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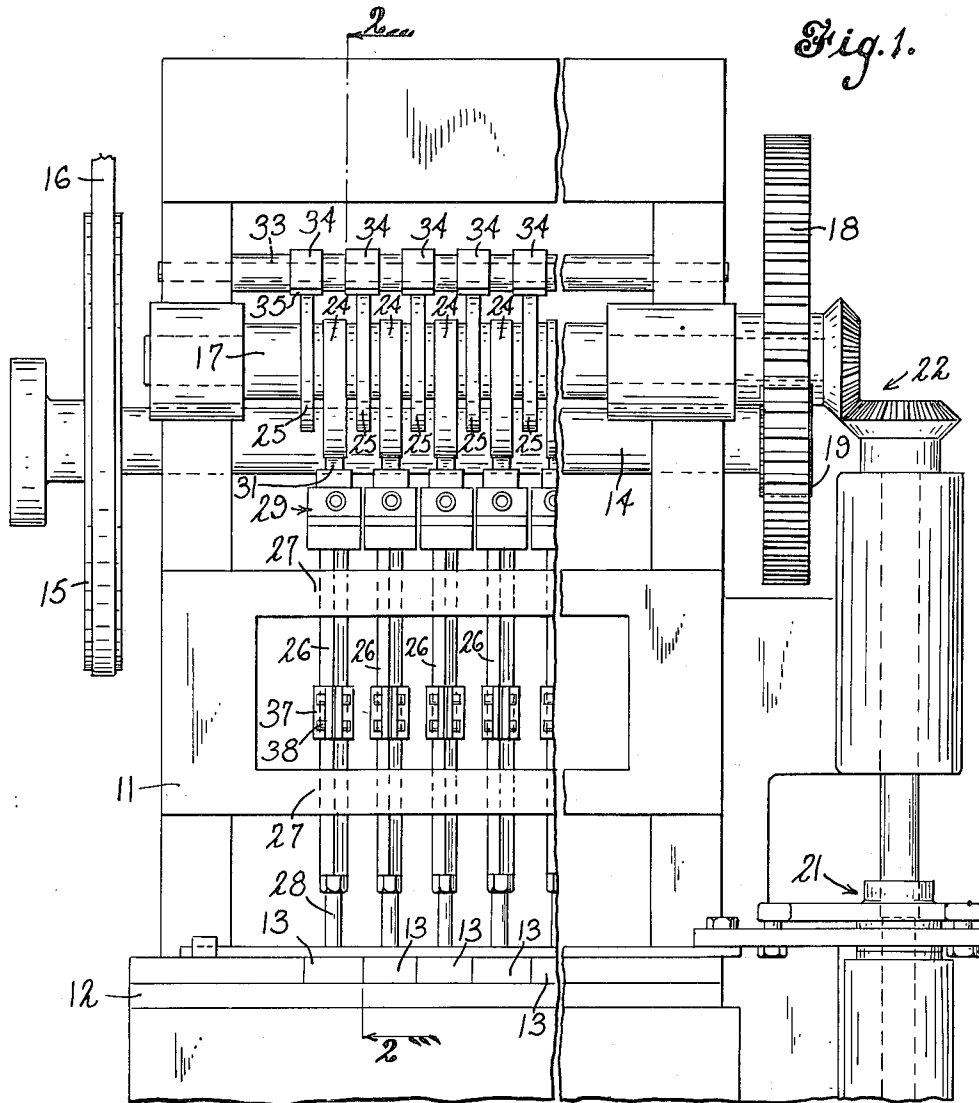
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3,199,358

