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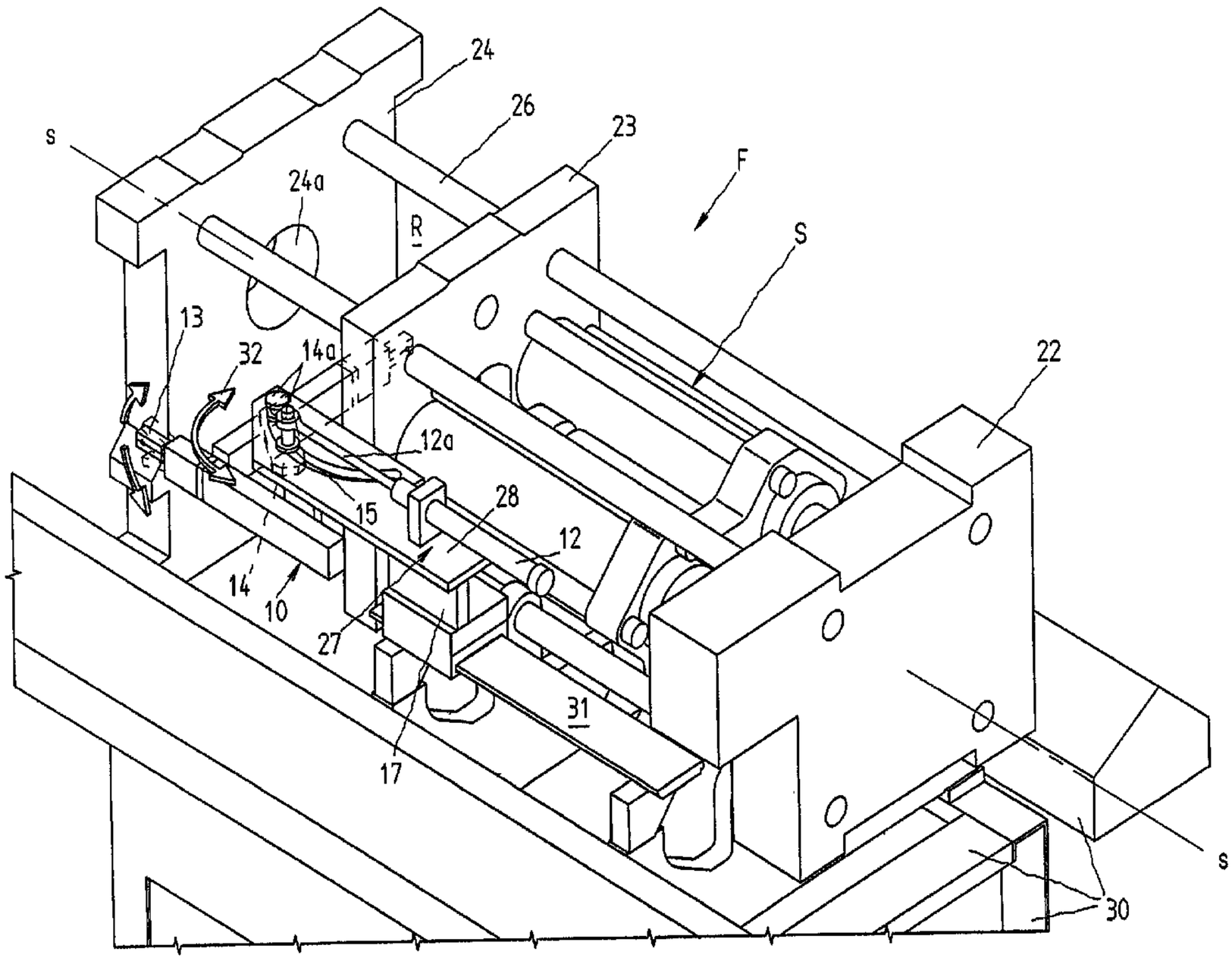
(54) Titre : MACHINE A MOULER PAR INJECTION COMPORTANT UN DISPOSITIF DE DEMOULAGE
(54) Title: INJECTION MOULDING MACHINE WITH AN EXTRACTOR



(57) Abrégé/Abstract:
An injection moulding machine for processing plastifiable compounds has an extractor (10) for removing injection moulded components from the open injection mould in the mould clamping chamber (R). The extractor (10) is moved together with its extraction medium (13) by a drive unit (12), when the extraction medium (13) is transferred into and out of the injection mould substantially transversely to the closing axis (s-s). The drive unit (12) is pivoted at one end on a crank unit (28) and at the other engages with a guide block (14) for the extractor (10) which, when the drive unit is actuated, can be moved on a guide track curved away from the closing axis in the form of a crank guide (15) running substantially parallel to the closing axis, with the transfer of the extraction medium into and out of the mould clamping chamber (R).

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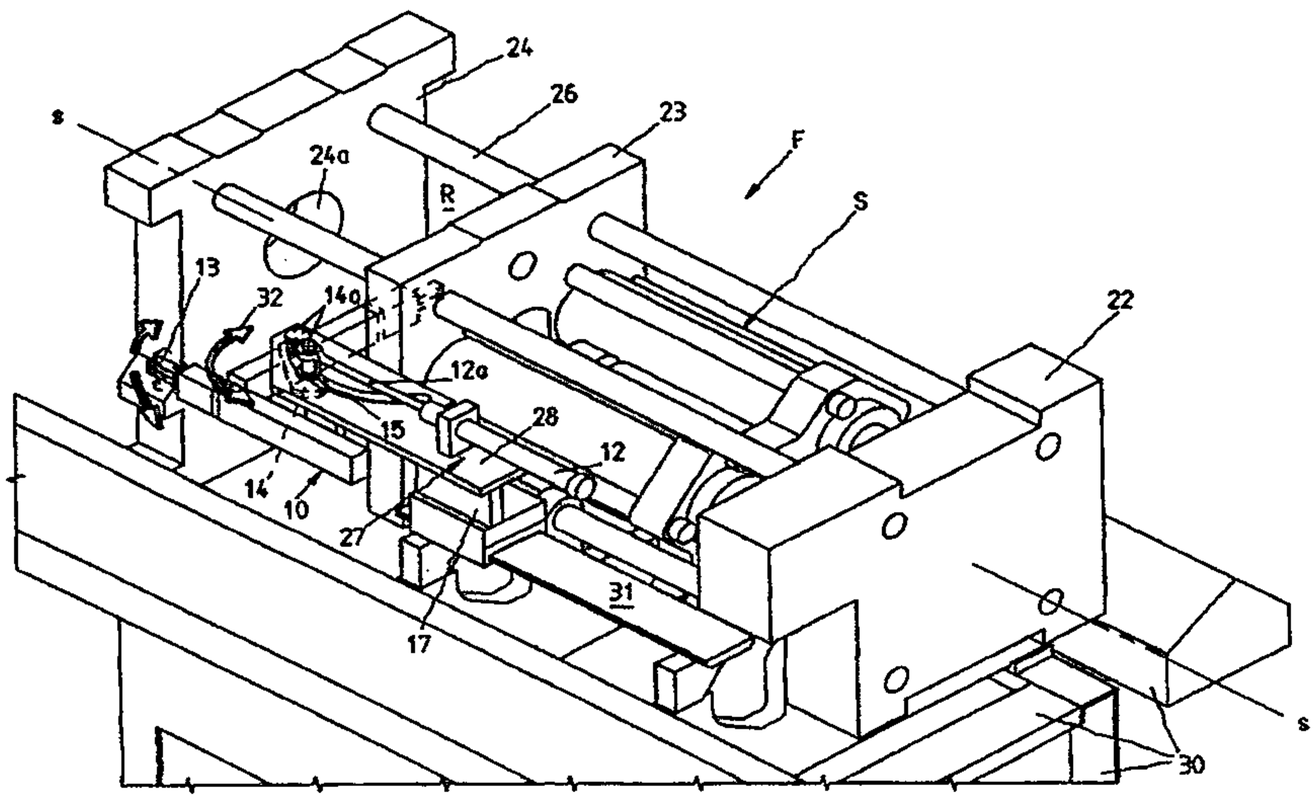
(54) Title: INJECTION MOULDING MACHINE WITH AN EXTRACTOR

(54) Bezeichnung: SPRITZGIESSMASCHINE MIT EINER ENTNAHMEEINRICHTUNG

(57) Abstract

An injection moulding machine for processing plastifiable compounds has an extractor (10) for removing injection moulded components from the open injection mould in the mould clamping chamber (R). The extractor (10) is moved together with its extraction medium (13) by a drive unit (12), when the extraction medium (13) is transferred into and out of the injection mould substantially transversely to the closing axis (s-s). The drive unit (12) is pivoted at one end on a crank unit (28) and at the other engages with a guide block (14) for the extractor (10) which, when the drive unit is actuated, can be moved on a guide track curved away from the closing axis in the form of a crank guide (15) running substantially parallel to the closing axis, with the transfer of the extraction medium into and out of the mould clamping chamber (R).



