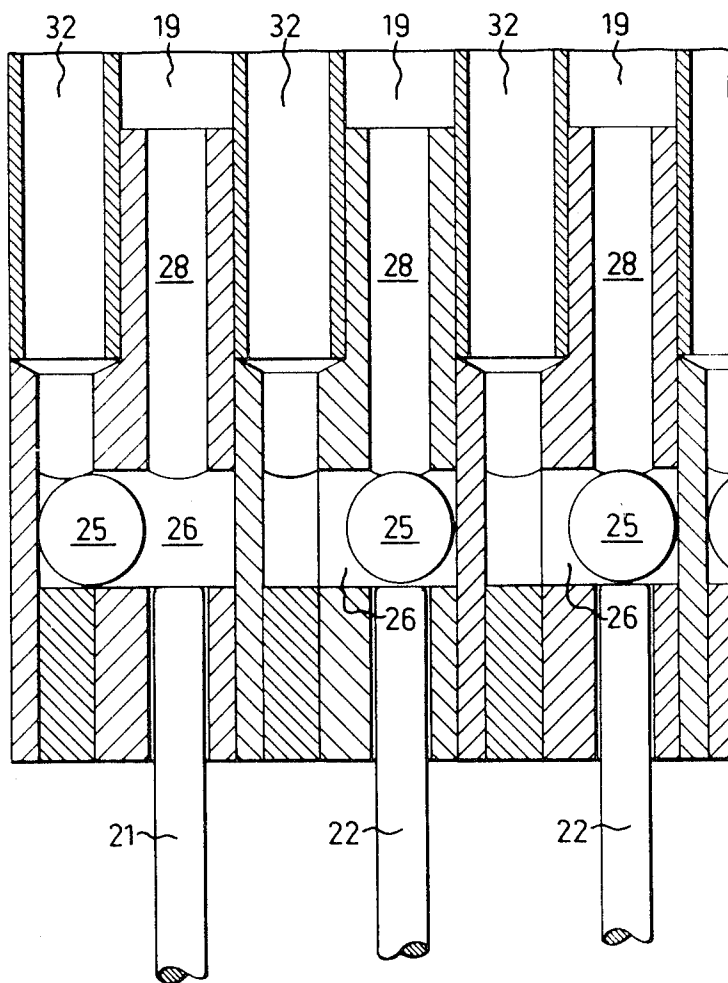


FIG. 13

INVENTOR:
 WILLIAM EGER NYBOE LAURITSEN
 by
Browne, Schuyler & Beveridge,
 Attorneys

CONTROL AND SELECTIVE MECHANISM FOR SELECTIVE THREADING MEMBERS IN KNITTING MACHINES, LOOMS, PATTERN MAKING MACHINES AND THE LIKE

This invention relates to a control and selection mechanism with simultaneous multiplication or repeating (repeats) and individual control of a number of working operations in pattern cards, marking repeats or the like, preferably in high-speed shedding mechanisms for looms in jacquard machines, knitting machines, card punching machines or the like.

For broad fabrics, with highly individual binding combination within every pattern repeat, jacquard machines are used. However, these machines cannot be worked at the same high speeds as modern looms and knitting machines with simpler threading arrangements. As the trend is towards increasingly higher production speeds, the jacquard machine is a retarding factor if one wishes a high production of jacquard-made fabrics per machine and unit of time, there are strong indications that even shaft-driven machines will be a retarding factor in the construction of looms operating with extremely high speeds. Furthermore, the jacquard machine is extremely bulky and blocks off the light. It is uncomfortable to work with, and the adjustment required for different pattern combinations, so-called threadings (different harness arrangements) are costly. For example, one cannot, without some difficulty, weave fabrics with less warp threads than the number of harness-strings. If one wishes to change one thread arrangement from a so-called point-threading to a right-over threading or vice versa, it will take at least one week for two persons to do this job, and then the time taken for the planning work has not been taken into consideration. Except for costs of materials and wages, a big production loss has to be added for the time the machine is not operating. For these reasons, it is therefore of paramount importance to find a new pattern weaving technique which can replace not only jacquards, but also the shaft-driven machines.