LIFTER MECHANISM

Filed July 11, 1962

2 Sheets-Sheet 1



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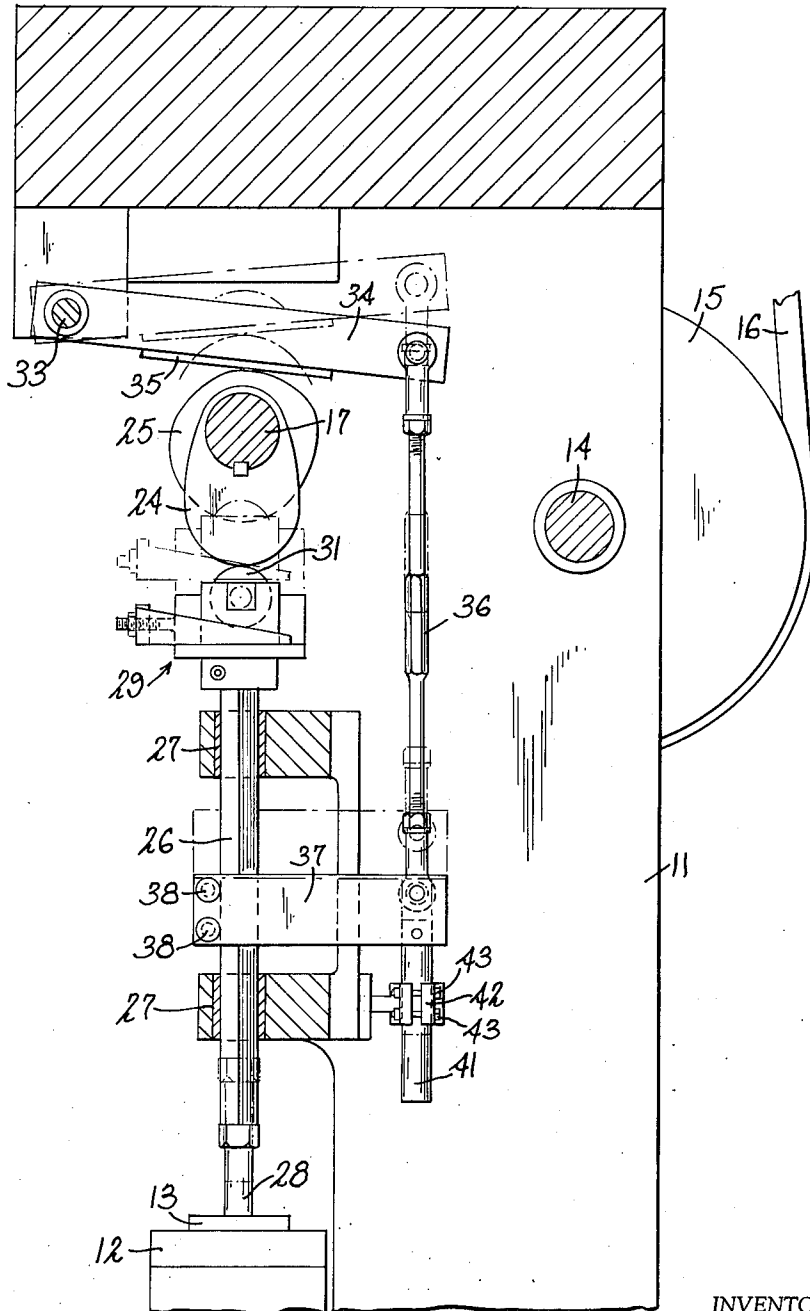
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2 Sheets-Sheet 2

Fig. 2.



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1

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LIFTER MECHANISM

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This invention relates to a cam-operated machine such as a cam eyelet machine, and to the lifter mechanism therefor. Particularly, the invention relates to a new and improved lifter mechanism additionally provided with simplified means for adjusting the stroke at each station.

In machines of this type, which are usually multiple-station machines, a plurality of plungers or punches co-operating with a plurality of dies are provided, the punches being actuated by cams to engage the work and perform the various manufacturing processes thereon, the work being transferred from one station or die to another so that it will be acted upon in turn by the tools carried by the plungers. In typical machines of this type, the plungers are cam actuated, and it is usual to employ separate means for lifting the plunger from the work to the top of its stroke and to advance the plunger toward the work on its operative stroke, each of these operations being effected by a separate cam, with the cams being mounted on a single shaft. In machines of this type, it is also desirable to provide adjustment of the length of stroke of the plunger, and this may be done by adjusting the lifter mechanism to provide more or less lift on the lifting stroke. If the maximum advanced position remains the same, adjusting the lifter mechanism to increase the amount of lift will thereby increase the length of stroke at the particular station. While lifter mechanisms are not new, many of the known mechanisms are bulky, difficult to adjust, have many lubrication points, and are otherwise cumbersome.

Accordingly, it is an object of this invention to provide an improved lifter mechanism having a simplified mode of operation.

Another object of the invention is to provide a lifter mechanism for a cam eyelet machine which may be easily adjusted to vary the stroke of the plunger.

A further object of the invention is to provide a lifter mechanism having a minimal number of lubrication points.