(57) Zusammenfassung

Eine Spritzgießmaschine zur Verarbeitung plastifizierbarer Massen besitzt eine Entnahmeeinrichtung (10) zur Entnahme von beim Spritzgießen entstehenden Teilen aus der geöffneten Spritzgießform im Formspannraum (R). Die Entnahmeeinrichtung (10) wird mitsamt ihrem Entnahmemittel (13) von einer Antriebseinheit (12) bewegt, wobei das Entnahmemittel (13) im wesentlichen quer zur Schließachse (s-s) in die und aus der Spritzgießform überführt wird. Die Antriebseinheit (12) ist einenends schwenkbar an einem Kulissenelement (28) gelagert und greift andernends an einem Führungsblock (14) für die Entnahmeeinrichtung (10) an, die bei Betätigung der Antriebseinrichtung auf einer von der Schließachse weggewölbten Führungsbahn in Form einer Kulissenführung (15), deren Längserstreckung im wesentlichen parallel zur Schließachse verläuft, bewegbar ist unter Überführung des Entnahmemittels in und aus dem Formspannraum (R).

INJECTION MOLDING MACHINE WITH AN EXTRACTOR

DESCRIPTION

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims the priority of German Patent Application 196 14 804.9, filed on 15.04.1996, the disclosure contents of which is herewith also explicitly made the subject matter of the present application.

FIELD OF THE INVENTION

The invention relates to an extractor for injection-molding machine for processing plastifiable compounds.

PRIOR ART

An injection molding machine of this kind, wherein the extractor is guided in a crank, which is a costly three-dimensional curved cylinder surface, is described in EP 0 624 448 A1. Here the extractor is arranged transversely to the closing axis. Therefore an additional space beside the mold clamping chamber is required, which demands an additional protection device. In the embodiment of the figures 11-14 therefore a considerable expenditure is necessary, in order to arrange the extractor under an adequate protection device, required by most of the industrial nations. The extraction means itself is guided by a guiding pin in a crank guide, however, the actuating element in connection with the two drive motors requires additional space, since a slewability of the drive motors is provided just as little as to guide the actuating element itself in the crank guide.

From U.S. Patent No. 3,773,457 an extractor is known, which is guided by a crank essentially running transversely with respect to the closing axis. Also here exists an additional space requirement in the plane vertical with respect to the closing axis, which should be covered by a protection device, if this principle would be transferred to an injection molding machine. This is also conditioned by a separation between the crank guide and the contact point for the drive unit, illustrated by a comparison between figure 3 and figure 4.

Besides, an injection molding machine comprising an extractor is known from EP-A 359 013. There a handling is used as extractor , which is destined to remove injection moldings from the mold clamping chamber. For this purpose a multiaxis system is provided, which enables an accurate removal of the injection moldings as well as an exact deposit of the injection moldings in receiving orifices. Apart from the coordination of the three axes necessary therefore, a not to be sub-estirnated space is required over the injection molding machine, which mostly makes necessary special manufactures for the protection device.

From EP-A 218 101 a biaxial extractor is known, in which the second axis in the symmetric plane of the injection molding unit immerges vertically into the parting plane. Also here a considerable space is necessary for the vertical axis.

SUMMARY OF THE INVENTION

Based on this state of the art the invention has the object to create an extractor for an injection molding machine of the kind mentioned at the beginning, which requires little space.

In accordance with this object, there is provided an injection-molding machine for processing plastifiable compounds, comprising:

a mold-clamping unit for accommodating an injection mold, the mold clamping unit including a mold clamping chamber and a clamping mechanism for opening and closing the injection mold in the mold clamping chamber in a direction of a clamping axis;

an extractor comprising an extraction means for removing articles produced during an injection molding process from an opened injection mold;

a crank element with a crank guide defining a guide path curved away from the clamping axis and having a longitudinal extension substantially parallel to the clamping axis;

a drive unit for moving the extractor along the crank guide, said drive unit having a driving movement and including a first end and a second end, said driving movement being substantially parallel to the clamping axis and the longitudinal extension of the crank guide; and

a guide unit connected to the drive unit and the extractor, said guide unit being guided at least at two locations on the crank guide,

wherein the first end of the drive unit is pivotably attached to the crank element and the second end of the drive unit is attached with hinges to the guide unit, and wherein the driving movement of the drive unit moves the guide unit along the guide path, for moving the extraction means in and out of the injection mold.

The actuation of the extractor now is essentially effected in one drive direction, wherein a transfer into the mold clamping chamber is made via a crank guide, which essentially extends parallely with respect to the closing axis. The crank guide works together with the drive unit so, that no or only a little additional space is necessary and the basical constructional conditions for an arrangement of the extractor within areas already used by the injection molding machine result from. Thus the extractor can be arranged under already existing protection devices, so that it can any time be easily retrofitted at machines already available.

Whereas insofar in the prior art not only an additional space for the extractor was necessary, which had to be covered by separate protection devices, but also expensive deviation means were provided, in order to achieve a statical determination of the drive unit, now the drive unit is at first beared jointedly at both ends. However, in order to achieve a static determination to enable to carry the extractor exactly to the extraction point, the guiding block itself is so beared in the crank guide at least at two points, that in every operating state a clear position is ensured. At the same time, however, the crank guide and the drive unit are so arranged, that the principal moving direction or the longitudinal extension,respectively,lies in direction of the closing axis, so that the extractor means in outwards swivelled condition does not require additional space. Nevertheless the extractor can easily be produced with a few constructional elements.

BRIEF DESCRIPTION OF THE DRAWINGS

It is shown in:

Fig. 1 a mold closing unit of an injection molding machine comprising an extractor mounted on it in a three-dimensional illustration,

Fig. 2 an illustration according to Fig. 1, wherein the extractor is additionally movable in direction of the closing axis,

Fig. 3 a further embodiment of an extractor arranged on a gallows frame in a view according to Fig. 1,

Fig. 4 the mold closing unit according to Fig. 3 in a side elevational view,

Fig. 5a-5d a schematical illustration of the motional course of the extractor,

Fig. 6 the mold closing unit provided with a protection device according to Fig. 3 in a view from behind.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The invention will now be described in more detail by example with reference to the enclosed figures. Though the embodiments are merely examples, which should not limit the inventive concept to any particular physical configuration.

In the figures a mold closing unit F of an injection molding machine for processing plastifiable compounds such as plastics, powdery or ceramic masses is illustrated. The injection molding machine is provided with a stationary mold carrier 24 and a movable mold carrier 23, which is movable via a closing machanism S. An injection mold M, which can be closed and opened again by the closing mechanism S for creation of a mold cavity, is insertable into a mold clamping chamber R between the mold carriers. The closing mechanism S is supported by a support element 22, which in the embodiment is in connection with the stationary mold carrier 24 via spars 26. Alternatively any force transmitting elements, which allow a free access without spars 26 to the mold clamping chamber R, are conceivable.

Usually a graphically not represented injection molding unit injects via the passing orifice 24a of the stationary mold carrier 24 into the mold.