This invention, in combination with the known principles of magnetic threading technique shall satisfy all reasonable requirements of thread combinations with a short rearrangement time of 10 minutes and high production speed, while at the same time it is low and compact and can be used as a broad knitting machine and loom.

This invention is applicable to such control and selection mechanisms or the like for simultaneous multiplication or repeating, distribution and selection of a number of working operations depending on a pattern card (punched cards) or the like, said working operations being controlled according to the servo principle, with pressure differences (control pulses) and primarily with air as a pressure and control medium.

The control and selecting arrangements essentially consist of a channel and distribution block with exchangeable sections constructed for simultaneous and/or varied distribution sequence of the distribution impulses and multiplication of repeats of the impulses, and of one or several selection mechanisms which are servo-controlled by control impulses and are connected to the channel block and, in cooperation with a previously known magnetic threading or shed formation arrangement, select and actuate the healds therein.

Further features of the invention and its advantages will appear from the following description, reference being made to the accompanying drawings which illustrate, by way of example, several basic embodiments of the channel block and the selection mechanism according to the invention. In the drawings:

FIG. 1 schematically shows the route of the pressure medium from and to the selection mechanism;

FIGS. 2—5 show the selection members within each selection mechanism;

FIG. 6 shows the channel and distribution block;

FIG. 7 shows two distribution blocks (sections) composed of plates;

FIGS. 8 and 9 show the construction of the distribution block;

FIG. 10 shows a variant of the hole distribution in an intermediary distribution plate;

FIG. 11 shows another variant thereof;

FIG. 12 shows a channel and distribution block in cross section; and

FIG. 13 shows on a considerably larger scale, a part of the blocking mechanism and its selection members.

In FIG. 1, the compressed air passes through a pipe 1 from a selection arrangement or a pump through a valve 2 into an air chamber 3 in a movable air box 29, the exterior wall of which is perforated with as many holes 4 as the pattern card when this has been punched to maximum extent. If there are holes in the pattern card, the air flows through them and into the corresponding holes 6 in an opposite press plate 7. The press plate 7 is directly connected to the channel block 9 which includes as many main channels 8 as there are holes in the maximally punched cards, i.e. a so-called machine repeat. The channel block 9 may wholly or partly consist of exchangeable distribution sections 10, 11, 12, 13 (indicated by broken lines).

Each main channel 8 within one distributor section (distribution block) is connected to one branch channel 14 which in turn is directly connected to one blocking or selection member 25, 25a in FIGS. 2, 3, 4, and 5 within each selection mechanism or actuator 15, 16, 17, 18 in FIG. 1. Each actuator thus contains as many blocking or selection members 25, 25a and movable units or selection pins 21, 22 as in a pattern repeat. In FIGS. 1, 2, 3, 4, and 5 each machine repeat contains, for the sake of simplicity, only two selection arrangements but may, of course, also contain a larger number of these.

FIGS. 2, 3, 4, and 5 show the same machine repeat in cross section, together with two selection arrangements, also in cross section. The machine repeats or machine units can be spaced apart in the manner of a ribbon loom, or they can be assembled into a single block. In the former case, the air chambers 19 of the machine actuators or repeats 15, 16, 17, and 18 in FIG. 1, must be interconnected through a pipe 20. In the latter case, the chamber 19, FIG. 2, is common to all machine repeats and all selection arrangements therein. The chamber 19 can either be open to atmospheric pressure or coupled to the pressure unit 1 through a pipe or a hose 23, FIG. 1, via a three-way valve 24. Through pipes 32 connected to branch channels 14, the air can actuate the blocking members which consist of a ball or a cylindrical piston 25 which can be moved horizontally between two end positions in a cylinder 26. When the ball is in one end position, it blocks a selecting pin 21, 22 movable through the cylinder wall from crossing the cylinder. If the pressure is higher on the left-hand side than on the right-hand side of the ball (as seen in the drawing), then the ball will move to the right. If the pressure is higher on the right-hand side than on the left-hand side, the ball will move to the left. Simultaneously as the pressure rises on the left-hand side of the ball, the pressure on the right-hand side is reduced because the hole 28, FIG. 5, is in communication with the chamber 19 which via the three-way valve 24, FIG. 1, then communicates with the atmospheric pressure. The movement of the ball to its original position to the left occurs as follows:

I. The air chamber 3 with holes 4 in the side 4a moves so far away from the pattern card 5 that the card is released from the press plate 7. Simultaneously as the valve 2 closes, the three-way valve 24 is opened to pressure to the chamber 19. The pattern card being no longer clamped between the press plate 7 and the movable air box 3, the air can rush back through the branch channel 14 and the main channels 8.

II. The compressed air enters the chamber 19 through the pipe 23 and the three-way valve 24 and from there through the holes 28 to the right-hand ends of the cylinders 26, thereby causing an excess pressure on the right-hand side of the balls 25. The balls are pushed to the left, and the selecting pins 21, 22 can then be moved through the cylinders.

In FIG. 2, excess pressure has entered the left-hand end of the cylinder 26 through pipes 32 and has moved the ball 25 to the right. In this position, the ball arrests the selecting pin 21.

In FIG. 3, an excess pressure has been produced on the right-hand side of the cylinder 26 via the pipe 20, the chamber 19 and the hole 28, while the pressure decreases on the left-hand side of the cylinder 26. The ball 25 is here on the point of moving to the left. In both FIGS., the nearest ball is unaffected. In FIGS. 4 and 5 the nearest ball 25 is actuated when the first-mentioned ball rests in initial position. The movement of the balls to the right is determined by the hole arrangement in the pattern card 5 in FIG. 1.

Once during each working cycle, the perforated chamber 3 is pressed against the press plate 7. Each time chamber 3 moves out of contact with the press plate 7, a new pattern card 5 enters between the chamber 3 and the press plate 7.

The channel and selection block 9, FIG. 1, may contain a large number of main channels 8 and branch channels 14 and serves to supply simultaneously a number of press (control) impulses to the same, double or greater number of selection members 25, 25a.

FIG. 6 illustrates schematically the distribution and the multiplication of the control and press impulses which have entered through the pattern card 5 and the main channels 8. Once during each working cycle, a new section (a new card) of a punched tape 5 is clamped between the oscillatory air box 29 and the press plate 7 which has as many corresponding holes as the air box 29. When the pattern card is clamped fast, air flows into the air box through pipe 1. The air flows through the holes in the card into the corresponding channels 8 in the channel block or distributor 9. The distributors 9 may consist of several sections 10, 11, 12, etc. in the so-called distribution block. Each distribution block contains a number of main channels 8 which correspond each to one branch channel 14, FIG. 1. In FIG. 6 three distributor blocks have been coupled together. The main channels 8 therein extend from one end wall to the other and correspond each to one main channel in the adjacent distribution block. By this arrangement of the channel and distribution block 9, FIG. 6, the control (press) impulses entering through the main channels 8 can be multiplied. In FIG. 6, each channel (only four are shown) is connected to three branch channels. The impulse distribution through a pattern card 5 can thus give three repeats. This number can be increased by adding further distribution blocks. The channel and distribution block may comprise e.g. 1,344 main channels, and each distribution block may thus have as many branch channels. The 1,344 broken-line main channels 8 (only four are shown) supply press impulses to the corresponding ones of branch channels 14 and in the distribution blocks 10, 11, and 12. Each branch channel 14 communicates with one selection member 25 (ball, piston), in FIGS. 2, 3, 4, and 5, through pipes, hoses or channels 32, FIG. 6. The channel and distribution block 9, 10, 11 and 12, in FIG. 6, is closed by a sealing plate 31.