Still another object of the invention is to provide a lifter mechanism having minimal horsepower requirements.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

Generally speaking, in accordance with the invention, the plunger at each station is provided with a mechanism adapted to lift the plunger at the end of its advance stroke. A cam adjacent the advancing cam acts on the mechanism to effect the lifting operation. The lifting stroke may be adjusted by adjusting the length of the mechanism. Means are further provided for frictionally holding the mechanism to hold the plunger in any desired position against the force of gravity when neither the plunger nor the mechanism are in contact with either of the two operating cams.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a partial front elevational view of a multiple-

2

station cam eyelet machine with certain parts being broken away for the sake of clarity; and

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1 showing in detail the construction of the lifter mechanism.

Referring now to the drawings, a cam eyelet machine having a frame 11 is provided with a die bed 12 on which are mounted a plurality of dies 13, one for each operating station of the machine. A main shaft 14 is rotatably mounted in frame 11 and is driven by any suitable means, such as by a motor (not shown) driving a pulley 15 on the main shaft through an endless belt 16. A cam shaft 17 is journaled in frame 11 and is driven from the main shaft by means of meshing gears 18 and 19 mounted on the ends of the cam shaft and main shaft, respectively. The cam shaft may also be used to operate the transfer mechanism, shown generally at 21, through a pair of bevel gears 22. Further description of the transfer mechanism is deemed unnecessary since it forms no part of the invention herein and such transfer mechanisms are known in the art.

Mounted on cam shaft 17 are a plurality of advancing cams 24 and lifter cams 25, one each being provided for each operating station of the machine.

Positioned below each advancing cam is a plunger mechanism. Since the plunger mechanisms for each operating station are substantially alike, the mechanism at one station only will be described. The mechanism comprises a plunger 26 slidably mounted in bearings 27 carried by frame 11. The cross-sectional configuration of plunger 26 may be square to prevent rotation of the plunger. The lower end of plunger 26 is provided with a punch 28 having any preselected configuration to cooperate with die 13 to perform the desired operation at the particular station of the machine.

Mounted to the top of plunger 26 is an adjustable wedge, indicated generally at 29, which carries a cam follower 31. The cam follower is rotatably mounted in the adjustable wedge. The adjustable wedge provides fine adjustment of the position of the cam follower, as is known in the art.

A pivot rod 33 is mounted in frame 11 parallel to cam shaft 17 and a plurality of lifter arms 34, one for each lifter cam, are pivotally mounted on the pivot rod. Each lifter arm may be provided with a cam follower plate 35 adapted to contact the face of the lifter cam 25.

A turnbuckle assembly 36 is pivoted at its upper end to the free end of lifter arm 34. The lower end of turnbuckle assembly 36 is pivoted to a lifter bar 37 clamped to plunger 26. Clamping may be by means of bolts 38. A friction rod 41 is also pivoted to lifter bar 37 and slidably engages a friction sleeve 42 mounted to the machine frame. Friction sleeve 42 may be split and secured by bolts 43, which permit adjustment of the pressure applied to the friction rod by the friction sleeve, thereby varying the frictional force between the two elements.

Briefly, the operation of the machine may be described as follows. Main shaft 14 is driven through pulley 15 and endless belt 16 by means of a motor (not shown). The main shaft effects rotation of cam shaft 17 through gears 18 and 19. The cam shaft in turn rotates the transfer mechanism through the bevel gears 22. Each station of the machine is independently controlled by an advancing cam 24 and a lifter cam 25. Advancing cam 24 acts upon cam follower 31 to advance plunger 26 and punch 28 mounted thereto into die 13. At the completion of the advancing stroke and in timed relation to the advancing cam, the lifter cam rotating with the cam shaft contacts cam follower plate 35, thereby pivoting lifter arm 34 in the counterclockwise direction, as shown in FIG. 2, about pivot rod 33. Lifter arm 34 raises

3

plunger 26 through lifter bar 37 by means of cooperative engagement of turnbuckle assembly 36 with the lifter arm and the lifter bar. When lifter cam 25 has raised the lifter mechanism to its maximum height, shown in phantom in FIG. 2, the lifter mechanism will be held in the raised position by frictional cooperation of friction rod 41 with friction sleeve 42. The mechanism will remain in the raised position until the profile of advancing cam 24 contacts cam follower 31 to again advance the plunger.