An extractor 10 for removing parts which have been produced by injection such as gatings and/or injection moldings 11 from the open injection mold M is provided in all embodiments. An extraction means 13 of the extractor 10 can have the form of a gripper as shown in the figures 1 and 2, however, it can also be applied in any other embodiment, for example as pneumatically actuated suction apparatus 13 as represented in figure 3. With this extractor 10 on the one hand gatings can be removed with a picker or also injection moldings, no matter if good or bad parts, can be handled. The extractor 10 is moved via a drive unit 12, which is actuable on a guiding ways essentially parallely with respect to the closing axis s-s. Figure 1 insofar elucidates the drive unit arranged parallely with respect to the closing axis s-s, which at one end is swivellably beared around a swivelling axis 27 at a crank element 28. The crank element 28 can, as represented graphically, be provided with the crank guide 15, however, also another arrangement is conceivable, in which the crank element 28 is formed by the mold closing unit or another component, wherein at one spot of the component the swivelling axis and at another spot the crank unit is foreseen, however, the two spots must not belong to the same component. In the embodiment the drive unit 12 is a piston-cylinder-unit. Its piston rod 12a as the other end of the drive unit cooperates with a crank guide 15 of a guiding block 14. The drive unit 12 is swivellably mounted on the crank element 28 and jointedly mounted on the guiding block 14. With this other end the drive unit 12 engages in this guiding block 14 for the extractor 10. When the drive unit is actuated, the guiding block 14 moves on the guiding curved away from the closing axis in form of the crank guide 15 so, that the extractor 13 is introduced into or withdrawn from the mold clamping chamber R. Preferably the crank guide is formed in such a way, that

it extends within an even area. Other embodiments are indeed conceivable, if the respective application purpose requires it, so that it is also possible to change to three-dimensional crank guides. This, however, in most cases is not necessary, since this requirement nearly does not occur due to the guiding of the guiding block 14 at two points within the crank guide 15.

In order to achieve static determination, the guiding block 14 is beared at least at two points in the crank guide 15 via the guide pins 14a, so that a precise guiding of the extractor 13 results and for each operating state a clear position inspite of the jointed bearing of the drive unit 12 is achieved.
The extractor can engage into the mold clamping chamber R horizontally, as it is represented in the figures 1 and 2, however, it can also engage vertically, if it is appropriately supported at the injection molding machine. It is also conceivable to arrange the bearing, which in the embodiment of the figures 1 and 2 is effected via the bearing rail 31, turnably in such a way, that the machine user can swivel the unit as desired, in order to optimize the space relations and for example create a free access to the mold clamping chamber. Anyhow the extractor 10 nearly does not engage into the mold clamping chamber or into the border areas in front of and above the mold clamping chamber. The extractor 10 is arranged with its drive unit 12 within the vertical or horizontal directed projection, respectively, of the injection molding unit transversely with respect to the closing axis s-s. Even in connection with the motional space required for the actuation of the drive unit 12 and the extractor 10, the extractor 10 according to figure 6 can be arranged under an usual and, contrary to the protection device 16, at the machine itself unchanged protection device. An additional space requirement in front of, beside or above the machine insofar is not necessary.

Whereas in figure 1 the extractor is swivellable into the mold clamping chamber R according to the arrow 32, in a further extension step in figure 2 a deforming stroke is additionally provided according to the arrow 33. For this the drive unit 12 is arranged on a slide 17 movable in direction of the closing axis. Hence it is possible that the extraction means 13 catches and ejects the mold and/or the gating 11, as it is shown in figure 2 by the extractor in two positions. Then the crank guide 15 is actuated and the extraction means is transfered from the final position of the drive unit 12 in removal position within the injection molding into the other final position into a throwing off position and/or transport position outside the mold clamping chamber R. This throwing off position is so arranged, that gatings for example via a size reduction unit can be recycled. If the space between the two parts of a mold is not sufficient for a place-saving swivelling of the extractor 10, the ejected part can be removed via a movement according to arrow 34 before the swivelling movement additionally from the cramped area within the mold clamping space R preferably by shortening the extractor unit. For this short stroke a drive mechanism of any type, graphically not represented, can be provided.

Already by the movable arrangement of the drive unit on the slide 17 it is possible to generate a motional combination, which in spite of the swivelling of the extractor into the mold clamping chamber enables a nearly straight carrying-out of the extraction means 13 from the mold clamping chamber R (compare below explanations to figures 5a-5d). The movability and the possibilities connected with it, however, can be even further increased by movably guiding the extractor 10 additionally on a support frame. In figure 3 such a support frame is represented, which there preferably comprises two support bars 19, on which guiding rails 36 for a cross slide 25 are provided. According to figures 3, 4 the support bars 19 extend

beyond the longitudinal extension of the mold closing unit F to the back . So the cross slide 25 can transfer the extractor 10 from a removal position above the injection mold M into a deposit position behind or above the mold closing unit. The two support bars 19 - if necessary also a construction with only one support bar is conceivable - are supported via each two backshores above the mold closing unit F. The rear backshore 21 is located at the height of the supporting element 22 for the closing mechanism, whereas the front backshore 20 according to figure 3 is arranged behind the movable mold carrier 23 in its rearest position. This relatively short support is made possible by the light construction of the extractor used here as handling, since essentially only one drive mechanism must be moved, which by the way contributes to a reduction of the inertia forces of masses. Hence the extractor 10 can be used as high-value handling.

The crank element 28 is arranged at the cross slide 25 projecting forward, just in order to mount the crank guide 15. However, this also enables the support bar 19 in its projection to penetrate only a little into the mold clamping chamber R. This facilitates essentially the access to the the mold clamping chamber R. The cross slide 25 itself is for example movable via an endless chain not represented graphically by the the drive 37.

The figures 5a-5d make clear the possibility of the extractor and also make clear that towards above the extractor 10 merely extends over the crank element 28, which allows an arrangement under a protection device 16 according to figure 6. In figure 5a the extraction means 13 of the extractor 10 removes an injection molding 11 from the open injection mold M. Here the guiding block 14 guided via guide pins 14a in a crank guiding 15 is in its final position.

In figure 5b, in which the before mentioned position is represented, as also in the other figures, by a dotted line, now on the one hand the crank element 28 is already pulled back a little, whereas at the same time the drive unit 12 has displaced the guiding block 14 a little along the crank guide 15. At still constant aperture stroke of the mold, the injection molding 11 is thus gradually, as also represented in figure 5c, removed nearly straight from the injection mold M. Figure 5c shows clearly the maximum aperture stroke required, which esentially corresponds to the stroke, which is necessary for the introduction of the extraction means 13 and the removal of the injection molding 11 according to figure 5a. In figure 5d the injection molding 11 is removed upwards from the injection mold and the guiding block 14 is nearly in its other final position, in which then results a position of the extraction means 13 as represented by the dotted lines above in figure 4.

For deposit of the injection molding 11 the drive unit is again moved in opposed direction, wherein at the guiding block 14 the extractor 10 is arranged, at which end the extraction means 13 is swivellably beared around an axis A arranged rectangularly with respect to the closing axis s-s. The thus given possibilities are illustrated in figure 4.

It is self understood, that this description can be subject to the most different modifications, changes and adjustments, ranging within the area of equivalents of the annexed claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINES AS FOLLOWS:

1. An injection-molding machine for processing plastifiable compounds, comprising:

a mold-clamping unit for accommodating an injection mold, the mold clamping unit including a mold clamping chamber and a clamping mechanism for opening and closing the injection mold in the mold clamping chamber in a direction of a clamping axis;

an extractor comprising an extraction means for removing articles produced during an injection molding process from an opened injection mold;

a crank element with a crank guide defining a guide path curved away from the clamping axis and having a longitudinal extension substantially parallel to the clamping axis;

a drive unit for moving the extractor along the crank guide, said drive unit having a driving movement and including a first end and a second end, said driving movement being substantially parallel to the clamping axis and the longitudinal extension of the crank guide; and

a guide unit connected to the drive unit and the extractor, said guide unit being guided at least at two locations on the crank guide,

wherein the first end of the drive unit is pivotably attached to the crank element and the second end of the drive unit is attached with hinges to the guide unit, and wherein the driving movement of the drive unit moves the guide unit along the guide path, for moving the extraction means in and out of the injection mold.

2. An injection-molding machine according to claim 1, wherein the crank guide is substantially planar.

3. An injection-molding machine according to claim 1, wherein the extractor and the drive unit are essentially arranged inside a projection of the injection-molding machine that is directed lateral to the clamping axis.