The channel and distribution blocks will now be described in detail. FIG. 7 shows two distribution blocks (sections) arranged in side-by-side relationship.

FIGS. 8, 9 and 12 show how the various components of the distribution block are constructed and assembled. FIG. 8 thus shows, by way of example, the three lowermost plates in FIG. 7, while FIG. 9 shows an exploded sectional view of the respective plates. FIGS. 10 and 11 show different air distribution systems in a distribution plate. The left-hand section of the channel and distribution block in FIG. 7 consists of a number of main channel plates, distribution plates, and branch channel plates, FIG. 8, superimposed in this order, and on top of these a sealing plate 34 is placed, FIG. 7. The drawings show only two sets of channel plates and two sets of distribution plates. FIG. 10 shows how the distribution plates in the right-hand section are perforated. The arrows on top of the distribution block I and II, FIG. 7, indicate the direction of distribution of the channel combination of the two blocks. The arrows through the plates in FIG. 8 show, by way of example, how impulses through the inlet holes 8a through 8f in the main channel plate are distributed through the distribution plate, the branch channel plate and finally are discharged through

the outlet holes 14a through 14f. Inlet hole 8f, farthest to the left, is thus connected to the outlet hole 14f, farthest to the right, in the channel block I. Channel block II has distribution plates as shown in FIG. 11, where the inlet hole 8f, farthest to the left, is connected to the outlet hole 14f, farthest to the left. Inlet hole 8a and its main channel 8 are connected to the branch channels 14 and their outlet holes farthest to the left on channel block I and farthest to the right on channel block II. If the impulse sequence in the main channels is from one to six, the distribution will be from outside towards the center of the outlet side. The distribution is the same as in so-called "wedge-threading" in a conventional jacquard machine. If the distribution plate used in block II is same as in FIG. 8, the sequence will be same as in block I; see the broken-line arrows. This corresponds to the "right-over threading" in conventional jacquard machine. The main channel plate 33, FIG. 8, has slot-shaped main channels which terminate in a wall at both ends, with inlet holes 8a through 8f and corresponding connecting holes 36a through 36f (only hole 36c is shown) extend through these walls. The intermediary distribution plate 37, FIG. 8, has holes 38a through 38f each of which correspond horizontally to but one main channel 8 in the plate 33 and vertically to but one branch channel 14 in the plate 39. The branch channel plate 39 has through slots 14 (branch channels). Outlet holes 14a through 14f are drilled through one end wall of the slots, FIG. 9. An alternate arrangement is illustrated in FIG. 11 which shows a distribution plate where the perforations are made in such a way that the impulses from one half of the pattern card are connected to the branch channels 14a, 14c, and 14e through the main channels 8a, 8b, and 8e while the other half of the pattern card is connected to the branch channels 14b, 14d, and 14f. Many other combinations are possible.