The stroke of the plunger may be adjusted in the following manner. Assuming a particular profile of both the advancing cam and the lifter cam, it will be seen that the advancing cam will always advance the plunger to a particular position while the lifter cam will always raise the lifter arm to a particular raised position. By adjusting the turnbuckle assembly 36 to lengthen or shorten the distance between the points of pivot of the turnbuckle assembly, by rotating the turnbuckle assembly in the clockwise or counterclockwise direction, as may be required, the maximum raised position of lifter bar may be adjusted. In other words, with the lifter arm in the maximum raised position as determined by the profile of lifter cam 25, shortening the turnbuckle assembly will cause lifter bar 37 to be raised to a higher position than will be attained if the turnbuckle assembly is adjusted to effect a greater distance between its end pivots. The raised position of lifter bar 37 also raises plunger 26 and cam follower 31 so that the cam follower contacts the profile of advancing cam 24 earlier in its rotation than would take place with a longer turnbuckle assembly. Since the maximum advance position of the plunger is the same as before, the advancing stroke being independent of the lifter mechanism, it will readily be seen that the length of advancing stroke is thereby increased. In a like manner, lengthening the turnbuckle assembly will shorten the plunger stroke.

Adjustment of the length of stroke could also be accomplished by slidably positioning lifter bar 37 along plunger 26 and securing it in any selected position by means of bolts 38. However, this mode of adjustment is not preferred since the accessibility of the elements and accuracy of adjustment would be limited once the machine was in operation.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. In combination, a machine frame, a shaft rotatably mounted in said frame, at least one advancing cam mounted on said shaft, at least one lifter cam mounted on said shaft, a plunger slidably mounted in said frame, said plunger carrying a cam follower adapted to engage said advancing cam, a lifter arm pivoted at one end thereof to said frame and adapted to contact said lifter cam, a lifter bar adjustably secured to said plunger, and a link pivoted at one end thereof to the other end of said lifter arm and at the other end thereof to said lifter bar.

4

2. The structure defined in claim 1, wherein said link is adjustable to vary the distance between its end pivots.

3. The structure defined in claim 1, wherein said link comprises an adjustable turnbuckle.

4. The structure defined in claim 1 and further including a friction rod mounted to said lifter bar, and a friction sleeve mounted to said frame, said friction sleeve slidably engaging said friction rod for maintaining said plunger at any selected position.

5. The structure defined in claim 4 and further including means for adjusting said friction sleeve to vary the force required to overcome friction between said friction rod and said friction sleeve.

6. In combination, a machine frame, a shaft rotatably mounted in said frame, at least one advancing cam mounted on said shaft, at least one lifter cam mounted on said shaft, a plunger slidably mounted in said frame, said plunger carrying a cam follower adapted to engage said advancing cam, and lifter means pivoted to said frame, cooperatively connected to said plunger and engageable with said lifter cam for raising said plunger independently of said advancing cam after it has been advanced by said advancing cam.

7. The structure defined in claim 6 and further including frictional means cooperatively connected between said lifter means and said frame for yieldably holding said lifter means in any selected position.

8. The structure defined in claim 6, wherein said lifter means comprises a lifter arm pivoted to said frame, and a link pivoted at one end thereof to said lifter arm and the other end thereof to said plunger, said lifter arm adapted to engage said lifter cam.

9. The structure defined in claim 8, wherein the length of said link between its end pivots is adjustable to vary the stroke of said plunger.

10. The structure defined in claim 6 wherein said lifter means comprises a lifter bar secured to said plunger, a lifter arm pivoted at one end thereof to said frame, and a link pivotally connected between said lifter bar and said lifter arm to effect raising of said plunger when said lifter arm is raised in contact with the profile of said lifter cam.

11. The structure defined in claim 10 and further including frictional means cooperatively engaging said lifter bar and said frame for frictionally maintaining said plunger in any selected position.

12. The structure defined in claim 10 and further including a friction sleeve mounted to said frame and a friction rod mounted to said lifter bar, said friction rod cooperatively engaging said friction sleeve for maintaining said plunger in any selected position.

13. The structure defined in claim 12 and further including means for adjusting said friction sleeve to vary the force required to overcome friction between said friction rod and said friction sleeve.

14. The structure defined in claim 10, wherein said link is adjustable to vary the height to which said plunger will be raised by cooperation of said lifter arm with said lifter cam.

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