4. An injection-molding machine according to claim 1, wherein the extractor, together with the drive unit and including an associated movement space, is arranged inside a space predetermined by a standard protective device of the mold-clamping unit.

5. An injection-molding machine according to claim 1, wherein the extraction means is a gripper.

6. An injection-molding machine according to claim 5, further comprising separate drive means for activating the gripper.

7. An injection-molding machine according to claim 1, including a carriage moveable in the direction of the clamping axis, the drive unit being arranged on the carriage.

8. An injection-molding machine according to claim 1, wherein the guide unit supports the extractor, said extraction means is arranged at an end of said extractor and is pivotable around a pivot axis, said pivot axis being arranged at a right angle to the clamping axis.

9. An injection-molding machine according to claim 1, wherein the mold clamping unit has a longitudinal extension, the injection-molding machine further comprising at least one carrier crosspiece extending parallel to the closing axis and past the longitudinal extension of the mold-clamping unit, and the drive unit is moveable along the at least one carrier crosspiece.

10. An injection-molding machine according to claim 9, wherein the at least one carrier crosspiece comprises first and second carrier crosspieces, the mold clamping unit includes a fixed support for the clamping mechanism and a moveable mold support, the injection-molding machine further includes front and rear crosspiece supports, said moveable mold carrier being moveable between a forward and a rear position to close and open the mold clamping chamber, the first and second carrier crosspieces being supported above the mold-clamping unit by the crosspiece supports, said rear crosspiece support being arranged adjacent to the fixed support, and said front support crosspiece being located behind the rear position of the movable mold support.

11. An injection-molding machine according to claim 10, wherein the extractor has a extracting position for extracting the articles and a depositing position for depositing the articles, the depositing position being at least one of above and behind the mold-clamping unit; and the first and second carrier crosspieces further include guide rails and a cross slide, the cross slide supporting the extractor and being moveable on the guide rails to move the extractor between the extracting position and the depositing position.