The function of the distribution mechanism in connection with a magnetic threading and shed formation arrangement is as follows. A magnetic plate 41 with a carrier plate 42 is at its lowermost position—initial position—in FIGS. 2 and 5. In FIG. 3, it has reached its uppermost position and is on the point of moving downwards. In FIG. 4, it is on its way down. In FIG. 2, the left-hand selection member, the ball 25, has been moved to arresting position for the selecting pin 21 because excess pressure has entered through the pipe on the left-hand side of the ball. The magnetic plate 41 begins its upward movement, at first slowly. At the same time, there is a magnetic force between the magnetic plate 41 and the armatures 45 and 46 which thus tend to participate in the upward movement. However, as the selecting pin 21 is blocked against upward movement, the armature 45 associated therewith is pushed away from the magnetic plate 41. The right-hand ball 25, because of the pattern, has not received any selection impulse and thus remains in its initial position, for which reason the selection pin 22 can move upwards. Due to the magnetic force, which is small at first, between the armature and the magnetic plate 41, the pin 22 moves upwards. The magnetic plate is magnetized after it has travelled a small distance (S) upwards. It can be stationary or begin a downward movement. The attracting force between the magnetic plate 41 and the armature 45 is then nonexistent owing to the distance therebetween, while the attracting force between the magnetic plate 41 and the armature 47 is at its maximum. The head 50 lies between the armature 45 and the armature 47 and is connected to both. Because of the greater downward pulling force of the armature 47 and its propagation to the armature 45, the gauge pressure on the selection pin 21 between the armature 45 and the ball 25 ceases. While the magnetic plate 41 is on its way up, an excess pressure is developed in the chamber 19 and at the same time the pressure on the left-hand side of the ball 25 decreases, and when the magnetic plate 41 starts its downward movement, the pressure difference between the two sides of the ball 25 is at its maximum, see FIG. 3. The ball 25 is now pressed back to its initial position. In FIG. 4, the magnetic plate 41 has moved about halfway down. In accordance with the pattern, an excess pressure is

now developed on the left-hand side of the ball 25a. The ball 25a is pressed against the selection pin 22 which, owing to the abutment 43 on the selection pin 22 and the carrier plate 42 connected with the magnetic plate, moves downwards. When the magnetic plate has reached its lowermost position 5, the selection pin has come so far down that the ball 25a can be pushed to its right-hand arresting or selecting position. Because of the pattern card the ball 25 has still not been actuated and remains in its initial position, i.e. the left-hand position. When the magnetic plate 41 moves upwards, the armature 45 is taken along, while the armature 46 remains in initial position because the ball 25a blocks the selection pin 22 and thus the armature against upward movement.

In FIG. 3, the armature 45 and the heald 50 are shown in their lowermost position.

The arrow in FIG. 4 indicates that the magnetic plate 49 is on its way up. The magnetic plate 49 can also be stationary and then the plate and the healds, including their armatures, which are not intended to follow the magnetic plate 41, remain in their initial magnet position 52, FIG. 3. The armature 45 (shown in broken lines in FIG. 3) is in its initial position. In FIG. 5, the armatures 46 and 48 and the heald 50 are in their initial or selecting positions. Another movement pattern for the heald selection can be achieved by letting the uppermost magnetic plate 41 remain stationary, while the lowermost magnetic plate 41 moves. To achieve a selection of healds and armatures which are to follow the lowermost magnet downwards, the ball box 53, FIG. 2, must move a small distance downwards from initial position. The broken line 54 symbolizes this movement which is congruent and simultaneous with the initial movement of the lowermost magnetic plate. All the time, the magnetic plate 41 has a certain attractive force, while the lowermost magnetic plate 49 is not magnetized until it and the box 53 have moved a small distance from the initial position 52 to the position 54. At the beginning of the shed formation period, the magnetic pull of the uppermost magnetic plate in principle need not be larger than is necessary to hold the armatures which are not pressed down by the selection pins 21, 22.

Another possibility is to use a movable ball box when both magnetic plates 41 and 49 are also movable. While the ball box 53 and the magnetic plate 49 move from position 52 to position 54, the magnetic plate 41 remains stationary. The magnetic plate 41 then begins its upward movement. The movement of the magnetic plates is then opposite to that mentioned earlier.

A similar selection technique can, of course, be achieved if the selection mechanism is placed beneath the lowermost magnetic plate 49 (compare Swedish Pat. No. 186,440, claims 1, 5, 9, 12, 14).

A stationary plate 55, FIGS. 4 and 5, through which the selection pins 21 and 22 move up and down, is intended to prevent the selection pins 21, 22 from falling out of the holes 56 in the ball box 53.