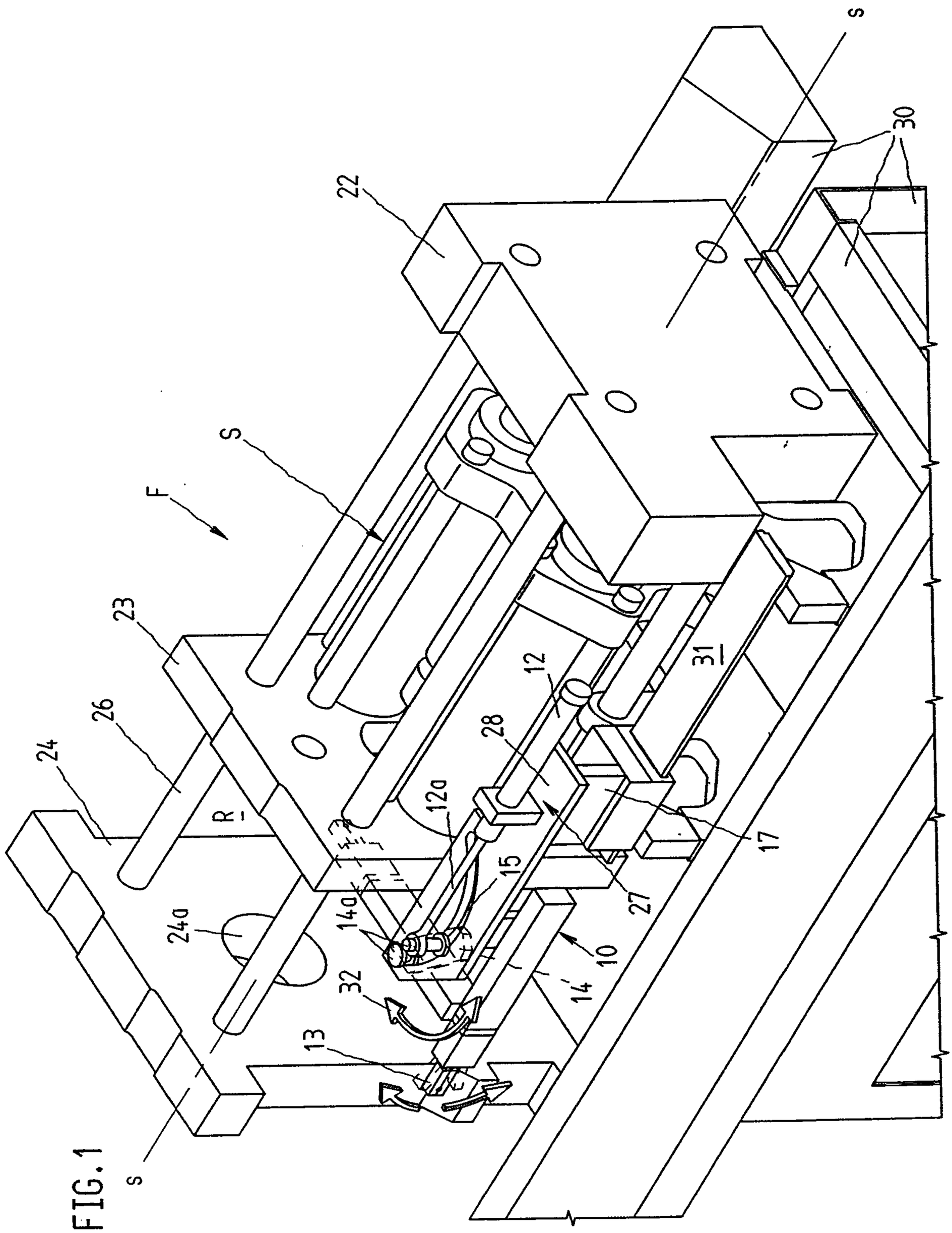


FIG.1

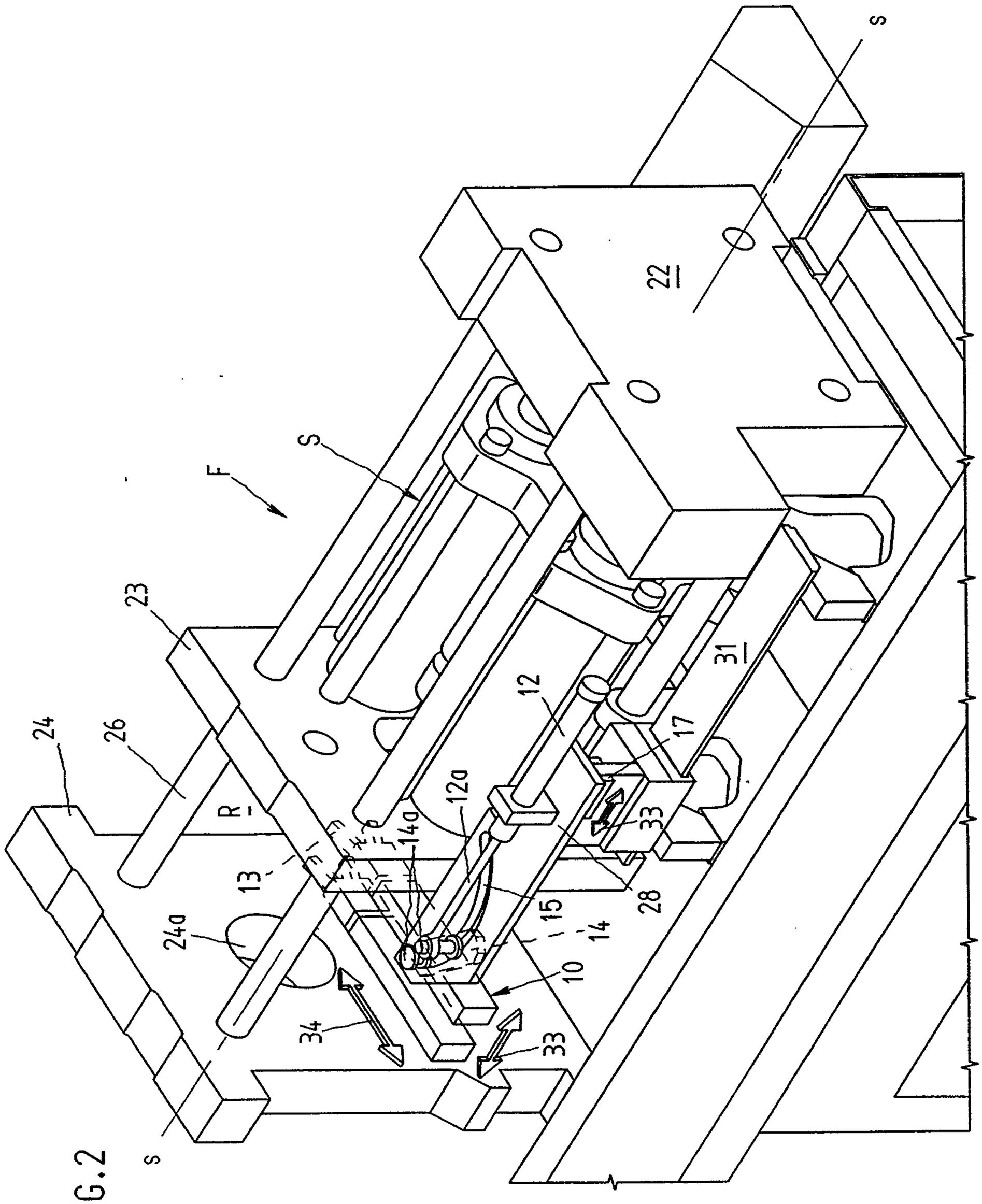


FIG.2

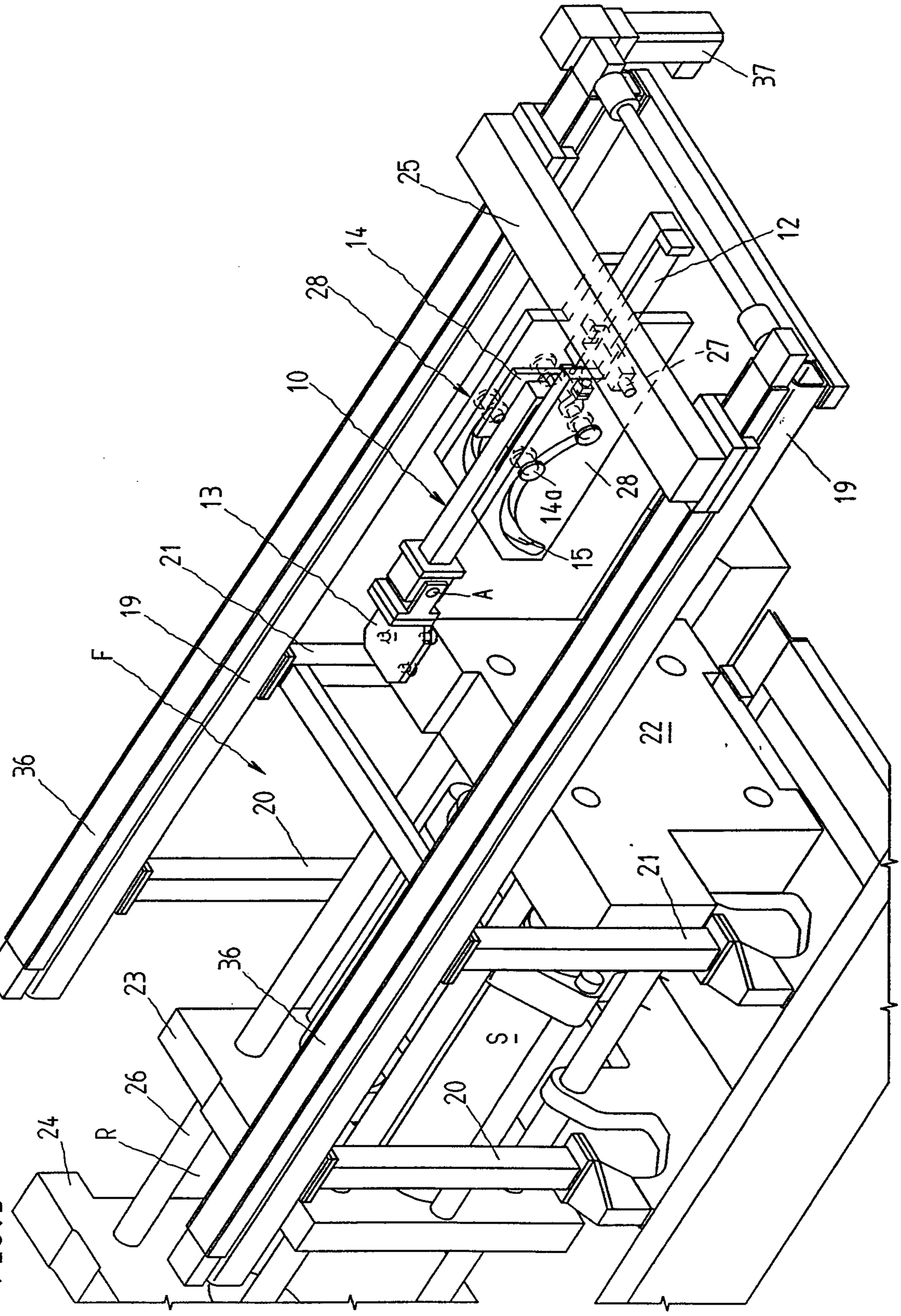


FIG.3

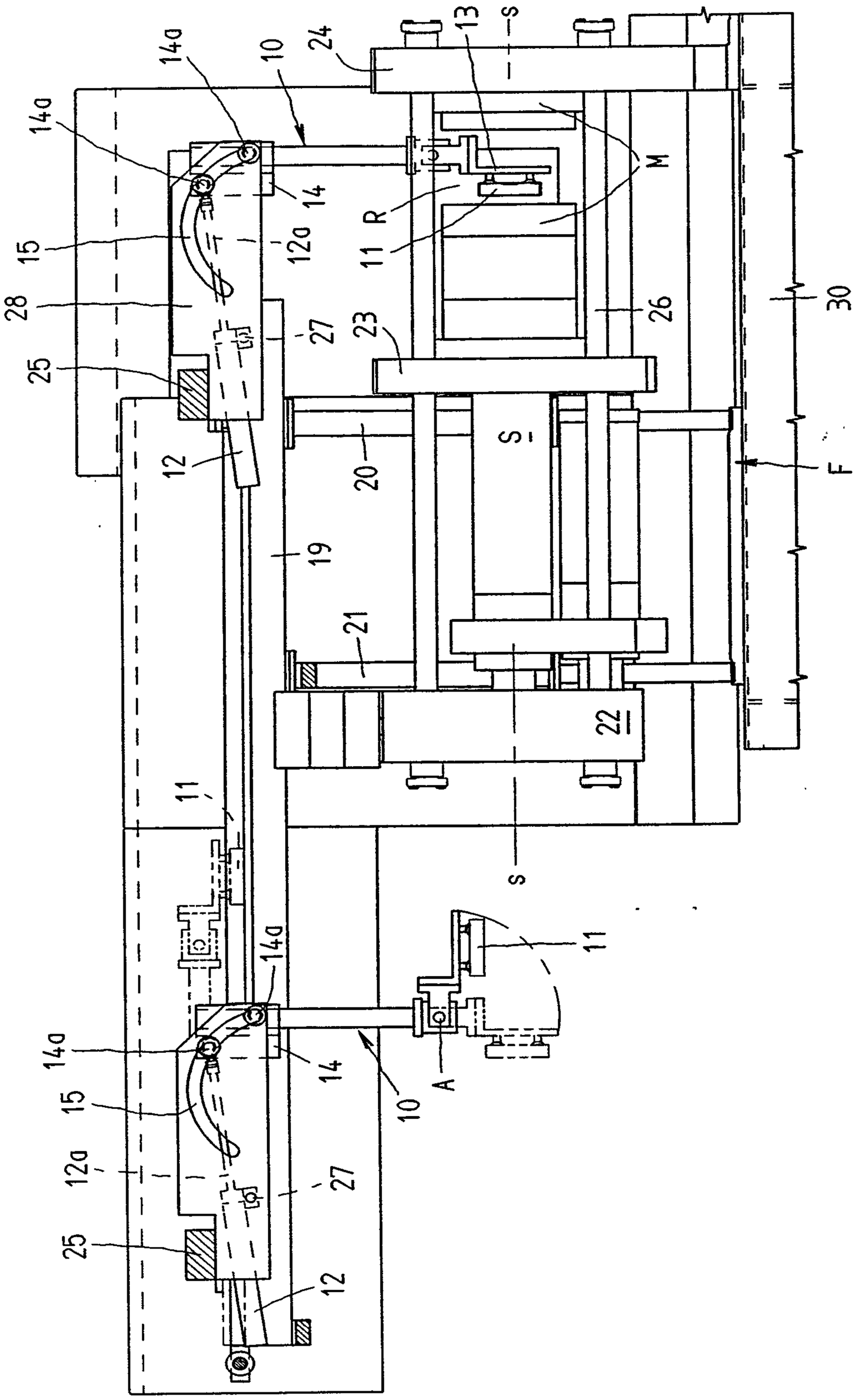

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FIG.4

FIG.5a

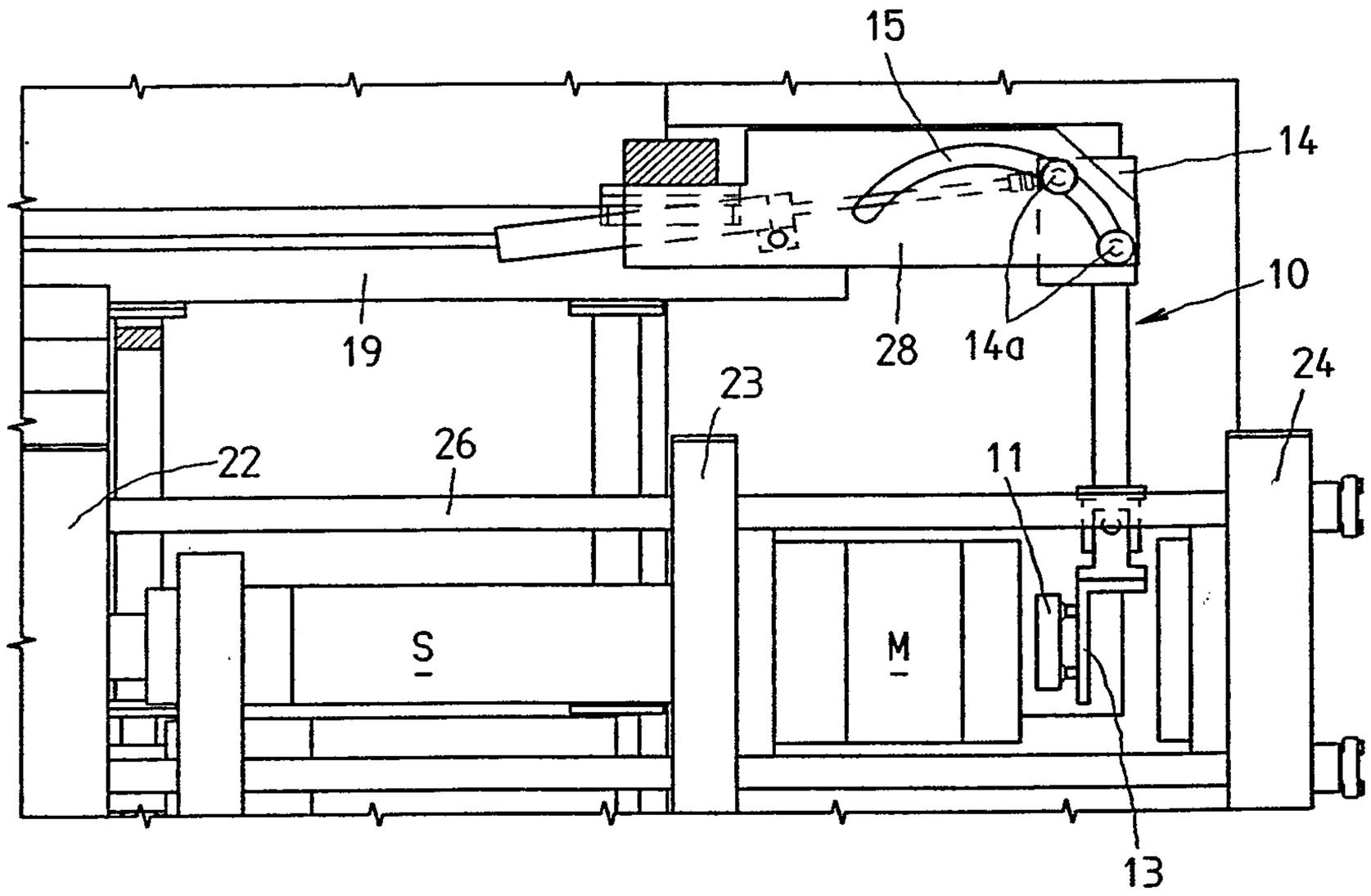
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FIG.5b

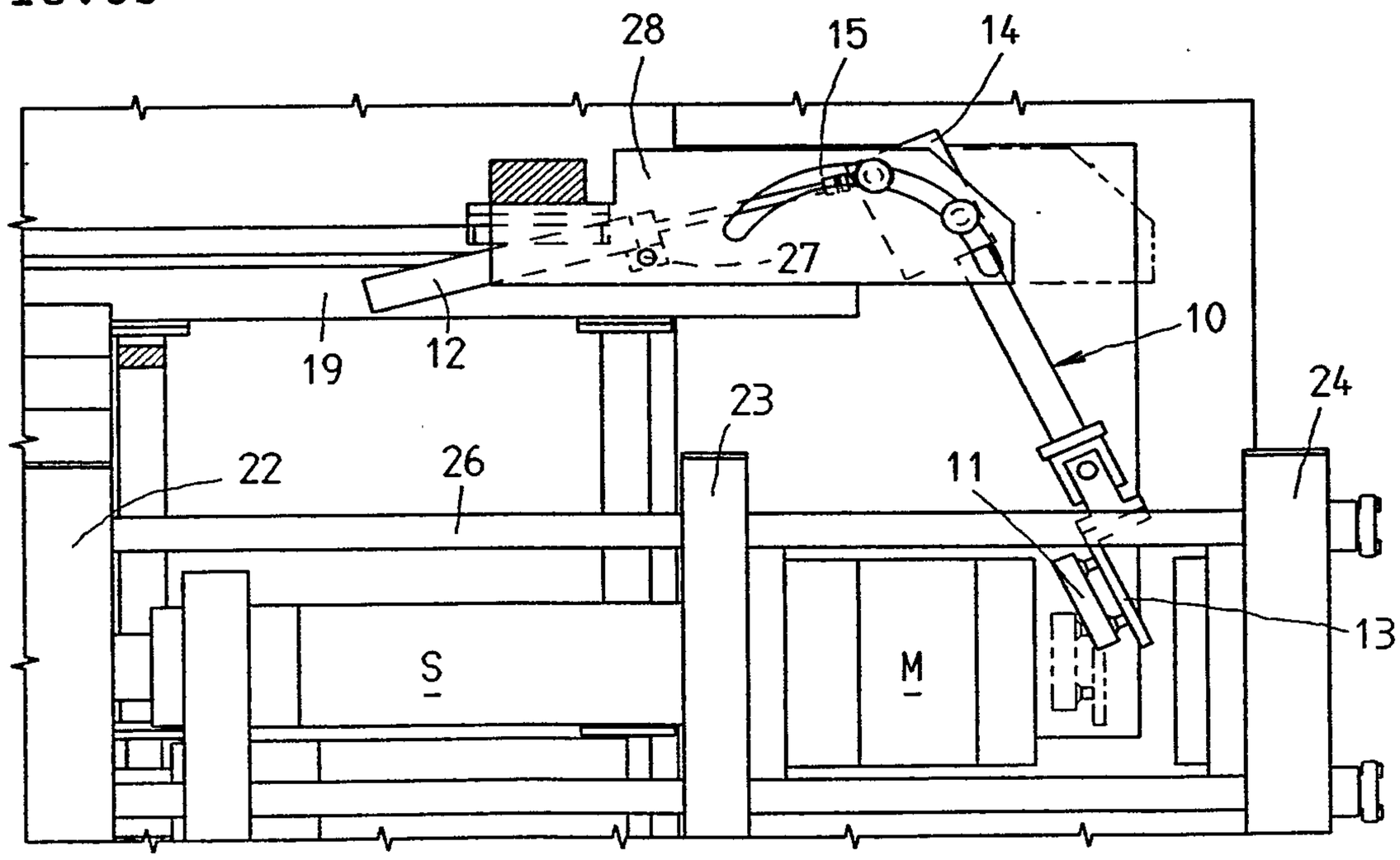
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FIG.5c