FIG. 12 shows a sectional view of a channel and distribution block against a solid base 57 and a sidewall 58. The holes 40 in the sidewalls of the branch channel plates 14 correspond to pipes or hoses 32 extending through the wall 58. The pipes 32 are connected each to one selection member (not shown) in the selection mechanism 15 which via the selection pin 21 and the magnetic plate 41 influences the armature 45 on the heald or punches 50. In FIG. 6 and 7, the channel and distribution block 9, 10, 11, 12 and 31 is tightly pressed against the wall 58 with its entire long side which is provided with outlet holes 40. The channel block is clamped between this wall 58 and a clamping device (not shown) on the opposite side of the channel block. In a similar clamping arrangement against the sealing plate 31, FIG. 6, the sections 10, 11 and 12 can be pressed against each other so that complete sealing is achieved between their surface-ground end walls. The block sections are easily replaced by removing the clamping device. Different threading combinations can thus be easily and quickly achieved.

I claim:

1. A fluid impulse distribution system for use with textile machines such as looms and knitting machines, said distribu-

tion system comprising, in combination, an impulse donor adapted to sense information contained on a carrier and to supply pressure medium in response thereto, a plurality of actuators operable in response to impulse signals to control the setting of units in said textile machines, and an impulse distributor disposed between said donor and said actuator and operatively connected thereto to distribute impulses in the form of pressure medium flows from said donor to said actuators, blocking means in said actuators adapted to be displaced to control the setting of said units, said distributor including at least one pair of plates each provided with a plurality of parallel grooves formed in one side thereof and with the grooves of one of said plates being disposed at an angle with respect to the grooves of the other of said grooved plates, an intermediary plate disposed between the plates of each said pair of grooved plates, a plurality of apertures formed in said intermediary plate with each aperture connecting a groove in said one grooved plate with a groove in said other grooved plate, the grooves of each of said grooved plates being open toward said intermediary plates, conduit means operatively connecting the grooves of said one grooved plate to said donor and conduit means operatively connecting the grooves of said other grooved plate to said actuators so that pressure medium from said donor may be supplied to said actuators in accordance with the desired distribution.

2. A system according to claim 1 wherein the distributor is detachably provided between the donor and the actuators whereby a change in the distribution of the flow actuating the actuators may be affected either by substitution of another distributor or by installing different plates in said distributor.

3. A system according to claim 2, wherein the distributor comprises at least two pairs of grooved plates.

4. A system according to claim 1, further comprising coupling means by which one grooved plate of further pairs of grooved plates are connectable to said donor in sequence with said one grooved plate of said at least one pair of grooved plates whereby a plurality of duplicate impulse signals may be transmitted from said distributor.

5. A system according to claim 1, wherein said grooved plates are supported in assembled relation in a rigid holder and wherein said grooves in said grooved plates which are connectable with said donor and the actuators, respectively, correspond to apertures in surfaces of said holder and connected to lines from said donor and to said actuators, respectively, said plates being adapted to be urged against said surfaces to provide a sealing connection between complementary apertures.

6. A system according to claim 4, wherein said coupling means comprises apertures extending through opposed surfaces of connected plates whereby connection between successive grooved plates may be established by aligning the apertured surfaces and clamping the plates to form a fluid seal therebetween.

7. A system according to claim 1, wherein the intermediary plate is fixedly connected with one of the two plates it is adapted to separate.

8. A system according to claim 1, wherein said actuator is adapted to cooperate with a magnetic shed formation mechanism and comprises a moveable member displaceable between first and second positions by means of said pressure medium and said moveable member permitting movement of a pin of said shed formation mechanism when in said first position and blocking movement of said pin at least in one direction when in said second position.

9. A system according to claim 1, wherein said donor comprising a valve device including a chamber connectable to a pressure source, throughflow passages extending through one wall of said chamber and connected to said one grooved plate, and a slotlike recess provided in said one wall and intersecting said throughflow passages to receive said information carrier, said information carrier having apertures corresponding to the desired distribution to permit passage of pressure medium to the distributor via the channels represented by the apertures in said information carrier while preventing throughflow through the remaining passages.