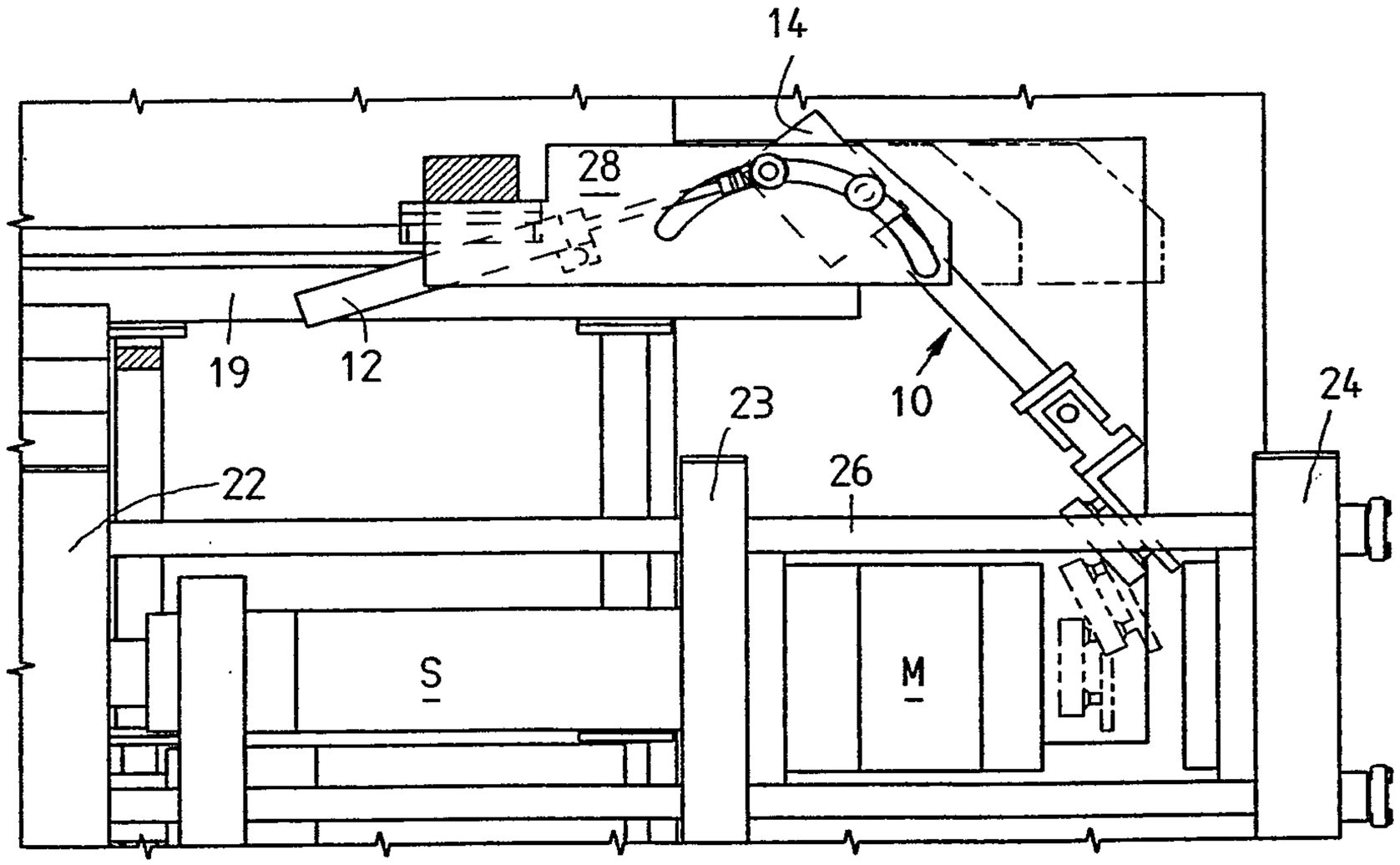


FIG.5d

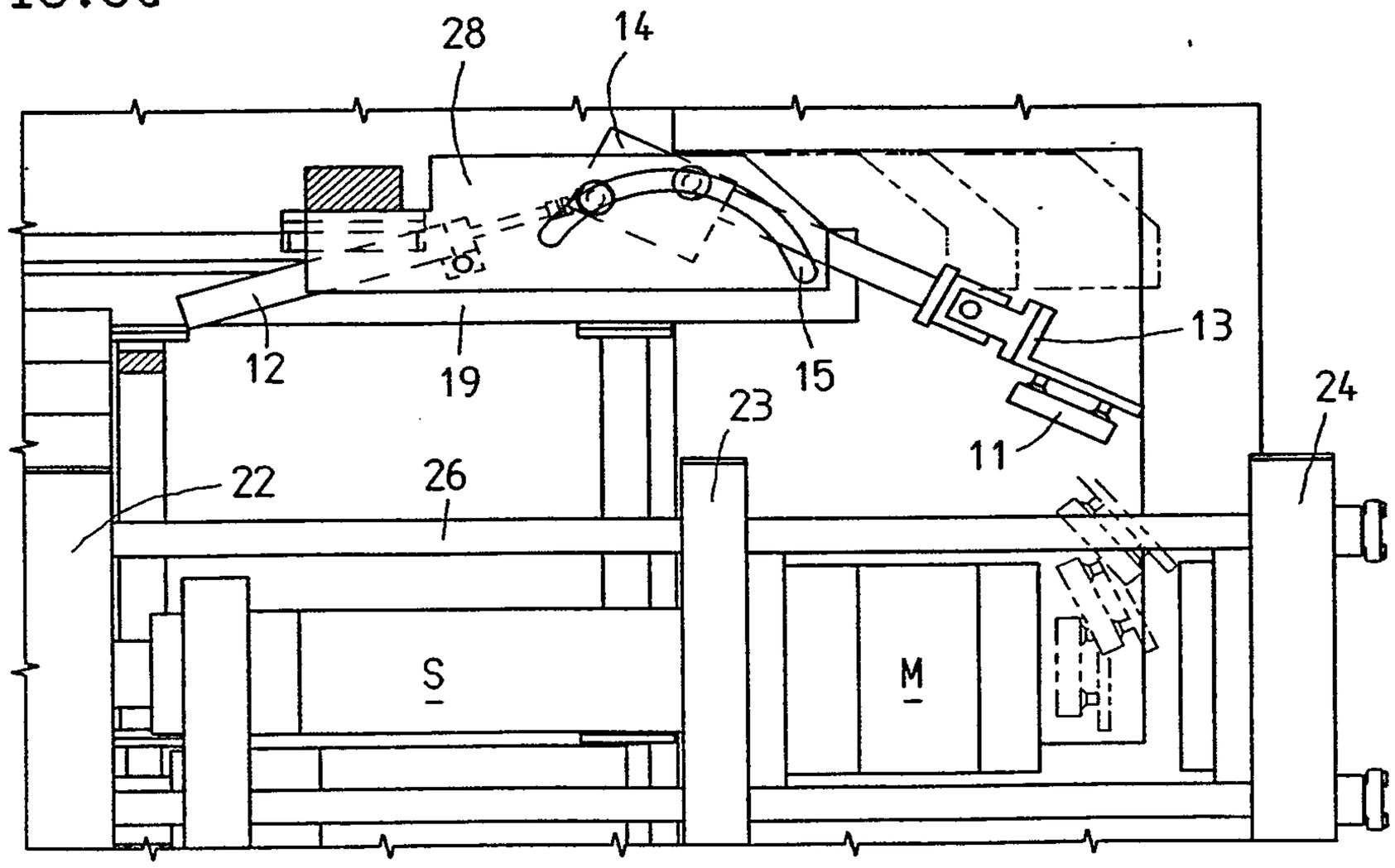
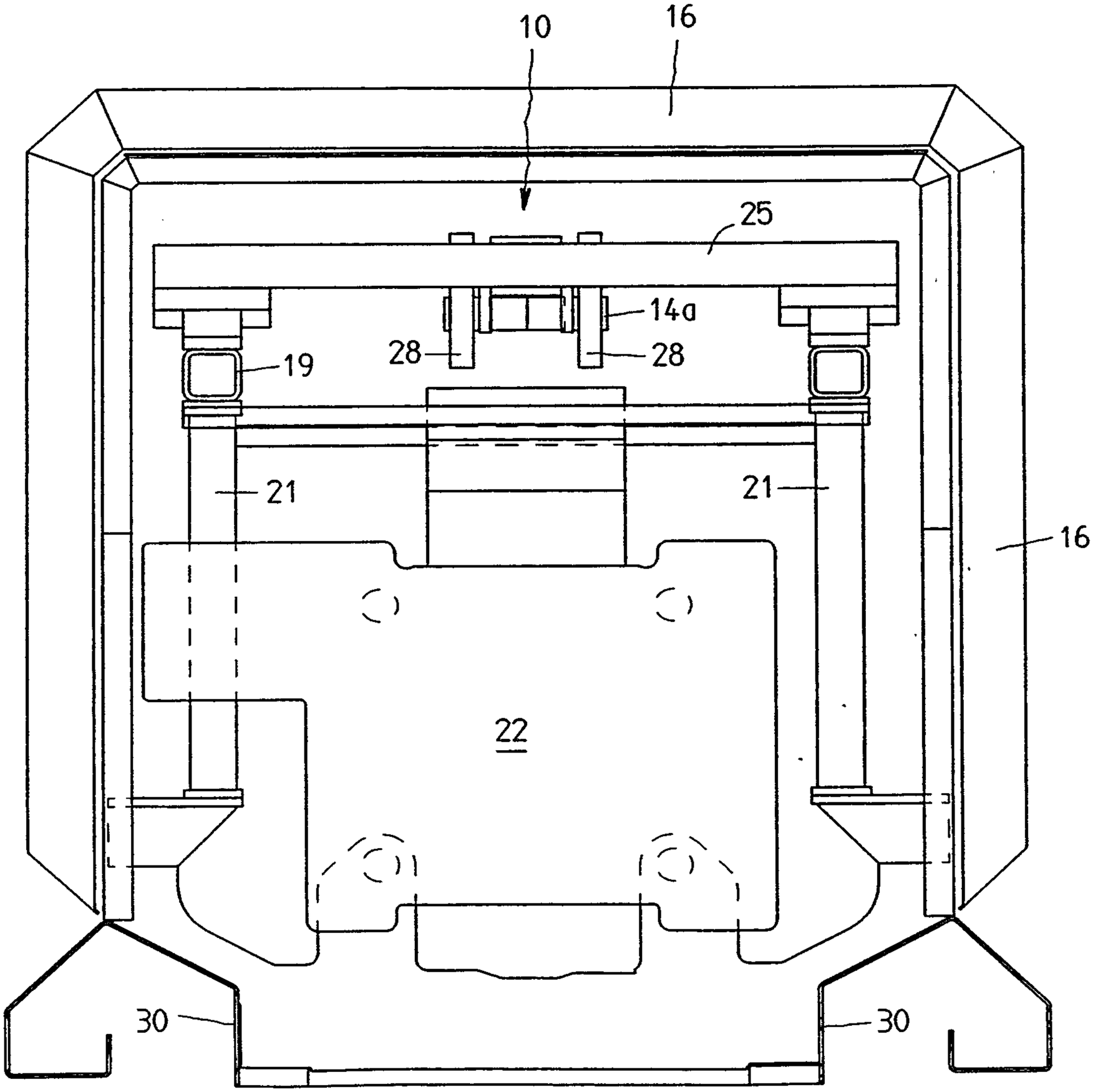
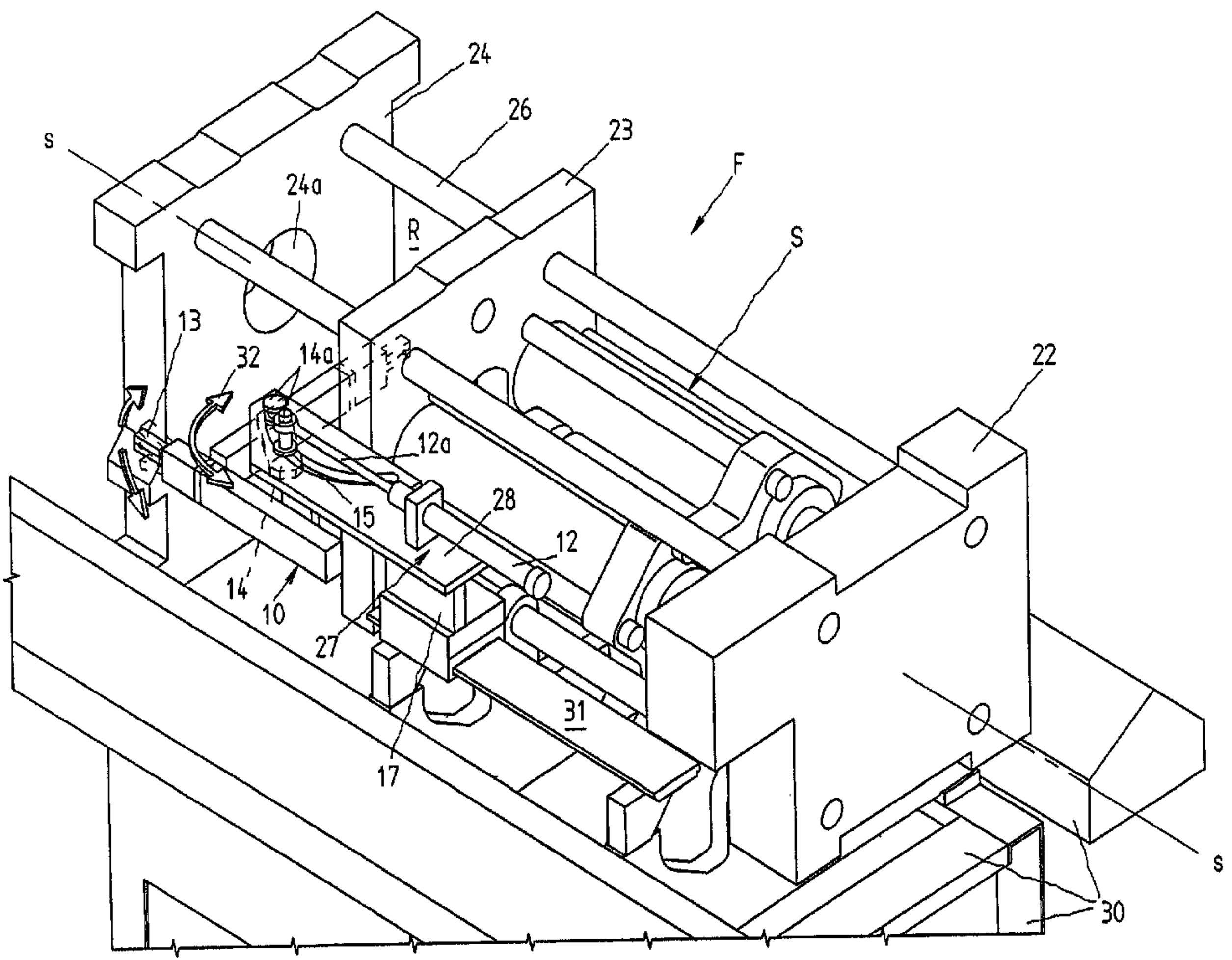


FIG. 6

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